

**Lectures on clinical surgery : delivered in the Hôtel-Dieu of Paris / by Baron Dupuytren ; collected and published by an association of physicians.**

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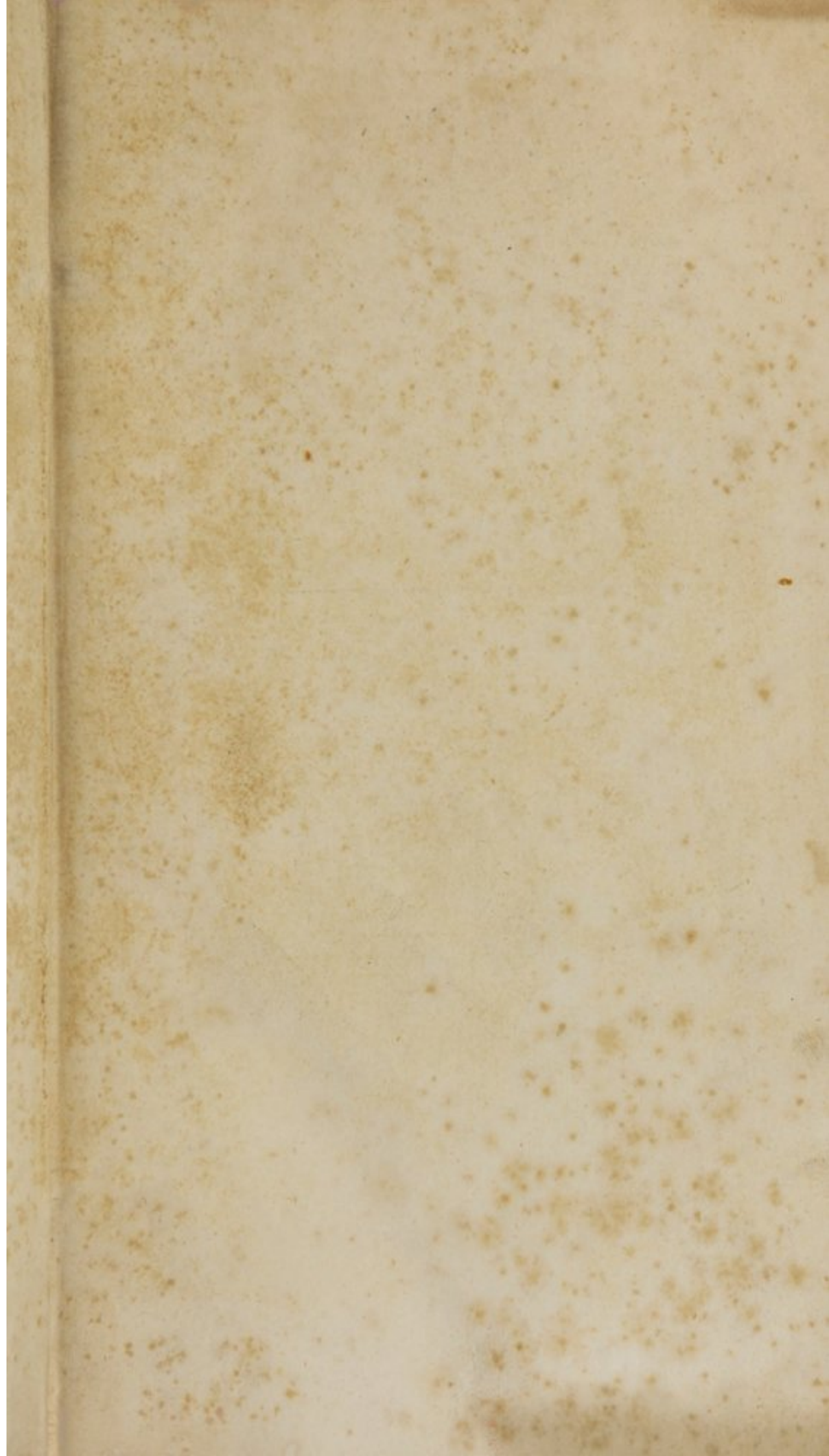
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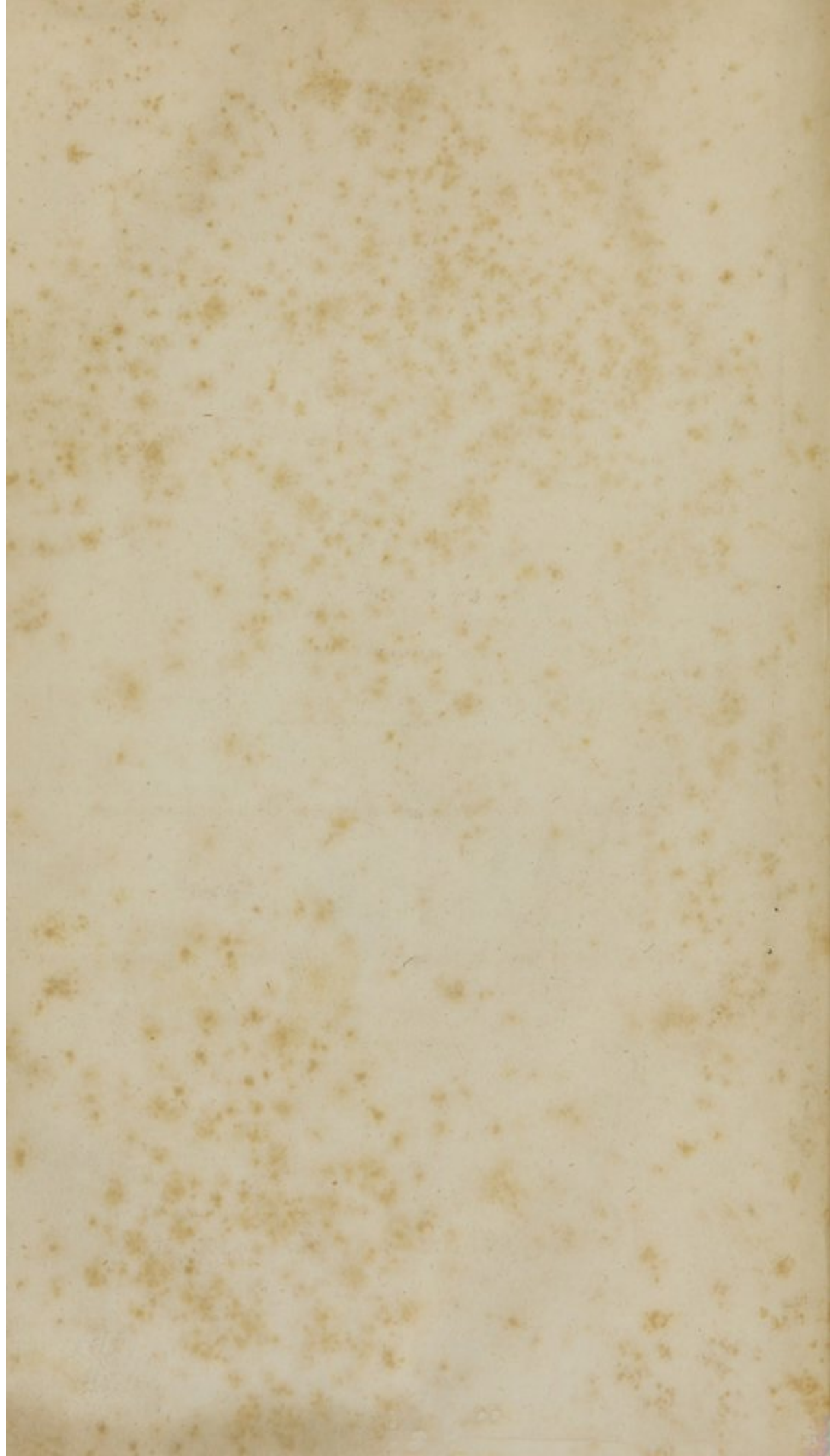
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ON  
CLINICAL SURGERY.

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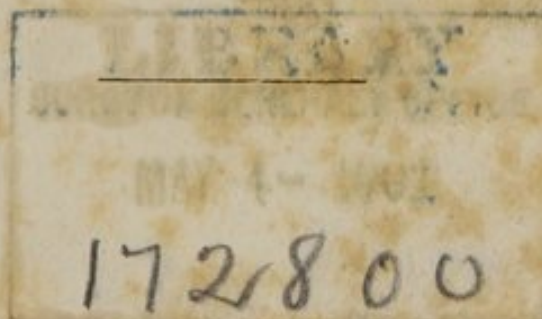
BY  
BARON DUPUYTREN,  
SURGEON IN CHIEF.

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COLLECTED AND PUBLISHED BY AN ASSOCIATION OF PHYSICIANS.

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ONE of the immense advantages of the Clinical Surgery of the Hotel-Dieu of Paris, is the great number of curious cases, either previously unknown, scarcely thought of, or badly explained, which presented themselves daily for observation. But if this theatre of human misery is rich in incidents of all kinds, the celebrated surgeon who there exhibits the resources of his genius, is justly entitled to the best part of the celebrity acquired by this establishment. An able, ingenious and inventive operator; a clear methodical and eloquent Professor: such are the qualities which recommend the instruction of M. Dupuytren to the physician and pupil. We shall esteem ourselves happy if we can give to these *Lecons* a part of the interest excited by the words of the Professor.



# LECTURES

ON

## CLINICAL SURGERY.

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### CHAPTER I.

*On the Permanent Contraction of the Fingers, in consequence of an Affection of the Aponeurosis Palmaris.*

The cause of the contraction of the fingers, and especially of the ring finger, was almost unknown until the present day. When we reflect on the multitude of causes to which it has been attributed, the quantity of remedies suggested, the numerous hypotheses advanced as to its origin, we should not be surprised that it was considered incurable. Those authors who have treated of the contraction of the fingers have done it very incompletely. M. Boyer in his Treatise on Surgery, designates it under the name of *Crispatura Tendinum*, but says merely a few words concerning it. It has been attributed successively to a rheumatic or gouty affection, to external violence, to fracture, to the metastasis of some morbid cause, as sometimes happens after an inflammation of the sheaths of the flexor tendons, or to a species of ankylosis: we shall soon see how unfounded are all these pretended causes.

The majority of individuals affected by this disease have been obliged to use violently the palm of the hand, and to handle hard bodies. Thus the wine-dealer and coachman whose cases we shall relate, were accustomed, the former to pierce barrels with a punch, or to stow away hogsheads; the latter to ply incessantly his whip on the backs of his miserable hacks. We might also cite the case of a gentleman employed in an office, who took peculiar care in sealing his letters. This is found among masons, who take hold of stones with the ends of the fingers; among gardeners, &c. We see, therefore, that this disease is mostly found amongst those whose business obliges them to make much use of the palm of the hand.

Individuals, in whom there exists a tendency to this disease, find that they can extend with less facility the fingers of the diseased hand; the annular finger soon begins to contract, commencing in the first phalanx, the others follow in succession; in proportion as the disease advances this finger contracts more and more; and now the flexion of the two adjoining fingers becomes very evident. At this period of the affection, no hardness can be

felt in front of, and around the cord presented by the palmar face of the annular finger. Its two last phalanges are straight and movable. The first is flexed at an angle more or less approaching a right angle, and movable on the metacarpus. In this situation, notwithstanding the greatest efforts, it cannot be extended. A person laboring under this deformity, with the desire of effecting a cure, suspended to his finger different weights, in all amounting to one hundred and fifty pounds, but in spite of this great weight, he could not succeed in overcoming the contraction.

When the ring finger is very much flexed, the skin presents folds whose concavity looks towards the finger, and whose convexity towards the radio-carpal articulation. These folds result from the natural adhesions of the skin to the altered parts. At first sight we should be inclined to suppose that the skin was affected, but dissection proves this not to be the case. On touching the palmar surface of the annular finger, we can feel a very tense cord, whose summit is directed towards the first phalanx; and it may be followed as far as the superior extremity of the palm of the hand. By flexing the finger it may be made to disappear almost entirely. On extending the fingers, the tendon of the palmaris longus is put in motion, which is communicated to the superior part of the aponeurosis palmaris, the continuity of these two parts explains their simultaneous action. It will be seen that this remark will demand our further attention.

To what, then, can we attribute the cause of the affection? The annular finger can no longer be extended, and the adjoining fingers but very partially. The patient can only take hold of bodies of small volume; on grasping tightly any object he experiences acute pain. When the hand is at rest, the pain ceases, and is only felt on attempting to extend the fingers too suddenly.

M. Dupuytren, having in public and private practice, seen thirty or forty cases of this nature, cites many different opinions as to the cause of the disease. Some have regarded it as a thickening and hardening of the skin, not remembering that it was drawn and folded upon itself. Because it followed the movement of the cause producing the malady; others have made it depend on a spasmodic affection of the muscles, but this explanation is purely hypothetical, for with the exception of extension, all the other motions are freely and easily performed. The majority thought that this contraction was connected with a disease of the flexor tendons; such was for a long time the opinion of Dupuytren. But it was necessary to determine the nature of the affection. Was it an inflammation, swelling, or adhesion of the cellular tissue, or a chronic disease of these parts? Dissection has answered all these questions, by showing that none of these supposed alterations existed. Some surgeons have thought it proceeded from a disease of the tendinous sheaths; others, from a peculiar arrangement of the articulating surfaces of the fingers and the lateral attaching ligaments. On examining the articulation, it will be seen that the surfaces are very extended, and united in such a manner as to affect more especially flexion, whilst the movements of extension are less easy. The lateral ligaments placed on each side of the articulation, present a remarkable disposition, they are nearer to the anterior than to the posterior plane, whence it follows that the fingers have a greater tendency to flexion than to extension. But admitting that this hypothesis was of value, it could not be applied to men in the flower of life; moreover, it falls before

facts. Lastly, some physicians think that this contraction is owing to a disease of the articular surfaces which has caused dryness, destruction, and ankylosis of the articulation.

We will waste no more time on these different theories; they have been mentioned merely as being closely connected with the history of the disease. The important point is, that some lesion exists, and it remains for us to discover its cause.

Such was the state of knowledge relative to this disease when a man laboring under this species of affection happened to die in the hospital. M. Dupuytren, who had observed him for a long time, was informed of his decease, and was fortunate enough to secure this remarkable fact for the benefit of the healing art. Having obtained the arm, he had a correct drawing taken of it, and then proceeded to dissect it. The skin having been removed from the whole of the palm of the hand and the palmar surface of the fingers, the folds and wrinkles which it before presented, entirely disappeared; it was then evident that the disease was not situated in the skin, but was communicated to it; but whence and by what means? The dissection was continued, the professor displayed the aponeurosis palmaris, and saw with astonishment that it was tense, contracted, diminished in length, and from its lower edge there proceeded two cord-like processes extending to the sides of the affected finger. In extending the fingers, M. Dupuytren saw clearly that the aponeurosis underwent a kind of tension, corrugation; this was new light to him; thus he conjectured that this aponeurosis was interested in the disease. But still the diseased point was undiscovered; he divided the processes sent to the sides of the fingers; immediately the contraction ceased, the fingers returned to one-eighth of their flexion, and the slightest effort sufficed to bring the phalanges into complete extension. The tendons were untouched; their sheaths had not been opened; what then had been changed? The removal of the skin, and the section of the extremities of the aponeurosis going to the base of the phalanges. In order to leave no doubt, M. Dupuytren displayed the tendons, they retained their ordinary size and mobility, their surfaces were smooth; he carried the examination farther; the articulations were in a normal state, the bones neither enlarged nor unequal; presenting no trace of alteration either externally or internally; no change in the induration of the articular surfaces; no alteration or ankylosis in the external ligaments; the synovial membranes, cartilages, and synovia were in a perfectly normal state. It was therefore natural to conclude, that the disease originated in the abnormal tension of the aponeurosis palmaris, and that this tension was owing to a contusion of the aponeurosis, by the too long continued action of a hard body in the palm of the hand. There now remained only an opportunity to apply this theory to new cases, which very soon presented themselves. The different opinions as to the causes of this affection have necessarily caused much uncertainty as to its mode of cure. Many surgeons have thought it beyond the resources of art. Sir Astley Cooper informed Dr. Bermati, who consulted him in the case of an Italian, named Ferrari, that he considered the disease incurable. Others, admitting the possibility of curing it, have suggested so many modes, of which immense number have proved their inefficiency. M. Dupuytren having had many patients with a contraction of the annular finger, has successively employed vapor baths, cataplasms day and night; leeches,

frictions with resolvent ointments, and especially mercurial pomatum, or with calomel; he had also recourse to alkaline, simple, sulphurous, and saponaceous cataclysm, of various temperatures, without any success. He has also used permanent extension by means of a machine made by Lacroix. The use of this machine produced no improvement; on the contrary, the acute pain felt in the hand when extension had been too long continued, caused it to be laid aside. Some surgeons had proposed the section of the flexor tendons. This operation has been twice performed. In the first case the tendon was divided in its middle; inflammation, with strangulation along the sheath ensued, the life of the patient was endangered, and the finger remained flexed. In the second case, the section was made lower down, nothing unpleasant occurred, but the finger preserved its contraction. Some time after these operations, M. Dupuytren was consulted in a similar case by Dr. Mailly; the following is the history of the case:

*Contraction of the Annular and Little Finger completely Removed by a simple Division of the Aponeurosis Palmaris.*

In 1811, M. L., wholesale wine merchant, having received a large invoice of wine from the South of France, insisted upon helping his workmen to stow them away in his cellar. In an attempt to lift one of the pipes, which are generally very heavy, by placing the left hand under the projecting extremity of the staves, he felt a slight cracking and pain in the inside of the palm of the hand. There remained for some time slight uneasiness and stiffness in the hand, but the symptoms gradually disappearing, he paid little attention to it. The accident was almost forgotten, when he perceived the ring finger beginning to contract and incline towards the palm. As no pain accompanied it, he neglected this slight deformity. Still it increased and every year became more obvious. At the beginning of 1831, the ring and little finger were entirely flexed upon the palm of the hand; the second phalanx bent upon the first, and the end of the third applied to the middle of the ulnar edge of the palmar surface. The little finger much flexed, was fixedly inclined towards the palm. The skin of the part was wrinkled and drawn towards the base of the two contracted fingers.

M. L. seeing this deformity increasing daily, and wishing to be relieved from it, consulted several physicians. All thought that the disease was situated in the flexor tendons of the affected fingers, and that the only remedy was the section of these parts. Some wished to divide both tendons at once, others only one of them. M. Mailly being consulted was of the same opinion, but advised the patient to rely entirely on the vast experience of M. Dupuytren. Scarcely had the latter seen the hand of M. L., when he declared that the affection was not seated in the tendons but in the aponeurosis palmaris, and that a few incisions in this aponeurosis would restore to the fingers their freedom of motion. The operation was agreed upon, and fixed for the 12th of June, when, assisted by Drs. Mailly and Marx, M. Dupuytren performed it in the following manner:

The hand of the patient being firmly fixed, he made a transverse incision ten lines in length, opposite to the metacarpo-phalangeal articulation of the ring finger; dividing the skin and aponeurosis palmaris with an audible crackling noise. After this step of the operation, the ring finger rose, and could

be extended almost as much as in the natural state. Wishing to spare the patient the pain of a new incision, M. Dupuytren endeavored to prolong the section of the aponeurosis, by passing the bistoury transversely and deeply beneath the skin, towards the outer edge of the hand, in order to disengage the little finger, but in vain. He could only succeed in slightly dilating the incision in the aponeurosis; he, therefore, determined on making a transverse incision opposite the articulation of the first and second phalanx of the little finger, and thus renewed its extremity from the palm of the hand; but the rest of the finger remained flexed. Then a new incision divided the skin and aponeurosis opposite the corresponding metacarpo-phalangeal articulation; it was followed by some relief, but its success was still incomplete. Lastly, an incision was made transversely, opposite to the middle of the first phalanx itself, and instantly the little finger was extended with the utmost ease; this result showing clearly that the last division had reached the point of insertion of the aponeurotic digitation. But little blood flowed from the incisions. The hand was dressed with dry lint, the fingers were kept extended, by means of an appropriate machine fastened to the back of the hand.

During the day that the operation had been performed, and the following night, there was little or no pain, but some slight uneasiness caused by the continual extension; the next morning, the hand was the seat of some swelling, resulting from the compression of the machine, which had been made by an unskillful workman. On the morning of the 14th, a machine invented by M. Lacroix was substituted, consisting of a demi-cylinder of pasteboard, terminated by metallic plates, which could be lengthened or shortened at will, and ending in a kind of thimble, which embraced the extremity of the fingers. The patient at first experienced some relief; but during the evening the irritation returned, the pain was redoubled, and the hand became much swelled. Then, without removing the machine, M. Dupuytren ordered the parts to be kept constantly wet with a cold solution of the *sacch. saturni*; under this treatment the pain and tension diminished, and he became more comfortable. The 15th, the lint was removed, suppuration was scarcely established, the hand was yet engorged, and a sensation of tension felt along the diseased fingers. Extension was still kept up, as well as the cold applications. 16th, Only a slight tension in the hand, stiffness of the fingers; suppuration was completely established. 17th, The severity of the symptoms diminished, the extension of the fingers could be increased without pain. Afterwards the swelling and tension disappeared, the wounds began to cicatrize but slowly on account of the separation of their edges, effected by the position in which the hand was purposely kept. On the 2d of July, the wounds had entirely cicatrized. The mode in which this took place should be preserved, as they observed a progression in proportion to the degree of influence exercised upon them by the extending power.

Thus there was perceived to close successively, 1st, that incision corresponding to the articulation of the first and second phalanges of the annular finger; 2d, that opposite to the middle of this first phalanx; 3d, that relating to the metacarpo-phalangeal articulation of the little finger; 4th, and lastly, the one first made, corresponding to the metacarpo-phalangeal articulation of the annular finger. The patient used the extending machine for more than a month, in order to guard against the contact of the edges of the aponeurotic

sections and to procure cicatrization alone. On taking away the machine, the patient can easily flex his fingers, and is only incommoded by the stiffness in which the state of continual extension has kept the articulations, but which will be removed, when he is allowed to use some motion. On the 2d of August, M. L. uses the machine only at night, and the joints of the hand are gradually recovering their mobility, which induces the supposition that the flexor tendons are uninjured, and that soon the fingers will have recovered their natural state.

The case we have just related leaves no doubt as to the cause of the disease, the opinion of M. Dupuytren, therefore, the only correct one, and that which truly accounts for the phenomena.

But how can the aponeurosis palmaris determine similar effects? this will be soon understood by a brief description of this fibrous envelope. The superficial aponeurosis palmaris proceeds partly from the expansion of the tendon of the palmaris brevis, and the prolongation of the anterior annular ligament of the carpus. At its origin it is very thick, as it advances it gradually grows thinner, so that near its inferior edge, it gives rise to four fibrous processes, which are directed towards the inferior extremity of the four last metacarpal bones. At this point each of them bifurcates for the passage of the flexor tendons, and each of the branches of this bifurcation is inserted into the sides of the phalanx, and not in front, as many anatomists have thought. These prolongations, which are more tense than the aponeurosis, should be divided. On dissecting the skin from the aponeurosis, we experience some difficulty in separating them, on account of the cellular tissue and the fibrous prolongations arising from the aponeurosis. These adhesions explain the wrinkling and movements of the skin. We might fear in the division of the fibrous prolongations injuring the nerves and blood-vessels, but when the aponeurosis is tense, it forms a bridge which protects them, so that we may cut without danger. The use of the aponeurosis palmaris is to keep the tendons of the flexor muscles in their place, to preserve the anterior concavity of the hand, and protect its different parts; in animals which roost, it is very well marked, and possesses great elasticity. Such are the ordinary functions of this aponeurosis; but it performs others, by which it tends constantly to restore the fingers to demiflexion, which is their state of rest, and it is the exaggeration of this function, produced by disease, which causes the contraction of the fingers.

This contraction, and especially that of the ring finger, is, therefore, now a disease whose cause is known, and the mode of treatment founded on fixed rules; hence we can easily imagine the success of the following operation, performed by M. Dupuytren, on Monday the 5th of December.

The individual was a coachman of about forty years of age. Many years since he had observed his fingers inclining towards the palm of the hand; the annular finger was especially contracted. When he came to the Hotel Dieu, there existed only one inch and a half between the end of the fingers and the hand; the skin of the palm was thrown into wrinkles, whose concavity was turned towards the fingers. On extending the phalanges there could be perceived a cord running from the finger to the palm of the hand. The disease existed in both hands. The diagnosis was easy. The patient being seated on a chair, M. Dupuytren took hold of the right hand, and desired him to

move his fingers; the tension of the aponeurosis was thereby made manifest; then with a curved bistoury he made two semi-circular incisions, one at the base of the ring finger, in order to divide the two lateral and digital prolongations of the aponeurosis; the second, an inch and a quarter below the first, in the palm of the hand, in order to make a second section of this digital prolongation, and to separate it at its base from the body of the aponeurosis palmaris. After these incisions, the ring finger regained almost its normal position; but little blood was lost. The patient being very weak, M. Dupuytren deferred until another day the operation on the left hand. The dressing was the same as in the preceding case.

The facts just enumerated prove incontestably that the contraction of the fingers in these cases, is owing to a contraction of the aponeurosis palmaris, and particularly of the processes it sends to the base of the fingers; and that this disease may be cured by the transverse section of these processes and of that part of the aponeurosis which furnishes them. But, it must be remembered, that all analogous cases do not resemble each other, that the same method is not applicable to all, that the best may be depreciated and dishonored by misapplication; such for example would be those in which we should apply the method to contractions of the fingers produced by rheumatism, gout, whitlow, &c.

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## CHAPTER II.

### *Effects of a Pistol-shot.*

Destruction of the greater part of the body of the inferior maxillary bone, the lip, and other soft parts as far as the os hyoides, causing an enormous hiatus, through which the saliva constantly flowed. Projection on the right side of a fragment of the inferior maxillary, which being lifted upwards, raised the upper lip, and assumed the appearance of a tusk. Removal of the bone as far as the mouth: formation of a lower lip, union of the edges of the wound by the twisted suture. (Case reported by M. Saubert, in the service of M. Dupuytren.)

Gun-shot wounds cannot, like fractures or luxations, be subjected to fixed rules. The course of projectiles, the injuries they produce, and the accidents they give rise to, demand on the part of the surgeon innumerable resources and sound judgment. Wounds of the head, resulting from attempts at suicide, demand especially peculiar attention. We might here cite many very curious cases, were we not forbidden to stray beyond the halls of the Hotel Dieu. The case we are about to relate is remarkable amongst those appertaining to the same subject.

Mercier, (C. A.,) about thirty-six years of age, a soldier, entered the hospital on the 23d of March, 1831, in order to be treated for a horrible deformity seated in the lower jaw. This man, who had served with distinction for fifteen years in the 6th dragoons, fell under the displeasure of his second captain, who, according to his account, neglected no opportunity of

manifesting his enmity towards him. In August 1830, numerous promotions were made in his regiment; he was designated for the post of quartermaster, and would have received it, but for the powerful interference of the captain who formally opposed his nomination. Mercier, thus seeing himself deprived suddenly and irremediably of the rank to which he had aspired for many long years, and which he thought he deserved, could not bear with such injustice, and resolved to destroy himself. With this intention, on the 31st of August, he discharged a horse-pistol loaded with two balls under his chin. It appears that the barrel of the pistol was directed obliquely forwards, for the lower jaw alone and the soft parts covering it were injured but in a most dreadful manner. The inferior maxilla was broken into fragments, extending from the canine tooth of the right side, as far as the ramus of the left; the lower lip, excepting about half an inch on the left, and the soft parts covering the chin as far as the os hyoides, disappeared in the explosion. Such a severe injury, however, gave rise to but few general phenomena; at the end of two months the wounds were cicatrized, but the cicatrices were horrible to the sight, as nothing had been done to diminish the deformity, and prevent the flow of the saliva. The deformity was afterwards increased, by the contraction of the masseter and internal pterygoid muscles, which not being counterbalanced by the antagonizing muscles, had insensibly raised the fragment belonging to the right branch of the lower maxilla, to a level with the alæ of the nose, where it projected like a tusk, lifting the upper lip. In this situation the patient came to the Hospital Dieu, determined to submit to any thing which might relieve the deformity. An enormous hiatus, of a triangular shape, existed between the lower maxilla and the os hyoides; its upper edge was formed by the upper lip, and its lateral borders converged to their point of meeting at the os hyoides; the left lateral border extending from the commissure of that side, was formed superiorly, and for the extent of about half an inch, by a fragment of the free edge of the lower lip; the right lateral border was formed entirely at the expense of the soft parts of the cheek and neck; the upper lip, at its point of junction with the right lateral edge, was raised up by the portion of the lower jaw of which we have spoken, and pushed out by the canine tooth which projected like a tusk; add to this description, a constant flow of saliva, and you can form an idea of the horrible appearance of the man. What was to be done? Was it possible to preserve the portion of the maxilla, and make it serve the purposes of mastication? In order to this, it must first be brought from its unnatural position, which could only be done by dividing the masseter and internal pterygoid muscles; and when they are divided, how is the jaw to be again elevated? This operation would be of no advantage to the patient; we must, therefore, confine ourselves to endeavoring to correct the deformity by the removal of the projecting portion of the jaw; attempt the formation of a lip; and unite the wound as far as possible.

How is the removal to be performed? By making a transverse incision on the right side of the cheek, displaying the bone, and using a chain-saw.

The lip on that side could only be made at the expense of the cheek, and the wound united by the twisted suture, after having pared away its edges.

The operation was performed on the 16th of April, in the following manner: A transverse incision of an inch and a half in length, divided the right cheek

at the junction of the upper edge of the hiatus with the right lateral edge. The maxillary bone was displayed and completely isolated. The saw was carried behind the second great molar tooth, and the bone sawed off in a few seconds. The lateral edges of the hiatus were then pared with a bistoury: the right along its whole length; the left as far as the point where there remained a portion of the lower lip, of which it was intended to make use. The wound of the cheek was then brought together by two stitches of the twisted suture; taking care whilst making this union, to draw strongly inwards the inferior fragment, which projected an inch beyond the superior, and thus assisted in the formation of a lower lip; the lateral edges were then brought together by five points of the suture. The union of this longitudinal wound was perfect, except at the junction of its inferior three-fourths with the superior fourth, at which point the tissues having acquired a fibrous texture were inextensible. The suture was aided by the application of adhesive straps and graduated compresses which brought the integuments powerfully forwards. On the fifth day, the needles were withdrawn from the wound in the face which was found perfectly united. It was thought proper to leave those in the neck a longer time; on the eighth day, upon withdrawing them the wound was found to be united above and below, and the lower lip formed; but at the point corresponding to the fibrous tissues, union by the first intention had failed, and the needle cut through the lips of the wound. However, there was still hope for union by second intention; the edges of the wound were therefore brought together by graduated compresses and adhesive plaister, applied behind the ears crossing each other on the median line. These means continued for a month, and assisted by cauterizing the wound, were entirely successful, and two months after the operation, there remained only an almost imperceptible orifice through which a little saliva percolated. Will this fistula be cured? We hope so. At all events, the patient would not be recognized; he has to regret the loss of the jaw alone, which no human skill could restore; instead of that enormous hiatus, displaying the whole of the mouth, there exists a linear cicatrix, and he possesses a new lower lip.

We have spoken in the course of this case of no constitutional phenomena, because none were developed. The patient was nourished with milk by means of a sucking-bottle.

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## CHAPTER III.

### ON CATARACT.

#### *Its different Species—Operations—Treatment.*

M. Dupuytren has lately operated at the Hotel Dieu on eleven patients affected with cataract, according to the method he generally follows, that is, by depression. These patients gave him an opportunity of developing those luminous principles which he has for many years taught concerning this disease. The improvements he has introduced into this interesting branch of

surgery, and the practical consequences he has deduced from his vast experience and numerous cases, are the motives which have induced us to present now to our readers all the doctrines (or rather an analysis of them) of this celebrated surgeon, with regard to cataract, the method of operating, and all the circumstances relating to the operation and its consequences. Such, indeed, is the plan we intend following in our account of the Clinical Surgery of the Hotel Dieu, as it seems most advantageous to the reader and student. In this manner, will constantly be presented to them, not only the remarks made by the professor in a recent lecture on a surgical case or analogous cases, but also the whole of the most important points of doctrine which he may have professed at other times, on the order or class of the disease to which these specific cases belong. By such means the reader will be presented with a complete treatise on surgery as practised by M. Dupuytren.

*Cataract*, like many other diseases, has been divided into a certain number of species. *Simple* cataract consists in an opacity of the crystalline lens. Another species, almost as common as the preceding, results from the opacity of the crystalloid membrane; it is called *membranous* cataract. The latter, according to the observation of Dupuytren, is to ordinary cataract in the proportion as 1 to  $1\frac{1}{2}$ . It is especially frequent among children, where it is congenital, and where Saunders has observed it in twenty-one out of forty cases. It is then most complete, very rarely incomplete. In adults it commonly follows blows, contusions, or punctures of the ball of the eye. It is also met with in persons of a scrofulous diathesis, and in those who have undergone the operation of extraction, without the precaution of displacing the capsule. Lastly, when incomplete, it appears under different forms. The most common is that named by Saunders, *central*, affecting the centre of the crystalloid capsule, which is sometimes congenital, but generally does not happen until after birth. It is known by a salient, opaque, and pearly point in the centre of the capsule. This point gradually decreases in opacity, and is sometimes divided into radiated filaments, as it approaches the circumference of the lens, so that this portion preserving in a degree some of its clearness, sight is not entirely destroyed. This variety of cataract is always accompanied by a convulsive movement of the eyes, which revolve on their axis, as if in order to present successively to the light the transparent parts of the membrane. The eyelids, and sometimes the whole head itself, are affected by a similar movement apparently with the same design.

After this variety of cataract, the most frequent is that called *milky*, *soft*, or *pultaceous*. In this case, the lens is at times throughout very soft; at others, this softness is only partial; often, indeed, it is entirely converted into a white, lactescent, opaque liquid. The crystalloid membrane, and the lens itself, may be encrusted with a greater or less quantity of calcarious phosphate, and acquire an osseous consistency; which is easily known by the shock produced by the contact of an instrument against this organ. In this case, the cataract is said to take place, *by ossification*. Again, according to some authors, cataract assumes the variety called *black cataract*. It is perfectly distinct from amaurosis, and manifested by sensible symptoms; sometimes reflecting many colors at once, sometimes brown or greenish, or radiated with white strips on a black ground, and always accompanied by great mobility of the iris. Many surgeons, and amongst them M. Delpech,

have denied its existence. M. Dupuytren in his extensive practice, never having seen the disease, is also far from believing it. We have frequently heard him relate the following anecdote: Pellatan and Giraud thought they had a patient laboring under this disease. They desired Dupuytren to examine him. He thought it was amaurosis. After some consultation, Pellatan and Giraud remained fixed in their opinion, and begged him (in order to be convinced) to perform the operation. He extracted it, and brought it out a lens perfectly healthy. The operation was followed by no bad symptoms, but the patient remained blind; the retina being paralyzed.

Many facts observed in the Hotel Dieu, have induced M. Dupuytren to admit a hereditary disposition to cataract. We will only relate one, taken from his public consultation which seems to establish this opinion beyond doubt. The following is a very remarkable example:

A lady came to the hospital, accompanied by a part of her family. At the age of sixty odd years the sight of this lady began to be impaired. Eighteen months after, both lenses were entirely opaque. The depression of one of them by M. Dupuytren was successful, and restored her sight, which she has since preserved, and at the age of eighty years saw very clearly. No operation had been performed on the other eye.

The daughter's sight began to weaken at the age of twenty-eight; she could no longer walk alone, but could distinguish day from night; the pupils were movable, the eyes healthy. Two years after the commencement of the disease, M. Dupuytren performed the same operation on one eye as on the mother, with equal success. Ten years after, the sight of the other eye remained unimproved. Encouraged by success, the patient wished to be rid of the remaining cataract. The journals of the day were filled with the praises of an oculist, she went to him, and he performed the operation of extraction. But as it happens in the majority of cases, this operation was not so successful as the former; acute pain, intense inflammation defeated the cure, the cornea became opaque, and the patient lost her eye; whilst the one on which Dupuytren had operated by depression remained perfectly sound.

The son of this lady, aged seventeen, had also two cataracts. The operation of depression was performed on him at the hospital with equal success.

The grandmother brought with him, another of her grandsons in whom the lenses were beginning to be opaque; and lastly, a granddaughter, who saw objects as through a cloud, a precursory symptom of opacity of the crystalline. Here were the grandmother, daughter, and three grandchildren, all affected with cataract. These cases are remarkable, both for the predisposition of this family to the affection, and the success of M. Dupuytren.

The professor has frequently operated on *congenital cataracts*, and made on the results of these operations some interesting remarks well worthy of perusal. But, said he, I must here observe, that I have never seen the prodigies spoken of by many authors, nor heard persons to whom I had restored sight, make upon the distance, form, and color of objects, those wonderful remarks whose history has been the subject of so many commentaries of metaphysicians and others. I have almost always, on the contrary, remarked, that persons blind from cataract, whether congenital or of long duration, accustomed to live with but four senses, were generally embarrassed by the new one restored to

them ; with difficulty, this could associate its actions to the others, and even have shown such slowness in using it, that I had been obliged to deprive them temporarily of one or even two of the senses, in order to force them to exercise their sight. Thus I have been obliged to close the ears of a child, who was guided by the sound or the impressions received by the hands which he carried constantly before his body, like tentacula.

Such serious difficulties sometimes arise, that M. Dupuytren has failed in restoring sight, even after having completely restored the organ of vision. Might there be, in such cases, a disease of the optic nerves at their decussation, or their origin, so that like paralyzed limbs, atrophied by long inaction, they have not been able to recover with their nutrition, their normal functions ?

There are three principal ways of destroying the cataract by turning the lens and its appendages from the axis of vision, in order to leave for the rays of sight a free passage to the bottom of the eye ; the extraction of the opaque parts by an incision into the transparent cornea ; depression or breaking up of these parts by a puncture in the sclerotica ; and lastly, keratonyxis, which is the depression of these same parts, performed from before backwards by means of a needle traversing the transparent cornea.

The professor condemned the practice inculcated by some authors, to constantly depress the cataract, or by others, to divide or break it up in all cases. He maintains that either depression or division that requires such conditions that we cannot decide *a priori* which operation is preferable. Indeed, a cataract of some density can only be displaced, not broken up, for the want of a support ; whilst a soft cataract cannot be wholly displaced, on account of its want of consistency, and should be broken up. M. Dupuytren maintained that we should be guided by circumstances, and perform depression or division accordingly.

But he prefers depression to extraction ; seldom perform the latter, and only in cases where it is manifestly indicated : as for example, when the lens or its membrane has undergone such an alteration in its nature, that its absorption is impossible. Division is only a modification of depression ; it consists in dividing the lens by plunging the needle into its centre, destroying its capsule, and scattering the fragments in the aqueous humor. According to M. Dupuytren, one-third of the cataracts which are depressed may be divided. We cannot be too well convinced how irrational it would be to employ the same method in all cases. In surgery, as in medicine, the same treatment does not always tend to the same end ; thus, in cataract, the age of the patient, certain conditions relative to the form and volume of the organ of sight and its appendages, may cause the surgeon to have recourse alternately to one or the other operation. As regards age, if we reflect on the degree of energy of the absorbent system, it will be seen that, in general, it is better to operate on children by depression, on old persons by extraction. In the former case, the functions of life are in all their energy ; the movements of composition and decomposition are executed with an astonishing rapidity ; the absorption of the lens is effected almost at the very moment when this organ losing its relations, loses its conditions of life ; besides, in youth the lens is never so consistent as in more advanced age, and, therefore, less difficult to be absorbed. In old age, on the contrary, the movements of composition and decomposition

are diminished, absorption especially seems to have lost part of its energy, exhalation predominates, and often the lens is remarkably hard, and on that account less easy to be absorbed. M. Dupuytren has found the lens wholly untouched, although displaced two years before, in old men who had perished by some other disease. But other considerations are in favor of depression in all ages; children are rarely docile; and not being able to distinguish between what is hurtful or advantageous, they will not keep their hands from their eyes, or remain perfectly tranquil during the operation. Thence arise difficulties for extraction, and causes which may produce the expulsion of the vitreous humor. In old age the eye is often deeply sunk in the orbit; the borders of the osseous cavity very projecting, or the ball of the eye small; in these cases extraction is exceedingly difficult. We meet with individuals of all ages in whom, on account of some aberration in the movements, conformation, or relations of the organ, this operation becomes very difficult; others, whose eyes are in continual and almost convulsive motion; lastly, it is a common observation, that with the loss of sight we lose the habit of looking; the movements of the globe of the eye no longer obey the will, and this circumstance increases the difficulty of extraction. Such are some of the reasons for which M. Dupuytren prefers depression; he has also made some modifications in the mechanical part of the operation. The needle he uses is neither the old spear-shaped needle nor the hook of Scarpa, but partakes of each, inasmuch as it presents a spear-shape like the former and the curvature of the latter; its blade is narrow and elongated, curved on one of its face, very sharply pointed, and sharply edged, the size of the stem exactly proportioned to that of the blade; qualities which render it equally useful in puncturing, dividing, seizing, and displacing, yielding to the hand, and moving without much effort, and without permitting the escape of the aqueous humor. For fifteen or twenty years this instrument has been adopted by a majority of practitioners, and is known by the name of its author. In cases requiring extraction, M. Dupuytren uses the knife of Richter, which he prefers to that of Lafaye, as the former acts by sawing, whilst the latter acts rather by pressure.

The operation of depression, when the cataract is simple and free from any complication, is performed after the ordinary method, and the lens, according to circumstances, is depressed in mass or divided. When the lens is depressed, and the capsule torn by the needle has been drawn out, M. Dupuytren examines carefully if this capsule is perfectly black and free. Should any fragments remain, they are carried into the anterior chamber, where absorption is more active than in the posterior. The same method is followed in the operation by division (*broiement*). If the cataract be membranous, whether the opacity of the capsule be complete or not, whether it be or be not complicated with opacity of the crystalline lens, it is treated precisely as in the preceding cases, and the operation by depression preferred. Indeed, this variety whose pathological history is so interesting, is of no importance as regards the operation. In milky cataract, partial or incomplete, depression must be accompanied by division, and the fragments being too soft to be conveniently divided, are scattered here and there into the aqueous humor by means of the instrument. But when this softening, having reached its full term, leaves in the interior of the capsule nothing but a fluid of greater or less

consistency, it necessarily flows into the interior of the eye when the capsule is divided by the needle, and then the observation of this organ conceals entirely from the operator the movements of his instrument. Under similar circumstances M. Dupuytren suspends the operation, and waits until absorption has restored the clearness of the eye, in order to recommence it. We shall say nothing about the operation for cataract with ossification; it is evident that here extraction alone can be performed. In order to perform it, the foreign body is seized by means of forceps, which dispose it in such a manner that one of its edges is presented to the opening in the pupil, according to the authors who admit the black cataract. The diagnosis in these cases is the most difficult point. When the color of the lens is only brown or spotted with many luminous reflecting points, there can be no doubt; but if it is entirely black, for example, we cannot certainly decide as to the existence of a cataract. M. Dupuytren, however, always treats such cases like those of amaurosis; and decides on the operation only when the means used have proved ineffectual. It may be easily conceded, therefore, that should the operation not succeed, the patient loses nothing, as he would have been equally blind without it.

About twenty-three years ago, M. Dupuytren was obliged by an unforeseen occurrence, to perform the operation for cataract in an unusual manner. Being unable to steady the eye of a young girl affected with accidental cataract, and penetrate the anterior and external part of the sclerotica, for the operation of depression; he determined to puncture the transparent cornea, the only part of the eye left clear by the convulsive motions of the muscles, to carry the needle as far as the lens, making it traverse the pupil; this operation succeeded perfectly. But as he had penetrated into the eye through the transparent cornea from necessity and not from choice, he did not think it a method that ought to be followed. He knew not, however, that it had been done before him in other countries, and above all, that it had been laid down as a regular operation. However, the favor it had acquired in Germany, and the advantages attributed to it, caused him to reflect on it; and he determined to perform several operations by depression or division from before backward, after having punctured the transparent cornea with a needle, or as it is called by *Keratonyxis*. After having subjected the patient to a preparatory treatment, of which we shall hereafter speak, as he also does in all operations; M. Dupuytren causes an assistant to raise the upper eye-lid, whilst he himself depresses the lower with the middle finger of the left hand, taking care to keep them well separated; directing then the point of the needle forward, and the concavity of the curve upward, he plunges it into the cornea, on a level with the lower edge of the pupil which has been previously dilated, and assists the passage of the needle by pushing it by its convexity with the index finger of the right hand, whilst he moves upwards and downwards, and from before backwards, with the other hand applied to the handle. Having traversed the cornea, the point of the needle is guided into the anterior chamber, in the pupil and as far as the lens. On reaching this point, if he wishes to depress the body in mass, he gives to the needle a rotatory motion on its axis, so as to direct the convexity of the curve upwards, and slipping its points between the upper part of the circle which bounds the pupil and the upper part of the lens, he embraces the lens with the concavity of the instru-

ment; then elevating the handle, he depresses the lens below the level of the pupil and the axis of the visual rays. Should he wish to divide the cataract, he presents alternately the point, and the cutting edge of the needle to the capsule and the lens, which he breaks in small fragments and scatters as far as possible from the axis of the visual rays. The operation is terminated by withdrawing the needle, having first given it the direction it had on entering the eye. The patient's eyes are covered with a bandage, the light carefully excluded, strict diet, and absolute rest enjoined. If unpleasant symptoms arise they are to be subdued by appropriate means. Since 1819, the professor has been engaged in very numerous observations, in order to determine the advantages or disadvantages of this operation, when compared with others. The following are his conclusions: 1st, That keratonyxis is not, in general, as easily performed as the operation through the sclerotica; 2d, that the facility with which it can be performed on both eyes with the same hand, is but a slight advantage, especially, if the operator can like himself, use indiscriminately either hand. However, M. Dupuytren thinks, that in this respect, it has an advantage over the puncturing of the opaque cornea, and that this circumstance should give it a preference over the puncturing of the sclerotica, if it did not present other inconveniences; 3d, that the situation of the hand and the needle, between the eye of the surgeon and that of the patient, does not permit him to follow with ease, the movements of the instrument, nor those communicated to the cataract, especially at the moment of depressing it, when it is necessary to raise the hand with the handle of the instrument; 4th, that the circle bounding the pupil obstructs the motions of the needle, and prevents the easy displacement of the cataract, its being plunged into the lower part of the vitreous body, and above all, the separation of the fragments of the capsule of the lens, which adhere so often to the ciliary processes; 5th, that keratonyxis neither prevents the nervous nor inflammatory accidents urged against the operation by depression, performed through the sclerotica; an important remark, since it is on account of the pretended safety of this operation that some German practitioners have given it a preference; 6th, that, moreover, according to reason and experience, this operation predisposes more to iritis than the ordinary method, since, indeed, the iris is much more fatigued than in the other manner of operating; 7th, that keratonyxis is sometimes followed by an opaque cicatrix, constituting either a deformity, or both a deformity and an obstacle to vision; 8th, lastly, that the results of the operation for cataract performed by this method, do not sensibly differ from those of the operation by puncturing the sclerotica. Of twenty-one operations of this nature performed by M. Dupuytren, on individuals of different sexes and constitutions, presenting cataracts with various complications, and such as are generally found in patients taken at random eleven were immediately and permanently successful; six were successful at the expiration of a month; two were followed by nervous accidents; five had slight ophthalmia; two were followed by inflammation of the iris; one by inflammation and atrophy of the ball of the eye; in five the fragments of the crystalline membrane remained adherent to the circumference of the pupil; on four, a second and even a third operation was performed; one lost his eye from inflammation; one lost his sight from the formation of an opaque cicatrix

before the pupil; two were attacked with amaurosis, independent of the operation and its consequences, and which thus prevented the cure.

It is true, on the one hand, that the nervous symptoms yielded after some days, to the use of antispasmodics and derivatives; and on the other, the ophthalmia was cured in ten or twelve days, by the antiphlogistic treatment; of the two cases of iritis, one yielded to these last means combined with derivatives and purgatives, and to the use of the belladonna, whilst the other was cured by an operation to detach the membranous pellicle, which almost always forms in similar cases behind the iris, and to which the edge of the contracted pupil seems to adhere.

In fine, of twenty cases, seventeen have recovered their sight, that is 17-21 of the whole. This result does not essentially differ from that obtained by M. Dupuytren, in the operation by puncture of the sclerotica. Nevertheless, he does not thence infer that we should abandon the keratonyxis; but, on the contrary, that it should be considered as a new resource, preferable in certain cases to the ordinary method by depression. It is true the number of these cases is limited, and up to the present time, the only considerations worthy of giving it a preference, are the projection of the orbit, the narrowness of the opening of the eye-lids, the small size and depth of the eye-ball, its excessive mobility, and the convulsive motions by which it is agitated in some patients, especially in children affected with congenital cataract, and in those laboring under cataract of the centre of the crystalline membrane. Under these circumstances keratonyxis should be preferred, not only to depression by a puncture of the sclerotica, but also for a still stronger reason to the operation by retraction.

It now remains for us to detail briefly, the general principles followed by M. Dupuytren, both before and after any operation he may perform. Before it, the professor attaches great importance to the careful study of the atmospheric phenomena, the temperature, and prevalent medical constitution. Every one knows that at certain periods ophthalmia is very prevalent, and at such times the operation would most probably be followed by severe inflammation. He pays, moreover, strict attention to the examination of the general state of the patient, and the nature of any affections accompanying the cataract. The affections, which often contra indicate or delay the operation, are—an old or a recent rheumatism, a pulmonary catarrh, disease of the stomach, intestines, &c., constipation, hæmorrhoids, cutaneous eruptions; the different central affections, may, directly or indirectly, aggravate the eye when irritated by an operation. If a rheumatic affection should exist, the operation may determine an attack of it to the head; the eye and its vicinity become painful, and often a severe ophthalmia follows. Explain this as you will, it matters but little, it is always most prudent not to operate in such cases. We should first subdue the rheumatism, and should we decide on the operation during the existence of some vague pains, we should first apply a blister on some remote part of the head. If a pulmonary catarrh exists, besides the inconvenience of the afflux of blood to the head by the effects of the cough, we should have to fear in the operation by depression, the ascension of the cataract, in consequence of the shock communicated to the head by the effects of coughing. Should an affection of the stomach be present, we should

have to dread not only the same mechanical accidents as in the cough, here produced by vomiting, but also all the complications necessarily resulting from the sympathy between the stomach and eyes, as we know that many affections of the latter depend immediately on disease of the *primæ viæ*. Moreover, if we operate during a disease of the stomach, although it be slight, we must keep the patient longer on diet, which is very difficult in the case of children and old persons, and in the latter sometimes dangerous. Diarrhea obliges the patient to rise frequently, thence arise displacements of the cataract. Constipation may occasion many of the inconveniences of cough and sympathetic effects resulting from irritation. The existence of bleeding piles contra indicates the operation, and although we may operate when the bleeding has ceased, we must guard against the cerebral congestion, and subdue the slightest symptoms of it by leeches to the anus. In cutaneous diseases, a metastasis of irritation is to be feared, which might give rise to some troublesome affection of the eye. It is only after having overcome all the complications of the cataract, which we have by no means enumerated, that M. Dupuytren decides on the operation. When no such circumstances obtain, the patient before undergoing the operation, is subjected invariably to preparatory measures, as important perhaps as the skill of the surgeon. They consist in baths, emollient enemata, drinks of the same nature, general or local bleeding, according to circumstances and the strength of the patient; from time to time a dose of castor oil, and lastly, if the eye is very movable, and excited easily by the approach of an instrument, it is accustomed to it beforehand, by simulating the operation, and exposing frequently to its sight the motions which it is afterwards to undergo. More particularly, previous to the operation of keratonyxis, M. Dupuytren drops between the eye-lids, a little of the solution of the extract of belladonna, or cherry-laurel water, in order to secure a dilation of the pupil.

After these measures the operation is performed, and that of depression generally preferred by the professor. The patient is laid in his bed, in the horizontal position, the head elevated; this position less favorable for retraction, in depression has the advantage of keeping the eye and the patient himself perfectly immovable; besides there is less danger of the ascension of the lens from the restlessness of the patient. Contrary to the opinion of many surgeons, M. Dupuytren prefers the horizontal position.

*Syncope* is a disagreeable occurrence which may happen when the patient is seated on a chair. This event, during so delicate an operation as that for cataract, is very embarrassing to the surgeon. Last year, (1830) M. Thusson desired M. Dupuytren to visit a patient who had undergone this operation some time since, and one of whose eyes was diseased.

In this case extraction had been performed on one eye only. The patient was placed on a chair, and the surgeon scarcely completed the section of the cornea, when he fell into a syncope, and the operation was left unfinished. The lens remained in its place; the wound healed, and some months after, the operation was performed in the same manner upon the other eye. He was placed as before, on a chair, he again fainted, and only after much time and difficulty the operation was terminated. This accident would probably not have happened, or been of shorter duration, had the patient been placed in bed. (Note by Doctor Paillard.)

After the operation, the patient's eyes were covered with a bandage, the light carefully excluded from his room, and he is confined to strict diet and rest. The duration of dieting is regulated by age, and other circumstances. If he be of a strong constitution, or evince any symptoms of cerebral congestion, the professor orders him to be bled, which is to be repeated whenever he has pain in the head or eyes; at the same time he administers to him an anodyne draught, pediluvia, and enemata. Should vomiting ensue, which is almost always the case in children, he prescribes an anodyne potion, composed of lettuce water (*lactuca virosc.*), orange flower water, and the syrup of poppy head (*diacodium*); should the vomiting still continue, seltzer water, or the draught of Riverus.

In case of restlessness and nervous symptoms, enemata, with a few drops of laudanum produce a happy effect. In short, general venesection, leeches, principally to the anus or inferior extremities, pediluvia, antispasmodics, diluents, purgatives, internal revulsives, blisters, setons, to the nape of the neck, are the principal remedies used by M. Dupuytren, and on which he relies more or less according to the nature of the symptoms.

Contrary to the practice of many celebrated surgeons, when the patient is affected with cataract in both eyes, M. Dupuytren operates at first, only on one, and waits before performing the operation on the other, until the fate of the first shall have been decided. Experience has pointed out to him the advantage of this method, which reason and a knowledge of the laws of physiology both justify. Indeed two simultaneous operations are more severe for the patient than a single one, and the consequent inflammation, seated at once in two important organs, will produce effects more serious and less easy to subdue. But the circumstance particularly worthy of notice is, that this inflammation seldom occurs in both eyes with equal force; it generally happens, that it is violent in one of them, and produces, rapidly complete disorganization, whilst the other is but slightly attacked. This is generally the case in inflammation of symmetrical organs.

Let us now turn our attention to the treatment of the different complications of cataract, which increase more or less the difficulties of the operation. One of the principal and most common is the contraction of the pupil: the pupillar aperture is sometimes so small, as not to allow the passage of the needle. This contraction depending on no organic cause, and which on that account, might be termed inorganic, is often found in individuals of a scrofulous habit; it is owing to an inflammation of the retina, known by the thickening and redness of the latter. This disease attacked in time, yields to antiphlogistics, and a few drops of the aqueous solution of the ext. of belladonna. Another complication is the adhesion of the capsule to the posterior surface of the iris, of the lens to its surrounding membrane, or of the iris to the ciliary circle, lastly, the displacement of the lens, &c.

In general, says M. Dupuytren, almost all the diseases affecting the crystalline membrane, the iris, pupil, ciliary circle or other parts of the eyes, implicated in cataract, are the result of inflammation of the iris, which is very common, and often injurious to vision. If we examine the adhesions between the capsule and the iris, we will see clearly that the vessels developed *ad infinitum* proceed principally from the latter, and every one knows, that in the formation of adhesions by which two surfaces are united, the greater number

of vessels proceed from that which is more active, that is the more inflamed. In these cases, therefore, very probably, the capsule has been secondarily affected. Again, when we reflect that 3-10 of membranous cataracts are owing to contusions, or external violence to the ball of the eye, or to a scrofulous affection displayed in this organ, this opinion appears more correct. Lastly, if we observe attentively the anatomical structure of the eye, and especially the disposition of the vessels distributed on its different parts; if we observe that the plexus of vessels is situated, not without, but within the conjunctiva; that the anastomoses of these little vessels are very numerous, and forming a kind of belt at the junction of the sclerotica with the transparent cornea, disappear at this point, as they penetrate the sclerotica to be spent upon the iris, we will understand how an ophthalmia, even arising in the conjunctiva, may be extended to the iris, and cause the effects of which we have spoken. What holds true as regards the alterations of the capsule, is not less so in other morbid lesions of the eye. A slight inflammation of the iris may produce two remarkable phenomena; the contraction of the pupil, and the deposition of a small quantity of lymph on its anterior part, filling the space which separates it from the crystalloid membrane; this quantity may increase so that the lymph effused, may traverse the pupil, and be suspended at the bottom of the anterior chamber. If nothing oppose the progress of the disease, the same thing happens as in all similar cases of effusion, that is, on the one hand, a false membrane is formed, and on the other, it forms adhesions between the different tissues; or the pupil is, rarely, entirely obliterated; or the iris adheres to the capsule of the lens.

But we should understand what we mean when speaking of iritis, and of contraction of the pupil. It often happens that a sympathetic state depending on inflammation of the retina is taken for an idiopathic inflammation of the iris. This inflammation is much more frequent than is generally supposed. Scarcely a week passes without our seeing a case of it. It is especially common in scrofulous children. When these last are brought into the house, the nature of the disease may be known, as far as they can be seen; they walk unsteadily, with their hands to their eyes to protect them from the light, and on stopping before a window they suddenly turn round, move the head to the opposite side, and cover their eyes; tell them to remove them, they keep them still more closely applied; they resist any attempt at removing them; separate the eyelids, they oppose it with violence, and when you succeed in so doing they scream violently; keep the eye turned convulsively upwards, and the transparent cornea hidden under the upper eyelid; they have a perfect horror of light. Now whence comes this hemeraphobia? Why does the least ray of light produce so painful an impression? Most certainly we cannot seek for the cause in a lesion of the tissues of the eyes which are completely deprived of sensibility. Is it an inflammation of the iris? But this inflammation often exists to a great degree without giving rise to this phenomenon. It must, therefore, consist in a phlegmasia of the retina, that nervous expansion endowed with an exquisite sensibility, and whose office it is to receive and transmit the impressions of light. The irritation of this organ reacts upon the iris, and produces that contraction of the pupil so often taken for a characteristic sign of iritis. We see, therefore, that the difference between the two cases, is, that in one, the pupillar contraction is the consecutive effect of an

inflammation of the retina ; and in the other, the immediate effect of an idiopathic affection of the iris. Their distinguishing mark is the horror of light, of which we have just spoken.

Another complication of cataract, of which it remains to treat, and which renders the operation completely abortive, is paralysis of the retina. It is highly important to be assured of this, in order to prevent an useless operation, and to save the patient from the accidents which may follow. In the absence of all other signs (as the adhesion of the capsule to the posterior surface of the iris) to which we can attribute the immobility of the pupil, this last is, perhaps, the least equivocal. But in some individuals, certain peculiarities exist, which establish, if not absolute certainty, at least a very strong presumption of, the existence of this paralysis. A young man, now in the Hotel Dieu, labors under accidental membranous cataract, that is, one produced by accident, a blow on the eye. The capsule of the lens is not wholly changed ; many points in its surface and the lens are perfectly transparent ; yet his sight is lost, he cannot distinguish day from night. An old woman, on whom M. Dupuytren operated on the 16th December ultimo, presented the contrary peculiarity. Although the lens was perfectly opaque, her sight still existed faintly, she could discern light from darkness. Whence arises this singular difference ? In the young man what prevents all perception of light ? Every one would suppose it was a simple cataract ; yet we have strong reasons for believing that it is owing to paralysis of the retina. We can then have but little hope of restoring sight. However, the patient insists upon the operation, even though it should be unsuccessful ; he wishes to be rid of the deformity. I have often seen, said the professor, persons in similar circumstances, especially females, desiring an analogous operation, without any hope of the restoration of sight, but in order to be freed from this blemish to the face.

However skillfully the operation by depression may be performed, it frequently happens, and this is one of the greatest objections to this method, that the lens ascends, and getting behind the pupil prevents the light from reaching the retina. An effort of coughing, an inconsiderate movement on the part of the patient, a thousand other causes may produce this effect.

If the cataract has been depressed in mass, two methods may then be followed. We may leave it and wait for its absorption ; but this generally takes so long a time, that it is generally better to depress it anew, which should be done as in the first operation.

In some cases the cataract has so great a tendency to ascend, that M. Dupuytren has been obliged to depress it as often as four times in a month ; but he has observed that the operation diminishes in danger in proportion as it is repeated on the same individual.

Under these circumstances, the lens is generally found softened and downy on its surface ; a proof that the absorbents had begun to act upon it.

We have also seen the lens which as first depressed in mass, after a time ascend, not wholly but partly ; the remainder having either been absorbed, or spontaneously detached, remaining plunged in the vitreous humor.

The cataract may also reappear behind the pupil, even when the depression has been effected with division ; in this case it is formed by the reunion of the portions of the divided cataract, which ascend, mingle, and collect behind the pupil. The absorption of this species of cataract, which might be called

*cataract by agglomeration*, is generally more easy and rapid than that of an entire cataract. We see, then, after some time, according to the age and state of the absorbent forces of the patient, some transparent spots appear, and extend until the pupil becomes completely clear. The sight of the patient is restored, increased, and strengthened in the same proportion, and as they daily improve, they daily make discoveries which give them as much pleasure as the attack of the disease had caused sorrow. Sometimes, however, fragments of the cataract obstinately remain, and impair sight more or less. We must then remove and turn them out of the axis of the visual rays.

The crystalline lens, continued M. Dupuytren, has its functions which are well known; if it is retracted, depressed, or destroyed, vision is no longer natural. Some near-sighted persons obtain, by the removal of the lens, an ordinary degree of sight; but far-sighted individuals see with more difficulty than before the formation of the cataract. The latter need an artificial lens, placed before the eye. The patient should not be permitted to use glasses until a long time after the operation, otherwise the intensity of the impressions they cause, would inflame the eye, and he would lose its benefit.

The lens is held firmly in its place in the capsule during health; but when it has lost its transparency, it appears to become more susceptible of displacement. Sometimes it is displaced entire, and passes into one of the two chambers, most frequently into the posterior; sometimes, remaining partly fixed, it is detached for a greater or less extent, and, floating by one of its edges, completely obstructs the pupillar opening. Thus it happens in similar displacements in patients affected with cataract, that they have suddenly recovered sight, after a quick movement or a blow upon the head or eye. Sometimes it plunges into the vitreous humor during the attempt at extraction, or it passes into the anterior chamber during depression. Lastly, some cases prove the power certain individuals possess of transferring, as it were, the diseased lens from one chamber of the eye to the other. The most remarkable of these, related by the professor, is certainly that mentioned by M. Demours, in his *Treatise on Diseases of the Eye*, which is here detailed: "I have sometimes seen," says M. Demours, "the opaque lens pass through the pupil into the anterior chamber, and thence return to its place. Some patients can communicate to it this alternating displacement.

Drs. Tillard and Busnel were at my house on the 3d of July, 1819, when M. Gastel, affected with cataract, in their presence, made the opaque lens pass into the anterior chamber, and repass behind the iris. The disease in the right eye began six years since, the lens has gradually descended behind the iris, about the period of puberty, (his age is now about thirty-one.) It was invisible at the age of eighteen, and plunged into the disorganized vitreous humor. At nineteen, during an active military life, it passed in front of the iris. The continual pain which he suffered, procured his discharge. I had intended to extract it; but the patient fearing the operation, I advised him to drop into his eye, the aqueous solution of the extract of belladonna, to dilate the pupil, and facilitate the return of the opaque lens behind the iris; to favor this passage, by laying for twenty-four hours on his back, and during this time, now and then, to depress the top of the head; lastly, to drop into the eye, as soon as the lens was no longer visible, some vinegar, in order to create an artificial inflammation, which would arrest the dilatation of the pupil, and

even render its diameter smaller than before the use of the belladonna; a treatment which I have sometimes found successful. He followed my advice with the result I had expected.

M. Gastel remained eight and a half years free from this singular affection, which recurred two years ago, as often as three or four times a month. If he inadvertently stoops forward, the lens passes in front of the iris; he then suffers, and can do nothing until laying on the floor, with the chin elevated and the head depressed, he restores it by strong friction on the ball of the eye, by means of the upper lid. I shall probably some day extract it."

It will be seen, said M. Dupuytren, that all these pathological varieties require certain modifications in the operation or the treatment, according to their causes and nature. If the contraction of the pupil is produced by an acute inflammation, antiphlogistics, leeches to the angle of the eye, cups to the temples, and above all, venesection in the foot will dissipate it; but if the affection has become chronic, if no sign of inflammation exist, these means will be of no use; then, we use with advantage frictions of belladonna, and especially cherry-laurel water, in order to sufficiently dilate the pupil, and render the operation easy.

Observation has taught me that cataracts accompanied by considerable contraction of the pupil, are often complicated with adhesion of the crystalloid capsule to the posterior face of the iris. In this species of adhesion, if we see the case when the effused lymph has merely begun to condense, and caused a simple agglutination easily separated, the belladonna may still be very useful; for the iris extending suddenly by the action of the remedy, thus destroys a large part of this recent adhesion, and but little remains for the operator. But if these adhesions become organized, it is necessary to carry the couching needle between the two membranes, and destroy their union before depressing the lens. The adhesion of the iris to the ciliary circle presents many varieties in different persons; in some, it is so extensive and intimate that they are with difficulty separated, when we wish to produce an artificial pupil; in others, the iris will tear before separating; lastly, in some, it is detached without the least effort.

In displacements of the lens, whether opaque or not, M. Dupuytren lays down as a general rule, that whatever situation it may occupy, so long as no inflammation is evinced, we should not meddle with it; but operate as soon as the least inflammatory symptom is manifest. Indeed, we gain nothing by extraction if it is not opaque, and in the contrary case, nature takes upon herself to depress it. When the lens is plunged into the vitreous humor there is nothing to do but to leave it there, as a similar result would be obtained in the operation of depression, and the lens is subjected to the action of the absorbents. When it is in the anterior chamber of the eye the operation is easy. In the majority of cases a small incision is made in the cornea, and the foreign body falls out spontaneously, or is extracted with a needle. Such is the general plan of practitioners.

M. Dupuytren first deviated from the beaten route in a similar operation in 1819, in an unusual manner, and till then unexampled. A soldier, thirty-four years of age, admitted into the hospital on the 2d of November, had the anterior chamber of the left eye completely filled by a round body, of a pearly white color, formed by the opaque crystalline lens, which had spontaneously

passed the pupil at the instant it appears, that the man had suddenly bent forwards his head. The eye was red, inflamed, painful, and weeping, the cephalalgia intense. These symptoms yielded to general bleeding and purgatives, and two days after, M. Dupuytren performed the operation in the manner we are about to describe.

The patient being in bed, his head raised by pillows, the needle was introduced at about two lines from the union of the transparent cornea with the opaque cornea; the operator made it traverse the posterior chamber, penetrated the anterior, seized the lens, made it repass into the posterior chamber, at the bottom of which he held it for some time, and then withdrew the needle. The patient could see the hand that had restored his sight, and the persons who assisted at the operations. The result was happy. The man left the hospital in six days, with a perfectly clear pupil, seeing very distinctly, and free from pain. In this case, the operator traversed with the needle the sclerotica, the posterior chamber, returned to the anterior, seized the lens, brought it into the posterior chamber, and then depressed it in the vitreous humor. We will give the opinion of the professor on this operation, hitherto unknown and adapted to a particular case, when an opportunity is offered to him to enlarge upon the subject.

We have now given the principal notions of M. Dupuytren on cataract. In the following pages we shall detail cases which tend to corroborate the correctness of these general principles.

## CHAPTER IV.

### ON ENGORGEMENT\* OF THE TESTICLES.

*Inflammatory, Scrofulous and Venereal Engorgements.*—The skill of the surgeon does not alone consist in separating parts condemned by nature, but also in preserving those which the ignorant practioner would not hesitate to amputate. How many wretches return from the field of battle, more maltreated by the surgeon than by the enemy! We might mention many hospitals, where a host of victims have been sacrificed to this mania of operating. How many surgeons, for instance, amputate a limb affected with a white swelling, without inquiring, if the lungs be the seat of tubercles or other lesions! This desire of operating has never been more strikingly manifested than in engorgements of the testicles. We cannot, however, avoid seeing, that sorrow, chagrin, and melancholy, almost always end the days of the victims of this cruel mutilation. This deplorable result did not escape M. Dupuytren, and thus, for many years, he has succeeded in preventing the operation in a great number of cases, by attacking the origin of the disease.

About one hundred individuals are yearly admitted into the Hotel-Dieu attacked with this malady; the greater part of whom, leave it cured without an operation. A large number of patients are at present in the ward of St. Martha.

\* The original term is here retained, as it has become entirely anglicised, and conveys more correctly the meaning of the author, than any word in our language.—TRANS.

In some the engorgement is seated in the epididymis; in others in the body of the testicle itself; and lastly, in some in both the epididymis and testicle. In these different cases, the disease has resulted three times from a blenorragia, twice it has occurred without any previous discharge.

About two months ago, one of these patients, forty years of age, was admitted for a tumor occupying the right testicle. The organ was six times its natural size. On touching it, a hardness was perceived such as does not exist in hydrocele; whilst its surface presented, wrinkles, and inequalities which are almost characteristic of schirrus. The weight was considerable, on questioning the man as to its origin, he attributed it to cold. In the greater number of cases, said M. Dupuytren, I have observed that engorgement of the testicles proceeds from external violence, an old venereal disease, a scrofulous diathesis, or some internal affection; therefore I never operate without using for a month or six weeks the treatment I think appropriate to the disease.

The first account given by the patient, made M. Dupuytren conclude that the engorgement arose from external violence, and that the antiphlogistic treatment would cure the disease. The man showed no signs of scrofula; therefore he advised the application of leeches to the tumor, emollient poultices, a bath, and extreme moderation in his regimen. He returned to the hospital without having received any benefit; and could not be persuaded to try the same remedies a second time.

He was again admitted a month ago (11th of November). A half extorted confession gave rise to a suspicion of an old venereal taint: therefore the professor prescribed the anti-venereal treatment which he has successfully pursued for many years. He was placed on the use of the decoction of sarsaparilla, the smilax china, and guaiacum, with the addition of four or five ounces of sudorific syrup; three times a day took the following pill:

Deuto-chloride of mercury	-	-	-	1-8 to 1-2 gr.
Opium gum	-	-	-	1-2 gr.
Extract of guaiacum	-	-	-	2 gr.

Experience having taught M. Dupuytren that fractional doses act more efficaciously than stronger ones, he gives every day three pills containing 1-8 or 1-6 of a grain of corrosive sublimate, so that the patient attains gradually its entire dose, one half of a grain.

Almost always in one or two months the symptoms disappear under this treatment; but in this case it was of no advantage whatever.

The size of the testicle had, on the contrary, increased; it was heavy and corrugated. The man experienced lancinating pains, extending along the cord to the loins. In this situation, M. Dupuytren thought it dangerous to delay longer the operation. I think I am not mistaken, added the professor, in announcing that there is a layer of effused fluid in the tunica vaginalis, but this symptomatic hydrocele is not the disease; the principal affection is the engorgement of the testicle, in consequence of the alteration of its substance proper. It is probable that this degeneration is not much advanced; for, if we can believe the patient, the engorgement has only existed three months. Had it existed a year, I should not hesitate in saying that we should find the testicle softened, greyish, presenting, in a word, the character of cerebriiform cancer.

How shall we remove the organ? the answer is easy; by a method as rapid, and certain as possible. We will make an incision, commencing at the inguinal ring, and extending to the inferior and posterior part of the testicle. Let us explain this incision. The testicle not only is affected in schirrous engorgement, the disease often implicates a portion of the spermatic vessels; we, therefore, extend the incision to the inguinal ring, in order to follow these vessels; it extends the whole length of the organ, in order to free it entirely from its coverings; for if the opening were only two or three inches in extent, the testicle could not be easily drawn out, and the dissection would be extremely painful. The intention of the posterior continuation of the incision may be also easily understood; if this were not made, the scrotum when brought together would form a sac in which pus might accumulate.

After the incision, the vessels should first be tied, as contraction, and the impression of air, might cause them to retract, and we should have to dread hemorrhage. After this step in the operation, we seize the testicle, draw it out, an assistant holds the scrotum, the cord is dissected; if any vessels are divided, they are to be secured, because the flow of blood might cause infiltration, inflammation, or abscesses, and we should at last be obliged to have recourse to the ligature. All the cellular tissue enveloping the testicle, cord, membranes, and cremaster muscle, should be carefully removed. If the cord be healthy, it must be divided above the testicle; if diseased, beyond the affected part.

Different methods are used for the extirpation of the testicles of animals. Some twist the spermatic cord and drag out the gland; some distend it and tear it out without twisting the cord. It will be easily seen how painful this operation is, by the position of the animal, and the care with which they contract the length of the abdomen. The extraction is indeed followed by no hemorrhage, but this advantage does not appear to us to counter-balance the severe accidents to which it might expose man. In Normandy, the testicles of horses are removed by compressing them between two short sticks (clamps), gangrene causing the separation of the parts. This dangerous method kills many horses.

In man the removal of the testicle is effected in two ways. A simple incision might occasion hemorrhage; besides the parts have not so much retractile force as in animals. We are, therefore, obliged to embrace the cord in a general ligature. This comprises the vas deferens, the cremaster, and the vessels. It must also include the nerves of the testicles, spermatic vessels and cord. But this method is very painful, and it is better to use partial ligatures. If the section of the cord be effected before the ligature is applied, this is a difficult matter. We should be careful not to divide the cord too near to the inguinal ring, for fear of internal hemorrhage. In order to prevent the retraction of the cord, the ligature is generally used, but this is painful, and it is more simple to hold the cord by means of a *tenaculum*. It is then divided below this instrument. The surface is then wiped free from blood, and the ligatures applied. If the operation has been short, and the ligatures well applied, the wound may be healed by the first intention. But the tissues of the scrotum enjoying retractibility and extensibility, the lips of the wound separate, shrink inwardly, and the skin alone remains in contact. This disposition is a great obstacle to cicatrization; therefore, M. Dupuy-

tren generally makes use of two or three stitches. This dressing has the advantage of hastening the cure and preventing hemorrhage.

Extirpations of the testicle are very rare in the Hotel-Dieu of Paris, whilst they are common in other hospitals; we have above given the reasons. We will add that the treatment in the Hotel-Dieu, does not prevent the operation; whence results the important precept, not to extirpate a testicle reputed cancerous, without being well assured that the disease does not depend on an external cause, a scrofulous or syphilitic affection, or an internal disease. Without this indispensable precaution, we might, after a time, find the other testicle also engorged. The following is a striking case of this:

M . . . . , forty years of age, a gardener, has had for two years an engorgement of the left testicle. This man, formerly a soldier, has had venereal. However, its size, hardness, and lancinating pains, left no doubt as to the nature of the engorgement; it was thought scirrhus; its proposed removal acceded to by the patient, and performed by Dr. C . . . . The cord, and inguinal gland, were healthy; the wound rapidly healed; but, after the expiration of a month, the right testicle began to swell. Was this a relapse? Was it proper to remove also this organ? Was there no fear of the disease extending into the abdomen? The case was very embarrassing. M. Dupuytren was then consulted. His experience, and habit of carefully questioning the patient, and subjecting him to a treatment conformable to the supposed cause of the engorgement, induced him to prescribe anti-venereal remedies. Scarcely had a month elapsed, when the engorgement diminished, and soon completely disappeared.

The following is a different case, and proves how careful the surgeon should be in his diagnosis.

In 1827 a man was admitted into the Hotel-Dieu, with a considerable engorgement of the left testicle. Lancinating pains existed in the tumor, and extended along the cord to the groin and loins; the patient much emaciated. No symptom indicated hydrocele, or a scrofulous or venereal engorgement; but on the contrary, scirrhus. M. Dupuytren observed, that if the hydrocele was complicated with a cartilaginous thickening of the tunica vaginalis, that a mistake might be made, as had often been the case. To prevent a similar error, added the professor, we will make a longitudinal incision into the skin, and having exposed the testicle, make a puncture through the tunica vaginalis, towards the centre of the tumor; if no fluid flows, or a little decomposed and fetid blood, we will seize the cord, tie it, divide it, and proceed to secure the separate vessels. We shall thus avoid reproach. If, notwithstanding appearances, water alone fills the sac, we shall act accordingly. The operation proved the correctness of the views of this sound practitioner, for in place of scirrhus, there was found a hydrocele with a cartilaginous thickening of the tunica vaginalis testis.

In inflammatory engorgements sometimes the body of the gland, sometimes the epididymis, is the seat of the disease, sometimes both; in the former case, the swelling is more pronounced, and more easily discussed; that of the epididymis is less voluminous, harder, more difficult of cure. The anatomical structure of the parts explains the difference. The testicle is indeed an organ formed of a soft, pulposus, parenchymatous tissue, one in which consequently, fluids are quickly formed and dispelled. The epididymis on the

contrary, much more complicated in its structure, and presenting internally a mucous surface, perhaps also a muscular membrane, and externally a fibro-cellular tissue; engorgements are formed in it more slowly, and are more difficult to dispel. In patients affected with this latter disease, the anterior part is soft and supple, proving the testicle to be sound; but posteriorly, we find a hard, unequal body, evidently belonging to the epididymis. Leeches, baths, emollient poultices, generally cure inflammatory engorgement of the testicle; whilst they are of much less use in swelling of the epididymis.

M. Dupuytren recommends at first the antiphlogistic treatment; if this be unsuccessful, he substitutes discutients, and then revulsives. Such are the three fundamental bases of his therapeutics in similar cases. Thus, in the acute stage, the antiphlogistic method, will mostly dispel the disease. One, two, or three bleedings, according to the strength of the patient; twelve, fifteen, or twenty leeches, repeated several times; baths, emollients, and severe diet, will effect a cure. These means are so powerful, that an engorgement will disappear sometimes in eight or ten days. If the engorgement has been first seen in the chronic stage, or, if from the acute, it has passed into the chronic form, we must begin by the use of emollients; afterwards discutients, such as plaisters of diachylum, or the soap of vigo with mercury, but the cure will be slow and difficult, without the use of purgatives every two or three days. Calomel so often abused, is here an excellent remedy. In place of it, we may administer the castor oil, about ten or eleven o'clock at night, in the doses of one, two, or three spoonfuls, according to circumstances. Other purgatives, such as the sulphate of soda, seidlitz water, &c., may be given with advantage. These means almost always succeed in resolving engorgements of the testicles, but when they are not persevered in, the organs degenerate into cancers and must be removed.

The causes of engorgement of the testicles may depend on a scrofulous disposition, and it does not seem difficult at first to distinguish between them and those engorgements arising from venereal or cold. I must however observe, adds M. Dupuytren, that they begin precisely like the rest, and it is only after some time that their true character can be known. Generally the latter do not yield to ordinary treatment, they are indefinitely prolonged, and often co-exist with other affections of the same nature, depending on a scrofulous constitution. Tuberculous degeneration, is one of the principal characters of this species of engorgement; in the majority of cases it affects the fibro-cellular tissues surrounding the epididymis; it also appears in the substance proper of the testicle. These tubercles are slowly developed, and may last three or four years; their development, progresses, and duration point out their nature.

These engorgements are softer than the scirrhus, and harder than the inflammatory kind. They are free from heat or redness, and cause a sensation of heaviness and numbness; the sub-cutaneous cellular tissue is generally free. The tumor is commonly unequal and irregular in its general configuration; whilst in scirrhus engorgement the testicle is globulous, and the epididymis uneven; the spermatic cord is sometimes healthy, sometimes diseased. As the disease advances, there form in the anterior of the organ points which soften; to the touch, it presents the sensation of a soft body. Soon we see appearing on the surface little projections, corresponding to bluish points. These points ulcerate and exhale a serous pus, a carious matter, yellowish

and pultaceous, evidently produced by a scrofulous affection. *Fistulæ* are established, giving issue to a serous and ill formed pus. At this stage we can no longer doubt as to the nature of the disease. It may last for years. If its cause is attacked and subdued, happy changes soon appear in the organ; but should the efforts of the surgeon be unsuccessful, the testicle becomes soft, fungous, and similar to the tissue formed around articulations affected with hydrarthrosis. From the scrofulous it may pass into the cancerous state, but this is rare. When it has reached this degree of disorganization, every one understands that extirpation is indispensable if it is confined to the gland.

When the scrofulous nature of the engorgement is ascertained, should any inflammatory symptoms exist, they should be subdued, and afterwards the patient subjected to general hygienic measures, which are often more efficacious than remedies. He should choose an elevated situation, dry, and with a southern exposure. He should be covered with flannel from head to foot, and use dry friction over the whole body. He should exercise in open air, and as much as possible in the sun; live on a generous diet, eat black meat, game, antiscorbutic vegetables, such as water cresses, black radishes, artichokes (*cinara cardunculus*), and celery. He must forbid himself all acids, mineral and vegetable, and especially farinaceous food. His drink should consist of an infusion of wild endive (*cichorium intybus*) and the tops of the leaves of the hop (*humulus lupulus*.) If he is highly lymphatic, he should take the syrup of gentian prepared with water, taking care to proscribe that made with wine or ammonia.

Other remedies may also be administered. Latterly, the iodine and its preparations have been highly celebrated. It is given in the dose of one eighth, one-sixth, one-fourth, or one-half grain, in distilled water aromatized by mint. The virtues of iodine, like that of all new therapeutical agents, have been much exaggerated; it sometimes succeeds, but is not a panacea. Externally it is used in the form of hydriodate of potash in ointment or lotion. When we do not wish to use this remedy, we may have recourse to sulphurous, salt, aromatic, or stimulating baths. Also, local applications of these same means. It will be also useful to inject these fluids into the fistulous passages, taking care that they are not extravasated. But it is better to direct upon the affected parts a stream of sulphurous, salt, or ioduretted fluid. By means of these remedies long continued, and by the cautery, we will often succeed in curing scrofulous engorgements.

But if, notwithstanding our efforts, the testicles reaches an advanced disorganization, tending to scirrhus degeneration, or if it becomes soft, pulpy, and contains many scrofulous abscesses, we should not hesitate to extirpate it, after having surmounted any internal affections. Without this precaution, the patient might fall a victim to consecutive disease, such as pleurisy, pneumonia, suppuration of the liver, &c.

If, after the operation, we examine the changes in the organ, (without complication of cancerous degeneration,) the healthy parts are found separated from the diseased; here and there we find many scrofulous degenerations, and a whitish, half-fibrous, half-cellular matter, containing coagulated albumen. Tubercles or collections of tuberculous matter, contained in mucous cysts, or without them, are also seen. These alterations are generally seated

in the cellular tissue surrounding the epididymis in the epididymis itself, sometimes in the testicle, more rarely in the cord.

Besides the two species of which we have spoken, a third exists, the venereal engorgement. Latterly, said M. Dupuytren, this disease has been treated exclusively by antiphlogistics; but two circumstances have been overlooked, the inflammatory and syphilitic principle. Sometimes this method entirely dispels the symptoms; but we should fall into a great error by supposing it was radically cured. As long as the syphilitic virus remains, a relapse is to be feared. I might add, continued the professor, which would clearly prove, that individuals laboring under venereal diseases, and who would not use appropriate remedies, have been affected with ulcerations of the throat, exostosis, engorgement of the testicles, which have yielded to anti-syphilitic remedies. No one of you has forgotten the history of the three pupils who inoculated themselves some years ago with the pus of a venereal ulcer. By the antiphlogistic treatment all the symptoms manifested rapidly disappeared. But after some time, the signs of secondary syphilis broke out with so much violence that one put an end to his life; the other two consulted me, and were cured by anti-syphilitics. How is the venereal engorgement to be known? Every day we see patients with a swelling of the testicles, to which they can assign no cause. They have had no blow, no fall, the swelling has disappeared and passed into the opposite testicle, or has continued always in one. If the tumor is elongated, having a cylindroid form, if it causes no lancinating pains, if the patient has had any venereal affection, such as blennorrhagia, bubo, chancre, treated by the cautery, the worst of all methods; if he declares that the testicle, after having been affected for six months, a year, or eighteen months, has returned to the natural condition, and that the other was attacked, the presumption is strong in favor of the venereal nature of the disease; for if the engorgement were scirrhus, this metastasis would not take place; it is even a pathognomic character of this kind of tumor. Another not less important observation is, that in the case of relapse, when we have removed a cancerous testicle, the cord is generally affected; whilst in syphilitic engorgement, it is the remaining gland. If a general examination reveals other symptoms such as pustules, exostosis, there can be no doubt. When a certain opinion cannot be formed, would it not be better to use for six weeks or two months, an anti-venereal treatment, than to perform a cruel and useless operation?

In latter days the existence of the venereal virus has been doubted, as we have already said; however, experience has indubitably proved the contrary. This belief, so generally established, has been shaken only by a mass of subtleties. Admitting that syphilis was an inflammatory disease, how has its communication in an immense majority of cases been overlooked? Was not this a characteristic symptom distinguishing it from other inflammations? The distinction established, added M. Dupuytren, of the two elements of the disease is essentially practical, and explains easily why so many persons treated on the antiphlogistic plan, have seen constitutional symptoms develop themselves six months, a year, or even longer, after their pretended cure. Is not the history of the three pupils, related above, the most conclusive answer that can be made to the dangerous hypothesis of the non-existence of the venereal virus? It is, therefore, a real, positive virus, which may be com-

municated like that of small pox. Woe to those who regard it only as inflammatory; by attacking that alone, they, indeed, destroy the effect, but the cause remains.

## CHAPTER V.

### ON TRAUMATIC EMPHYSEMA.

1st. *Emphysema produced by Fracture of the Ribs and Laceration of the Lungs and Pleura.*—On the 9th of last December, two individuals were brought to the Hotel-Dieu, affected with traumatic emphysema, of different degrees of severity. One of them was a water-carrier, sixty-eight years of age, who, during the day, had been struck by a blow from the pole of the wagon of a wood vender. He was thrown nearly transversely under the wheel which passed over the left anterior portion of his chest. Although the wagon was empty, the weight of the wheel was sufficient to produce the accident we are about to describe. This man had cough, great oppression, his pulse was full and frequent. A careful examination of the right side of the thorax discovered no injury; but on the left, he had acute pain, and great sensibility in the precordial region. The hand, when applied, received the manifest sensation of a crackling, similar to the ends of fractured ribs coming in contact during the respiratory movements of the thoracic parietes. This sound was equally perceptible to the ear, which could also perceive a noise analogous to that produced by the rapid dropping of water. There was also on the same side, considerable tumefaction but without any change in the color of the skin, or the least sign of inflammation; which tumefaction could be displaced and driven away by compression. This was not all; on pressure, a distinct crepitation was heard, such as takes place in animals whose cellular tissue has been filled with air, preparatory to flaying them. These are undeniable symptoms of fracture of the ribs, and emphysema formed in this region, that is, the infiltration of atmospheric air into the subcutaneous cellular tissue. However, the life of the patient does not appear to be in danger; the emphysema is inconsiderable; thus far it is limited to the left side of the chest; nothing evinces its having attacked the internal organs; and experience demonstrates that when this phenomenon is limited in extent, the infiltration is reduced to a few cubic inches of air, and absorption soon takes place. It is far otherwise when the air has reached not only the whole extent of the cellular tissue of the surface, but also that of the internal organs and the abdomen, when there is not only infiltration, but effusion of air into the great serous cavities; such is the state of the patient of whom we will hereafter speak. In the case just related, the accompanying injuries, the direct cause of the emphysema, must not be forgotten. It has certainly happened that the fragments of the ribs thrust against the lungs, have torn the pleura, and perhaps the air vessels; thence results an organic lesion of the lungs and the rush of air towards the thoracic parietes. In this patient the small quantity of extravasated atmospheric fluid leads to the supposition that the laceration is inconsiderable.

Let us now explain how this infiltration takes place. When, on account of former pleurisy or pleuro-pneumonia, adhesions exist between the pleura, and that thus a continuity of tissues is established between the surface of the lung and the thoracic parietes, emphysema is easily understood; the air passes directly from the interior of the lung into these newly organized cellular meshes, travels gradually through them, and thus reaches the fractured spot, even in the subcutaneous cellular tissue. When there are no adhesions, the air inspired escapes partly by the aperture in the surface of the lung, and is first effused in the neighboring tissues and the pleural cavity. Driven thence by the alternate expansion and contraction of the agents of respiration, and by its own elasticity, it is gradually infiltrated in all the external and internal organs; so that, if the quantity effused be considerable, it invades not only the parietes of the thorax and abdomen, the superior and inferior extremities, the scrotum, neck and head, but also the pleura, two mediastina, even the pericardium, and the cellular tissue uniting the different organic elements of which the lungs are composed.

The patient in question was bled on the day of his admission into the hospital; the following morning M. Dupuytren prescribed a second bleeding and some additional treatment; compresses saturated with a discutient solution were applied to the injured side, and the body surrounded by a bandage. The extension of this last remedy was to suspend the action of the external respiratory muscles, and oblige the patient to breathe by the diaphragm, in order, on the one hand, to favor the union of the fractured ribs, and on the other, to prevent as much as possible the emphysema. After having described the different agents and the mechanism of respiration, he proved by example the possibility of breathing by the external muscle alone. Such, indeed, is the case in lesion of the superior portion of the spinal column, when all the external muscles are paralyzed.

The other patient, older than the preceding, in a quarrel was thrown down by his adversary, who not content with his victory, kicked him repeatedly in the chest. Several ribs were broken, and fragments of these ribs, driven violently inwards, wounded the lung seriously; an enormous emphysema ensued, attacking first the shoulder, then the whole of the anterior and posterior region of the thorax, the neck, which was considerably swollen the day after the accident, and lastly, the abdominal region and testicles. The man also labors under an old asthmatic affection, which is at present peculiarly unfavorable. Emphysema to such an extent, remarked the professor, is always in itself an exceedingly serious disease; the infiltration makes rapid progress, the atmospheric air invades quickly, as we have said, the cellular tissue of the internal organs, and the patient can soon no longer breathe. I have seen many perish in extreme agony from suffocation, due to no other cause than that just pointed out. Judge what must happen, when the respiratory functions are the subject at once of a severe asthma and an emphysema, such as you see. The patient then, generally, quickly perishes; thus we despair of the life of this old man. You have, indeed, seen to-day, the great anxiety under which he labors in his futile efforts to articulate a few words in answer to our questions; at each inspiration a new column of air escapes from the lung and aggravates his situation; there is not only infiltration, but also effusion of atmospheric fluid into the great cavities; his expectoration is bloody, announc-

ing a deep injury of the lung; his pulse is small, corded, and convulsive. The efforts of art are here useless. What, indeed, could we do? Use the same means as in the first case? It would be only to hasten his end; for here a bandage would produce the most violent anguish. Incisions in the skin have been advised, to give exit to the infiltrated air; without the least confidence in the measures, they have been made in different parts of the body, principally over the pectoralis major muscle, rather in conformity with established precept than in the hope of beneficial result; they have been useless, and I think it superfluous to explain the reasons. In an inconsiderable and circumscribed emphysema in which we might hope to subdue by appropriate treatment the cause which produced and maintains it; and in which, therefore, the organic lesions are not beyond the resources of art, it may be supposed that incisions over the spot in which it is seated, might prevent a greater infiltration of air, by giving it issue externally; but in cases analogous to the present, the insufficiency of this plan is too evident to occupy us longer with the subject.

The prophecy of M. Dupuytren was but too well founded; the patient sunk in a few hours, and a post mortem examination, completely confirmed his diagnosis. Externally, general tumefaction, color of the skin unchanged, the latter unequal, soft, very easily compressible, and accompanied by its characteristic crepitation. Internally, we observed the large quantity of air contained in the anterior and posterior mediastium, and the presence of this fluid throughout the whole extent of the interlobular tissue; as the professor had declared. Three ribs were fractured on the right side, and the lateral surface of the lung of that side presented a large and deep laceration.

Our first patient, on the other hand, went on improving. In the course of five days, he no longer felt any pain in the affected side when he coughed; the expectoration was not at all bloody; the infiltration had nearly disappeared, the pulse was good, respiration little impeded, his appetite began to return, in a word, he is in the way of complete recovery.

In both patients we see how important a part of their malady the emphysema constituted; it was the most manifest symptom, and carried to such an extent in one, that independently of the serious lesions, of which it was the result, it formed of itself a grievous disease. In some cases it only makes its appearance among the secondary symptoms, and is not easily recognized.

However, it should be clearly recognized, in order to oppose its further progress, and as it also enables us to appreciate the concomitant disorders. A man, aged forty-one, of a strong constitution was jammed against a wall by the pole of a carriage; when taken to the Hotel-Dieu, it was observed that his breathing was exceedingly short and laborious; on the left side no lesion could be perceived; the sternum was transversely fractured at the junction of the upper two-thirds with the lower, and the upper fragment deeply sunk into the mediastinum. On the right side of the chest, the fourth, fifth, and sixth ribs, at about four or five finger's breadth from the sternum, were much depressed, and a crepitus was heard, which evidently indicated their fracture, and perhaps that of their cartilages. The projecting ends of the external fragments could be even distinguished by the fingers. A little below the seat of these fractures there was an ecchymosis, about the size of a five franc piece, (one and a half inches in diameter.)

The features of the patient were marked with deep anxiety, his answers were short and impeded, his pulse rapid, and almost imperceptible, his skin cold. By feeling in front of the fractures, a crepitation was perceived, resembling that produced by air traversing the cellular tissue; but what was most remarkable, every time inspiration took place, the tumor increased considerably, and extended from the lower part of the sternum to the seat of the fracture; it diminished, on the contrary, during respiration; on a level with the depression resulting from the fracture of the ribs, the skin rose and fell in the same manner, but formed a much smaller tumor. The least pressure gave rise to the emphysematous crepitation, and was sufficient to reduce the tumor. In the two inferior thirds of the right cavity of the chest the stethoscope detected a very distinct gurgling (*gurgouillement*.) The patient was bled, compresses were applied to the seat of the emphysema, and a bandage was put round the trunk. At first this treatment promised well—the pain was greatly alleviated; but on the fourth day, suddenly, the oppression was redoubled; the cheeks assumed a hectic flush, the pulse became small, hard, and quick. He was again bled. Ten days thus passed over, with alternations of better and worse, as to the suffocation; the tumors of which we have spoken disappeared, and no trace of the emphysema remained; a large and very black ecchymosis extended, however, from the base of the chest to the upper and exterior part of the thigh. The chest became more and more embarrassed, and on the twelfth day the man died. On examination of the body, old and strong adhesions were found between the pleura; the upper fragment of the sternum fixed in the pericardium; the right ventricle of the heart torn by it, to the extent of two-thirds of its thickness; a great quantity of bloody serum, and of pure black blood was found in the pleural cavity of the right side; the fourth, fifth, and sixth ribs were broken, and their cartilages detached from the sternum; between these there was a lacerated opening large enough to admit the finger easily.

2d. *Traumatic Emphysema of the Eye-lids*.—The introduction of air into the subcutaneous or intermuscular tissue is not peculiar to penetrating wounds of the chest; it may take place in any of the parts connected with the respiratory system. Emphysema of the eye-lids is by no means rare, it is mentioned by several authors, and we have had more than one case of it in the Hotel-Dieu.

CASE. *Emphysema of the Eye-lids, from supposed Fracture of the Os Planum of the Ethmoid Bone or of the Os Unguis*.—A laborer was struck on the forepart of the head, neck, and chest by a quantity of earth which fell upon him; on being extricated, he only complained of a slight pain at the root of the nose, to which he paid but little attention and went on with his work. About a quarter of an hour after, on blowing his nose, a considerable tumefaction of the eye-lids immediately ensued, the whole eye was covered up by it. What is the cause and nature of this swelling; is it erysipelas? The skin was, indeed, bright and tense, as in that disease, but there was neither the redness nor heat which characterize it. The eye-lids retained their natural color and temperature. Was it œdema? (Edema never is formed so rapidly; and, on the other hand, we do not discover that doughiness (*empatement*) of the tissues peculiar to serous infiltrations. Was it an effusion of blood in consequence of some violent contusion from the blow he received?

But this would have been known by the pressure of numerous violet-colored ecchymosed spots, and by a brownish hue, more or less deep, of the eye-lids. From these negative signs, we could not but suspect that it was an infiltration of air; in fact, upon touching the parts, emphysematous crepitation was perceived, not at a single point, but throughout their whole extent. In such cases, whenever incisions are made in the skin, a certain quantity of air makes its escape. On the bodies of individuals who have died either from the severity of the emphysema itself, or the injury of the other organs involved, the presence of air has been demonstrated just as crepitation had been noticed during life. Having had to treat an individual in whom this phenomenon was very manifest, we were induced to make some incisions in the part affected, upon which a considerable quantity of air rushed out. In fact, there can be no doubt of the fact; the only question in the present case is, how to account for the infiltration. Now, I think, that the fall of the earth having compressed the face, rupture of the os planum of the ethmoid, or of the os unguis has ensued, through which aperture the air made its way from the nasal fossæ into the interior of the eye-lids. It was remarkable that the emphysema did not occur immediately after the accident, but only after the lapse of some time, and subsequent to the patient's efforts in blowing his nose. The reason of this is evident; the fracture of the bone did not cause immediately a laceration of the soft parts, and the latter excluded the air; but as soon as the patient forced a column of air against them in his efforts, they gave way, and the communication was thus established between the nasal fossæ and eye-lids. We were curious to know, said the professor, if after the accident any drops of blood were shed by the nose; it having occurred in all the other cases of the kind I have seen. In this instance it does not appear to have taken place.

The treatment consisted in general bleeding, and the topical application of compresses steeped in a resolvent solution. The patient was desired to use no effort in attempting to blow his nose, to avoid coughing as much as possible, and to do nothing that would tend to re-open the unnatural passage of the air. On the third day, the crepitation had much diminished; on the fourth, it was almost insensible; and on the fifth, the eye-lids were nearly in their natural condition. The following case is very analogous to the preceding, and varies only by a slight difference in the seat of the injury.

CASE II. *From a Supposed Laceration of the Pituitary Membrane.*—A young man who had received a violent blow from a plank striking him on the nose, felt at first only an acute pain; but in the course of a few hours, upon violently blowing his nose, he perceived, as it were, a line of fire passing from the side of the nostril to the inner canthus of the eye, and thence spreading itself into the two lids of the left eye. So great a swelling immediately ensued, that the eye was closed, and the passage of the luminous rays entirely intercepted. He was received in the Hotel-Dieu. The eye-lids were much distended and resisting, but indolent, and without any change in the color of the skin. Emphysematous crepitation was very distinct. The same treatment as in the preceding cases effected a cure in four or five days. M. Dupuytren thought that the blow received, had caused a rupture of the pituitary membrane opposite the lateral cartilage of the nose, which had been detached from the lower edge of the bones of the nose.

CASE III. *Emphysema of the Temples, from Fracture of the Frontal Sinus.*—Emphysema may be produced in parts remote from the respiratory organs, by causes much more serious than those of the preceding cases. The following is an instance :

A man received a fall on his forehead. Some time after a tumor of considerable size appeared in the temporal region. The nature of this tumor seemed unaccountable to some persons who saw it; but when it was slightly compressed, it might be made to pass to the front of the forehead and thus disappear. It was owing to the passage of air into the surrounding cellular tissue, in consequence of fracture of the frontal sinus which created an opening under the skin.

We might readily multiply examples of traumatic emphysema, resulting from penetrating wounds of the chest, or from a communication of some other kind, forcibly formed with the air passages. But those already cited, with the remarks we have made, may probably suffice to give you precise notions of this curious malady, its diagnosis, and the treatment it requires. A few words may be added with respect to the infiltration which sometimes takes place in some of the highest points of the respiratory system. Besides the crepitation, called emphysematous, and the negative signs already noticed, it may be still recognized when there is doubt about the nature of the disorder, by desiring the patient to blow his nose, when an evident augmentation of the eye-lids or other parts affected will be perceived. If the patient be in such a state as to be unconscious of what is required of him, by pressing his nostrils, an immediate increase of the tumor will be observed, owing, no doubt, to the column of expired air, which not finding egress by the natural way, is forced into the one newly established by the injury. In every case of emphysema of the eye-lids, the swelling takes place with rapidity—owing, no doubt, to the great laxity of the cellular tissue of which they are composed.

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## CHAPTER VI.

### ON CARIES OF THE VERTEBRAL COLUMN; ON FISTULOUS SINUSES AND SYMPTOMATIC ABSCESES.

About two months ago, a woman came to the Hotel-Dieu to be treated for an abscess situated on the upper internal part of the thigh. This woman had besides, a curvature of the spine, concave inwardly, convex outwardly. It is known that the spinal marrow is never compressed unless the curve be right angled, and that, consequently, no paralysis of the lower extremities takes place. Such is the state of this patient, in whom the bodies of the vertebra were carious. The tumor on the thigh opened spontaneously, and discharged some pus. On the opposite side, another tumor formed, less voluminous, but evidently due to the same cause. It is manifest that these abscesses communicate by fistulous passages with the caries. This patient had been treated

for three months with iodine, and thought cured; but she was far from it. The caries followed its course, and she came for our assistance. Moxas were ordered to the sides of the curvature. A month ago, she seemed to have much improved, when suddenly, either from change of temperature or perhaps absorption of pus, she was seized with symptoms of pleuro-pneumonia. This was ineffectually combatted by repeated leachings to the affected part, a blister to the sternum, and topical emollients, &c.; the patient died on the 15th of December, seven or eight days after the attack of the pleuro-pneumonia.

*Autopsy; thirty-six hours after Death. General Appearance.*—Body emaciated, projection of the spinous processes of the eleventh and twelfth dorsal vertebra; marks of cups on the right side of the chest. *Head*; nothing remarkable. *Thorax*; considerable sero-purulent effusion, with false membranes, free and adhering; the corresponding lung collapsed without pneumonia engorgement. *Abdomen*; some organized adhesions on the lower, and in the lower pelvis are the only vestiges of an old peritonitis. The gastric mucous membrane was pale and congested in its most depending portions.

The body of the eleventh dorsal vertebra was entirely destroyed by caries. The vertebral canal was not diminished, and the spinal marrow was healthy. The bodies of the tenth and twelfth vertebra, partially denuded, were the seat of a superficial caries. A vertical section, following the antero posterior diameter evinced no softening; in front of the eleventh dorsal vertebra, the cellular tissue and periosteum were condensed and hypertrophied, forming a sac with thick, resisting parietes, internally of a greyish color, in contact with pus and purulent false membranes. This sac also adhered to the bodies of the diseased vertebra by some strong fibres. From this sac proceeded on either side a fistulous passage contained in the sheath of the psoas muscles of which the fleshy portion was atrophied and discoloured. These sinuses were filled with pus: the one on the right side would admit several fingers, containing a serous, ill-formed pus, composed of thick false membranes, beneath which was formed a smooth apparently mucous and roseate membrane. This sinus was dilated as far as the crural arch, narrowed under this arch, dilated again in the upper part of the thigh, where it formed a large sac, in which were formed the lesser trochanter, and other newly formed osseous parts. The fistulous opening in the skin communicated with this abscess. The left fistula proceeded also from the ante-vertebral sac, transversed the fleshy fibres of the psoas, and reached their anterior and internal part, on a line with the superior strait of the pelvis; thence it passed under the crural arch, and opened on the interior of the thigh, without being at all dilated. Its internal surface was of a greyish color, covered by a newly-formed mucous membrane, under this membrane, there existed a whitish, resisting and fibrous tissue. The canal was almost entirely composed of this tissue; formed at the expense of the cellular tissue, through which the pus was at first diffused. Then this canal returned upon itself, could not receive the little finger, and in some points, was almost capillary. Every thing, in a word, proved that nature was endeavoring to cure the fistula. (Reported by M. Loir.)

Hunter first pointed out the formation of these canals apparently mucous. M. Dupuytren, has since added to, and thrown much light on Hunter's opinions. According to M. Dupuytren, the canals establishing a communication between a carious point and any part of the body, those between the

urethra and perineum, in the vicinity of the anus-fistulæ of the duct of steno, canals communicating from the air passage externally, all present the same nature and organization. Accidental and abnormal, they however supply natural channels which have been destroyed, perforated or diminished, by giving passage to fluids which before flowed through them. These accidental canals are formed at the expense of all the parts with which the pus or extravasated fluid comes successively in contact. Then fibrous, nervous, osseous and mucous tissues, may enter into their composition. This has been evidently proved by the examination of the fistulous passage in the case we have detailed. There could be there distinguished the mucous and the osseous tissues, the nerves, veins, and cellular tissue. Each of these parts, form a simple element, the cellular tissue in which are formed the granulations uniting them together. Soon these passages being traversed by fluids take on a mucous structure. In the case, for example, of caries of the vertebral column, the following is the mechanism by which these canals are organized: Caries being once established, the pus remains some time in the carious part and those surrounding it, and especially in the cellular tissue. First a cyst forms, in which matter collects. When the quantity of pus becomes considerable, the cyst takes a dependent position; it elongates, and extends either on one side of the column, or on both at once; it then travels on, pushing before it the lower end of the cyst; if it meets with an obstacle, it dilates, it diminishes under pressure, and again dilates when that pressure is removed. Having at length reached the skin, after the pus projects and forms a tumour which terminates in an abscess.

This purulent collection, known by the name of *abscess by conjection*, and which M. Dupuytren calls more justly *symptomatic abscess*, is a very serious disease, and generally thought fatal. Some well authenticated cases prove, however, that these abscesses may dry up, close, and entirely disappear, when the caries has been cured.

Caries may be arrested and cured when actively treated by cautery, moxas, internal remedies, and a regimen appropriate to its cause. But will the abscess terminate as favorably? Should it be left to nature, or be the subject of some surgical treatment? The ordinary course of the disease should be our rule in this respect.

These abscesses remain stationary for years, without any bad symptoms; the pus is gradually absorbed, and no traces of it remain; at other times the skin covering it inflames, opens, and gives exit to the pus which flows out, and is never reproduced. Sometimes the pus, having remained a long time in the abscess, is converted into matter resembling adipocere; chemical experiments, proving in fact, that such is the nature of the substance sometimes formed in this kind of abscess.

Many years ago, M. Dupuytren had under his care a young man, affected with a conjected abscess, proceeding from caries of the vertebral column, accompanied with considerable curvature; the caries was cured by the repeated use of moxas, the cautery, &c. The abscess did not disappear, and only diminished slightly in size. Five or six years after, he perished by a pleuro-pneumonia.

On examination, the caries of the spine was found entirely cured, the curvature alone remaining; the abscess converted into a fatty, soft, unctuous

matter, presenting the physical and chemical qualities of adipocere; the canal extending from the carious points of the column to the abscess, was diminished, obliterated in some spots, and some of this matter found in it.

It is considered dangerous to open a symptomatic abscess, resulting from caries of the spinal column, which has yielded to remedies. This would expose us to a relapse of the principal disease, and the loss of the benefit of a long and active treatment. Hence it is better to leave them to nature, even should our endeavors to cure the caries prove ineffectual.

We have seen the organization of fistulæ of the spinal column; we shall find the same mechanism in the formation of urinary fistulæ. Let us suppose the urine to be collected in a sac, and in considerable quantities; after some time it forms an abscess. This soon opens, there then remains a fistula. From that time an accidental canal of a mucous nature is organized in this passage. We now see the consequences of this formation. If, when the abscess first opens, we introduce a sound into the urethra, the fistula is easily cured; but if it remains for six months, or a year, without using this remedy, its cure is almost impossible, because a definite organization is established. Thus, at first the parts are too weak to resist; but after six months, or one or two years, the fistulæ are so completely organized, that they remain and furnish a matter nearly analogous to that of mucous membranes.

At first, they have not the characters they afterwards assume. They generally commence by an abscess, from whose aperture there issues a pus which, variable as its cause, is sometimes white and well formed, sometimes dull and flaky, sometimes pure, sometimes mixed with some natural secretion; only a small number of fistulæ begin in this manner; they are those made by a wound in a excretory duct; in this case the fluid flowing through the wounded duct, follows generally the course of the weapon, and the fistula which remains is a simple passage. In the first case, on the contrary, that is, whenever nature alone presides over the development of the disease, the accumulated liquid may open at one or several points. If the abscess is near the surface of the body, the opening communicates immediately with it, and the fistula is only as long as the thickness of the parietes of the abscess. When the latter is deeply seated, either a single fistula is formed opening externally by one or several apertures, or several fistulæ uniting in one, or opening each separately. Such is the first stage of their formation.

If their course be very short, the phenomena of the second stage are very simple; the inflammation disappears, the edges of the fistulous opening are habituated to the contact of the foreign fluid; they cicatrize without closing, and the fistula remains. If the abscess be very deeply seated, the part becomes the seat of remarkable phenomena. Its parietes contract but do not adhere, and to it corresponds the original extremities of the fistula. The external opening, which, like the first, may be single or numerous, contracts, is rounded, and soon appears under the form of a little red fungus, having in its centre an opening often difficult to find, narrower than the canal, and furnishing a quantity of pus beyond all proportion with its apparent size. At the same time throughout the whole extent of the fistula, an acute inflammation takes place, in which the neighboring tissues share, and which loses its force as the parts become accustomed to the impression of the irritating matter. Soon, without entirely disappearing, this inflammation yields to a

process under whose influence the whole canal becomes organized, isolated, and transformed into an excretory duct; this canal presents the same characters, in whatever tissue it may be formed; generally simple, sometimes branched at its extremities, sometimes straight, sometimes tortuous, and lined as has been before said with a true mucus membrane, which cannot, indeed, be separated, in some rare cases, but which may always be known by its appearance, by the fluid which it furnishes, the organic elements composing it, and differing only from natural mucous membranes by the absence of follicles, and an epidermic layer.

When the inflammation is passive, the canal becomes so completely organized, that is, covered exteriorly with a cellular tissue, analagous to that around natural excretory ducts, and to which anatomists have given the name of sub-mucous cellular tissue; but in the majority of cases, the irritation remains in the surrounding tissues, and these passing into a state of induration form masses, more or less voluminous, through whose thickness the fistula passes.

I have said that these accidental canals resembled natural mucous canals; the case before you proves the truth of the remark. Thus, you see here a false membrane analagous, to that formed in esophagitis. By scraping, it is removed, and the subjacent membrane is red like all other mucous membranes; it is like them soft, and villous; examined by the microscope, the villi are easily distinguished, less evident, undoubtedly, than in the natural state, but still easily recognized. Pursuing the comparison, externally we find a fibro-cellular membrane, similar to that surrounding the mucous membranes.

Nature sometimes cures these fistulous canals in the following manner: The mucous passages ceasing to be moistened by a fluid (of whatever nature it be) the tissues composing it, endowed with contractility, like the other tissues of the organism, contract, their parietes approach each other, unite and form a fibro-cellular cord, which after some time partly or entirely disappears. How do these canals disappear? In the same manner as they are formed; that is, at the expense of all the tissues they had traversed, by taking from them the elements of their organization; they disappear by restoring what they had borrowed. The truth of the assertions has been abundantly proved by pathological anatomy. Persons cured of symptomatic abscesses, and afterwards dying of other diseases, have, in some cases, shown the fistula transformed into a cord, as we have said; in others, this cord was no longer continuous, and presented only some fragments here and there throughout its track; lastly, in others it had entirely disappeared. The following case is very remarkable as regards this latter remark.

A woman came to the Hotel Dieu with a strangulated hernia occasioning an artificial anus. No one could deny that, in this case, the intestine adhered to the abdominal parietes. Two years afterwards, she was again admitted into the hospital for another disease, of which she died; on examination, M. Dupuytren thought that he had been incorrect in his diagnosis, for no adhesions were found; but on unfolding the convolutions there was found a cord which terminated at the upper part of the crural arch, and extending to the intestine; thus his opinion was verified, that in many similar cases these accidental canals restore to the neighboring parts the elements they had borrowed from them.

In the first case we have mentioned, the old passage was diminished in size, while the recent duct was much larger. The parietes of the former almost touched each other; internally an albuminous matter similar to that of false membranes was found; these were the means by which the reunion had been effected. It is true, that natural mucous ducts are not easily obliterated, but it is sometimes the case; thus the proposition of Bichat, though true generally, admits some exceptions. Accidental canals, on the contrary, are more easily obliterated; the reason is that the former possess a highly developed secretory apparatus, whilst it exists but feebly in the latter. Thus a square of natural canal will present a hundred villi, but in the same space of an accidental passage we will find only five or six.

The remarks first made, show the necessity of opposing immediately the organization of accidental passages, and of establishing, as soon as possible, the natural course of the secretion by appropriate means. But when this cannot be effected, the same means become insufficient and even inapplicable; it then remains only to remove the parts.

The cautery may be still used advantageously, but actual cautery should be direct, and follow exactly the canal. In other cases, we must have recourse to injections of nitrate of silver, diluted nitric acid, taking care that these fluids are not extravasated. M. Dupuytren used for these injections, twenty or thirty grains or a drachm of nitrate of silver to a pound of distilled water. He has observed that these injections frequently succeed, when the fistulæ are of a scrofulous nature.

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## CHAPTER VII.

### ON HYDRO-SARCOCELE.

*Case Remarkable for the Difficulty of its Diagnosis.*—Some time ago, said M. Dupuytren, a surgeon of the navy consulted me for an affection of the left testicle. Some medical men having examined it before, pronounced it to be hydro-sarcocele. The following is the history of the case: Since childhood, his left testicle had never descended into the scrotum. A tumor of variable size frequently appeared in the course of the spermatic cord, descended more or less, sometimes as far as the testicles, and, ascending gradually, disappeared anew at the inguinal ring. At last it fixed itself without the abdomen. It was thought owing to a hernia, for from his youth, the patient had constantly worn a bandage. Therefore, remark this fact, which has powerfully influenced the modifications which afterwards took place in the organs. It may be admitted as a principle that whenever a bandage is not useful, it is almost always hurtful; it maintains a constant pressure, whose effects are almost always injurious; and often determines scirrhus engorgements. However, the patient now thirty-two years old, has not worn it for many years. Another circumstance to be remembered, is, that the tumor frequently presented sensible variations in size. During a

long cruise, it increased considerably. On his return, a fluctuation could be felt on the anterior and inferior portion; above and behind this fluctuation a hard spot. When I first saw the patient, I thought, indeed, that there was a collection of fluid; but the difficulty was to determine which organ was represented by the hard body of which I have spoken. I was inclined to think it an engorgement with hernia by adhesion; and prescribed only rest, baths, emollient topical applications, and endeavored to reduce it, but without success.

The patient being obliged by his profession to make long voyages, desired to be freed from his disease at all hazards. The case was very embarrassing for the surgeon. The only thing certain was, that there was a collection of fluid, beyond that all was obscurity. At first sight it is often difficult to distinguish hydrocele, complicated with a cartilaginous thickening of the tunica vaginalis from sarcocele; but, moreover, it was here necessary to ascertain if this hydrocele was simple or accompanied by sarcocele, an engorgement of the testicle, or a hernia; or if this hernia had, or had not, contracted adhesions; for one or other of these circumstances might exist. Every day these complications are met with, and they should regulate our conduct. We first intended to make an exploring puncture; but, this step demanded reflection. The trocar, inoffensive and useful in the case of a simple hydrocele, would have been very dangerous if the tumor was formed by an engorged testicle, but without degeneration or by the intestine, one of them might be wounded. On the other hand, in the case of sarcocele the puncture would be useless.

These considerations determined us to open the tumor with the bistoury. An incision, about an inch long, was made in the integuments at the inferior portion, prolonged a little posteriorly, and carried gradually and with caution as far as the sac containing the water. This sac presented a bluish aspect and was resisting. Having punctured it with a bistoury, a fluid escaped, entirely similar to that of simple hydrocele. Desirous of preventing the infiltration of this fluid in the cellular tissue, we enlarged the incision; and about eight or ten ounces flowed out. The tumor lost only two-thirds of its volume. It was then evident, that the hard portion was formed by the testicle itself. But in what state was it? This was an important question. In the first place, was this engorgement due to a venereal, scrofulous, or rather some external cause? The patient declared he never had any thing more than a running for five or six days; on the other hand, although he presented some characters of scrofula, they were not sufficient to account for the development of this affection; the patient has a good constitution and has always enjoyed excellent health. We were, therefore, induced to think that this engorgement resulted from the compression, kept up for many years upon the testicle by the bandage applied for the support of the hernial tumor. Lastly, even should the cause have been venereal, must the operation be abandoned, the wound healed, and the anti-venereal treatment employed? Having carefully examined the testicle, we found on its surface some wrinkles and inequalities; it was hard, nearly indolent; this hardness was especially remarkable in the epididymis, which had acquired a considerable size.

These were strong reasons for suspecting a degeneration of a great portion of the organ, and we determined to remove it. But beforehand, wishing to ascertain the state of the upper part of the spermatic cord whose integrity was

recognized, and that of the inguinal ring, we reached this ring without difficulty, and found it open and perfectly free. Then we could conceive why the volume of tumor had so frequently increased and diminished; it was evidently caused by alternations of a hernia and the spontaneous reduction of a fold of intestine. But how was it with such a state of the ring that the tumor containing the fluid could not be returned into the abdomen, despite of our attempts? The state of the epididymis explains this circumstance; being placed at the entrance of the ring, where it was thrust by the tumor, it closed it completely. It is known that in dogs a reflection of the peritoneum, placed there like a valve, opposes the return of injections thrown into the tunica vaginalis. In this patient the epididymis fulfilled occasionally this natural function in dogs.

On account of this peculiar disposition of the ring, the operation might be followed by two equally grievous accidents. On the one hand, a portion of intestine might protrude from the abdomen, and be engaged in the wound, as sometimes happens in the operation for strangulated hernia. On the other, should hemorrhages supervene, the blood being effused into the peritoneum, might produce inflammation of this membrane. In order to prevent this we thought it proper to tie carefully the vessels of the cord, and also those of the integuments.

Let us recapitulate the circumstances of this interesting case. This tumor was formed both by a collection of fluid by the abnormal size of the testicle, and accidentally by the protrusion of a fold of intestine. The fluid amounting to eight or ten ounces, was the product of the morbid secretion of the tunica vaginalis, and constituted a true hydrocele. Although the inguinal ring was widely open, the communication of the tunica vaginalis with the cavity of the peritoneum not being free, owing to a peculiar disposition of the inferior portion of this canal, it was impossible to reduce the sac containing the fluid. As to the removal of the testicle, it was thought correct. The operation, indeed, was painful, long, and difficult; but all this does not equal the accidents which would have resulted from the progress of the disease, or an operation done with a different intention. Lastly, an examination of the morbid part, shall decide whether we acted well or ill. The testicle, three times its proper size, on being divided, presented a carcinomatous appearance, in the first degree, that is, without degeneration and softening (*ramollissement*). This was a fortunate circumstance, and favorable to the radical cure of the patient. The epididymis, at least quadrupled in volume, was in the same state. The general constitution of the individual, the integrity of the cord, the supposed nature of the affection, all led us to believe that the cure will be complete.

## CHAPTER VIII.

## ON PROLAPSUS OF THE RECTUM.

*Treatment of M. Dupuytren. General Considerations.*—It is daily repeated that surgery is a science carried to the last degree of perfection; yet daily it is enriched with discoveries of greater or minor importance as regards the operative part of it. A few years ago, M. Boyer succeeded in curing fissures of the anus by simple incisions. The procidentia of the mucous membrane of the rectum, if not a very grievous disease, certainly a very inconvenient one, had been treated until the present day by remedies mostly useless, or merely palliative. We have succeeded in curing it completely by an operation as simple as it is safe and certain. It is known that this disease, more common in infancy and old age, than any other time of life, consists in the inversion of the intestine, of which the upper portion is invaginated in the lower as far as the anus, and continuing outwardly, projects two, four, five, and even six inches. Generally, this prolapsus takes place when the patient has a stool, and sometimes when he remains long erect. This disposition of the organ appears often to be connected with a soft, feeble, lymphatic, and hemorrhoidal constitution.

The first thing which occurs to the mind, is the reduction of the prolapsed intestine; this is sometimes but not always easily affected; sometimes the action of the sphincter is so great, and the tumefaction so enormous, that the gut is strangulated, and immediate relief is demanded. The latter, displaced is sometimes doubled and tripled in volume, becomes ecchymosed, of a violet color, and is sometimes threatened with gangrene. In such cases reduction should be immediately attempted, and in the following manner: The patient laid on his belly, the pelvis elevated by pillows, so that the anus is the highest part of the trunk. After having enveloped the tumor with wet cloths, in its whole length, and placed a compress in the centre of its external extremity, we press gently on its base, in order to diminish its size, and endeavor to return it gradually with the finger. The reduction thus begins by the portion which protruded last; if this cannot be accomplished, some surgeons advise scarifications; but as they cause wounds, and consequently inflammation of the large intestine, we should abstain from them as much as possible. The same remark applies to leeches, which may occasion internal or external hemorrhages and intestinal ulcerations.

Even when the reduction has been effected, the disposition to again protrude still exists; thus this remedy can be considered only as a palliative measure.

Lotions and cold baths have also been used as a curative measure, with the intention of strengthening the action of the sphincter, and opposing the prolapsus of the rectum. Cold baths sometimes succeed, but they require much time, perseverance, and cause disagreeable sensations which all patients cannot bear, and which forbid their continuance. Astringent lotions, pressure made by a sponge covered with fine linen, and supported by a T bandage,

suppositories of different kinds, &c. &c. are sometimes successful in children after some time, but frequently fail in persons advanced in age. We must, in this case, have recourse to the operation, and remove the tumefied part or a portion of this part which projects, and any hemorrhoids which may exist on the mucous surfaces. But this excision, for which Sabatier and many others have taken much credit, is obnoxious to accidents, and especially a hemorrhagy which may be serious and sometimes fatal. The removal of a greater or less portion of this mucous tumefaction and the hemorrhoidal tumors, followed by the cautery with a red-hot iron, independently of the acute pain may occasion violent inflammation of the intestine and neck of the bladder.

These reflections have induced M. Dupuytren to seek a new mode of treatment, which, free from the inconveniences of the old method, offers more certain results, and a few years ago he invented an ingenious plan, which we shall describe after a short description of the anatomy of the parts.

The skin covering the margin of the anus, is thinner than that of other parts of the body, and of a different color; it contains very numerous mucous follicles, which secrete an oily matter of a peculiar odour. This skin forms projecting folds, separated by grooves, converging from the circumference of the margin towards the centre of the anus; these folds are engaged in the anus itself, and are numerous and projecting in proportion to the projection of the latter; disappearing when it is dilated; it may be conceived that their use is to facilitate the dilatation of the anus, and assist the expulsion of the fecal matter. Beyond the skin, there is a layer of a fibro-cellular nature, above the external and internal sphincters, two organs constituted by circular fibres and of a muscular nature.

We will now explain the operation of M. Dupuytren; the patient being laid on his belly, the head depressed, the pelvis, on the contrary, elevated by pillows, the thighs are widely separated, in order to expose the margin of the anus and the anus itself. The operator holding in his left hand a pair of dissecting forceps, of large size in order to give less pain, seizes successively on the right and left, and even before and behind, two, three, four, five, or six of the radiating folds, sometimes obliterated, or more or less projecting; with the right hand, armed with scissors curved on their flat surface, he removes each fold as he lifts it; the incision should be prolonged as far as the anus and even within it, in order that the effect may extend beyond the aperture; if the relaxation is considerable it may be carried as far as half an inch, but generally a few lines are sufficient, if the relaxation is moderate one, two, or three folds on each side, are generally removed; if very great, more will be necessary.

This operation gives but little pain, and offers no objection, is not followed by hemorrhage, for the cutaneous vessels alone pour out blood, and at most the extremities of the hemorrhoidal arteries are implicated. If however the incision be very deep, the internal hemorrhoidal arteries might give out much blood.

The consequences of this operation may be easily deduced from the anatomical structure; there exists excessive irritability of the anus; we propose to cure it by retrenching one of the tissues entering into its composition, and strengthening others; the double end is attained by the excision of the

skin and subsequent inflammation. The cicatrix formed both by the junction of the edges of the wound, and the formation of an accidental tissue, evidently contracts the anus.

By this method a new, and compact skin has been substituted for a skin of which the adhesions were very loose. The inflammation also which follows this simple operation, extending a little above into the sub-mucous cellular tissue of the intestine, assists in increasing the adhesion of the mucous with the muscular coat.

No dressing is necessary; the pain causes instantly a contraction of the sphincters; the inflammation is soon communicated from the incisions to the cellular tissue and the sphincters. Generally the patient has no passage for the first few days; the inflammation subsides, the sphincters momentarily relax for the passage of fecal matter, but contract on the least exertion; the cicatrization is complete in a few days, and then the excrement acting no longer on ulcerated surfaces, the opening is diminished and the cure perfect. M. Dupuytren first adopted this plan many years ago; he has since operated frequently, and always successfully; he has never seen a relapse except where, by his own account, the operation had been imperfectly done, on account of the struggles and cries of the child. The merit of the invention is certainly due to him. That performed by Hay (practical observations) for the cure of a patient laboring under piles, complicated with procidentia of the mucous membrane, differs from it in many essential points. It may be seen, by the observations of this surgeon and others, that it was only by accident, that patients affected with prolapsus of the rectum, were cured by an operation exclusively intended for hemorrhoids, and which could be applied only when the prolapsus was the sequence of a hemorrhoidal affection. M. Dupuytren's method, on the contrary, is applicable, especially to prolapsus of the rectum without complication of hemorrhoids. He is convinced that nothing but the excision of the margin of the anus can relieve the patient of his disgusting infirmity.

The following case shows us the application of these principles:

A young woman of a good constitution, laboring under procidentia of the mucous membrane of the rectum for many years, was admitted into the Hotel-Dieu in May, 1830. She could attribute it to no cause. During her stay in the hospital, no hemorrhoidal affection existed, but the prolapsus of the rectum presented this peculiarity, that it appeared monthly, when the bowels of the patient were moved, and lasted a few days, then did not reappear until the following month. The inconvenience experienced by its prolapsus was very great; pain, tenesmus, and the flow of a glairy bloody fluid, &c., annoyed her excessively, which induced her to submit to the operation. The patient being laid on a bed, the pelvis elevated and the thighs separated by an assistant on each side, M. Dupuytren seized a fold of the margin of the anus, raised it, and removed it, prolonging the incision as far as possible into the rectum. Four duplicatures were thus removed. The pain of the operation was not great; no hemorrhage followed; no dressing was applied; and on going to stool some days after, the rectum did not come out. In fifteen days, the wounds were cicatrized and the woman left the Hotel-Dieu.

CASE II. In the latter part of November 1831, a child about three years of age, of a good constitution, was brought to M. Dupuytren. It had, for a long

time, been affected with inversion of the intestine, with prolapsus of the rectum, after every evacuation of the bowels. This child, which enjoyed good health, was of a lymphatic temperament. The operation was done precisely as in the former case; the patient laid on a pillow, the thighs and buttocks separated by assistants, three folds were successively removed as far as one or two lines from the anus. But little blood followed. The next day, on going to stool, the gut came out, a rare occurrence, but not at all serious. Fifteen days afterwards the child was brought back entirely cured; the wounds were nearly cicatrized, and suppuration existed merely in a few spots.

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## CHAPTER IX.

### ON NERVOUS DELIRIUM.

An operation is skillfully performed; the assistants are astonished at the dexterity of the surgeon; yet accidents the most serious may supervene and threaten the life of the patient. Sometime a violent inflammation seizes the extremity which has been operated upon; or some internal organ is attacked and the patient carried off at the very moment success seemed certain; sometimes purulent absorption sets in, announced by shiverings and erratic fever; and again the nervous system being irritated, gives rise to painful spasms, which frequently terminate in fatal tetanus; or finally, the brain, agitated by pain, by fear, nay, by joy, forms conceptions which are no longer in correspondence with external objects, and reason quits the patient at the very time when her presence would be most valuable. It is on accidents of this nature, said M. Dupuytren, that I wish to-day to fix your attention. Obscure in its course, variable in its progress, and frightful in its symptoms, nervous delirium seldom proves fatal, when it is met in time by proper remedies.

Before entering upon the consideration of this disease, we will cite some cases of this complication of wounds and operations, in order that the reader may have clear notions concerning it.

CASE I.—On the 15th of December, 1831, a man was brought into the Hotel-Dieu, having had his leg broken in a quarrel at a *café*. The fractured limb was in a very disordered condition; the upper fragment had torn the soft parts, and made a triangular opening in the skin. The fracture was reduced, but during the whole night the patient uttered the most distressing cries. At the visit of the next morning, he seemed as if he was buried in a fit of intoxication; during the dressing he uttered the same cries again. M. Dupuytren remarked, that this want of courage or excessive sensibility of the patient was an unfortunate circumstance, through the influence of which grievous accidents might ensue. He was bled three times; the next day he was a little better, but on the following was delirious; his ideas were incoherent and confused. This was the day on which his friends were allowed to visit him; patients on these occasions almost always receive food unsuitable for them, or

circumstances occur which tend to aggravate their condition. Was the change now observed in the patient due to this cause or some other? It was found that he had experienced some vexation arising from some private business in which his mind was engaged; and during his delirium constantly repeated, that his stay in the hospital would ruin him. Leeches, anodyne potions, and an enema of asafœtida were administered; but all in vain; on the morning of the 9th he expired.

The death of this man gave rise to several important questions: Was he the victim of one of those internal inflammations which frequently give no note of their presence, except by the fever or delirium they produce? or had he perished in consequence of the fracture, or the profound lesion which it caused in the nervous system? Besides, justice interfered in the business; the professor was called upon to answer whether the fracture was occasioned by a fall in the scuffle, or caused directly by kicks inflicted on the leg.

At the post mortem examination, M. Dupuytren took occasion to observe how difficult it was to conceive that such a fracture should be occasioned by a mere fall; that in this case it did not seem probable; and to be barely possible, it would require the concurrence of a variety of circumstances, which could not be easily appreciated. On the other hand, a fracture of this kind might result from many different causes, such as a fall from the first story of a house, the passing of a carriage wheel over the legs, &c. It was, therefore, impossible to decide how the accident had occurred; the case affords a good example of the necessity there is in such circumstances of proceeding with caution, when reports are to be drawn up for the purposes of justice.

Inspection of the fractured limb showed that the parts had been violently dissevered; the tibia broken in fragments; the fibula divided, the soft parts contused and lacerated; the left pleura contained a considerable quantity of blood; the brain was healthy.

CASE II.—M. R. C..., a tradesman, aged twenty-five, of a lymphatic, nervous temperament, and of little moral energy, was operated on for a voluminous sarcocele. Alarmed by the fear of hemorrhage, he was restless the whole of the succeeding day. On the following day his agitation increased; the least movement, gesture, or word annoyed him. Every thing went on well; but he soon began to complain of pain in his limbs and chest; his eyes became bright; respiration hurried; he called for food, and wanted to get up. His intellect became disturbed; he repulsed his nurse, and loudly called for his family, who were not near him. The whole body was in motion. His cries, brilliant eyes, immovable pupil, his face covered with perspiration, and his pulse calm and regular, in the midst of this agitation, left no doubt of the presence of nervous delirium. The patient complained loudly of pains in the chest, though no examination could detect their nature. M. Dupuytren then ordered, what he generally does in similar cases with great success—namely, a semi-lavement with six drops of laudanum, which was given immediately; some of his friends, alarmed by the accident, were sent away; the patient ordered to be kept strictly by himself. He now ceased to be talkative, and fell asleep; awoke the next day entirely free from the delirium. The cure was complete in twenty-five days.

CASE III.—Langlois, a mason, aged twenty-six, came to the Hotel-Dieu in May, for fracture of a rib occasioned by a fall from a house. A bandage was

put tightly around his chest to secure the immobility of that part—a proceeding necessary for the cure. Those fractures generally go on so favorably that no attention was paid to the patient; but he was seized on the third day with delirium, which gave him no rest. He was agitated in a thousand ways; all his muscles were in a state of continual tension; his eyes bright, and skin covered with sweat; his pulse alone was calm. Langlois thought he saw figures floating in the air; fancied that physical experiments were performed on his bed, and that all the patients in the ward were undergoing the same treatment. This disturbed him much; and he knew not whether to submit or resist. Being of a sanguineous temperament, he was bled, with no effect; an enema with ten drops of laudanum was then administered, with better success. Next day the dose was doubled, but with no great improvement. His cries disturbing his neighbors, and being excited by the movements and visits in the ward, he was put into a separate chamber. The laudanum was increased to forty drops, and under this treatment the delirium subsided.

But the man had suffered so much by the continuance of his agitation at a time when repose was required, that the pleura, irritated by the roughness of the fractured rib, became inflamed, and the lungs were attacked. Cough, with bloody expectoration, showed the presence of intense pneumonia, evidently aggravated by the repeated occurrence of the original cause during the violent fits of coughing. He was treated by venesection, calming potions, and revulsives. He seemed to be cured, but his convalescence was not satisfactory; he was pale and feeble, had frequent cough, oppressive fever; and on leaving the hospital, after a residence of two months, he appeared to be laboring under chronic pneumonia.

CASE IV.—Vincent François, aged thirty-two, a *chasseur* in the 3d regiment of royal guards, of a bilious-nervous temperament, having met with some annoyance, determined to destroy himself. He got drunk, went into the church of Notre-Dame, and cut his throat. He was carried immediately to the Hotel-Dieu. The integuments were divided from one angle of the jaw to the other; some of the muscles were cut; and the weapon had penetrated even to the pharynx, between the hyoid and thyroid cartilage. He was dressed and guarded. On the second day he was attacked with delirium and confined in a strait waistcoat. A calming potion, consisting of half an ounce of syrup of diacodium produced but little effect. However, at last, he became rational; but the disturbance of the previous twenty-four hours, gave rise to severe accidents; smarting pain, and a feeling of strangulation, with a violent cough, and purulent expectoration, all came on rapidly. The wound assumed an ill appearance on the fourth day, and on the seventh delirium returned. The same remedies were used with success. These accidents and some others gave rise to many fears as to his safety; however, he was cured in fifty days.

CASE V.—L. Le N., aged thirty-five, a hair-dresser, having spent in a short time a considerable sum of money, which he had been long and painfully amassing, gave himself up to a profound melancholy. The loss of his place, too, in the house where he worked, augmented his despair, and in a moment of fury, he inflicted on himself seven wounds with a pair of scissors—three of which were of considerable depth. Being taken to the Hotel-Dieu, he was immediately bled, treated with a pisan of linden flowers flavored with

orange, and an anodyne draught. The delirium was not calmed, on the second day a new bleeding was practised, without improvement in the state of the patient; he thought he was pursued by the police, and wishing to escape them, he was confined. Yet, notwithstanding all this disturbance, the pulse was by no means frequent; the tongue was clean, and the body covered with an abundant sweat; the appetite was good, only he would not eat for fear of the police. For two days this state of things continued, although other bleedings and antispasmodics were tried.

On the fifth day, M. Dupuytren prescribed two lavements with ten drops of laudanum in each. They were scarcely administered when the delirium ceased, and at the end of six days it had entirely subsided, in consequence of the lavements.

About a fortnight after, Le N...., was brought back to the hospital for a second attempt on his life. The number of blows with the scissors was so great that they resembled the marks of scarifications. Nervous delirium again occurred, and he was cured by the same means. (Case reported by M. Mirambeaud.)

CASE VI.—Marianne R...., when about fifty-eight years of age, found her sight gradually impaired; at sixty-one she was unable to distinguish day from night. Admitted into the Hotel-Dieu, both crystalines were perfectly opaque. Every thing being favorable for the operation, after fourteen days of preparatory treatment, M. Dupuytren operated on her by keratonyxis in his usual manner.

During the day of the operation, she suffered from frequent vomiting, but this was entirely subdued. On the third day she had headache and burning tears; four foot-baths and two enemata were ordered. On the next day, intense inflammation of the eyes and eye-lids set in. A portion of the cataract rose behind the pupil and formed an opaque semilunar curtain. On the left, the pupil assumed a square form, and behind it, portions of the lens and its capsule could be seen, of a deep red color; other portions of the same bodies were in the anterior chamber; the patient can no longer see, suffers acute pain (seton to back of neck.)

On the night of the fifteenth day, very intense nervous delirium ensued, the strait waistcoat was applied. The next morning the patient recognized the assistants, and complained of the pretended bad treatment she had undergone, answers illy all questions, (antispasmodics, sinapisms to the legs,) no improvement. On the seventeenth day, a quarter lavement with eight drops of laudanum; on the eighteenth, the same with ten drops brought on sleep, and by a continuance of the remedy the disorder was completely removed.

This terminates the subject under consideration. We may, however, add, that divers other accidents happening to the organs of sight, the patient left the hospital in a very satisfactory state.

CASE VII.—E. M...., aged fifty-four, performing an awkward evolution on coming down stairs, missed his footing and fell on his left side. He could not get up, but was carried to the Hotel-Dieu, when the house surgeon recognized a fracture of the inferior extremity of the fibula, with rupture of the internal malleolus at its base. The limb was placed in the bandage ordinarily used for fracture of the leg; the pain was intense, great swelling. The next day, M. Dupuytren applied his apparatus and administered resolvents.

On the third day the pain ceased, and the swelling diminished; on the fourth, violent delirium came on; required the strait waistcoat; a quarter lavement with from eight to ten drops of laudanum; the next day the delirium having disappeared, the remedy was discontinued. On the sixth day, the disease returned, lasting until the eighth, and then yielded, permanently, to the repeated administration of enemata. The fracture went on favorably, notwithstanding the different disturbances; consolidation was complete on the thirty-sixth day, and the limb was free from any deformity.

The preceding cases will serve to introduce what we have to say of the history of that complication of fractures and operations which M. Dupuytren calls *nervous delirium*, or, as some call it, after the exciting cause *traumatic delirium*.

Its approach, sometimes indicated by the gestures, disordered and thoughtless movements of the patients and incoherent expressions, is most frequently sudden and unexpected. It is manifested by a singular confusion of ideas about places, persons, and things. Harassed with sleeplessness, the patient is generally overpowered by some prevalent idea connected with his profession, passions, taste, age, and sex. He labors under perpetual jactitation. The upper parts of the body are covered with profuse sweat; the eyes glisten and are injected; the face brightens up, is flushed, and menacing words are uttered with extraordinary loquacity, and alarming cries. Such is the insensibility which some patients display when thus affected, that we have seen them, when laboring under comminuted fractures of the lower extremities, tear off the bandages and walk about, without betraying the least pain; others with fractured ribs shake themselves and sing; and lastly, some who have undergone the operation for hernia, introduce their fingers into the wound, and coolly amuse themselves with tossing about their intestine, as if they were handling those of a dead body. But, serious as are these symptoms, the pulse tranquil and calm, experiences no other disturbance than that which arises from the disorderly movements. There is no fever; the excrementitious functions proceed with their accustomed regularity; but the appetite fails; and after two, four, or five days, the complaint terminates in death, but much more commonly in recovery. If the latter be the result, it occurs without a crisis, and as suddenly as the disorder began. Exhausted by fatigue the patient is seized with a deep sleep; from which he awakes with perfect intelligence, but unconscious of what has passed; weak and very sensitive; the appetite returns, the former complaint resumes its course, and every thing proceeds with its usual regularity. This delirium may return two or three times, after the interval of a day or two, but is weaker in each succeeding relapse.

The tranquillity of the circulation, and absence of all febrile symptoms, are the most remarkable features of the disease. You see a patient furious, distracted, the sweat pouring down his face, his voice raised to the highest pitch, you think him the victim of burning frenzy; approach him, his pulse is calm, regular, and the state of the skin banishes all idea of inflammation. This is a true mania, differing from that commonly met with only in its duration; rarely lasting longer than five or six days.

Nervous persons of a pusillanimous nature, whose brain is affected by some vivid fancy, are most exposed to this delirium. It was so frequently the case

with suicides, that some have thought it peculiar to them. Nor are the athletic exempt from it. Women are seldom attacked by it; and it never has been observed amongst children.

Nervous delirium may of itself be dangerous. I have seen (said M. Dupuytren) a young man, of vigorous constitution, who was seized with this affection, in consequence of a simple excoriation of one of the toes, sink under it in eight and forty hours, the primary affection not seeming to have had any influence in causing death. However, in the great majority of cases, the severity of the disease is proportioned to the accident. Thus a more unfavorable issue may be anticipated when it arises from fractures of the extremities, or of the ribs, or after wounds of the throat, than when it results from simple wounds, such as are in themselves trivial\*.

Inspection after death, moreover, discovers neither in the cerebro-spinal system nor other internal organs any material lesions that would explain the symptoms during life, nor give any satisfactory reasons for death. Treatment.—Sedatives of all sorts, bleeding, pushed even to fainting, revulsives, and all other means which I have seen used, and been for a long time in the habit of employing, have all proved inefficacious in this disorder; for they neither affected its progress nor intensity. Narcotics, the liquid laudanum of Sydenham, have not been more beneficial; it is easy to explain this want of action, by a physiological reason. The stomach, destined to elaborate the first element of nutrition, is endowed with powers of digestion, and contains juices which disorganize more or less, the substances which come into contact with it; so that much of the medicinal matter introduced into the stomach remain inactive being mingled with the food. This is the reason why so many medicines of the vegetable class more especially, are uncertain in their action, and often useless. It was owing to the evident inutility of those divers remedies, and the conviction I had of the effect of the stomach on remedies, that I was induced to make trial of a method which has constantly succeeded in my hands, and which, indeed, may almost be looked upon as specific. This method, as simple as it is powerful, consists in merely adding to an enema a few drops of laudanum. Five or six drops to a quarter lavement, are more effectual than triple the dose introduced into the stomach. The reason is known; but we may add, that the rectum, destined to receive the residue of digestion, absorbs and does not digest; and hence the medicines committed to it, especially when they are retained for some time, must more certainly reach their destination. These enemata should be repeated twice, thrice, or four time, every six hours. When they are retained, they are perfectly sufficient to subdue even the most furious delirium.

\* It is singular that *habitual intemperance* should have been omitted among the causes enumerated; the *nervous delirium* of M. Dupuytren, appears to be precisely similar to the *delirium tremens* of other writers.—TRANS.

## CHAPTER X.

## ON FRACTURES OF THE INFERIOR EXTREMITY OF THE FIBULA, AND LUXATIONS OF THE FOOT.

*General Considerations.*—Although weaker and more exposed to external violence than the tibia, the fibula, however, is much more rarely fractured than the former bone. This peculiarity is explained, by the species of isolation in which it is found, relative to the line in which the weight of the body is transmitted to the foot. The elasticity which it enjoys, even in advanced age, the slight exertion it makes in its whole length, the protection it receives in front, by the muscles filling the interosseal space, and the tibia itself, behind, by the common mass of the gastrocnemius and soleus muscles, externally by the lateral peroneal, are so many circumstances tending to weaken the effects of blows received upon it, and diminish the frequency of its fracture. We should, however, observe, that some of these injuries have been frequently mistaken, and others often confounded with luxations of the tibio tarsal articulation, so that they are actually more common than is generally admitted by a majority of authors. Thus, M. Dupuytren estimates fractures of the inferior extremity of the fibula alone to be to fractures of the bones of the leg:: 1 : 3.

Among the forces producing a fracture of this bone, some act upon it immediately; others through the intervention of the foot; thence result two kinds of fractures, those taking place in the middle and upper parts of the bone, and those of its lower extremity; they differ from each other in the triple ratio of their causes, effects, and treatment necessary for their cure.

The situation of the shaft of the fibula on the outer side of the leg, its delicacy, the space between it and the tibia in the middle of the leg, its articulation to the tibia by its extremities; all would induce us to suppose that it would frequently be fractured in its middle; this, however, is not the case. Two causes oppose it; the protection the fistula receives from the lateral peroneal muscles, and the rarity of circumstances capable of producing a solution of continuity by a direct cause.

These fractures, therefore, follow generally direct blows, resulting from a blow by a contusing or cutting weapon, gunshot wounds, the fall of heavy bodies on the exterior of the leg, &c. They suppose and require no muscular agency. Thus they occur without being ordinarily preceded or followed by any turning of the foot either outwardly or inwardly, and are generally cured by rest, without being accompanied by any of the accidents which so frequently complicate luxations of the foot. These fractures have a remarkable analogy with those of the ulna, which are never singly produced, but by force directly applied.

However the force may be applied, a fracture of the shaft, or of the upper extremity of the fibula, when the tibia is untouched, is followed by no alteration as to length; the foot preserves its natural position, and at the seat of

fracture, there may be felt with difficulty a depression caused by a slight sinking of the bony parts. Thus the diagnosis of injuries of this kind is very obscure, especially if much swelling exists. The circumstances accompanying the wound; the violence of the blow; or the weight of the body falling on the limb; an extensive ecchymosis; a severe contusion on the spot; the ease with which the finger carried over the surface of the fibula sinks at this spot, and depresses the fragments towards the tibia, are the principal symptoms which must guide the surgeon.

Motion of the foot, or of the extremities of the bone, scarcely ever evince any appreciable crepitation, on account of the small size of the fragments and the exactness of their opposition.

Fractures of the fibula are never accompanied by shortening of the limb, because the tibia serves as a sort of splint. They are seldom serious, except the injury to the soft parts be considerable. In simple cases, nature generally effects the cure. The indications of a fracture of the shaft of the fibula, are to maintain the limb immovable, by means of the ordinary bandage for the leg; and to apply the proper dressings to the contusions and wounds, which may accompany the fracture. The consolidation generally takes place in thirty or thirty-five days, and mostly, entirely free from deformity.

*History.*—But the solutions of continuity of the malleolar portion of the bone, of which we are about to treat, are dangerous, and lead to much more serious results. For a long time they were confounded with luxations of the foot. Duverney, and J. L. Petit, are the first modern surgeons, who have spoken of them. Petit, especially, remarked, that lateral luxations of the tibio-tarsal articulation could not take place without rupture of one of the malleoli. David, Fabre, Bromfield, Pott, Pouteau, Boyer, and Charles Bell, have since, by their observation, thrown more light on fractures of the lower end of the fibula. However, the history of these injuries was very incomplete; the mode of treatment, seldom obviated the deformity they so frequently cause, when M. Dupuytren gave his attention to the subject, and made their treatment as efficacious as that of other fractures.

*Causes.*—The inferior extremity of the fibula may be broken, either by direct causes, of which we have spoken, or a *contre coup* by violence to the foot. The mechanism of the former species of fracture, presents nothing remarkable; the latter, however, demands the attention of the practitioners, because it is highly important to recognize the causes of the accident, in order to ascertain, in doubtful cases, the possibility of the existence of this injury. A pebble, an excavation, or even a simple inequality of the ground, a fall from any height on the feet, when they bend inwards or outwards, are the most common causes of this accident; it is the immediate result of the action of the weight of the body, and muscular contraction acting suddenly on the inferior articulation of the leg, at the moment when the foot has deviated from the vertical line.

Let us now inquire how fractures of the fibula may take place, in the violent lateral motions of the foot. It is evident that the cause of the rupture is a change in the line of support of the body. When the foot is turned inwards, the line, instead of following the axis of the tibia, and falling on the astragalus, cuts obliquely, from within outwards, the lower end of the tibia; the articulation of the foot, and is extended to the external side of the limb, after having

crossed the external malleolus. The external malleolus, and lower end of the tibia, are thus obliged to support the weight of the body; therefore, in this case, the external malleolus, or the inferior extremity of the fibula, yields to the traction of the external lateral ligaments; a traction so much the more powerful, as these ligaments then take a direction perpendicular to the malleolus, and this latter rests on the sharp edge of the astragalus, which is forcibly thrust from within outwardly by the tibia. This latter bone stronger and thicker than the fibula, ordinarily resists, and if, as it sometimes happens, its malleolar is broken, and, as it were, torn off; it is not primarily, and from the sprain, but secondarily, and from the effect of the outward displacement of the foot, that this malleolus, and sometimes the end of the tibia itself are fractured.

In the second case, that is, in the outward movement of the foot, the centre of gravity of the body, instead of following its usual line, traverses obliquely the inferior part of the fibula, the articulation of the foot, the malleolus, or the internal lateral ligaments, and meets the ground, at a greater or less distance, from the inner edge of the foot. These ligaments and the malleolus, to which they are attached on the one hand, and the lower end of the fibula on the other, therefore, support the weight of the body and the action of the muscles; they are either torn or fractured; first, the lateral ligaments, or the internal malleolus; and secondly, the inferior extremity of the fibula.

*Characters.*—Two orders of characters, designate the disease under consideration; some belonging to fracture of the fibula, others to the luxation of the foot; a useful distinction, since fracture of the fibula may sometimes exist without luxation of the foot.

They are of two kinds: presumptive and characteristic.

The presumptive characters, according to M. Dupuytren, are the nature of the accident, a noise, or sort of crackling heard at the moment, a fixed pain in the inferior part of the fibula, the difficulty, or even impossibility of walking, swelling around the articulation of the foot, and principally around the external malleolus and inferior extremity of the fibula.

The characteristic signs are: inequalities, an unnatural mobility of some point of the inferior extremity of the fibula, a crepitation more or less distinct, the power of moving the foot transversely, the ease with which the fibula may be brought near the tibia, a change of the point of meeting of the axis of the leg and the foot, the deviation of the latter, outwards, inwards, and sometimes backwards, an angular depression more or less evident at the external inferior part of the leg, the projection of the internal malleolus, the disappearance of these signs on an attempt at reduction, and their instantaneous return, when this attempt is discontinued, and, especially, when the limb is put in a state of extension.

Let us now consider in detail, these divers signs, and above all, the characteristic symptoms. The fibula is hardly fractured, when remarkable phenomena ensue in the tibio-tarsal articulation. The external edge of the concavity which receives the astragalus, having lost its solidity, resists no longer the muscles which tend to throw the foot outwards, and which, therefore, overcome their antagonists. Then the outer edge of the foot rises, the inner edge sinks, the dorsal surface is carried directly upwards, the plantar region inclined outwardly; the pulling of the astragalus is directed upon the

internal malleolus, and sometimes makes a projection easily recognized through the integuments; the external malleolus, on the contrary, makes a vibratous movement on the tibia, by which its summit is elevated, and the superior extremity of the fragment which it terminates, is brought near to the axis of the limb. From that moment the foot is placed without the centre of the inter-malleolar space; and by producing the axis of the tibia, it will fall on the inner edge of the tarsus, and the weight of the body be supported by the internal malleolus, and the ligaments attached to it. This outward displacement of the foot, is the only one which necessarily results from fracture of the fibula, and is the more marked, in proportion as the bone is broken low down, and the patient afterwards endeavored to use the injured limb. In the case where fracture has resulted from the violent inward inclination of the foot, muscular action soon draws it outwardly, and effects in its relations with the leg, the changes indicated.

Should the rupture of the lower extremity of the fibula be mistaken or improperly treated, the accidents accompanying it go on advancing, muscular action gradually turns the foot outwards, the astragalus is carried above the internal malleolus, the corresponding ligaments are put on the stretch, the soft parts inflame, and become altered, and the synovial capsule being opened, caries attack the articular extremities and destroys them. In the most favorable cases, the patient unable to trust the weight of his body to a weakened, deformed, and painful limb, whose extremity presents to the ground only the internal malleolus and inner edge of the foot, is obliged to use crutches, or a wooden leg. Many cases attest the unfortunate consequences which may follow a fracture of the fibula when not recognized at first.

It is, therefore, important to establish the diagnosis of these lesions. After a knowledge of all the accidents capable of producing them, we should examine attentively the lower part of the leg, and the tibio-tarsal articulation. The presumptive signs, undoubtedly, may belong to a simple sprain, or one complicated with rupture of the ligaments; but may also render probable the existence of a simple fracture. If there is displacement, it is almost always possible to recognize, inequalities produced by the fragments. Running the finger over the whole extent of the lower portion of the fibula, we may perceive, at the seat of the fracture, an abnormal mobility, which must be distinguished from the elasticity of the bone, and whose existence is rendered more manifest by grasping the tibia with the four fingers of each hand and applying successively the thumbs to the fractured portions. Crepitation is rarely evident and often it cannot be heard. On grasping with one hand the tarsus, and with the other the lower part of the leg, we will find, if the fibula be fractured, that the foot may alternately be carried outwards and inwards.

The first of these movements causes the internal malleolus to project, removes the external malleolus from the joint, and also in a manner the astragalus from the line in which the weight of the body falls upon it; the latter movement restores the parts to their natural situation. As we have above remarked, the foot, left to itself, inclines inwardly; the internal malleolus projecting considerably; the integuments covering it are tense; the axis of the leg falls on the inner edge of the tarsus instead of corresponding to its middle part; the space between the malleoli is increased; on the external side of the articulation, the skin is transversely wrinkled, the external malleolus

seems sunken; above it and at the seat of the fracture, a sudden depression is almost always observed, with an antero-posterior direction, a sort of *hatchet blow*, according to an expression of M. Dupuytren, which is a pathognomic sign of a fracture of the bone. This depression, however, should not be confounded with that formed by the fibula immediately above the malleolus, and between the anterior and lateral peroneal muscles.

In some cases, the foot has been so forcibly turned inwards that it remains inclined despite of the fracture of the fibula; but then the upper extremity of the lower fragment raises the skin, and threatens its laceration, the finger can perceive the irregularities of the fracture. After the reduction of the luxation, the phenomena above indicated, are manifested, and the disease cannot be mistaken. Its chief characteristic is the facility with which all the symptoms may be reproduced, after having been made to disappear by giving to the foot its natural position.

*Prognosis.*—Fractures of the lower part of the fibula are grievous, in proportion to the severity of the concomitant accidents. A simple fracture, which is soon recognized, and properly treated, is generally happy in its termination, and free from deformity. They become dangerous only from the effects of ignorance which mistakes them, or unskillfulness which does not apply the proper remedies.

*Species and Complications.*—Fractures of the fibula are divided into *simple* and *compound*.

They are *simple* when limited to a solution of continuity of this bone, without any other lesion. Under this form, it is extremely rare, and can only happen at a certain distance from the inferior extremity of the fibula, and when the cause producing it, exhausted immediately after, has been incapable of producing other effects; or when another cause, consecutive to the first, has not occasioned other lesions.

It is very difficult to recognize a fracture of the fibula in this state of its greatest simplicity. We have nothing to guide us but presumptive signs.

One of the most frequent causes of the rarity of this species of fracture, consists in the efforts made by the patient, immediately after the accident, to rise and walk home, or to some neighboring place. Sometimes it has lost its primitive character of simplicity, long after the accident, by the imprudence of the patient, who, fatigued by constant rest, has endeavored to walk and leaned on the broken limb. It may thus be perceived how important it is, in these cases, to keep them quiet, and make them abstain from all motion. This treatment and some resolvent application, generally effect a cure in a short time.

This species of fracture presents *two varieties*. In the first the fibula is broken at more than three inches distance from the top of the external malleolus. Its distinguishing sign, is that it is unaccompanied by displacement of the foot. This is owing to the length of the inferior fragment of the bones and the integrity of the tibio fibular-ligaments.

It is generally found in fractures from a direct cause, and scarcely ever in those from an indirect blow. The reason is that the latter is always preceded by a violent motion, or a displacement of the foot. This variety is not dangerous, and requires merely rest and the demi-flexion of the limb. The second variety consists of those cases in which the fibula is fractured by a

direct or indirect cause, at less than three inches from the externa malleolus and without displacement of the foot. It may take place at all points of this space; but when the foot has been violently turned outwards, it is generally found about two and a half inches from the malleolus, because there the fibula, weaker and thinner than any where else, and curved inwardly by the weight of the body and action of the muscles, offers less resistance. If, on the contrary, the foot has been forcibly flexed inwardly, the fracture generally takes place below this point, and on the part of the bone, lodged in the groove of the tibia. What particularly distinguishes this variety from the preceding, is the facility with which the foot is displaced.

The complications of fractures of the fibula are numerous, and give them a serious character, which of themselves they do not possess. Let any cause, for instance, produce a violent outward flexion of the foot, the effort of flexion and extension which will fracture the fibula, is first exerted on the soft parts of the internal face of the articulation, and the inferior extremity of the bone, and brings about the rupture of the internal lateral ligaments, or even fracture of the internal malleolus; or, lastly, should the fracture be occasioned by the inward flexion of the foot, and the individual then endeavor to walk, and lean on the foot, it will be carried outwardly and the same accidents take place. Thence follows the first complication. Sometimes instead of the lateral ligaments and the internal malleolus, the inferior extremity of the tibia is fractured. This fracture whether preceded or followed by that of the fibula, is generally oblique and accompanied by displacement of the foot. Luxation of the foot, is a third complication always met with, except in very rare cases. It takes place in different ways, inwardly, outwardly, backwards, and sometimes upwards. The first is so common and so intimately connected with fracture of the fibula, that it is one of its most certain signs; it consists in a displacement of the head of the astragalus, which is carried below and on the inner edge of the tibial malleolus, a displacement resulting from the prolonged action of the causes producing the fracture, from the action of the abductor muscles of the foot. The second is owing to the action of the gastrocnemius and soleus muscles, which acting on the foot, no longer restrained by the external malleolus, cause the astragalus to slip from before backward on the lower end of the tibia, and communicate to the inferior fragment of the fibula, a motion by which its inferior extremity is carried backwards, and the superior forwards.

The third species of luxation is most rare, and difficult to explain. The astragalus is then carried on the side of and below the fibular malleolus, whilst the outer edge of the foot is depressed, the sole inwardly, the inner edge upwardly; the tibial malleolus is concealed and disappears between the foot and the leg at the bottom of a receding angle, situated at its internal edge, the external malleolus forms with the astragalus a salient angle, rounded outwardly. From this disposition of the parts, the foot presents the appearance of congenital club-foot. The professor desiring to account for this extraordinary displacement, examined successfully the organization of this portion of the lower extremity, the relative action of the antagonising power, the equilibrium which governs it, and its effects. On the one hand, in rest and sleep, in the case of club-foot, and the major part of false steps and sprains which ensue from it, the foot being constantly directed inwardly, and the

astragalus outwardly, the displacement of these parts, should almost always take place, in the same direction after fracture of the fibula and the lower extremity of the tibia; on the other hand, the study of the respective powers of their antagonising muscles, proves that in a majority of cases, the abductors should, and in fact do, overcome the adductors; thus it is observed that the outer edge of the foot is generally turned outwardly and the astragalus inwardly, whether there be fracture of the malleolus and the inferior extremity of the fibula, or of the two malleoli at once, and at the same height; lastly, in fracture of the tibia alone, at its extremity, although the foot has no inward support, and preserves, on the contrary, that furnished by the fibula and its malleolus, there is almost always a more or less sensible inward displacement of the astragalus, which can only be attributed to the superior power of the abductors. From all these considerations, we must conclude, that the outward luxation of the foot (in which the astragalus is carried outward, and the foot inward) can occur only from very peculiar, unusual and rare circumstances. Reason and observation show that these circumstances consist in the obliquity of the fracture of the tibia, and the greater or less resistance of the inferior fragment of the fibula, the obliquity of the former by influencing the direction of the displacement, and the muscles capable of effecting it; the resistance of the latter, by preventing the foot from being carried outwardly and consequently favoring the action of the abductors.

The last species of luxation, that of the foot outwardly and upwardly, which had never been observed, has been remarked but once by M. Dupuytren, in a practice of upwards of fifteen years, and two hundred cases of fractured fibula. But it has been so well described, that hereafter it can never be mistaken; in this species, the astragalus, at first, luxated outwardly, afterwards mounts along the external face of the tibia. In the example cited by the professor, the astragalus, external malleolus, and foot, were first carried on the external side of the leg, and then ascended, for the space of two inches along the tibia, still remaining together, like parts naturally widely joined to each other. It may be perceived that this can only take place with fracture of the fibula, and complete laceration of the tibio-peroneal ligaments.

If the tibia be fractured at once in several places and different directions, which generally happens when it is caused by a heavy blow, or the passage of a wheel over the leg, a compound fracture results, with puncture, tension, infiltration, laceration of the soft, nervous, tendinous, aponeurotic, and cutaneous parts, and subsequently, pain, inflammation, eschars, convulsive movements, and tetanic spasms, &c., endangering the life of the patient, and rendering the treatment long and difficult.

But this species of complication, however serious it may be, is not to be compared with that frequently produced internally, and concealed by the skin. These are sometimes such, as to make us despair of their reparation, did experience not teach us that they are often cured, and that in a short time. Thus we see both the tibia and fibula broken, or one of them, at a single or numerous places, with acute cutting; spiculæ driven into the flesh; the articulation opened, and its cavity filled with bloody synovia; the internal, lateral tibio-fibular, and external lateral ligaments lacerated; the tendinous sheaths of the muscles opened; the tendons themselves and the nerves tense, twisted, compressed, displaced, and partly, or wholly divided; the arteries

and veins, and especially the great saphæna, compressed, ruptured, and surrounded by effused blood; the cellular tissue torn in every direction, and filled with a reddish serum, and more frequently with blood, extravasated as far as the toes on the one side, and the knee on the other. Add to all this the various displacements, which the long parts may undergo, and you may form a faint idea of the disorder sometimes accompanying this kind of fracture. The arteries or veins may alone be wounded, without this formidable aggregate of lesions we have just enumerated, and cause an extravasation of blood into the meshes of the cellular tissue, an effusion of this fluid into sacs, formed at the expense of the cellular tissue, which separate the soft parts, surround the fragments of the bones, extend around, and sometimes penetrate the articulation. This kind of lesion, constitutes a new complication, one of the most common, indeed, of fractures in general, and of the fibula in particular; it ought to be especially distinguished on account of the serious accidents which result, and the treatment proper to it.

Frequently, the skin has been carried away, opened in one or several places, by the extremities of the fragments of the fractured bone; these openings, commonly irregular, with ragged edges, contused and disorganized, sometimes embrace the bone, hold, and as it were, cap it; sometimes are free and pour out a blackish blood, or fragments of flesh, and half disorganized tendons. They are produced in various ways, either primarily, as we have pointed out, or secondarily, by the effect of inflammation, the falling of eschars, or a process of elimination, by which nature endeavors to expel the blood and pus, and all parts foreign to the organization. These lesions of the integuments, are another species of complication, so serious in their effects, that fractures, otherwise unimportant, may become very dangerous, whilst we should never despair of the cure of internal injuries, however great they may be, as long as the skin is uninjured. The most dangerous are those produced immediately by the fracture, on account of the subsequent inflammation, the pain, fistulous sinuses, exfoliations, necroses, and a host of other accidents, resulting from the formation and infiltration of pus.

The tumefaction, tension, and strangulation, subsequent to fractures, are different degrees of the same complication, and the result of the afflux to the nervous, fibrous, and other parts, distended, stretched or torn, by the bones, and the displacements they have undergone. When these symptoms are not immediately dispersed, the tumefaction and tension, may acquire, in a few hours, a high degree of intensity, and give rise to great danger; phlyctenæ, filled with a reddish serum, appear here and there; the limb becomes livid, cold and insensible; and if the disease be not arrested at this stage, strangulation takes place; and excessive distension of the external, and not less violent compression of the internal parts, bring on gangrene, and the limb partly or wholly becomes dead. The development of these phenomena, reaches their highest degree without any signs of inflammation, a circumstance owing, undoubtedly, to the rapidity with which it takes place. But in other cases, the inflammation succeeds the afflux of which we have spoken, and follows then two different courses; sometimes the symptoms gradually increase; the pain, redness, heat, swelling, and tension, the local and general fever reach their greatest height, and are followed, as in the preceding case, by numbness, lividity, and icy coldness of the limb, the cessation of pain, at

which the patient, ignorant of the cause, rejoices, and gangrene. The skin, and with it, the cellular tissue, the tendons, nerves, ligaments, and sometimes the whole foot, becomes mortified. Sometimes this inflammation takes the form of a mild, but tedious, phlegmonous erysipelas; after some days, the symptoms increase, the fever is higher, the tongue dry, diarrhea comes on; soon an obscure fluctuation is felt under the skin, and the crepitation of elastic fluid; phlyctenæ appear; beneath them a slough is formed, which opens and gives exit to a mixture of pus and elastic liquid. The sub-cutaneous cellular tissue mortifies; the skin separates for some extent; a slow fever sets in, the strength declines, and the patient exhausted by the fever, suppuration, or diarrhea, perishes sooner or later.

The displacement of the bones, the puncture, laceration and distension of the parts, determine and maintain a permanent secondary pain, which inflammation, and its different stages increase, accompanied by fever, insomnia, restlessness, and which at last, by its intensity, or the peculiar sensibility of the individual, may cause convulsions and tetanus. The convulsions generally disappear, as by enchantment, on the reduction of the fracture, according to the axiom, *sublata causa*, &c. But tetanus, when once declared, resists the most active treatment, and even amputation rarely arrests it.

*Nervous Delirium* is another complication of fractures of the fibula and surgical diseases in general, too common and important to be passed over in silence. For a particular account of this affection, see chapter VI.

If, by the effect of perforation or destruction of the soft parts, the bone is exposed to the air, or if inflammation and suppuration destroy the life of the splinters, or detach the periosteum which nourishes them, then these splinters die, and necrosis of the bone follows, constituting another complication of fractures of the fibula. Nevertheless, this necrosis seldom attacks the fragments of the fractured fibula, but very frequently the tendons of the lower extremity of the leg. The reason is because the tendons are more exposed to the disorders subsequent to the fracture. They do not occur immediately, but after some time. Then we perceive pain, redness, heat, swelling, tension, and an obscure fluctuation along the affected tendons; the skin becomes thin and breaks, the pus escapes through the aperture, filaments issue from it, and are renewed until all the parts destroyed by the necrosis are expelled. Lastly, a frequent complication of fractures of the fibula, when followed by inflammation, is an adynamic affection, which, according as it is true or false, essential or symptomatic, demands such different treatment and care, that the safety of the patients depends almost always on the distinction which is made.

*Treatment.*—Even until the present day, there was perhaps no surgical disease, whose treatment presented more uncertainty and inefficiency, than fractures of the fibula accompanied with luxation of the foot. Yet, there are none, which, on account of their frequency and seriousness of the accidents which complicate them, demand more imperiously a fixed treatment, certain in its results, and founded on experience. This imperfection of the therapeutics of this accident is owing to two causes, one of which may be called theoretical, and consisted in the insufficiency of the knowledge of the disposition and respective uses of the multitude of organs composing the lower extremity of the abdominal limb, and of the mechanism of the causes producing

this fracture and luxation. The second, which may be considered as a consequence of the first, consisted in the imperfection of the means of reduction, and especially of maintaining the parts when reduced in perfect relation. Indeed, if we compare the former methods with the mode of action of the vismotrix of the limb, we will see that none of them were sufficient to maintain the reduction. Pott, who, of all the predecessors of M. Dupuytren, has alone pointed out the manner of reduction without difficulty and exertion, has indicated no means of prolonging this reduction. The number of failures from the preceding causes, was also prodigiously increased by the error of opinions formed concerning the proper time of the reduction according to the nature of the complications. M. Dupuytren has reformed this theory, established the gentle and easy process of Pott for reduction on its true foundation, and discovered a method, as certain in its effects as it is valuable in its results, in order to maintain the parts reduced in exact relation until their perfect consolidation.

*Indications of Cure.*—The first indication presented is to prevent any displacement of the fragments. Rest and immobility are sufficient for this end and for the cure, whenever there is merely a simple solution of continuity, whether it takes place at more or less than three inches from the lower extremity of the fibula. These means, joined to reduction, will also suffice, if the fracture is merely complicated with a simple displacement of the foot, in whatever direction this latter may occur; and they should immediately be used, if we desire to prevent deformity, and the accidents which result. But there is a question which it is important to answer, as on it the safety of the patient sometimes depends: Does there exist any kind of complication of fracture of the fibula which contra-indicates reduction? All the species of disorders we have heretofore described, are the immediate effect of the forces producing the fracture, or the consecutive effect of the fracture itself. Departing from this principle, conformable to the nature of things, and the observation, that in both cases the bad symptoms are kept up, increased, and urged to the last degree of intensity by the very cause which has determined them, and must become more serious the longer this cause persists; M. Dupuytren admits as a general rule, that the most certain and prompt way to arrest them, is to reduce the parts in all stages of the malady. It was also the opinion of Desault, who performed the reduction, if necessary in the height of an inflammation of the parts, but whose apparatus for maintaining the reduction, cannot be here offered as a model.

*Reduction.*—There is no reduction more easily effected, than that of fractures of the fibula accompanied by displacement of the foot, when the resistance of the muscles has been once overcome. The obstacles presented by this resistance, have exercised the genius of surgeons from the days of Hippocrates down to the present. Now, it is sufficient simply to flex the leg on the thigh, and attract suddenly elsewhere the attention of the patient. The muscles lose their tension, the resistance ceases as by enchantment, and the parts resume, almost without effort and spontaneously, their natural situation and relations. Nevertheless, however exact the reduction made in this manner may appear, it is always incomplete, the fragments of the bone remain depressed towards the tibia, the foot has a constant tendency to yield to the action of the lateral peroneal muscles and to incline outwardly. A method

is wanting to raise the fragments, separate them from the tibia and place them as near as possible in apposition with each other. What shall it be? It is impossible to act upon the superior fragment which is never depressed, but, on the contrary, always projecting; and we can operate on the lower, only through the medium of the foot. Now, there is so strong a union between the foot and the malleoli, that when it is inclined to either side, one malleolus is elevated and the other depressed in the same ratio. We see, therefore, that the inferior fragment may be elevated, by exerting upon it an oblique traction, that is, by forcibly adducting the foot. The external lateral ligaments, yielding only to a certain point, will exert upon this fragment a tension the more efficacious, in proportion as the foot is inclined inwardly. In this manner the inferior extremity of the tibia sinks into the depth of the articulation, the astragalus is thrust from within outwardly, the lower end of the fibula performs on the latter a vibratory movement, in a direction contrary to that which displaced it, and thus it takes its proper position under the superior fragment.

*Means of Retaining the Reduced Parts in their Proper Position.*—It is evident that the position which so much facilitated the reduction of the fracture, is also the first which must be used to keep them in position. But it would be very improper thus to abandon a fractured limb to itself, and some retentive apparatus is necessary to keep the bones in contact until their union is complete. This apparatus will, of course, be modified, according to the nature of the luxation accompanying the fracture.

That used so successfully by M. Dupuytren, for five and twenty years, in fracture of the fibula, with *inward luxation*, consists simply in a pad, a splint, and two bandages. The pad made of linen and two-thirds filled with chaff, should be two and a half feet long, four or five inches wide, and three or four thick. The splint eighteen or twenty inches long, two and a half inches wide, and three or four lines thick, should be made of compact and inelastic wood. Lastly, two bandages made of half-worn linen, and about five or six yards in length.

The pad, folded on itself in the shape of a wedge, is applied on the inner side of the fractured limb and extended along the tibia, its base downwards, resting on the internal malleolus without going beyond it, its apex above on the internal condyle of the tibia. The splint applied on the pad, should project three or four inches below the inner edge of the foot. These first portions of the apparatus are fastened to the upper part of the leg by a few turns of the bandage.

In this situation, the splint extended beyond the base of the pad like an arrow, leaves between it and the foot a space equal to the thickness of the pad, that is, of three or four inches; this end of the splint serves as a point d'appui for the inward inclination of the foot. In order to effect this, a second bandage is carried successively from the splint over the instep, the outer side of the foot, under the sole over the splint, then from this latter over the instep and under the heel, continuing in this way until the bandage is exhausted. By thus including in the same circles, which may be shortened at pleasure, the splint and the instep, the splint and the heel, alternately, the foot is placed in such a state of adduction that the outer edge becomes inferior, the sole is directed inwardly, and the inner edge upwardly. Therefore, as the foot

yields to the action of this apparatus, the tibia, pressed upon by the base of the wedge, represented by the pad and upon which all the apparatus bears, is driven outwardly as well as the astragalus. The lower fragment of the fibula, pressed above by the tibia, and drawn below by the external lateral ligaments, performs on the external edge of the astragalus, the see-saw motion of which we have spoken, and by which it is brought to its natural position. If we wish to effect a complete reduction, we should not be content merely to bring the foot under the leg, but continue our efforts until it is drawn inwardly as much as it had been displaced outwardly by the fracture.

This apparatus, besides the advantage of reducing without effort, and almost without pain, and of maintaining the parts in their proper situation, possesses still another advantage. By leaving between the bandages a considerable space, exposing the articulation and the seat of the fracture, we can apply such topical remedies as may be required.

The same apparatus is equally applicable to all cases of fracture with simple *outward luxation* of the foot. In cases of *outward and upward luxation*, it will be necessary to place it outside, that is, along the fibula.

There is much more difficulty in cases of *luxation backwards*; both in the reduction and maintaining the parts reduced. In the first, this difficulty arises from the resistance of the muscles, to the elongation of the parts, and the restoration of their natural relations; in the second, the superior face of the astragalus, convex antero-posteriorly, is so that the tibia can scarcely rest perpendicularly to this bone, and has a constant tendency to be carried forwards, whilst the astragalus itself, drawn incessantly by the extensions of the foot, which are more powerful than the flexors, tends continually to fall behind the lower extremity of the tibia. To M. Dupuytren, is owing the invention of a method, adapted to the conditions of this case; and which consists merely in a modification of the apparatus above described, and its mode of application. To it, is added a small pad of a few inches square, filled with horse-hair or chaff. The large pad, folded as before, is placed on the posterior part of the leg, extending from the heel to the hollow of the ham, with its base downward. The splint is laid on the pad, and fastened to the upper part of the leg by a bandage; a second bandage embraces the lower extremity of the splint and the leg; this is the truly effective part of the apparatus. The small pad is intended to cover the tibia, and protect it from the bandage; this latter, bearing on the splint and the tibia, carries, at the same time, the heel forwards, and the tibia backwards. Its efficacy is such, that we have only to fear its overaction.

Fractures, complicated both with *luxation of the foot inwards and backwards*, are almost always cured by the treatment suitable to the predominant displacement. In the contrary case, it is easy to combine the two apparatuses we have described, so as to fulfil the double indication.

In order to confirm the principles we have just advanced, we will now detail some cases, and the most prominent features of their treatment.

CASE I.—*Presumptive Symptoms alone Present; Subsequent Development of the Characteristic Symptoms.*—M. D., was walking on a narrow causeway, when the earth gave way under his left foot, and his body lost its support on that side; a sudden movement brought the weight of the body on the right leg; but the ground still yielding, he slipped from the top of the causeway,

into a ditch, and fell on the inner part of the right leg, which was doubled up, and demi-flexed under the breech. He felt an acute pain at the moment of falling, and was unable to rise. He was carried home without having made any attempt to walk or lean on the injured limb.

Sent for, eight or ten hours after the accident, M. Dupuytren found the foot and leg in their natural position. The foot presented no unnatural mobility, nor the malleoli, the slightest symptom of fracture. The patient suffered no pain in the situation of demi-flexion, which he had instinctively chosen, nor in the examination made by his surgeon. However, he could not bear the slightest weight on the foot, without experiencing acute pain above the external malleolus; even the application of the finger to this point caused him great suffering. At that point, there was an ecchymosis, extending upwardly along the fibula, and downwardly around and below the external malleolus, as far as the corresponding side of the foot. But there was no perceptible mobility or crepitation, nor displacement of the foot, the only characteristic signs of fracture of the fibula. The professor, however, suspected that one existed, but without displacement, and prescribed demi-flexion of the limb, resolvents and rest, means equally indicated in a simple sprain or contusion.

After some days, the patient, at the instigation of a friend, got up, taking care to scarcely touch the ground with the wounded limb, and felt but little pain. Encouraged by this attempt, next morning he went further and tried if the limb could support his body. He had hardly made this dangerous experiment, when an acute pain, accompanied by a sensible crackling and laceration was perceived; he fell, unable to rise. Being again sent for, the professor found outward displacement of the foot, mobility and crepitation. He applied the apparatus we have described and the patient was entirely cured in six weeks, notwithstanding some inflammation which was subdued without suppuration.

*CASE II.—Fracture; Inward Luxation of the Foot; Serious Symptoms; Treatment by the New Method; Complete cure without Deformity.*—Jean Tronille, by trade a smelter, 26 years of age, slipping on a damp and greasy pavement, fell upon his right side, with the foot adducted, and the leg bent under the breech. He felt a smart pain in the lower part of the leg, and endeavored to rise; but being unable to walk he was carried home, and the next day brought to the Hotel-Dieu.

*Symptoms.*—Outward displacement of the foot so great, that the axis of the leg produced below the inferior extremity of the tibia, instead of falling upon the astragalus, would have left on the right this bone and the entire length of the tarsus, rotation of the foot upon its axis, by virtue of which its inner edge was directed downwardly, its outer edge and dorsal surface upwardly; considerable projection of the tibia and internal malleolus; opposite to this, extreme tension of the skin phlyctenæ filled with a reddish serum. On the opposite side, deep depression and transverse corrugation of the skin, two inches above the external malleolus; sudden disappearance of all the symptoms by the least effort at reduction, and spontaneous return of them on ceasing this effort.

In addition an acute pain towards the lower part of the fibula; inequality, mobility, crepitation, sensible displacement of the fragments, and the foot

could be carried transversely with so much ease, that the malleoli and their ligaments might be supposed to be destroyed; all indubitable symptoms of fracture of the fibula with inward luxation of the foot.

*Accidents.*—A large ecchymosis, extending from the seat of the fracture and the internal malleolus to the corresponding surfaces of the foot and leg; considerable tension and swelling around the articulation; pain acute, but moderated by restoring the foot to its natural position. The house surgeon merely applied a poultice; on the next morning an œdematous swelling of the flesh had increased the tension.

M. Dupuytren effected the reduction, and applied his apparatus. The patient was feverish, (venesection, sweetened drinks, anodyne draught, diet.)

On the third day, the pain ceased, he slept during the night, but the swelling remained; this was attributed to the pressure of the bandages, which were loosened; on the fourth day the same swelling, shooting pains, redness, heat around the external malleolus, and fever; some leeches were applied along the fibula; the fifth, fluctuation observed in the centre of the ecchymosis, fever, removal of the leeches; the sixth, the swelling and tension diminish, less fever, fluctuation more apparent; application of sedative resolvents, acetate of lead; the seventh, still improving, but there could now be perceived a large abscess filled with fluid and fluctuating matter, extending from the head of the fibula towards the seat of the fracture. It was supposed to be filled with effused blood; resolvents, with the addition of stimulant (camphorated spirit;) the ninth, still better, the absorption of the blood apparently commencing.

On the tenth day, some imprudent movement of the patient deranged the apparatus, and the limb rested on the folds of a rumpled sheet; from this, there resulted pain, deep marks upon the skin, blisters in different spots, fever; on the 13th, all these accidents had disappeared, and the blisters replaced by superficial ulcerations; the swelling having nearly entirely disappeared, it was found that the internal malleolus had been fractured at its base. The absorption of the blood is no longer doubtful, the abscess reduced one third. On the 15th, the limb, fatigued by the position in which it was kept, was alternately laid on its internal and external side.

On the fortieth day, the fracture was consolidated, no deformity, the apparatus was removed. On the sixtieth, entire convalescence.

*CASE III.—Simultaneous Fracture of the Lower Extremities of the Tibia and Fibula; Very serious Consequences; Treatment by the New Method; Cure with a Slight Deformity.*—F. C. Michel, forty-eight years of age, on descending a stair-way, suddenly twisted his foot, and at the moment felt a smart pain in the external inferior part of the leg. The limb turned outwardly and bearing, both on the internal malleolus and the knee, had to support the whole weight of the body, and caused a new pain more violent than the preceding, at its lower internal part. The patient was immediately carried to the Hotel-Dieu.

There existed, pain, swelling, unnatural mobility, crepitation; and besides, 1st, outward displacement of the foot, an obtuse and depressed angle, with ecchymosis, mobility and manifest crepitation on the lower and external surface of the leg, characteristic signs of a fracture of the fibula; 2d, backward displacement of the foot, extension of it on the leg, a projection at the

distance of an inch and a half from the articulation, formed by fragments belonging to the body of the tibia; 3d, lastly, displacement of the inferior extremity of this bone backwards, which had accompanied the foot in this movement; evident fracture of the tibia.

The house surgeon merely performed the reduction and applied the ordinary apparatus for fractures of the leg. A very painful inflammation supervened, blisters appeared. The next morning the effects of the reduction were small. M. Dupuytren effected it anew, applied his apparatus, covered the parts with sedative resolvents, and prescribed venesection and refreshing drinks.

On the third day, the pain was less violent, the progress of the swelling arrested; the phlyctenæ covered with cerate. On the fourth and fifth, the suppuration from them began to diminish; the projection of the upper fragment of the tibia appearing to be about returning, the professor endeavored to push the foot and inferior fragment forwards. On the eighth, eschars on the upper projection of the tibia and opposite the fracture of the fibula; the patient is uneasy; tonic drinks were ordered. On the twelfth, swelling less, the sloughs began to fall off, the bones do not appear denuded, but the extensor tendons were exposed. On the thirteenth, the pus remaining under the skin was expelled by gentle pressure and proper dressings; the apparatus for fracture was removed. On the sixteenth, the double displacement of the foot, outwards and backwards, and the projection of the fragments were reproduced; the apparatus was reapplied with the addition of a piece under the foot, in order to bring the inferior fragment of the tibia beneath the superior fragment.

From the sixteenth to the twenty-first day, the dressings were renewed twice in twenty-four hours. From the twentieth to the twenty-fourth, the pus, notwithstanding all our care, remained between the tibia and fibula, and an abscess appeared in front of, and below the fracture of the former. On the twenty-sixth, the abscess was opened, and the pus escaped. On the thirty-first, the skin had healed, the swelling had nearly disappeared, the limb was in a very good state. On the fortieth and following days, pains in the outer side of the leg, opposite the fracture of the fibula, which were attributed to the weight of the limb and the compression made on part of the wound. The apparatus was removed, and the limb laid on the opposite side. On the forty-fifth day, the foot was again displaced, showing that as yet consolidation had not taken place; the forty-seventh, the apparatus was reapplied as on the sixteenth day. From the forty-seventh to the fiftieth, flexion of the foot was painful; it was diminished.

On the sixty-sixth day, the tendons of the extensors began to exfoliate; the callus seems to have acquired solidity; the apparatus was removed and replaced by paste-board splints over the whole limb, sustained by a bandage.

Sixty-ninth. The foot yet appears turned outwardly; the apparatus was applied for a third time and kept on for forty successive days, and removed only about the one hundred and tenth day, when the callus was found entirely consolidated.

Some time afterward, the patient began to walk with crutches. A stiffness of the joint, very analogous to a false ankylosis, the adhesion of the extensor tendons to the cicatrix, a slight deviation of the foot backwards and outwards, and a projection in front of the superior fragment of the tibia rendered the

convalescence long and difficult. The patient left the hospital, after a lapse of one hundred and eighty days, with the use of his limb, although it still was less supple than the other, and presented some incurable deformities.

CASE IV.—*Results of the Old Method in some Cases without serious Accidents.*—M. J. P. F. C....., a student of medicine, was running a race with one of his companions, when they came to the edge of a ditch which they had not perceived, and fell from a height of about thirty feet upon dry and stony ground. Both fell on their feet, one had merely a sprain, and the other, M. C....., a fracture of the fibula and internal malleolus, with double displacement of the foot inwards and backwards, characterized: 1st, the fracture of the fibula, by a depression on the outer and lower part of the leg above the malleolus, and by the projection of the latter; 2d, that of the malleolus internus by another unequal and ragged projection of the inferior extremity of the tibia under the skin of the inner and lower part of the leg, and by a depression also unequal and ragged, at some distance below the tibia, formed by the malleolus itself, which was carried outwards and downwards; 3d, the luxation of the foot inwards and backwards, by the outward deviation of this part, the upward direction of its external edge and dorsal face, its internal edge downwards, the sole outwards; and lastly, by the projection of the inferior extremity of the tibia at the interior part of the joint.

Assisted by his companion, M. C. himself reduced the fracture, endeavored to maintain the reduction by a handkerchief placed in figure of 8 around the joint, and was in this state brought to Paris. During the ride, considerable swelling of the articulation took place, especially on its inner surface, with a slight displacement of the foot. On his arrival, the parts were replaced, and the ordinary apparatus applied, with this difference that the lateral splints went beyond the sole of the foot, and the bands placed at the height of the malleoli were tightly tied. He was bled; however, the swelling increased, fever set in, and he was delirious.

On the second day, the apparatus was removed for the dressing, the swelling extended to the knee and thigh, the foot retained its usual position; (emollient poultice and re-application of the apparatus; he was bled twice.) Third day, spasmodic contractions; syrup of diacodium, which gave some rest and induced sleep. Fourth, phlyctenæ on the anterior and internal face of the articulation; engorgement of the inguinal glands. Fifth and sixth, engorgement diminishes; the pain in the heel calmed by the application of a wet compress under the tendo-achilles. Seventh, the pain and inflammation still diminished; but compresses wet with camphorated spirit having been substituted for the poultices, excited again pain which was followed by erysipelas. Eleventh, small ulcerations take the place of the blisters and are dressed with resolvers and emollients. Fifteenth, the swelling of the foot sufficiently diminished to manifest a depression of the fibula, accompanied by a projection of the external malleolus, no endeavors were made to replace these parts in their natural position, and nothing was done but tighten the band situated over the fracture.

Twenty-fourth day, little pain in the instep, none in the heel, the ulcerations had healed. Thirtieth, the apparatus was removed, the parts in the same state as before. Forty-fifth, apparatus removed, and replaced by a bandage in figure of 8 around the joint.

The depression of the fibula towards the tibia, the projection of the external malleolus outwardly and of the internal inwardly, remain; the leg is, as it were, atrophied; the movements of flexion and extension very limited; those of adduction and abduction still more so.

Fiftieth day, the patient got up, and experienced acute pain on putting his foot to the ground. He walked for a month on crutches.

Eightieth day, the movements of flexion and extension are yet embarrassed and walking painful. Acute pain still remains in the articulation of the foot, that of the tarsus and metatarsus, in the heel, and especially in the internal and anterior ligaments of the tibio-tarsal articulation.

At the end of eighteen months, that is, twenty-one months after the accident, notwithstanding exercise, and the use of emollient, and sulphurous pediluvia, opiated poultices, liniments of divers kinds, the movements of the limb, says the patient, the subject and narrator of this case, were still limited; if I walk, or stand for some time, I suffer especially in the ligaments of the tibio-tarsal articulation; the extremities of the tibia and fibula are larger; the limb has very gradually recovered its volume, and is at present some lines smaller than the left.

Such was the result of the old method applied to a fracture of the fibula but little complicated, treated by one of the first surgeons of Paris, and seconded by the courage and skill of a patient then initiated in the art he has since adorned by his talents.

*CASE V.—Result of the Old Method in cases of Fracture without Remarkable Complication.*—Lefebvre, being at work on a bank, was thrown from a height of twelve feet, by a mass of earth under which he was buried for some minutes. When extricated, he had at the inferior part of the leg a fracture accompanied with inward luxation of the foot, and twisting of this part on itself, so that the sole looked outwardly, the outer edge upwardly, and the inner downwardly. A large quantity of blood was effused and extravasated around the joint; the skin otherwise sound. The parts were reduced, and the limb placed in the ordinary apparatus; the patient being young and of a sanguineous temperament was bled several times, and put on strict diet.

The dressing was only removed after eight days, a considerable outward displacement of the foot had taken place, a large abscess existed on a level with the internal malleolus; it was opened, and a large quantity of bloody and fetid pus escaped. Its cavity was filled with lint. The apparatus was replaced by a circular bandage, some splints placed on the sides of the joint, and a flat piece of wood, were to be relied on to keep the foot in its situation. From this moment the displacement knew no bounds, acute, continual pain, enormous swelling, violent fever with delirium were developed; the skin became tense, inflamed, mortified, fell off in flakes, and displayed the extensor tendons of the toes, which exfoliated, and the ends of the tibia and fibula, both fractured, the former at its base, the latter two inches from its malleolus. A very copious suppuration was established, the patient lost his sleep and strength, and was seized with fever and colliquative perspiration. Amputation appeared indispensable, but was not performed. Opium, bark, numerous dressings, but especially his youth and good constitution, saved him. After some months, the violence of the symptoms abated; some shells of bone were separated from the tibia and fibula, at the time of the accident, others formed

by necrosis were carried out by the suppuration. The actual cautery was also several times applied in order to hasten the exfoliation.

At the end of a year, the suppuration began to lessen, fleshy and vascular granulations were developed on the bones, and the fractures consolidated. After eighteen months the cicatrix, formed partly by the union of the edges of the skin and partly by the production of a new cutaneous tissue, covered the seat of the injury. The limb was then demi-atrophied, the foot entirely incapable of furnishing any support to the body, and was, moreover, displaced as on the first day of the accident.

Two years afterwards, the patient having at first used a compressing bandage, then a dog-skin stocking, baths, and shower-baths, the limb began to regain nutrition and strength.

Forty-two years after his accident, he consulted M. Dupuytren for a cutaneous disease. He then presented a perfect specimen of the disease of which we are treating. Moreover, he walked with difficulty, the movements of flexion and extension of the foot were extremely weak, those of abduction and adduction impossible; there existed, besides, numerous varices, a chronic tumefaction, which increased on the least exertion.

*CASE VI.—Fracture with inward Luxation, and Wound on the Outer Side of the Joint; Treatment by the Old Method; Consequences of a Frightful Nature; Amputation; Death.*—Madame L., quite young, was riding in her carriage, and finding the horse pulling back without being able to stop him, jumped, fell upon the inner side of the left foot, experienced an acute pain in the lower part of the leg, and was stretched on the earth unable to rise.

A displacement of the foot was found, so that the inner edge was directed upwardly, its sole inwardly, and the astragalus outwardly; a large and deep wound on the outer side of the joint, between the tendons of the lateral peroneal muscles, on the one hand; and on the other, the peroneus brevis and the extensor communis digitorum pedis; the projection through this lacerated wound, of the fractured tibia and fibula, the latter at two inches from its extremity, the former at the base of its malleolus; the patient suffered agonizing pain.

After the reduction, the bandage of Scultetus was applied, the limb placed upon a pillow, extended on the thigh. On the second day, the dressing was removed, the pain still remained as violent as ever; she was sleepless and had continual spasms. A consultation proposed amputation, but it was rejected by the parents. The bandage was reapplied, the limb placed as before; she was bled, and anodynes administered.

Third and fourth days. Insomnia, pain, spasms, cries of the patient. On removing the dressing, a resisting and elastic tumor was seen around the joint; a mixture of pus and altered synovia, covered the surface of the wound. Towards the eighth day, the preceding symptoms were much aggravated, and nervous sensibility became much exalted.

In the evening of the ninth day, there came on involuntary painful and permanent contractions in the calves of the legs, the masseters, the pharynx, and the posterior part of the neck; closing of the jaws, difficulty in deglutition, continual expectoration, inclination of the head backwards; respiration

painful, short, unequal, hurried; pulsations of the heart frequent, tumultuous; pulse quick, rapid, and bounding; cold sweat over the whole body; displacement of the fragments, accompanied by intolerable pain, at each tetanic spasm; cries continual jactitation, expressions of deep grief on the features (laudanum, in the dose of several drachms daily); no relief.

On the tenth, the tetanic affection extended to nearly the whole body, which was bent to an arc of a circle, at each spasm, resting on the occiput and the heels (narcotics in larger doses, but without success). Eleventh, the apparatus removed, a phlegmonous inflammation was discovered on the inner side of the tibia (emollients, narcotics). Twelfth and thirteenth, all the tetanic symptoms persist, and there is so great an excitability, that the slightest noise, ray of light, or breath of air, the contact of unequal surfaces, is sufficient to bring on spasms. The abscess along the tibia was opened, a large quantity of pus escaped. It was decided then, that the limb should be left to itself, and the laudanum given by spoonful during the day, both by the mouth and enemata!

Fourteenth and fifteenth days, the foot forms with the leg a right angle. The tibia and fibula protrude from the wound; the tetanus and its concomitants, seemed to have reached their greatest degree of intensity, and to have extended to the alimentary canal; indigested liquids are rejected by the stomach, and thrown out of the nostrils; the abdomen is as tense and resisting as a board.

Sixteenth and seventeenth days, the opium is given in enormous doses, but far from producing narcotism, gives not the least relief. Attempts were made to reduce the extremities of the fractured bones which projected, and on which, at each spasm, the patient leaned with a force that redoubled her agony; but in vain. In this desperate situation, amputation, which was considered a few days before as useless, was now resolved upon, as the only chance of a cure. It was performed. The muscles were hard, very tense, black, and apparently carbonized, as if they had been exposed to the air. Some vessels alone poured out blood; from the others not a drop flowed, and left the wound perfectly dry.

The symptoms still persisted.

On the eighteenth day, towards evening, there was a remission but fallacious. The patient expired at eight o'clock.

*CASE VII.—Reduction Deferred on Account of the Symptoms. Unfortunate Consequences of this Erroneous Principle.*—A servant of M. T., fell from a tree upon the inner edge of the right foot, he felt some pain in the leg, and articulation of the foot, and considerable swelling immediately took place in the parts.

A country surgeon was called, who thought it merely a sprain, and prescribed venesection and some resolvents. Another more skillful, called in on the fifth day, recognized, notwithstanding the swelling, the true state of things; but he decided on the internal use of some diluents, emollient topical applications, leeches, an enlargement of the wound should it be necessary, the opening of the abscess should one form, and on delaying the reduction until the cessation of these symptoms.

The symptoms remained unabated, several points of the skin and cellular tissue were threatened with gangrene, a copious suppuration took place around

the joint, the life of the patient was endangered, and M. Dupuytren was called in consultation.

Struck with the extent of the displacement of the foot, the projection of the internal malleolus and astragalus inwardly, the outward deviation of the foot, the depth of the re-entering angle resulting from the depression of the inferior fragment of the fibula, and the grievousness of the existing symptoms, convinced that they were owing alone to the disorder indicated, and would disappear on reduction, proposed the immediate attempt of this operation.

The attending surgeon, however, rejected the proposal, considering the reduction as useless and dangerous; useless because, it might be effected at a later period without difficulty; dangerous, because the parts were not in a state which would bear the manipulation necessary to reduction. The treatment was therefore continued as before. Large sloughs appeared opposite the projection of the internal malleolus, others opposite that of the superior fragment of the fibula, which not having followed the movement of the inferior fragment, elevated the skin in a very painful manner. The whole sub-cutaneous cellular tissue, was in a state of suppuration.

The violence of the symptoms having diminished, and a slight remission occurring at the end of three weeks, it was considered proper to attempt the reduction. It was done by extension and counter-extension, which were painful, and almost useless; and afterwards, the ordinary apparatus applied, so that the inner splint did not go beyond the malleolus of that side; and the external was depressed below the corresponding edge of the foot, and a pad doubled for the length of two inches, pushed this part from without inwardly. In vain! the foot could not be replaced under the leg, whether the means were inefficacious, or the soft parts yet swollen by inflammation, changed in texture and incapable of yielding, would not allow the bones to assume their proper position.

These attempts were several times renewed during fifteen days, with so little success, that they were abandoned. However, the patient after having incurred a new danger from erysipelas of the leg, bilious fever, excessive suppuration, colliquative sweats and fever, was cured. He is still greatly deformed, and therefore walks with difficulty.

*Effects of M. Dupuytren's Treatment.*—1st. Its most important effect, and that on which the others, in a manner, depend, is the return of the foot to its natural situation and relations with the leg; and the second, not less important, is so exact a reduction of the fragments of the fracture, that notwithstanding the degree of displacement, after the cure is effected, in scarcely a single case does there remain a vestige of the disease, or of the deformity it has occasioned; 3d, in the almost instantaneous cessation of the pain, caused by the displacement and tension of the parts; 4th, in the rapid diminution of the swelling, tension, and strangulation, occurring around the articulation; lastly, in the annihilation of all the causes capable of producing a host of secondary symptoms. In short, it prevents spasms, involuntary contractions, tetanus; inflammation and suppuration are much more rare, and always less dangerous; gangrene is never developed; the effused blood is easily absorbed; the lacerations of the skin are not so serious, and cicatrize like ordinary wounds; internal affections have the means of getting well, and the necrosed parts of separating; lastly, this method, deprives these

different consequences of their serious characters, when it cannot prevent them.

*General Results.*—The duration of the treatment, that is from the application of the apparatus, is generally from twenty-five to thirty-five days in simple fractures, and in the majority of those complicated with inward, outward, or backward displacement; infiltration or effusion of blood, separation of the lateral ligaments, from the summit or the base of the internal malleolus; from forty to sixty days, in those complicated with extensive injury of the soft parts, either internal or external, inflammation, suppuration, abscesses, &c.; from sixty, eighty, one hundred days, or even more, in fractures complicated with numerous scales from necrosis of the tendons and bones.

Whatever may be the nature of the fracture, the time of convalescence is, in general, double that of the treatment.

In all cases, the foot is more or less adducted, after the removal of the apparatus. But the action of the muscles, or according to circumstances, the application of the dressing on the outside, are sufficient, the former after some days, the latter in a few hours, to restore the foot to its natural position.

Of two hundred and seven patients, treated according to M. Dupuytren's method, two hundred and two were cured; five only died, three of them of affections depending on the malady itself, and two of diseases independent of it.

In all those cured, the limb has preserved its shape, with the exception of two, in whom the heel was slightly elongated, and the inferior extremity of the tibia projected forward.

All recovered the free use of the foot; one alone was affected with ankylosis of the tibio-tarsal articulation.

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## CHAPTER XI.

### ON FALSE ANEURISM OF THE BRACHIAL ARTERY.

Venesection is commonly supposed to be so simple an operation as not to be deserving of much notice. That it is so considered is only an instance of the low opinion generally entertained for the offices of minor surgery. Hence, however, we can account for the accidents which have so repeatedly occurred within our observation, during the last twelve or fifteen years. The hospitals are filled with students who neglect bleeding; and these are followed by a still greater number of young men, who are admitted to practice without ever having performed venesection. How often may we see in the clinical wards, five or six punctures in the skin, before the vein is opened.

It is to this awkwardness that the phlegmons are to be attributed which ensue in those cases; it is to this, that we must likewise attribute the great number of cases of phlebitis, latterly so common, and formerly so rare. The unfitness, and uncleanness of the instruments, are frequently the cause of these disastrous consequences. But it is chiefly to inattention to a few simple

principles, that we must trace the occurrence of those arterioso-venous aneurisms, diffused and circumscribed, to which we have so frequently called your attention. Towards the end of the year 1831, I showed you two persons who had been operated on and cured of those aneurisms; and we shall certainly have occasion to show you some more in the course of the present year. I can safely say, that for the last fifteen years, there has scarcely a year passed without my being consulted at least twice for affections of this kind; and if the same thing occurs in the practice of other surgeons, it is easy to infer the frequency of these accidents. Yet, very simple precautions, would seem to prevent them. 1st, The operation should never be performed until the beating of the artery is felt; 2d, the vein should never be opened in front of this artery; 3d, other veins should be preferred. It is true that the latter are sometimes difficult to be found, and that frequently they do not yield as much blood as may be wished; but these inconveniences are trifling, compared with the accidents, to which we at present allude.

It has long been usual to appropriate the name of *false aneurism* to a tumor formed of blood, confined either within the arterial sheath, or in the cellular tissue, which surrounds the vessels conveying red blood. At one time the disorder shows itself immediately after a wound; at another an interval more or less protracted occurs after the infliction of the wound. There are two kinds—the *primitive* or *diffused*, and the *consecutive* or *circumscribed*, differences founded on the time and mode of the effusion of blood from the artery. There are also other differences founded on the parts constituting the aneurismal cyst; but they belong to the false consecutive kind. Sometimes the walls of the sac are formed by the surrounding cellular tissue. The lamellæ of this organic element, distended by the blood, which is extravasated slowly, or drop by drop, are pressed against one another, and form a cavity of variable magnitude, opening into the wounded artery by a small aperture. In other cases the arterial sheath is cicatrized during the employment of the compress, while the lips of the wound of the interior coats are still apart or connected but with an imperfect cicatrix. When the compress is removed the lateral pressure of the blood raises up the filamentous sheath, isolates it from the fibrous tunic, and disposes it into the form of a cyst. In still other instances the lips of the wound in the artery are closed by a membrane of new formation, resulting from the exudation of albuminous matter. There are cases on record of arterial wounds, which after having been for a time staunched by a small clot supplying the solution of continuity, upon this clot being displaced by some accident, a false circumscribed aneurism was formed.

We have seen persons affected with encysted false aneurisms, which it was attempted to cure by Anel's method, but in vain; none of them were operated on a second time, and in one case amputation of the limb was necessary.

*True aneurisms* of the brachial artery, at the bend of the arm, are very rare; the case reported in Pelletan's Clinique is probably the only well authenticated one on record. The two cases of Paletta and Plajani, related by Scarpa, are not sufficiently precise; the same may be said of those given by Saviard and Hodgson.

The same remark does not, however, apply to false aneurisms whether

primitive or consecutive, occupying this region; in fact, these were, for a long time, the only aneurisms known. Galen, Celsus, Ætius, have described them, and given directions for their treatment. It is rather surprising that operations of this kind should have been practiced so often without discovering the laws of the general circulation. Long after this great discovery, much ignorance prevailed as to the course the blood took on the application of ligatures to the arterial trunks. Heister first pointed out the anastomoses. Before his time, the process was explained by supposing a second brachial artery. Sharp asserted this opinion as a matter of fact; but soon after, Molinelli, in the *Acta Bologna*, and Charles With demonstrated clearly the agents of the collateral circulation. Later the injection of an arm in which the brachial had been spontaneously obliterated, furnished Pelletan an opportunity of displaying the anastomotic passage. Half a century has given rise to many improvements in this branch of science; at present every thing is foreseen and arrested, and the surgeon knows perfectly what must take place.

We have said that the lesion of the vessel in phlebotomy was one of the most common causes of this species of aneurism. This accident is often the effect of a mistake. There are persons in whom the artery lies so superficially, its volume, its color through the skin, &c., are so striking that the operator has often been tempted to puncture it, until he fortunately recollected the caution required. On laying his finger upon the vessel, the pulsations are immediately perceived, the vein is found to lie more deeply at its side. Whenever a vein is thus situated—running alongside of an artery, it ought to be treated with great caution. MM. Sauson and Begin in their excellent treatise on operative surgery, lay it down as a rule, that we should *almost never* bleed where the artery passes; for my part, I should say, we ought *never* to open the vein in such a situation. How often have I denounced the practice of bleeding over the brachial? I have constantly inculcated the propriety of choosing any vein but the one which is there placed. Even when the fold of the arm affords no other sufficiently eligible, I recommend bleeding in the fore-arm or even the hand.

Injury of the brachial artery by the lancet may take place in several ways. Sometimes the instrument meets the artery and vein at a point where these vessels are not exactly in juxta-position, and an effusion of blood follows. Again, they communicate by the wound, and form an *arterioso-venous* aneurism, called also *varicose*, because the vein is distended by the arterial blood. This species differs essentially from all the others caused by the same means. The following is the case of false aneurism which has more immediately given rise to the preceding remarks.

CASE I.—*False Consecutive Aneurism of the Brachial Artery from Venesection.*—A man, aged about forty, of a good constitution, was bled about two months ago by a midwife, who pierced both the vein and brachial artery. The blood immediately spouted out with violence, and was of a bright red color. Generally a jet from a vein does not extend more than one or two feet, rarely three; but when an artery is opened the jet is more energetic; we sometimes see it carried to the distance of five or six feet, often reaching the ceiling or the opposite wall. The mode in which the fluid issues is characteristic; it comes in jerks, not in the regular stream which generally marks the venous flow. It may happen, however that this peculiarity depends on the vein

being placed immediately over the artery ; for, in this case the movements of the latter may be communicated to the vein, and at first sight it may seem that the artery is opened. Several years ago I was called upon in great haste by a distinguished physician who had just bled a patient. Seeing the blood come out in jerks, he thought the artery was touched ; but I presently ascertained the cause, although the physician, to this day, is persuaded that the artery was injured. It would appear that in the case under consideration, the midwife was aware of the mischief she had done, for she used very powerful compression and applied a tight bandage. The patient felt the parts benumbed, and found his forearm and hand swollen, owing apparently to the bandage ; he also perceived the existence of a considerable ecchymosis, caused by the effusion into the cellular tissue ; but there was no tumor immediately formed. The puncture in the artery was apparently very small, and the compression must have closed it. But in about three weeks the aneurismal tumor made its appearance ; at first very small, and marked by movements of dilatation and contraction synchronous with the pulse. In the course of four weeks it was about the size of a pigeon's egg. On examination one half was found prominent while the other was buried in the substance of the arm.

But how has the tumor been formed ? When an artery has been punctured as by a lancet, the margins of the wound must be brought into contact by compression ; but as soon as the latter ceases, and the patient uses the limb, the effort of the blood again opens the wound ; it infiltrates, and pushes before it the lamellæ of the cellular tissue, with the skin and forms a pouch ; this increases and communicates with the artery by the small aperture. This is exactly what happened in the case before us ; the blood was at first repressed, then it made an effort, a pouch was formed, it presently grew large, and all the characters of aneurism are now manifest. If you notice the tumor with attention, fixing the eye on a particular point, you will observe the movement of dilatation and contraction ; and if you lay your finger on its summit, you will feel it alternately raised and lowered. By flexing the arm, the movements are very visible ; but by firmly extending it, they are by no means so apparent. It was formerly thought that these two signs infallibly proved the presence of aneurism, but we now know that the mere vicinity of the artery will often give rise to them ; and still more so, if the tumor be situated over the track of the vessel ; so that suspension of the movements on the occurrence of compression, is not a positive sign. A further examination shows that the tumor is pointed, and that the integument at the point is very thin. A slight inflammation at this spot might cause us to fear an opening, attended by a fatal hemorrhage. In order then, to prevent so grievous an accident, we must adopt some prompt and efficacious method. Compression has been already tried without effect ; besides, this mode of treatment is tedious, and may lead to gangrene ; and in the present instance, it is inapplicable on account of the wasting of the integument. Ligature is the proceeding that remains to be adopted. How shall we apply it ? It would certainly be safer to use two, one above, and the other below the wound, because in this way we avoid the communications which are sometimes formed when Anel's method is used. But this operation involves several serious inconveniences. In fact, when we have suspended the circulation in the part by compression, we have then to cut through the integument over the tumor, open the sac, empty it,

and find the aperture in the artery (often no easy matter); then tie the artery without including the nerve, also difficult owing to the flow of blood from all parts. Even supposing the operation performed as successfully as possible, the extensive wound in the integuments may occasion a phlegmon. The flow of blood, I have said, may much embarrass the operator; this is a point of so much importance as to deserve a few moments' attention. In the course of any operation, we are almost always sure of being able to suspend the course of the arterial blood by compression; this, however, is not the case with regard to the venous blood; simply for this reason: in the former case the compression acts on a single vessel; in the latter, it should act on a multitude of different branches, at one and the same time, in order to be effectual.

Since, then, a ligature to both ends of the artery, though more certain, is tedious and troublesome, and often very difficult, we may with reason have recourse to the method which consists in the application of a single ligature above the tumor. This method is much easier than the other, for, we avoid by it the infiltration of blood, and the greater part of the obstacles just alluded to. It is accordingly the process most commonly employed; yet we should not omit to add, that when it is applied to arterial parts which have numerous anastomoses, it fails. This is particularly observed to be the case in aneurisms of the primitive carotid and its divisions; the ligature placed below the tumor puts a stop to the pulsations at first, but they soon reappear; and the same thing may occur at the bend of the arm.

The reason why we have established a distinction between simple false aneurisms, and those of the arterioso-venous kind, is, that in the former, the method of Anel arrests the pulsations, while in the latter, it has not the same effect.

We shall now briefly describe the part which is the seat of the disorder. The arm is composed of several layers in the following order: First, (proceeding from without inwards,) we find a smooth envelope, then a fatty cellular layer, permeated by a great number of veins, lymphatics, and superficial nerves; a third layer common to the whole contour of the arm, is composed of brachial aponeurosis; more deeply there are three sheaths, the outer and upper of which, as well as the posterior, belong to different muscles; the third, the most important in our present inquiry, is common to the biceps placed superficially to the coraco-brachial and anterior brachial placed beneath; while between them is perceived the external cutaneous nerve which perforates the coraco-brachialis above. At its outer and inferior side, this sheath contains the trunk of the radial nerve and an arterial branch; at its inner side along its whole length, it embraces the brachial artery with its two attendant veins, along with the median nerve, the relations of which to these vessels are of the highest importance; above, this nerve is *external*; in the middle it is *anterior*; and below it is *internal*. Thus we must seek the artery above, inside the median nerve, and outside the cubital; in the middle, we must avoid, with the greatest care, touching the median nerve, which the artery crosses in passing one time in front and other time behind. Below, we must constantly seek the artery outside this nerve, the cubital having now no longer any relation to it. Lesion or ligature of this nerve would occasion numbness or palsy of the limb. The internal edge of the biceps is also a good director in finding the brachial artery; on opening the sheath of this muscle,

towards its internal part, the artery is soon seen in all its relations to the median line.

In performing the operation, the patient was put in a horizontal position on a bed, the arm semiflexed; an incision, three inches in length, was made towards the lower and inner part of the arm; the skin, cellular substance, and aponeurotic layer were successively divided. Having reached the sheath of the vessel, it was raised with the forceps and opened; this aperture being enlarged for two or three lines with a director and bistoury, the end of the flexible silver sound was passed beneath the vessels by means of which the ligature was conveyed. In order to prevent the lesion of the nerves and veins, the instrument carrying the ligature should always be introduced between them. M. Dupuytren at first moderately tightened the ligature, the pulsations ceased; he then slackened it, they returned. Certain then that the diseased vessel was included, he tied it with two simple knots. The wound was then cleansed and brought together by a bandage. He recommended a delay of the dressing until all danger of hemorrhage should have passed over. For two days pressure was maintained by means of a pyramidal compress, which was removed in order to examine the tumor; it had diminished, and was entirely free from pulsation. In five days more the wound had united with the exception of the point of passage of the thread. Every thing promises entire success, and that the patient will be cured as the one whose case we will now detail.

CASE II.—(*Communicated by Dr. Marx.*)—A pedlar about thirty-two years of age, of a strong dry constitution, being bled for a violent headache, had the brachial artery opened along with the vein. The surgeon saw the accident by the vermilion color of the blood, by its alternate jerks, and permitted it to flow until syncope came on. By means of compression he then endeavored to prevent a recurrence of hemorrhage, and desired the patient to continue it, without, however, informing him of the injury he had met with. The wound in the arm cicatrized, the patient thinking he had nothing to fear, omitted the compression; a tumor appeared at the bend of the arm and increased daily.

On coming to the Hotel-Dieu, the tumor was as large as the closed hand, with all the characters of its aneurismal nature; the pulsations very evident when the arm was flexed, disappeared on extending it. Compression above the tumor made them cease; below, rendered them stronger and more apparent. It was inferred from these facts: 1st, that the opening in the artery was not large; 2d, that there was a defect of parallelism between this opening and that of the aneurismal sac; 3d, that the tumor received its blood only from one quarter; 4th, that the greater part of the blood contained in the sac was coagulated, and that consequently a well managed compression would effect a cure. It was accordingly employed and assisted by the use of ice; but as there was not much benefit derived from it, at the patient's request, the operation was agreed upon.

It was performed in the amphitheatre, the patient sitting in a chair facing the spectators, and the professor placed behind the arm affected. The several steps of the operation were similar to those of the preceding case; but the patient having fainted when the ligature was applied, and about to be partially tightened, it was necessary to wait for some time, lest the nerve should have

been included. Then being assured that the ligature was in its correct situation and that the pulsation of the tumor could be arrested it was tied. The wound was brought together by adhesive strips, and dressed with a perforated piece of linen, spread with cerate, charpie, compresses, and a bandage; the patient carried to bed, and the tumor covered with ice.

During the evening the skin of the arm recovered its natural temperature; the patient passed a good night, and complains of nothing but a pricking sensation in the fingers. The next morning, pulsation returned in the radial artery, then ceased, and again returned. The ice was continued. On the fifth day the dressing was removed, and an erysipelas found to extend over the arm and forearm. The ice was suppressed. The erysipelas treated by blisters to the most inflamed spots, and by this means soon disappeared.

Eighth day, the tumor opened and discharged a mixture of pus and blood, which lasted for several days. Tenth day, the ligature came away without any hemorrhagy. Fifteenth day, the different openings in the aneurismal sac were enlarged. The clotted blood in the tumor was removed, hemorrhage came on, the wound was plugged with lint. Suppuration was afterwards established in the tumor, the dressing removed, and pus alone escaped. From this time, the wound diminished daily; that of the ligature healed; nothing remained but a small opening leading to a narrow sac, the remains of the aneurismal sac; the motion of the arm and hand returned; the patient could write; and in two months was perfectly cured.

It may probably be asked, whether forced exclusion of the arm, kept up for some time, and assisted by ice and compression, might not have rendered the operation useless. But continual extension would have been very fatiguing and painful, and might have caused anchylosis, which would have been a very serious affair.

Compression and ice would undoubtedly have been useful; but they must have been continued for some time, and are not free from some danger. The operation which we have described, was adopted by M. Dupuytren, after an examination of the tumor had removed all idea of a varicose aneurism. The length of the operation was owing to the fainting of the patient and the fatiguing position of the operator. The arm being extended horizontally, the blood fell in sheets upon the deep seated parts, and discolored them uniformly. Thus, observed the professor, the difficulties which I created for your instruction, should be a guide to you. In this operation the patient should be laid on a bed; the arm supine, and freely extended, then presents to the surgeon a conspicuous surface, easily accessible to the fingers, eye, and instruments.

The circulation returning so quickly, made us fear that the operation had been useless; the application of the ice was continued in order to prevent the reflux of blood in the tumor.

M. Dupuytren has first pointed out the phenomena, which occur in the anastomotic circulation. He has proved that the blood arrives below the ligature long before the artery begins to pulsate. The distension of the vessel, its elasticity, are the first stages of the recurrence of the circulation. Later a slight agitation is perceived, very irregular in force and quickness. It re-appears after some time and indicates certainly the return of the heart's influence. This latter phenomenon, which is always looked upon as the crite-

tion of the success of the operation, may disappear after a longer or shorter time. Thus we have seen the circulation suppressed at the end of 15 days, one, two, and three months, and gangrene follows. But not a single case of gangrene has followed the ligature of the brachial artery, when the nerves has not been included. The most frequent of these accidents is the re-establishment of circulation in the tumor; when this takes place, both ends of the artery should be tied. Erysipelas is generally successfully treated by blisters. We will make but another remark concerning the ligature; it generally comes away on the 10th day; whilst in another patient operated on for aneurism of the crural artery it remained until the 25th day; it will be understood that the time varies according to the calibre of the artery, the degree of pressure exercised by the thread, and the quantity of cellular tissue embraced by the ligature.

CASE III.—A young man, twenty-two years of age, a pork butcher, was bled by a physician in the median basilic vein; the operator crossed the vein from side to side, and punctured the artery; bright red blood issued forth to a great distance. Perceiving the mischief that was done, having taken the requisite quantity of blood, he was anxious to apply a steady compression on the wounded part. The hemorrhage was at first arrested, but did not fail presently to begin anew. The patient became uneasy, and came to the Hotel-Dieu. Nine days after the accident, the tumor had attained the size of a walnut; it was soft and fluctuating, and presented pulsations isochronous with those of the heart; and there were movements of expansion and contraction, observable at the bend of the arm. On compressing the artery above the pulsations ceased; and increased when compression was made below. The existence of aneurism was thus well established. The wound in the vein cicatrized, nothing remained to show that it communicated with the artery. Ligature, being considered the best operation, it was performed next day. The patient was kept in bed, his arm in a state of supination; and incision, two inches and a half in length, was made above the fold of the arm, and along the course of the brachial artery. The sub-cutaneous cellular tissue was found infiltrated with blood; the fibro-cellular sheath surrounding the median nerve and brachial artery, was dense and thick, but easily lacerable; a very large vein that ran across the incision was divided. The sheath was opened, and the ligature passed, as it seemed, between the nerve and artery, by means of a canuletted sound, and needle-shaped stylet. But the patient suffered a sharp pain, and numbing sensation, when the ligature was tightened, which showed that the nerve was not free. This led to a new search and re-adjustment of the ligature. The pulsations ceased, and no pain was felt on its being tightened the second time. The arm was dressed as in the preceding case.

No accident occurred in the after treatment. The fore-arm preserved all its temperature and natural color. On the third day, pulsations began to be perceived in the radial and ulnar arteries, but none in the tumor. On the tenth day, the ligature came off, and the wound was nearly healed, one angle alone discharged a little healthy pus. On the nineteenth day, the patient was able to leave the hospital. (Case by Dr. Paillard.)

Here was another successful instance of the benefit of a single ligature, between the injury and the heart. However, we are not always so fortunate

in managing so easily this dangerous affection; in a great number of cases it becomes necessary to tie both ends. The following case from the private practice of M. Dupuytren, will serve as an example of this remark.

CASE IV.—An envoy from Brazil, who had arrived not long since in Paris, while mending a pen, and cutting the nib on his thumb nail, let the knife slip out of his hand. It was thrown upwards several feet, and then came down perpendicularly on the anterior and exterior surface of his left arm, as it laid on the desk; the blade was very sharp, pierced the skin and subjacent parts, and opened the radial artery. An abundant hemorrhage took place. A surgeon who was immediately called in recognized the accident. Hoping to succeed by compression alone, he methodically applied compresses, and a roller from the tips of the fingers to the seat of the injury. The dressing remained undisturbed for several days, and there was no hemorrhage during the time. When it was at length removed, to the surprise of all parties, the wound in the integuments was perfectly well; but mean time aneurismal tumor was formed, which it was hoped to subdue by bandages; but in vain, the tumor increased every day. I was called in, and proposed the ligature of the artery; the patient consented. It was done. One ligature was used, and the moment it was applied the tumor ceased to beat, as did the radial and ulnar arteries. The wound was dressed, but this was scarcely finished, when the circulation was re-established in the lower part of the arteries just mentioned, and the tumor began to pulsate very distinctly. Another ligature was now applied below the tumor, when the pulsations ceased altogether. In about a fortnight, the patient was quite well of his double operation.

CASE V.—A wine dealer, aged forty-five, of good constitution, but subject to hæmoptysis, had himself bled by his medical adviser. The lancet was scarcely withdrawn from his arm, when the blood spouted out in arched jets; strong compression was immediately tried, but without success; and in the course of a month, when the patient came to me, he had at the bend of the arm an enormous tumor. The operation was imperiously required, and performed at once. The moment the ligature was applied, the pulsation ceased in the tumor; some persons, however, fancied they perceived feeble oscillations in the radial artery. The night after the operation, the patient had a violent attack of hæmoptysis, which made it necessary to bleed him twice. Indeed, it is not rarely observed that, after the ligature of a large arterial trunk, symptoms of plethora and hemorrhagy appear. There are sometimes palpitations, uneasiness, temporary defect of tight oppression; sometimes epistaxis, hæmoptysis, &c.; one or two bleedings in these cases, are generally successful.

In this man it was remarked that pulsations were rapidly perceptible in the radial artery, in consequence no doubt, of the state of the capillaries; in the tumor, however, they never re-appeared. This was probably owing to the existence of a clot, between the artery and the tumor. The case, however, warns us to be prepared for the recurrence of pulsations in the tumor, when the anastomoses are numerous, and the circulation is soon restored to the vessels in which it had ceased. The patient, in the present case, was fortunately not in this predicament; he got well rapidly, and left the hospital about four weeks after the operation.

I shall conclude with an observation, to which I attach some importance—namely, that ligature of the arteries, performed above their lesion, is almost always successful when that lesion is recent, and when the edges of the opening in the vessel are fresh, and disposed to unite; but that this operation presents far fewer chances of success, when this lesion is old, the edges cicatrized and, therefore, incapable of adhesive inflammation. Ligature of the upper end of the artery suffices in the former case, whether the centre of effusion be in communication with the external air or not; whilst in the latter, ligature of both ends of the vessel is required. There is no exception to this rule, unless where the injured artery is situated at the extremity of a limb, its numerous and varied communications then render indispensable the ligature of both ends. This important theory explains facts, which, till the present time, it has appeared difficult to understand.

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## CHAPTER XII.

### ON FRACTURES OF THE PATELLA.

Fractures of the patella present many interesting points, on which authors are as yet divided in opinion. Such are particularly the manner in which they take place, the most appropriate mode of treatment or apparatus, the formation of callus, and above all, the possibility of effecting the complete reunion of the fragments.

Six patients, affected with this species of fracture, have been treated in the Hotel-Dieu, since the commencement of the present session. All presented the transverse fracture; not one, the vertical. Five were perfectly cured, without the least deformity, and recovered the entire use of the limb. One is as yet under treatment. In his case the fracture was the result of a fall on the left knee; it was accompanied by pretty considerable swelling, owing to the effusion of blood in the soft parts, and of bloody synovia in the articular cavity. However, the injury was recognized at once. The finger carried over the patella, met with a wide space, dividing the bone into two fragments, one superior, the other inferior; besides, both could be moved in contrary directions, and crepitation was evident; notwithstanding the serious accidents complicating the fracture, the patient has rapidly progressed towards a cure. But, as frequently happens, the uniting bandage acts only by having some point of support on the skin, the latter carried from before backwards, has formed a fold, interposed between the fragments, like a wedge, and which has kept them separated. A new plan has been adopted.

Fracture of the patella may be produced in two ways; either by a direct blow on the anterior part of the knee, or by violent exertion of the extensor muscles of the leg. However, it sometimes happens without any considerable increase of muscular exertion; cases of this accident are related, resulting from jumping, attempting to kick, or prevent a sudden fall backwards. In all these circumstances, the patella touches only by a single point the anterior

face of the condyles of the os femoris, at the same time the thigh being demi-flexed, the lower ligament of the bone and the extensor tendons, draw its extremities strongly backwards. During the exertion which then takes place, the femur serves as a fulcrum to the powers which act above and below on the patella, and fracture of the latter bone takes place.

A large number of these fractures have been improperly attributed to a fall on the knee. It has been forgotten that the weight of the body, almost entirely, is borne by the projection of the tibia, to which the ligament of the patella is affixed; on account of the flexion of the leg at a right angle, this projection first strikes the ground and receives the blow, whilst the patella, held up by the rectus femoris muscle, and as it were, preserving its vertical position, can only touch the ground at its inferior extremity. Falls upon the knee, are, therefore, very frequently the result, and not the cause of fractures of the patella.

Sharp and contusing weapons directed against the knee, may fracture directly the patella into a greater or less number of pieces; this accident may happen in a fall, if the leg is strongly flexed on the thigh, and the bone strikes violently against the inequalities of the earth; but even in this case, the muscles play a conspicuous part. We know, indeed, that the slightest blow upon the knee, will produce contractions of the rectus femoris, and without much force they will fracture the bony fibres of the patella; it is probable that to this cause, is to be attributed the frequency of transverse ruptures, and the rarity of those in a vertical direction.

As we have already said, there are remarkable differences between fractures of the patella produced by muscular exertion, and those resulting from direct force applied to the knee. The former are rarely complicated by contusions, lacerations of the soft parts of the articulation, unless from a subsequent fall; the latter, on the contrary, are often accompanied with extensive disorder of the surrounding tissues; sometimes the patella has been, as it were, crushed, and reduced in many fragments, scattered in every direction, and at the same time, the articular capsule has been opened and filled with effused blood. These complications aggravate seriously the principal disease; the following is a case in point.

An old man, laboring under fracture of the patella with slight separation, but accompanied with serious complications, perished during the month of November last, from cerebral and enteritic disease. The knee was carefully examined. At first sight the fracture could scarcely be observed, the patella was movable, the groove formed by the separation, imperceptible to the eye, was sensible only to the finger; the articulation being opened was internally of a deep red color, filled with a bloody and purulent matter, and in sufficient quantity to be collected with the scalpel; there had been, therefore in this spot, inflammation terminating by effusion. As to the blood, it was owing to the contusion received at the time of fracture. The synovial membrane was extremely red, on account of the development of the blood-vessels. The cartilages were also inflamed. These disorders of the joint, account sufficiently for the symptoms of which the patient died.

On the inner face of the patella, the transverse groove could be perceived, but it was lower than the outer groove. The bone had, therefore, been broken transversely, from below upwards, and from in front backwards. The two

fragments had closely united ; no trace of fracture could be perceived on the tibial side, and it was very slight on the side of the fibula.

On the preservation or destruction of the fibrous covering of the patella, there depends equally a very remarkable difference in the facility with which the fragments can be kept in their proper situation and the solidity of the parts after the cure. This fibrous covering form a kind of sheath, which contains the fragments, opposes an immoderate separation, and serves, as it were, as a basis for the substance which is afterwards to unite them. It will be seen how carefully they should be treated, and how improper are the movements of extension so often made, in order to ascertain the existence of the fracture of the bone which it protects.

Although the vertical fracture is much less common than the others, it does sometimes occur, but is rarely treated of in modern works on surgery. The oldest case, and probably the most precise, is to be found in the treatise of Lamotte. The fracture resulted from a fall from a high place ; the two portions of the bone were slightly separated, although the limb was demi-flexed ; it was completely extended, the knee covered with resolvent compresses and a moderately tight bandage. In twenty days the consolidation was perfect, and the man went about his ordinary business. Nearly twenty years ago, a middle aged man, was admitted into the Hotel-Dieu, who having fallen from a considerable height, had fractured a great number of bones ; the knee was much contused and deformed. He died on the third day. The examination of the knee showed a longitudinal fracture of the patella. The bone was divided in almost equal portions ; the fragments gave a very manifest crepitation, and could be moved at will in every direction, the cavity of the joint contained a large quantity of sanguineous fluid.

Six months after a man was brought to the hospital who had been thrown down, when drunk, by a carriage ; the wheel had passed over the right leg, knee and thigh, and fractured the patella vertically. The crepitation was evident, as also the vertical displacement of the fragments ; it was treated by position and an appropriate bandage. He was nearly cured, when he was attacked by a pleuro-pneumonia, which carried him off on the twentieth day after the accident. The parts were carefully examined, and a well formed callus found, uniting the fragments, and allowing only a very limited movement. The relation of the articular surfaces was exact, and every thing promised a perfect cure in less than a month.

Three years from this time, a man was admitted into the Hotel-Dieu, for varicose ulcers of the leg. On examining the diseased limb, the patella was found larger and presenting a considerable vertical projection. Nothing similar existed in the other leg. Being questioned as to this deformity, the patient said that several years previous he had fallen and broken his leg and thigh in several places. The patella had also been fractured and its size evinced a pretty considerable development of callus. When the extensors of the leg were relaxed the motions of the bone on the condyles of the femur could be easily effected ; but then, a pretty well pronounced projection was felt against the condyles. The fracture had evidently been vertical, and this irregular union had resulted from the attempt of nature alone to cure the disease or an improper position of the parts.

The following is a striking case of this species of fracture :

A servant-girl, nineteen years of age, small and of a weak constitution, laboring for a long time under a pulmonary catarrh, with very copious mucous expectoration, fell from the second story upon a grated glass partition, which gave way under her. On reaching the pavement of the court, she was wounded in the left knee and slightly in the head. She rose, but was unable to lean on the injured limb; she was laid in bed, the wound brought together and dry dressings applied. Brought afterwards to the Hotel-Dieu, the dressing was removed and the wound found ununited, the patella broken into two unequal fragments. The bruised parts being the seat of considerable sanguineous infiltration; suppuration was copious, and the patient suffered acute pain throughout the whole limb.

Her general situation was unfavorable; the tongue was furred, red at the edges and point, covered at its base and middle by a white exudation, her ideas confused, skin hot and dry, great thirst; complete anorexia, sleeplessness which yielded only to opiates. Moreover the abdomen was indolent, there was no diarrhea, expectoration copious, and merely mucous. The patient died from the internal disease.

It follows that vertical fractures of the patella are not very rare; and that the facts observed, prove that they always depend on the direct action of external causes, and are generally accompanied with wounds and contusions, which demand special attention on the part of the surgeon.

The diagnosis of fractures of the patella is generally easy. In the transverse fracture, if the patient is standing, he falls, unable to rise, or if he attempts it, he immediately perceives that the limb has lost its strength and solidity; he cannot walk, but drags himself backwards, with the leg extended and uses the sound limb. These circumstances indicate already the existence of the fracture; but on examining the knee, it is found deformed and flattened, and by placing the finger on the patella, it is easy to feel the separation of the fragments of the bone, the upper one is drawn by muscles, whose tendon is inserted into it, whilst the other is kept down by its ligament. By extending the limb, and raising the whole extremity on the pelvis, the muscles of the anterior part of the thigh are relaxed, and the separation nearly entirely disappears. At this time crepitation may be perceived. The swelling of the knee is scarcely ever an absolute obstacle to the establishment of the diagnosis; the thinness of the integuments and the softness of the tumor, generally allow us to reach the patella, and recognize its solution of continuity. When it is oblique or longitudinal, it demands a more attentive examination, on account of the smallness of the separation of the fragments, which are uninfluenced by muscular exertion. However by semi-flexing the leg on the thigh, we can produce, as did Lamotte, a more evident disjunction of the portions of the bone. In all cases, if serious accidents, as a considerable tumefaction of the joint, prevented a certain recognition of the fracture, it would not be here more inconvenient than in the other species of fractures, to apply to them proper remedies, before proceeding to the reduction.

After the remarks made, it will be soon perceived what should be the basis of the *treatment* of these fractures. It consists in the application of means appropriate to the accidents which complicate them, and the attempt to procure the re-union, as exact as possible of the portions of the bone. Rest, general and local bleeding, emollient topical applications, and refreshing

drinks, generally accomplish the first intention. We must not lose sight of the general state of the patient, of the digestive and cerebral organs, whose functions are often disturbed in consequence of the agitation, or from idiosyncrasy, of the wound itself.

As to the union of the fragments in cases of transverse fracture, their separation being caused and maintained by the action of the extensor muscles, which are inserted into the superior fragment, and by the flexion of the leg, the first indication is to neutralize this muscular power, and place the limb in a proper position. This position, absolute rest, until perfect consolidation of the callus, and the application of an apparatus suited, on the one hand, to keep the fragments in exact apposition, and on the other, to resist the contractions of the extensors, resulting from the inconsiderate or involuntary movements of the patients, are essential to a perfect union. The apparatus of M. Dupuytren is the following. It is composed of—1st, an inclined plane formed by pillows placed upon each other, and extending from the heel to the tuberosity of the ischium, having the double intention of opposing the contractions of the flexor muscles of the leg, and by position of relaxing the extensors; 2d, two compresses, about twenty inches long and four wide, made of unbleached, thick, strong linen; they should be sewed at the ends and sides, one having slits (*fenetres*) at one end, these slits being also sewed; the other is divided into three strips at its opposite end; 3d, two bandages of three fingers breadth, and nine or eleven yards in length; 4th, some graduated compresses six or seven inches long, and seven or eight lines thick.

We begin by inclosing the foot in some turns of the bandage, placing on the part of the turns corresponding to the dorsal face of the foot, the end of one of the long compresses; it is to be fastened with pins and a few turns of the bandage, and then extended on the anterior surface of the leg. That done, the bandage is continued along the limb, as far as beneath the patella; at this point its extremity is brought down parallel to the leg.

Whilst an assistant supports the posterior muscles of the thigh, the operator passes around it, at its middle, three turns of the second bandage; places then the end of the second long compress, on its anterior surface, fastens it by two or three new turns, brings down the upper end, makes two or three circular turns, and then continues the bandage as far as the upper edge of the patella; what remains of it is spent upon the thigh. We then place above and below the patella, the graduated compress, and passing the strips of one of the long compresses into the corresponding slits of the other, the fragments are brought together by drawing on the strips. Lastly, the two ends of these compresses are fastened, one upon the thigh, the other upon the leg.

The dressing being finished, the limb is placed on the inclined plane, of which we have spoken, in such a manner that the heel is much higher than the knee and thigh.

It will be seen that this apparatus, although consisting of four pieces, each having a distinct action, together tends to but one end; nevertheless with all its advantages, it would be useless unless seconded by the docility of the patient. About three weeks ago, two patients were cured at the hospital, both affected with fracture of the patella, one of them disorderly and unmanageable, constantly moved about and several times removed the dressing; in his case there was a separation of nearly an inch; the other bore with fortitude

and patience, the rest and compression of the bandage, and was discharged with a small groove scarcely admitting the head of a common pin.

This fact and many others observed by M. Dupuytren, during a long and extensive practice, have left no doubt in his mind as to the possibility of procuring a close union of the fragments, by the formation of an osseous callus, if the parts are kept in perfect contact during the whole time necessary for their consolidation.

Generally, union takes place by means of a fibro cellular substance. Astley Cooper and other surgeons, have observed, with much attention, fractures of the patella, and the neck of the femur; and after having exposed these bones to the action of turpentine, have found between the fragments a transparent fibrous or fibro-cartilaginous substance. When this celebrated English surgeon was in Paris in 1829, I exhibited to him some specimens of an immediate reunion, and in which this fibro-cartilaginous substance could not be seen. This was owing undoubtedly to the long interval of time after the cure; the callus had time to become strong. Observe what takes place in vertical fractures; here, as there is no separation, the callus is always osseous after six months or a year. It is, therefore, this separation, produced by muscular action, which opposes the ossification.

But however firm and well applied the apparatus may be, its action is constantly weakened by the relaxation of the bandages, and the shrinking of the tissues it incloses; whilst the muscular power increases in the same ratio. Again, the compression becomes sometimes insupportable, and we are obliged to relax or entirely remove it. Sometimes it produces serious accidents, inflammation, tumefaction, and excessive tension of the parts, and even gangrene. These results follow the more easily if we apply the dressing soon after the accident. Therefore, at first we should be careful to apply it moderately tight, and then watch the patient attentively, in order to prevent the unfortunate consequences of which we have spoken. In confirmation of these precepts, we will detail a case recently published, and which must have cost the surgeon many bitter regrets that he had not followed them.

A man forty-four years of age, fell on the right knee, and fractured the patella; he was carried to a hospital in Paris. The next morning the joint was much swelled, and very painful; however, an apparatus somewhat similar to that of M. Dupuytren was applied; so tightly that even in the evening the patient could not bear the suffering; he passed the night in agitation and crying continually; no attention was paid to it on the visit of the third day; and it was only on the fourth day after the accident, that the violent and continual cries of the patient determined the surgeon to remove the dressing. Ecchymoses were formed in different parts of the leg and foot, some brown spots appeared; the bandage was, however, again applied, but was obliged to be removed the day after. Numerous brown spots then existed on the back of the foot and leg; gangrene came on with delirium, the skin was hot and pale, the lower part of the leg became cold, insensible, and mortified. On the sixth day, there was but little hope of saving his life even by amputation, it was, however, performed, but the patient expired on the following day.

The fracture, on examination, was found to be transverse, the fragments separated about one inch; but was still held together by the common tendon of the extensors, which had not been divided, and by little fibrous bands

which came from the interior and not the surfaces of the patella. These bands were at first supposed to be of recent origin, but this idea was inconsistent with their strength. The fractured surfaces were free from asperities; these seemed to have been absorbed. Between the two fragments a reddish substance existed, whose consistence increased as it approached the fractured surfaces. At this point it was almost cartilaginous, and appeared incorporated with the patella.

The treatment of vertical fractures demands, also, rest, immobility, and complete relaxation of the muscles.

It has been advised to cause contraction of the biceps extensor, in order to bring together the two fragments. This theory is erroneous, and experience proves, that by making the articulation project, the fragments are separated, probably on account of the anatomical disposition of the osseous surfaces and the insertion of the capsule of the joint around these fragments. The tension of the soft parts are not more suitable to these cases than to longitudinal wounds of the muscles. These ideas are purely speculative and not justified by practical results. The best plan is, to keep them as much relaxed as possible and this principle is applicable to all analogous lesions. Besides the passive state is the only one supportable; and it must not be forgotten that the patient is soon unable to maintain a permanent contraction.

The limb, therefore, should be kept elevated by pillows, and protected by a hoop from the pressure of the bed-clothes. In this position the fragments cannot separate, and the formation of callus goes on regularly.

In this species of fracture, as in those of the neck of the os femoris, for example, consolidation of the callus takes place in sixty or eighty days or even more. At this period, if the state of the soft parts will allow, the patient should be permitted to take gentle exercise, for the disposition of the fragments can create no alarm as to the elongation or rupture of the callus. Besides, by the application of a cap to the knee or a simple circular bandage, the joint may be rendered sufficiently solid. Again, experience and observation prove that by a longer confinement to bed, we obtain the formation of an osseous cicatrix almost imperceptible and much firmer; in a word, that the extent of the groove or separation observed after the formation of the callus, is in an inverse ratio to the continuance of this plan. For example:—A man having had a comminuted fracture of the patella by a fall, and at the same time of the upper part of the thigh bone and of the cranium, was obliged to remain five months in bed. For a month or six weeks, the ordinary apparatus was applied, removed as often as the relaxation of the bandages required. At the end of the five months the patella was so exactly and solidly united, that no appreciable trace of the fracture remained; there could only be felt some slight and very hard inequalities on its surface.

## CHAPTER XIII

GENERAL CONSIDERATIONS ON THE TREATMENT OF FRACTURES OF THE  
EXTREMITIES.

*Description and Mode of Application of the Bandages.*—There are few positions in which the surgeon can be placed, that require of him a greater share of acquaintance with the details of his profession, than the treatment of fractures in general. It is by no means sufficient that he exercise a correct diagnosis, and employ those means which form the general basis of his management; he must be further familiar with the conduct required for the different complications he has to deal with, and the several circumstances connected with each particular lesion. Nay if he be really accomplished, he will not disdain to stoop to those minute particulars which some people may think of little importance, yet the neglect of which may lead to serious consequences. Thus the precaution to be taken in stripping a patient of his clothes, and in transferring him from one place to another, so as to avoid cruel sufferings, and the aggravation of injuries already done to the soft parts, the situation in which the patient should be placed, the manner in which the surgeon should proceed to dress him and apply the necessary bandages, the means of ascertaining the consolidation of the callus, and the advice to be given to the patient; all these are points which experience shows must be attended to, and that with no inconsiderable degree of diligence. In the observations which I am about to offer, I shall call your attention in the first place, to the kind of bandages which I usually employ in fractures of the extremities.

When the fracture is seated in one of the thoracic extremities and is unaccompanied by any wound, the roller bandage is to be preferred. Some compresses are placed across the limb, where the fractured point is prominent, and over the splints, whether they be of metal, paste-board, or wood.

If the humerus be fractured, the patient is seated on his bed; one, two, or three compresses are applied, over which some turns of the bandage are made; other compresses are then introduced, both above and below; after which splints are put on the four sides of the limb, taking care that they shall not press on the osseous prominences of the joints. A general bandage is then applied over all.

In the case of fracture of the fore-arm, the apparatus required is—a bandage four or five yards long, graduated compresses, two splints of the length of the fore-arm, or a little longer—at all events broader.

The patient being placed in a sitting position or lying down, the fore fingers of the hand are grasped by an assistant, another takes hold of the lower part of the arm, and the fore-arm being now reflected a little towards the humerus extension is attempted.

The surgeon by means of well directed pressure on the anterior and posterior aspect of the limb, collects the muscular substance of the flexors and extensors into the inter-osseous space, to which he thus restores its natural

dimensions, the fragments of the radius being thus separated from those of the ulna. The fore fingers and metacarpal bones are rolled in a bandage up to the wrist. This part is now committed to an assistant; and the graduated compresses, previously steeped in Goulard's lotion, are applied to the dorsal and pulmar surfaces of the parts, encroaching somewhat on the wrist and tuberosities of the humerus. The two splints are applied above these, the bandage at the wrist is resumed from the hands of the assistant, and continued from the wrist to the elbow. The antero-posterior diameter is thus enlarged, and the inter-osseous space necessary for the movements of rotation preserved. If the fracture should be complicated with a wound, we use the bandage of Scultetus, or one analogous.

In fracture of the radius, I am in the habit of using, in addition, a splint, which I call the cubital splint. It consists of an iron plate, curved at its lower extremity and its concavity having several buttons. The upper extremities of this metallic plate is laid along the ulnar margin of the fore-arm; and a compress, folded several times, being placed between the inner side of the wrist and the convexity of the splint, the hand is drawn towards the metal, and made to grasp the radial margin of the first, by means of a handle formed with a compress, placed between the thumb and fore finger, and the two ends of which, being furnished with two strings, are connected to the splint by means of one of the buttons which are upon it. When the olecranon is fractured, I prefer the bandage which is used for the union of wounds transversely, rather than that in common use, and as in extension of the limb, the upper fragment or olecranon is the only portion that has a tendency to be displaced. I only put compresses above that portion; I also employ the anterior splint, but the one I use is straight.

Scultetus's bandage is the one I almost exclusively use in fractures of the leg and thigh, where the roller cannot be kept adjusted, but is displaced by every movement. It is composed of the following pieces; 1st, several pillows; 2d, several folds of muslin; 3d, the tapes; 4th, a splint cloth; 5th, a many tailed bandage; 6th, transverse compresses; 7th, longitudinal compresses; 8th, graduated compresses in case of prominence of the bone; 9th, a perforated linen covered with cerate, charpie, or diachylum in case of a wound; 10th, pads filled with chaff; 11th, immediate splints; 12th, mediate splints; 13th, a body roller; 14th, a support for the thigh, and foot board. Let us examine each of these parts in detail.

The pillows are for receiving the fractured limb, and while they support, they receive the serous or bloody discharges which would otherwise soil the mattress.

The folded cloths, doubled several times, are placed upon the pillows, in order that the blood and pus may not touch the latter; this precaution is above all things necessary in hospitals, where, if neglected, the foul cushions may become nests of infection.

Over the cloths come the tapes, which are intended for keeping the several parts in their proper position, and incorporate the whole; there are three for the leg, and three for the thigh.

The splint-cloth should be as long as the limb, and folded double; it is placed crosswise over the tapes, intended to receive the splints on the extremities and to support them.

The *bandelettes* are placed upon the splint-cloth, and forming by the eighteen tailed bandage, either united or separate. If there be a wound and blood or pus discharged, they ought to be separate, so that they may be changed occasionally when soiled. If there be no wound the tails need not be separate, every ten or twelve of them may be connected by overlapping; that is, the first should be half covered by the second, the second by the third, and so on. They are applied commencing from below upwards, for if we began from the upper part there would be numerous wrinkles, which should be avoided. The tails should be long enough to go nearly twice round the limb.

The transverse compresses are placed the lowest at the most elevated part; they must be merely a double fold, for if triple, their application would be more difficult, and they ought to be as long as the *bandelettes*.

If there be a wound the compresses must be removed without changing the apparatus. It is in such cases that the advantages of the longitudinal compress is felt, which must be removed when it is soiled.

Compresses of various forms, but generally square, and two, three, or four in number, are then applied around the limb; nor is it less useful to place graduated compresses on the length or breadth of the limb. If the tibia, for example, be fractured, and the fragments project outwardly, the compresses are to be applied along the sides of the leg; or transversely, if the upper fragment projects in front.

It is also in similar cases that we require the splints which I have called *immediate*; for they act directly on the fragments from which they are separated by the graduated compresses alone. These splints should be made of paste-board or light wood—if they are inflexible, they would injure the parts. We must not forget, always to interpose one or two compresses between them and the fragments.

Every thing being thus far settled, we apply the transverse compresses, and afterwards the *bandelettes* around the whole limb, taking care always to direct obliquely forwards so that they may partially cover each other. Next come the mediate splints, between which and the limb we place the bran cushions; their length should exceed a little that of the limb, and their breadth be about five or six inches. They ought to be modelled according to the shape of the part, by diminishing their thickness when there is convexity of the limb, and on the other hand, increasing where there is a concavity.

The apparatus is now to be combined into one piece by the tapes connected to the external splint; the knot should be simple, and tied on the outside. A stirrup made of a long compress, or a leather sole with strings to it, and which may be fastened to the sides of the splint-cloth, will serve to support the foot in a steady position.

Lastly, some hoops should be placed over the extremity so as to protect it from the weight of the bed-clothes. But this is not all. In order thoroughly to prevent the motions of the limb, a cloth, folded like a cravat, is fastened to one side of the bed, then passed over the leg or thigh (whichever is fractured) and the other end tied at the opposite side. If it be fracture of the thigh, then is to be placed around the pelvis a body-roller, encompassing the haunches and upper end of the external splint. This last is a precaution of so much importance, that in cases of fractures of the upper part of the neck of the femur, the patient cannot get well without a curvature of the bone. An

apparatus arranged in the manner we have described, is of exceeding firmness, and not liable to disturbance, even should the patient be delirious.

I will further add, that the bed of the patient should not be very soft; it must be perfectly even, and should be a hair mattress, both for the comfort of the patient and to secure his cleanliness. Lastly, there should be no head board nor raised feet.

Having thus described the several parts of which the bandage we employ consists, and their mode of application, I now call your attention to the care which the patient requires immediately after the accident has happened.

If he be carried on a litter, you need be in no hurry to remove him from it; he ought to be stripped on it while his bed and the requisite dressings are preparing. His boots and stockings ought to be slit up, not drawn off, in order to avoid all unnecessary pain; the limb should be washed, so that the bed may not be soiled afterwards by the process. All this done, an assistant must take the patient round the body, another by the two extremities, whilst the operator must take charge of the fractured member. In this way the patient is carried to his bed, and there deposited; his pillow should have little or no elevation, so as to avoid slipping downwards in the bed; a very slight elevation, however, may be advisable, in order to support the head, and not to favor the occurrence of sanguineous congestions.

When applying the bandages, the operator is placed on the outer side of the fractured limb; an assistant on the inner side is exclusively charged with supplying him with each piece of the apparatus. Another assistant holds the foot, with his left hand in front and over the instep, and with his right holding the back part just above the heel. A third assistant at the knee or haunch, as the case may be, holds the sides of the condyles of the femur or tibia, taking care not to press on the vessels or popliteal nerves; for if there be a wound the pressure may occasion hemorrhage. After this, compresses steeped in Goulard water, or some other resolvent, are held by two of their angles by the operator, while the first assistant holds the other two; they are then laid on the limb smoothly. If there be a wound, it is either dressed with diachylon, or a perforated compress spread with cerate, and over this charpie is laid. Lastly, the several pieces of the apparatus are applied in the manner just now described.

If there be no wound, we should proceed on the following day to a fresh dressing, with the removal of the bandages; for it is not unusual to find, after four and twenty hours, that considerable swelling or perhaps gangrene, has ensued. But this being done, it will be enough to visit the patient every fifth or sixth day, unless he feel pains, when it will be necessary to see him more frequently.

*Duration of Treatment.*—The apparatus may be kept on in general, for twenty-eight or thirty days in cases of children; forty days for adults, and much longer for aged people. It ought never be removed until we have ascertained that the consolidation is complete.

In order to be sure of this, the operator lays hold of the two fragments, and cautiously tries if he can produce any motion between them. If the callus yield, the apparatus must be immediately reapplied; but if it do not, the bandages need not be put on again, but should be left in readiness by the side of the limb for three or four days. At this period, it will not be safe to allow

the patient to walk immediately, for the callus may give way to the weight of the body or the action of the muscles; he must remain in bed for ten, twelve, or fifteen days longer. He may then sit up in his bed, or in an arm-chair, with his foot laid on a pillow, and the whole limb wrapped in a roller for about three weeks. Crutches may now be given him, and should be tipped with cloth, lest they slip on the floor. The patient ought, if possible, to be kept in a chamber on the ground floor, and he should avoid walking on uneven pavement, smooth sanded walks being much preferable.

I have thought it thus necessary to dwell at length on these minute and apparently trifling details, because experience has taught me how very important they are for the practitioner, and, at the same time, how generally they are misunderstood, and frequently, also, how improperly they are practised.

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## CHAPTER XIV.

### ON THE EXCISION OF HEMORRHOIDAL TUMORS.

The inferior extremity of the rectum is, in many persons, the seat of sanguineous tumors designated by the name of *hemorrhoids*.

These tumors may exist during a long life, without creating any distress; but are also often the cause of serious accidents endangering the life of the patient, and which would infallibly terminate in death, were they not subdued. The celebrated Copernicus and Arrius perished by hemorrhagy from the bursting of piles. Borden and Benjamin Bell relate cases equally unfortunate. This fatal result was known to the ancients, and they had devised several plans of treatment, amongst others, the ligature. Hippocrates in his book *de ratione victus in acutis*, recommends us to tie them with a thick and solid woollen thread. You must tie, continues he, all the tumors except one; you must not cut them off, but hasten their destruction by appropriate topical application. Paul Ægineta inculcated the same doctrine. Celsus thought it proper to scarify with the nail or the scalpel the hemorrhoidal tumor. I merely mention these opinions, to prove to you that the ancients were well acquainted with the dangers of this disease.

Before reviewing the different kinds of treatment which have been employed, it will be proper to say a few words concerning their nature, anatomical structure, and the cases in which the operation of which I shall treat in this chapter is applicable.

Many opinions have been advanced as to their nature. Some, with Montegre, think that the discharge comes neither from the arteries nor the veins, but from capillaries intermediate to these two orders of vessels.

Laennec, and Abernethy, considered them as depending on the formation of new vessels. According to Duncan, Le Dran, Cullen, MM. Recamier and Delaroque, they are formed by cysts into which arterial blood has been effused.

Lastly, Stahl, Alberti, Vesalius, Morgagni, J. L. Petit, Pinel, Boerhaave, considered them to be veins dilated and varicose; such also is my opinion.

On examining the composition of hemorrhoidal tumors, we shall find that they may be divided into internal and external.

The internal species, covered by the mucous membrane of a violet color, form a kind of partition in the rectum. There are between them fissures which facilitate their isolation, and which sometimes disappear from inflammation. The tissue of this membrane presents venous swellings, like the head of a pin, which pour out, when torn or cut, venous blood, giving it the aspect of a sponge. On removing the mucous membrane, we perceive organized false membranes or a cellular tissue; lastly, the muscular tissue constitutes the most external coat. Large arterial trunks often ramify over them.

The external piles form a kind of crown around the anus, and are composed 1st, externally, in a great measure by the rectum, and somewhat by the skin; 2d, by the false membranes which often exist in the internal tumors, or by the venous coat which appears to be continued with the *fascia superficialis*; 3d, by the dilated veins constituting hemorrhoid; 4th, by the external sphincter which embraces their pedicle, and sends some of its fibres there; 5th, by nervous filaments distributed over their surface; 6th, lastly, by the fat placed sometimes between the skin and these tumors.

After these remarks, let us examine in which cases the surgeon should interfere, and in which he should refrain.

It would evidently be highly improper to cure hemorrhoids, in individuals affected with organic disease of the intestines, the liver, and especially the lungs. It is a fact well ascertained, that in persons laboring under phthisis, the destructive action of this disease has been suspended for a longer or shorter time by the presence of these tumors, and that in consequence of their suppression, the disease has progressed with all its former energy.

In women, towards the latter period of pregnancy, or by the efforts of labor, hemorrhoids are often developed; they are owing to an evident cause, and disappear with it.

When these hemorrhoids have not degenerated in their tissues, and give rise to no hemorrhage, or abundant discharges of purulent serum, plunging the patient into an anemic condition, surgical means should not be applied to remedy the accidents, or rather the inconveniences they cause, antiphlogistics alone are sufficient. But when the life of the patient is threatened, when these inconveniences demand prompt relief, and the tumors become disorganized, antiphlogistics no longer suffice; and no plan but that of excision can be followed by success. This chapter is, therefore, devoted to disorganized hemorrhoids demanding an operation.

The two kinds, internal and external, may, or may not, occur simultaneously; they form a circular band of tumors, either internally or externally, and have been hence called by M. Dupuytren, *internal and external hemorrhoidal tumors*. The external are known by a circle of smooth and round tumors, of a brownish color, where they are covered by the skin, of a bright red where the mucous membrane forms the envelope; rarely ulcerated on their outer surface, they are frequently so on the inner, and give rise to hemorrhage more or less copious, and purulent or sero-purulent discharges, which tend to weaken the patient.

The internal, situate above the anus, and often strangulated by the sphincters, in consequence of the engorgement or prolapsus of the internal mucous membrane of the rectum, give rise to the same accidents, and are known by the red color of the tubercles. Both varieties sometimes appear in the same patient.

Individuals affected with this disease, walk with difficulty; the acuteness of the pain arrests them at every step; they constantly apply their hands to the nates, or sit down on posts, in the hope of returning the hemorrhoid; some rub themselves against the wall; but these means procure only a temporary relief, and the return of pain follows the protrusion of the tumor.

Exhausted by the copiousness and frequency of the loss of blood or the sero-purulent discharges, the patient becomes thin; his skin pale, discolored, and dull, resembling wax; he falls into a state of deep sorrow and melancholy; his intellect becomes impaired, and he frequently attempts his life. Still the disorganization progresses, a scirrhus affection of the anus and lower part of the rectum takes place, and death closes the scene, unless prompt and efficacious treatment puts an end to the march of the disease.

Recourse must then be had to an operation. To which shall the preference be given? Compression, the ligature, the actual cautery, recision and excision have all been used by different surgeons. Let us examine in detail their respective merits. Compression would cause the hemorrhoids to waste and perish, but the spot is unfavorable, therefore it was abandoned. The ligature, as has been seen, was anciently used; the objections to it are very serious, as it exposes the patient to inflammation, insupportable pain, and sometimes death, as in a case related by J. L. Petit. The cautery has been frequently used. Of undoubted utility when conjoined with excision, it would produce horrible pain, and great danger if applied to large tumors, requiring the prolonged action of the hot iron. Recision has been praised by some. It consists in scarifying the tumors with scissors; but such a plan apparently would produce hemorrhage, leave the tumors, and excite inflammation, and does not warrant the praise accorded to it. There remains, therefore, excision, which with us has been highly successful. We will now explain how it is to be done; and speak afterwards of its inconveniences, its dangers, and the means of overcoming them.

The diagnosis being established, and the operation decided upon, the patient is laid on the edge of the bed on his side, or upon his elbows and knees, the legs separated, or still better, one of them flexed upon the thigh, and the other extended. If the tumor is internal, we request him to strain, as in the act of evacuating the bowels; it thus projects; it is then to be seized with a large forceps, whilst an assistant separates the thighs, and removed by a few strokes of a pair of large scissors curved on their flat side. I generally remove only the portion of the tumor projecting outwardly; for, the removal of the whole of it, might cause serious hemorrhage, and subsequent contraction of the anus. I thus leave, apparently, a large mass in the margin of the anus, and it might be supposed, that a sufficient portion had not been removed; but cicatrization restores every thing to order, and the opening returns to its normal state. The same thing happens in excision of the tonsils.

The excision of the internal tumors is less easy; in order to make them project, the patient should be placed in a warm hip-bath, and requested to strain

violently; as soon as it projects, he is put to bed, in the position above mentioned, the operator seizing them suddenly, and allowing no time for their re-entrance, removes them entirely.

Before the operation, M. Dupuytren prescribes a mild laxative and an enema; we shall hereafter see the motive of this precaution.

Excision is not without danger, nor free from objections, but the latter are not important, and the former may be prevented by proper care.

The danger consists alone in the hemorrhage which follows; when the tumor is external, it is soon perceived, and arrested by the cautery. We must also resort to the same remedy where it is internal; but here its application is more difficult, and the hemorrhage less easily seen.

It may be known by a sensation of heat in the abdomen of the patient, which gradually ascends, as the blood fills the intestines; or rather colicky pains, and always a peculiar uneasy sensation, resembling tenesmus. The abdomen becomes tender, especially on the left side, and iliac fossa. Respiration is painful, and interrupted; the pulse at first intermitting and irregular, becomes afterwards small and frequent. The skin is pale, and the face covered with a cold sweat. Despair soon succeeds the uneasiness felt by the patient, anorexia and vomiting ensue, convulsive contractions of the limbs, vertigo, &c

When this accident is recognized, the intestines must be immediately evacuated, by desiring the patient to make efforts similar to going to stool, and a cold enema administered; these efforts always bring the wound outside, and by means of an iron at a white heat, the spot from which the blood proceeds is cauterized. M. Dupuytren has caused two irons to be made expressly for this purpose, one is called the bean-shaped iron (*en haricot*); the other the reed-shaped (*en roseau*). This always arrests the blood, and I have never seen it followed by any dangerous consequence. I always leave the patient in charge of an intelligent assistant, who on the slightest indication of hemorrhage, applies the cautery and prevents all danger.

Dr. Marx has proposed the following question to me; whether *we should not always use the cautery immediately after the operation*, rather than run the risk of hemorrhage. I think out of a great number of cases on which I have operated, both in public and private practice, that internal hemorrhage took place in two-fifths of the patients who had not been cauterized; on the contrary, not once in those who had been. The question then is, Do the objections to the cautery, outweigh the danger to which the patient is exposed? It has been remarked that no comparison can be instituted between them; that the inflammation, and swelling which follow the cautery, the irritation extended to the rectum and urinary organs, generally yield to simple remedies, and never cause fatal results; but internal hemorrhage certainly endangers the patient's life. Let us suppose a case in which the cautery has been neglected, internal hemorrhage comes on, the patient dies, and the operator has the painful remembrance of not having prevented it by the application of the iron. Again, since this hemorrhage occurs in the greater number of cases, and as it is impossible to determine *a priori*, whether the accident will take place or not, why should not this principle be admitted, that the cautery should be *always* used? I confess that these remarks are just, and that they will some day induce us to modify the plan, we have hitherto followed.

Another method, but less certain, of arresting hemorrhage is to introduce into

the anus a bladder, which is afterwards stuffed with charpie. Although sometimes successful, it is very inconvenient, and almost always involuntary expelled by the patient.

The other consequences of the excision of hemorrhoidal tumors are less serious and important. There is always excited a considerable swelling of the cellular and adipose tissue of the anus; the principal inconvenience resulting from this is an irritation of the rectum, on account of which the patients are unable for five or six days after the operation to evacuate the bowels; but the laxative and enema they have taken, the strict diet to which they are subjected, moderate this desire, and deprive the constipation of its unpleasant effects. This swelling may occasion retention of urine, but that is easily cured. As to the tumefaction itself, it promptly yields to leeches, emollient fomentations, baths, &c.

The pain produced by excision is acute but almost instantaneous, and this inconvenience inseparable from the slightest operation cannot be compared with the pain and danger of the disease. In consequence of the operation, the patients are exposed to divers accidents, which should be the particular object of the surgeon, and which it is in his power to spare him. We have seen persons affected with degenerated hemorrhoidal tumors reduced to a state of complete anemia, and asthenia produced by the abundance and frequency of the hemorrhages or sero-purulent discharges. These evacuations to which the patients have been long accustomed, are not suddenly arrested without a reaction of the whole economy; a general state of *artificial* plethora is established, sanguine congestions take place in the lungs, liver or brain; the patients are often attacked with syncope, spasms, vertigo, and fall into an alarming state of insensibility; the arteries beat so violently that they would seem to have taken on an aneurismal character, if these abnormal pulsations did not at every moment change their position and character. What is still more remarkable, this state of plethora is coincident with a pale yellow or an earthy color of the skin, and especially of the face, with a peculiar weakness of the patient.

Repeated bleeding, for some time at short intervals, if the patient be of a sanguineous habit, young and healthy, and formerly subject to bloody evacuations from the anus; the formation of an issue, if these evacuations were of a purulent nature; both combined, if necessary; gentle laxatives often administered, is the most appropriate and rational prophylactic treatment which can be employed. When the excision of the external tumor is once done, the cicatrix which forms, either by the constriction of the sphincter itself, or the tension of the integuments and the radiating folds of the anus, suffices, in the majority of cases, to effectually prevent the projection of the internal tumour and the latter may then remain. Excision may sometimes be followed by contraction of the anus. J. L. Petit relates a case, in which the pipe of a syringe could hardly be introduced. This may be prevented by introducing into the intestine, bougies of sufficient size and remaining there until a perfect cure is effected.

Some cases shall now furnish the application of the preceding principles:

CASE I.—A shoemaker about thirty years of age, was admitted for hemorrhoids, which gave him a great deal of uneasiness. His trade obliged him to be constantly in a sitting and bent position; but he attributed his disease to

residence in Champagne, where he had drunk very freely of the wine of the place. Then, indeed, he first perceived some tumors at the margin of the anus. They were at first small, and not painful, and projected only when he went to stool. They afterwards largely increased. As in many similar cases these tumors had two epochs; one of which may be called that of *inertia*, during which there was no discharge, or only a slight serous exudation, and presenting no inflammatory character; the other, designated by the name of *hemorrhoidal crisis*, was manifested by swelling, inflammation, sharp lancinating pains, a copious discharge of blood, and bloody serum. These crises were more frequently renewed, and lasted longer; the patient suffered intensely, and his health was visibly impaired.

On his admittance, he was feeble, thin, and yellow; he walked in a bent position, unable to be erect. This position was owing to the large mass of hemorrhoids around the anus, at least equal in size to the fist of a child seven or eight years old, and composed of two tumors, one internal and the other external. He was besides affected with an obstinate constipation, which is often the result of an irritation extended to the rectum, and retention of urine, a complication not less frequent than the preceding.

An enema and a bath were prescribed; by this means the retention of urine ceased, but that of the fecal matter persisted. The swelling of the hemorrhoids had greatly diminished, they were less red, the patient did not suffer so much. There was no doubt but that the actual crisis might be cured by leeches, emollient fomentations, baths, enemata, rest, and appropriate drinks; but this treatment could only be palliative, and the unpleasant symptoms would again occur, according to the state of the patient's constitution.

It may be asked what impropriety there is, in using the palliative method, at the return of every crisis? It is adopted by many physicians, and many patients who fear the operation. It sometimes happens, indeed, that temporary cures retard the return of the crisis, and render it more rare; but in the generality of instances these crises happen more frequently, and impair the health of the patient. This motive, however plausible it may be, is nothing in comparison with the effects of the disease; often the tumors, both internal and external, become scirrhus, ascend beyond reach into the rectum, and disorganization takes place in the interior of the intestine. From all these different consequences, I think the operation of excision to be generally preferable; but do not understand me to say, that it should be performed in every case, as I have above indicated the cases in which it is contra-indicated.

After the preliminary remarks, the patient was introduced. He was placed on a bed, on his elbows and knees, his thighs separated, and the hemorrhoidal tumors removed by means of the scissors. The wounds were not cauterized. The resident surgeon was desired to watch him very carefully, and in case of hemorrhage, to immediately apply the cautery.

The dressing was delayed for several hours after the operation, lest it should prevent the outward flow of the blood, and cause it to re-gurgitate into the upper part of the intestine.

As had been expected, hemorrhagy came on; the surgeon was not mistaken as to its symptoms, and had immediate recourse to the proper means. He administered an enema, which brought away a large quantity of blood, and

a second caused the expulsion of a considerable clot; desiring the patient to strain, in order to favor the escape of the remaining blood, to relax the sphincter, and expose the wounded parts, he then applied the actual cautery. The bleeding ceased, and he had no return of colic, nor syncope.

It has been said that, three, four, and five pounds of blood, have been lost after this operation. It ascends to the descending, the transverse, and ascending colon, as far as the cœcum, but never beyond this last.

The patient whose case has just been related, seemed destined to present a complete collection of the symptoms of the disease, and the consequences of the operation. The cautery produced retention of urine, for which the catheter was necessary. After the evacuation of a large quantity of water from the bladder, he experienced sharp pains, which ceased only when the organ became again filled. Another remark yet remains. It is known that individuals affected with piles, are subject to obstinate costiveness; in this case it lasted several days, and was increased as sometimes happens, by the operation; laxative medicines should be given only when the inflammation and swelling have diminished or disappeared, because before this time the fecal matter cannot be expelled without acute pain, and an increase of irritation, and danger of laceration of the parts. On the sixth day after the operation, all unpleasant symptoms had disappeared, the bowels were opened without pain, and the man demanded his discharge.

CASE II.—About fifteen years ago, a banker, forty-five years of age, of a bilious temperament, consulted M. Dupuytren for bleeding piles. The discharges had reduced him to a very weak and anemia condition. Pale and wan, he daily grew thinner; and was unable to pursue his business. He could scarcely bear to write a letter. An internal hemorrhoidal tumor was perceived, its excision proposed, and eagerly accepted by the patient. A few days after it was done in the following manner.

The gentleman having taken, and passed an enema, came out of a hip-bath and was laid on the edge of the bed; his thighs separated; violent efforts caused the projection of the tumor, which was seized and excised, after some difficulty, by the scissors. No hemorrhage followed. M. Dupuytren remained with the patient; in a quarter of an hour, he saw him become pale and excessively weak; his pulse was small and corded; his body covered with a cold sweat; and he felt in the abdomen a sensation of heat gradually ascending; these symptoms indicated internal hemorrhage. He then desired the patient to endeavor to expel the blood hardly yet coagulated; cold enemata were uselessly tried; the hemorrhage was not arrested; a bladder was then introduced into the anus, and stuffed with charpie, which succeeded perfectly; but a difficulty was found in keeping it in its place, on account of the involuntary efforts of the patient. He was exceedingly weakened by the bleeding, which would have been fatal if assistance had not been at hand. His recovery was rapid.

CASE III.—The banker above mentioned, had a brother at Berlin affected in the same manner; the latter having heard of the cure of his brother, wrote to M. Dupuytren. He advised excision. But the accident which had happened to his brother, induced him to desire a more efficacious plan of arresting the hemorrhage, and consequently of obviating the greatest danger of the operation. He, therefore, wrote down the rules to be observed, and advised the cautery with an iron, *en haricot*, if hemorrhage came on.

The surgeon in Berlin neglected this advice. He left the patient immediately after the operation. Very soon symptoms of internal hemorrhage were manifested; the patient became weak, pale, and bathed in cold perspiration. One of his young brothers, who had been present at the first operation, recognized the cause of the danger; the surgeon could not be found; this young man had then the presence of mind, to introduce, as he had seen done, a bladder into the anus stuffed with charpie, and thus succeeded in arresting the hemorrhage. But the loss of blood had been so great, that the recovery of the patient was extremely tedious.

CASE IV.—A broker, the father of a large family, had been for many years affected with external and internal hemorrhoids; they at last became so annoying, that he could not walk sixty paces without being obliged to stop, and lean his nates against a post in order to find a temporary relief. Finding himself under the necessity of giving up his employment, and unable to provide a maintenance for his children, he consulted M. Dupuytren, who examined him and found a double hemorrhoidal tumor of two and a half inches in diameter in every direction; it constantly discharged blood and pus, and scirrhus seemed on the eve of appearing. Excision was proposed. He dreaded the operation, as some unfortunate cases in the hands of other surgeons had come to his knowledge. With a good deal of difficulty, however, he was encouraged and convinced that cautery of the vessels would obviate every unpleasant event. He at last consented, but wished to be admitted into the Hotel-Dieu, in order, as he said, to be better watched, and that any accidents might be relieved at its onset. The excision was performed, a few vessels cauterized, and on the twelfth day he left the hospital entirely cured.

CASE V.—M. Ex....., a Scotchman, and an officer in the British cavalry, forty years of age, of a sanguineous temperament, had experienced for three years great suffering from internal hemorrhoidal tumors, which projected whenever his bowels were moved. As his profession increased his distress, he came to Paris to consult M. Dupuytren.

According to the advice of this surgeon, the following operation was performed: The patient was laid on his side, the upper thigh raised by an assistant, each tumor was successively seized and removed. These tumors, three in number and small, gave issue to but little blood. The cautery was thought unnecessary. An assistant remained with the patient, who was perfectly tranquil. Five hours after the excision, the characteristic symptoms of hemorrhage were manifested; anxiety, shuddering, anorexia, cold sweat, sluggishness of the pulse, convulsive contractions of the limbs, inexpressible anguish, vertigo, syncope; the tenesmus increasing, the patient got up, and the expulsion of a large quantity of partly coagulated blood, produced decided relief; a cold enema was administered; it soon passed away, and was replaced by another which remained sometime. However, after the lapse of an hour, the accident returned with more intensity than at first, unmaning the patient entirely; he asked for a notary and desired to make his will, resolved rather to meet his death, which he considered inevitable, than submit to the actual cautery, which he saw preparing. This was not a time to yield to his wishes. Drs. Paillard and Marx took upon themselves the responsibility of attempting violence in order to save his life. He was held, and it may be

conceived how difficult the operation must have been in such a situation. However, by means of a perforated speculum (*fenetre*) introduced into the anus, and turned round, the spot furnishing the blood was discovered, and the discharge arrested by the application of an iron bent at the end, beaux-shaped and at a white heat. The blood stopped, the alarming symptoms disappeared; the inflammation and dysuria resulting, yielded to the use of cataplasms, enemata, and the hip-bath; a bougie was kept in the rectum, and in a few days, the patient was entirely cured.

CASE VI.—M. Joseph Cur....., forty-eight years of age, had for many years suffered much pain in the expulsion of the fecal matter; this resulted from the presence of internal hemorrhoids, as large as a hen's egg. During the act of defecation they projected, but were soon most painfully strangulated, and could not be reduced without much difficulty.

These tumors were not accompanied by an habitual or periodical discharge, except when the patient was constipated; the hard excrements then caused erosions from which issued a little blood.

He came to Paris to consult M. Dupuytren, who advised him to enter the hospital for a few days previous to the operation. The patient being placed in the proper position, the tumors, three in number, were drawn out and excised. What was remarkable in this case was, that notwithstanding the large size of the tumors, the excision caused the loss of but little blood, and did not need the cautery. A year after his cure, we chanced to see the patient; nothing had occurred to mar the success obtained with a rapidity truly astonishing.

CASE VII.—A man, about forty-seven years of age, small, of a sanguineous temperament, came to the Hotel-Dieu to be treated for hemorrhoids, under which he had labored for fifteen years. They were so painful that he could use no violent exercise, without their projecting, and becoming irritated by the friction of his clothes. Repeated inflammation ensued, and a discharge sometimes bloody, and at others purulent; the act of defecation was a continued punishment.

For fear of the consequences sometimes following excision, must the patient be left a victim to his disgusting disease? Every renewal of inflammation would hasten the disorganization of the tumors; and gradually the bloody and purulent discharge would undermine the constitution of the patient. There could be no hesitation; the operation was indicated for its dangers, were not unavoidable; whilst those of the disorganization would necessarily result in death. The operation was agreed upon, and the man prepared by all the means appropriate to insure success.

He was bled in order to prevent the violence of the inflammation following the excision of the tumors; a blister was applied to his arm, to divert the danger sometimes following the suppression of a natural issue; lastly, he was placed on a light diet, and the evening before the operation, the intestinal canal was emptied by means of a purge.

A tumor, composed of seven or eight brownish tubercles, surrounded the anus externally. When the man was tranquil, the tubercles were grouped so as to form an uneven and brownish tumor about as large as a walnut. When, on the contrary, he contracted the abdominal muscles, the external tumor opened, and discovered a second circular tumor, formed also of seven or eight

small tubercles, but of a different color from the former, as they were uniformly of a rosy hue, and completely covered by the internal membrane of the rectum.

The patient was then laid on his abdomen upon the bed, and requested to strain as in defecation. The internal tumor then projected was seized and removed; the same was done with the external tumor, and an iron at white heat was immediately applied upon the bleeding points of the wound.

The patient was then put to bed, and a few hours afterwards a small bougie covered with cerate introduced. He could not retain it long. During the day he had a slight attack of colic. (Diet, diluent drinks, an anodyne draught in the evening.)

On the next day, the colic was more frequent, and of longer duration, the margin of the anus was swollen and painful; he passed water with difficulty, some fever. (Venesection, diluent drinks, anodyne.)

On the third, fourth, fifth, and sixth days after the operation, the pain decreased, the urine passed freely, the fever disappeared; appetite was returned, some food permitted.

Seventh day, the patient's bowels have not been evacuated since the operation; he took an ounce of castor oil which had a good effect; he had five or six stools during the day, accompanied by excessive pain of the anus, and yet after each of them, the patient was relieved.

The next day he had a free and natural passage; the colic less frequent.

Twelfth day, the colic returned and with it diarrhea. Cause unknown. (Gum-water.)

Next morning, in the same state. (Theriaca,\* one ounce.)

Fourteenth day, the diarrhea has ceased, and with it the colic. (Rice-porridge.)

Fifteenth day, the patient is doing very well; some food is allowed him. He is radically cured of his hemorrhoids, and the circumference of the anus is free, in whatever position he may be. Defecation is performed without difficulty. He left the hospital perfectly free from his disease.

## CHAPTER XV.

### ON LUXATION OF THE VERTEBRA, AND ON MALADIES WHICH SEEM TO PRESENT THAT CONDITION.

Luxations of the different parts of the body have been so well observed, and so carefully described, and this department of surgery brought to so high a degree of perfection, that it would seem as if nothing more were to be desired; that the facts already ascertained were sufficient, and that we had only to fol-

\* Theriaca Andromachi. An opiate electuary prepared for the emperor Nero by the physician Andromachus. First known to Mithridates of Pontus, and by him considered as an antidote to poison. A drachm contains nearly a half grain of the extract of opium.

low the principles laid down by writers. Yet it is not exactly with this branch of the medical art as it is with others, the precise boundaries of which are apt to escape the eye of the observer until certain difficulties are surmounted that concealed them from his view.

The vertebral articulations, placed as they are, in consequence of their limited action, and the nature of their mutual connections, at the bottom of the scale of those combinations of bones which are endowed with motive powers, have always been thought particularly safe from luxations, which are so frequent about parts which have a more extensive range of movement; and if the luxations of the first conical vertebra or the second be excepted, they have been either not noticed at all, or directly denied by the generality of authors.

Many of the older authorities, it is true, have spoken of these luxations; but as they have not given us the *post mortem* examinations which could alone corroborate their remarks, we cannot attach much importance to what they say—or rather, we should reject them altogether. It is especially since pathological anatomy has enabled us to trace morbid effects to their causes, that the idea of the possibility of these luxations seems to have been renounced.

And, in truth, the number and strength of the ligaments which unite the vertebra, the almost vertical or slightly oblique direction of their apophysis, the mutual adaptation of their upper and lower processes, the extent of surface by which these bones touch each other, and their very limited motion, all this would seem to render vertebral luxation very difficult. Then, if we consider the facility with which the bodies of the bones break during life, in consequence of efforts made by the spinal column; or, after death, as has been ascertained in numerous experiments; we shall not be greatly surprized at the opinions which most of the moderns have advanced relative to the nature of this disorder.

The arrangement, above all, of the articular apophyses of the vertebra, presents such obstacles to luxation of those bones, that some authors have found it difficult to conceive how it could happen as long as these apophyses exist.

There is much plausibility in this opinion; and it will derive no small weight from the cases which I shall presently relate; although in two of them the luxations might have occurred without the previous fractures, which is clearly proved by the third case, the most important that I have hitherto been able to procure.

These remarks are chiefly applicable to the dorsal vertebra, and perhaps still more so to the lumbar, which have a more substantial body than the others, with apophyses ranged vertically, that is to say, in the direction of the principal movements of which the parts are capable. Thus, it is the opinion of most practitioners, that cases of luxation of the dorsal or lumbar portion of the vertebral column, characterized by a sharp angular, sometimes rectangular, and a permanent curve of the parts, with or without paralysis of the lower limbs, perceived for the first time after a blow on the trunk, or a fall, and from which the patient sometimes recovers, though the spine retains its deformity—are in reality fractures of those parts.

But if authors reject the notion of luxations of the bodies of the vertebra,

they admit on the other hand, those of the articular apophysis, and particularly that of the atlas with the axis. In order the better to understand the mechanism of the latter luxation, I shall say a few words on the mutual relations of these two vertebra.

The atlas is articulated anteriorly with the odontoid process of the dentatus, and latterly with the corresponding parts of the same vertebra, having articular surfaces. The connection of these two bones, consisting only of a capsule and a transverse ligament, destined to complete the ring in which the odontoid apophysis is received, would expose them to frequent accidents were it not for a special ligamentous apparatus, extended from the occipital to the axis, and composed of the two lateral ligaments of the odontoid, and their accessory ligaments, with the suspensory also, and the transverse, and above, all the great ligament extending from the basilar process to the posterior surface of the fifth vertebra. This is the apparatus which gives much strength to those articulations; confines the movements of the head's rotation within proper limits; and which, in fine, by its elasticity, prevents these articulations from producing solely flexion of the head, which is, in fact, the joint action of partial movements executed by the other cervical vertebra. Luxation of the atlas upon the axis may take place from a violent bending of the head, or a forced rotation of the part. Always attended by laceration or compression of the spinal marrow by the tooth-like process of the dentatus, it is immediately mortal, and beyond the aid of art. The cases recorded of recovery from accidents of this sort, have been nothing more than luxations limited to the articulations of the articular process of some of the other cervical vertebra.

Luxation of the other cervical vertebra is usually limited to one of the articular processes. It is often produced by too sudden a movement executed for the purpose of working behind. It has also been occasioned in children standing or tumbling on their head, while the neck too weak to sustain the body, is at once twisted and turned away, which is essential in producing this species of luxation.

The attempt to reduce luxation of this nature is very dangerous, the patient has often perished in the act, in consequence of the compression and elongation of the spinal marrow. Petit Radcliff saw a child die under the manœuvres practised for reduction. It is at the present day a sort of general rule to leave such cases to themselves. The pains gradually subside, but the patient has ever after crookedness of the neck.

The details which I have now submitted to you, will enable you the better to understand the difference between true and false luxations, in the cases which shall presently be laid before you. We shall in the first place give some cases illustrative of luxation of the bodies of the vertebra.

*CASE I.—Laceration of the Ligaments of the Body of the Vertebra without Luxation; Death.*—A man, aged fifty, was waiting at the end of a cart, his body fixed, his head and neck outstretched, in order to have a quarter of beef laid on his shoulders. The load slipped from the butcher's hands, and fell with force on the porter's neck, the man was at once struck to the ground. He was taken to the Hotel-Dieu, where I saw him the next day deprived of all feeling and power of moving the lower part of the body. The posterior and inferior part of the neck painful to the touch and to the least movement presented a considerable ecchymosis, though without any swelling; and at

this part, a distinct crepitation was perceived upon turning or raising the patient's head.

The anus, parietes of the chest, abdomen, and lower limbs, were destitute of motion and sensation; there was paralysis of the bladder, and retention of urine. The diaphragm muscles of the neck and face, were alone endowed with contractile power, respiration was effected with difficulty, yet the voice was scarcely altered.

This state continued for two or three days, when suddenly, the respiration became exceedingly difficult and laborious, the pulse irregular, the eyes prominent, the skin red and livid; the man died with all the symptoms of a true suffocation.

On examining the body, a very large ecchymosis was found in the region of the last cervical vertebra. The inter-vertebral substance uniting the fifth and sixth, was completely lacerated, while the bodies of these vertebra, remained quite safe. The transverse and articular spinal processes of the fifth, sixth, and seventh cervical vertebra were broken, and a luxation from before backwards, could readily be effected, of the upper upon the lower portion of the vertebral column. At first sight, the spinal marrow seemed uninjured, notwithstanding the disorder of the surrounding parts—it only appeared somewhat more voluminous than usual; but upon slitting it in the length, the centre was found mashed and mingled with decomposed blood.

CASE II.—*Laceration of the Ligaments, with Luxation.*—A man, aged from forty to forty-five years, working in a quarry, received a mass of earth on his loins, under which he fell, after having made some efforts to extricate himself. He was at first carried home, where he remained three days deprived of all power of motion or sensation in the lower part of his body; and it was not until the fourth day, that he was taken to the Hotel-Dieu. The upper part of the loins was then found to be much swollen, soft all around, while the centre of the tumor felt hard, and a distinct crepitation was perceptible. Through the abdomen could be felt another tumor, resisting at all points, running in the direction and along the line of the vertebral column. The abdomen was evidently shortened, the base of the chest coming as far as the crests of the ilia; there was at the same time, complete paralysis of both, sensation and motion, in the lower limbs and parietes of the belly; the bladder distended and paralysed, allowed the urine to flow involuntarily. No fecal matter was discharged, though the belly was large and soft, the pulse was small and corded, respiration short and difficult. The patient complained of dull pains in the dorsal region; the intellect was unimpaired.

All these symptoms evidently indicated a solution of continuity, with luxation of the vertebral column. On the fifth and sixth days of the accident, the palsy extended to the left arm, and the motions of the right began to be slow and uncertain. On the seventh, respiration was more difficult, and only took place by the diaphragm. The patient perished by asphyxia.

Upon opening the body, we found the transverse and articular apophyses of the last dorsal vertebra, and the two first lumbar, broken; the body of the last dorsal and of the first lumbar vertebra separated from their processes, and from the body of the second lumbar, had passed in front of the latter, and overlapped it to the extent of above an inch. The spinal marrow was lacerated, and the crura of the diaphragm were torn; a large ecchymosis

rounded the vertebral column. An attentive examination of the displaced vertebra, showed, not a fracture of their body, but a laceration of their intervertebral substance, which, only in one corner, had carried away a very small portion of the lumbar vertebra.

CASE III.—A woman, aged fifty-six, full and corpulent, in coming down stairs, met with a heavy fall, the lower and back part of her neck striking violently against a step. She had descended twenty steps in the fall, and was taken up deprived of all sensation and motion of the parts below the neck. She suffered much during the night from pain in the seat of the injury, and excessive thirst. Her bowels were not opened.

Next morning, on being brought to the Hotel-Dieu, she complained greatly of the pains in the neck, which were greatly increased by the slightest touch and motion of the part. The head and neck were bent forward, and a little to the right, the lower part of the neck was depressed, while the upper part of the back was prominent. The lower extremities, rectum, bladder, and parietes of the abdomen, were deprived of sensibility, and all was dead up to the diaphragm. Above this part, the thoracic members only labored under a partial paralysis, respiration was frequent and laborious, but the voice, the senses, movements of the face, and the intellect, had experienced no alteration; the pulse, also, was full and unimpaired; the tongue was dry, and a little brownish, and the skin natural as regarded exhalation and vital heat.

From these appearances, it was not difficult to conclude that there was a serious injury of the spinal marrow, caused by a solution of continuity of the spinal column, with luxation.

The patient was bled in the arm, and in the evening the respiration seemed better; the thirst had abated, and the tongue was less dry; yet it was clear, that no hope of recovery could be entertained. On the following night the respiration became stertorous, speech embarrassed, the face swollen, and the patient sunk thirty-four hours after the accident, her intellect remaining perfect to the last.

On examining the body, we found an ecchymosis, and bluish suggillations on the back part of the neck, a projection backwards of the dorsal column, with a projection forwards of the cervical at the same place. The cellular tissue and subjacent muscles were bathed with blood. The parts immediately in contact with the vertebral column were destroyed, and allowed the upper articular apophyses of the seventh cervical vertebra to be seen, whilst the sixth vertebra was perceived to be indented half an inch before the seventh. In the interval of these two bones, the spinal marrow could be seen spread laterally and compressed. The spinal column, examined in front, presented a very remarkable prominence on the part corresponding with the sixth cervical vertebra, and it was enveloped in blood. The anterior ligaments of the part were destroyed, and the pharynx lacerated.

Upon dissecting the cervical portion carefully, the yellow ligaments were found to be torn, and so were the anterior and posterior ligamentous envelopes, and the intervertebral substance between the sixth and seventh cervical vertebrae. This substance was ruptured in such a manner, that two-thirds of its thickness adhered to the seventh vertebra, while the sixth held only the remainder.

With regard to the bones themselves, it was perceived that the seventh

vertebra was perfect in every respect; that the end of the spinous process of the sixth, was slightly broken, as well as the margin of its lower articular process. All the articulations of the vertebra, above the luxations, were in their natural condition; that of the seventh cervical with the first dorsal was much more free than usual.

Of the three preceding cases, the first presents an example of laceration of all the ligaments of the vertebra and of fracture of the articular apophyses, yet without luxation; the second an instance of the same injury with luxation; and the third a pure and simple luxation, without any fracture of any part of those bones.

In all the three cases the vertebral column received a shock while in a state of tension, which must have been augmented at the moment of the accident. There was a percussion, and not merely a distention of the part; and the determining causes of the injury were all applied to the posterior part of the vertebral column.

In all the three cases, the intervertebral substance was ruptured, and the body of the vertebra remained uninjured; but in the two first, the spinous processes, and the transverse and articular processes were broken and separated from the body of the bones, whilst in the last all the parts remained uninjured.

In the first case, the power which operated on the spinal column, seems not to have been sufficient to cause a luxation; in the second, it produced laceration of the ligaments, fracture of the apophyses, and an enormous luxation in the thickest part of the vertebral column. In the third case, finally, the power produced a remarkable laceration of the ligamentous substances, and a very great luxation in causing the articular apophyses of one of the vertebrae to slide over those of the other.

In all the three cases, the fatality arose from injuries to the spinal cord. All the parts below the lesion were equally paralyzed, although the injury to the bones was materially different. In all the three patients, the affection which was at first limited to the parts below the injury, soon extended upwards, until it reached the origin of the diaphragmatic nerves. The respiration, which, till then, was executed without much difficulty, became suddenly laborious, and the patient died, by the successive interruption of the different respiratory phenomena. This termination so promptly fatal, is generally observed, when the lesion has taken place above the origin of the diaphragmatic nerves; whilst life may be more or less prolonged, if it have occurred before their origin; and thus we find that the position laid down by certain authors, that luxation of the bodies of the vertebra is impossible, does not hold good. Was further proof needed, I would recommend you to examine the Anatomical Museum of the School of Medicine, and the Garden of Plants; you will there find additional corroboration of the facts already detailed.

Having now concluded my remarks relative to luxation of the vertebra, and the disorders arising from those solutions of continuity; and shown the difficulty which sometimes attends the diagnosis; I shall proceed to offer some observations, descriptive of a complaint, which, as it strongly resembles luxation of the vertebra, has more than once deceived even skilful practitioners.

CASE I.—*Rheumatic Affection, Simulating Luxation of the Cervical*

*vertebra*.—A boy of fifteen, was brought to the hospital on the 30th of January last, by the direction of several practitioners, who advised that I should be consulted on what they conceived to be a luxation of the first vertebra upon the second. The boy, it appeared, had two days previously, in taking off his shirt, made a violent movement. He felt at the instant a sharp pain in the cervical vertebra, and heard a distinct crackling noise. His head was turned to the left and fixed there. Medical men being called in, thought they recognized an incomplete luxation of the first cervical vertebra upon the second; and advised the lad to be taken to the Hotel-Dieu. Upon examining him, I found the head strongly bent to the left, with the spinous processes of the first vertebra prominent; the neck was convex on the opposite side, sharp pains were felt in the part, and were augmented on the slightest effort to straighten the head. The boy complained, moreover, of feeling a numbness and twitchings in the right shoulder and arm; he swallowed with difficulty, and could neither flex, nor turn his head.

Many of those who were present at this examination participated in the opinion of the boy's medical attendants, but I was of a different opinion, and did not hesitate to pronounce it the effect of rheumatism. I observed, on the occasion, that there were certainly apparent reasons for supposing a luxation, and that, therefore, I should explain the grounds of my opinion. I have often seen symptoms of the same description in persons, who, being subject to rheumatism, felt all of a sudden a sharp pain in the neck, from the fixation of the erratic rheumatismal principle. Thus persons, while dancing, have been seized with a sudden pain in the calf of the leg, which by no means depends on the rupture of the gracilis muscle, as some have supposed, though the patients have been unable to walk for two or three days. It is not unusual to find those pains, when they subside in one place, making their appearance in another. Some persons, in stepping into a carriage, feel a sudden pain in the loins, and the common mass of the sacro-lumbar muscles; a pain so acute that they become alarmed, thinking they were struck with a stick or a sword.

Now, what induces me to believe that this lad's case is of similar nature is, that he is employed in selling wine, that he is obliged to go down every day into a cellar, and remain there for several hours, and that he has had rheumatism. We shall cup him on the left side of the neck.

On the following day, the improvement was so great that no one could any longer entertain the idea of any vertebral disorder. The patient could bend and turn his head without much difficulty. There was no longer any feeling of numbness on the right side. Nothing more was done, except to apply a few cataplasms and flannels to the part, and in a fortnight he was as well as ever, and left the hospital.

*CASE II.—Distension and Engorgement of the Intervertebral Ligaments of the Cervical Region.*—A man came to the Hotel-Dieu complaining of pain in the neck. He said that in "the days" of July, he had received some blows from the butt of a musket on the head and neck; but he confessed that some months previously he had had a fall, which gave him sharp pain, but did not prevent him from work. Upon his admission, the neck was convex posteriorly, and concave anteriorly; and consequently was changed in form, the upper part of the cervical column was prominent, and the spinous processes could be readily

felt. He could not, by any means, turn his head, and when he desired to turn round to look at any one, he did it in such a way that it seemed as if the head were soldered to the body. If he attempted to turn suddenly, he felt pain. The complaint was aggravated by work, and there was evident engorgement of the ligaments uniting the vertebra. The first application of cups did much good; they were again tried on the opposite side but without equal benefit. A moxa was applied to the nape, which was so efficacious that the patient himself begged for another. A cure was effected in this way, and the man had eventually no obstruction in the movement of the parts.

CASE III.—*Apparent Luxation of the Vertebra; Cure.*—An old man recently came to consult me for an affection of the spinal column, which seemed, at first sight, to be a luxation. The neck was convex posteriorly and concave in front; and so great was the stiffness of the parts that no movement could be effected. There was also observed in the vertebral column a vicious curvature, attended with pain on the least attempt at motion, and immobility of the articulation. It was supposed that there must be in this part a disease of the ligaments, which, in the effort to extend them might cause a spontaneous luxation. Leeches and emollient poultices were applied. Two moxas were placed on the sides of the gibbosity, which succeeded in producing a decided improvement, the patient could turn his head right and left; but, for a radical cure, he was obliged to continue under treatment for a considerable time.

We shall add one other case, which, though not exactly analogous to the preceding, is still, perhaps, sufficiently interesting to be introduced into the present lecture.

CASE IV.—*Engorgement of the Occipital and Vertebral Ligaments; Paralysis and Atrophy of the Left Half of the Tongue.*—A man, aged thirty, whose employment it is important to notice, as it materially influenced the development of his disorder, was admitted into this hospital in the course of last year. He was a weaver, and was accordingly obliged to work in cellars and on cold and damp ground floors. Persons of this trade are very subject to rheumatic affections, and swellings of the ligaments of the joints.

Three years ago, this man was seized with very sharp pain in the left posterior side of the head, which totally prevented motion of the parts, and also sleep. In the course of five or six days they changed their position and settled in the left side of the upper part of the neck. The pains were not now so violent but motion of the head was still impossible.

Lateral flexion of the head, it is true, was partly performed by the totality of the cervical column; and the head could, moreover, be slightly bent forward and backward by the same means. The seat of the malady was evidently in the vertebra themselves, it was not in the muscles; a supposition, which, as we shall see, was inadmissible.

The next peculiarity observable in this case was, a difficulty in speaking, at first inconsiderable, but increasing gradually to such an extent, that, at the end of two months, the patient could not be understood. He said that the air passed by the left side of his tongue with a whistling sound, and when he wanted to say *je* he could only utter *ze*. There was some pain at the angle of the jaw and in the cheek of the left side; but no paralysis of the muscles in that quarter.

Another symptom now became remarkable. The tongue began to diminish in bulk on the left side, and the diminution soon amounted to a perfect atrophy. The organ at this part appeared to be formed of nothing more than membranous folds, which could be rubbed together, without feeling in any degree muscular; it felt like an empty leather purse. When the tongue was thrust out, its right side seemed sound enough; and the atrophy of the left which was most visible at the end and middle portion was inconsiderable at the base. The right side seemed also to enjoy an unusual degree of strength and activity, as is observable in other parts of the body when the corresponding parts are paralyzed. There was a curvature to the right side when the tongue was thrust out.

It was only during the first months that articulation was difficult or impossible; when examined at the hospital he could speak as if no atrophy existed. This must have been the effect of practice; for it is known that speech can be effected by this means with half a tongue, nay, with a less portion, a third, a fourth part, and even with a stump scarcely visible.

I was anxious to find what changes had occurred in the sense of taste; and with this view, made four watery solutions of sugar, sulphate of quinine, common salt, and an acid. I tried them first on the healthy subject; some of the pupils submitted to the experiment. Keeping the tongue motionless, a few drops of these solutions were applied to the tip, there was no taste perceived; they were applied then successively to the middle and base, when the different flavors were perfectly distinguished.

Repeating the experiment, it was found that there was no sense of taste, at the tip of the atrophied side; but in the middle portion, and according as the base was approached, the more acute and perfect was the sense. Thus it appeared that though the muscles were gone, the sense of taste remained in all its perfection, a remark of very great importance.

By considering next, what nerves are distributed to these muscles, we were still further able to form an opinion of the seat of the disorder, and the cause of the atrophy. These nerves are the lingual glosso-pharyngeal, and the hypoglossal; the lingual being distributed to the nervous papilla of the surface; the glosso-pharyngeal to the back part and lateral portions of the pharynx; the first is subservient to the taste, the second to the motions of the organs. Now the sense of taste being unimpaired, the lingual was sound; and if there had been an alteration in the glosso-pharyngeal nerve, the functions of the pharynx, would have been impaired, and the base of the tongue more or less atrophied.

The nerve of the ninth pair, the great hypoglossal, then remains; and it is important to consider its origin. It arises from filaments situated between the corpora-olivaria, and pyramidalia or the sides of the medulla-oblongata, and issues from the skull by the anterior condyloid foramen, at the internal and posterior side of the foramen lacerum. The eighth pair, in like manner passes through the same place; but does not appear to have been involved in the disease, for the functions of the stomach and alimentary canal remained unimpaired. The nerve of the ninth pair receives and gives off numerous branches; some of these are distributed to the muscles inserted into the hyoid bone; others supply the middle cervical plexus; and accordingly in the present case the left side of the neck seems not to have been so well supplied as the right.

This nerve, in short, which is the true mover of the tongue, is terminated every where in muscular parts.

So much then being premised relative to the different functions of the nerves of the tongue, we shall now consider whether the atrophy depended on the brain or the nerve.

The acute pains felt by the patient at the commencement of his disorder, were simply external or superficial; there never was any disturbance of the intellectual functions, nor in the locomotive powers; there has been no palsy in parts supplied by the cerebral nerves, nor does the medulla-oblongata appear to be the origin of the affection, for there have been no palsies, pains, convulsions or contraction in parts supplied from that source. Nor can the spinal marrow be considered as the cause of the malady.

Taken in every point of view, the disorder in this case appears to me to result from a lesion of the nerve of the ninth pair, not within the skull but after its departure from that cavity. This opinion seems corroborated by the lesion of the occipito-vertebral articulation. The inability to execute motions of the head seems to point out some affection existing between the vertebra, the cause of which is probably rheumatism, and the seat of the ligaments. The disorder began on the left side, it descended on the same side; the point of departure is therefore between the occipital and the first vertebra, perhaps also between the first and second vertebra.

Diseases of this kind are by no means rare. There are in the collection of the School and Museum of Comparative Anatomy, ten or twelve cases of stiffness, with or without luxation, of the first vertebra with the condyles of the occipital bone.

Thus, in the present case, there was inflammatory engorgement, acute or chronic, of the ligaments uniting the vertebra and occipital bone; and as the nerve of the ninth pair passes out by the foramen in front of the occipital condyle, this nerve must have been either compressed, or altered in its tissue at the point of exit; it must then have become atrophied, and hence the paralysis and atrophy of the left side of the tongue.

The treatment in this case was energetic; for as the disorder appeared to vanish from the left side, it was found to have some tendency to migrate to the right, the patient beginning to complain of similar, although slighter pains, on that side. Cupping was freely practised, and frequently repeated behind the mastoid processes, and the moxas were afterwards employed. The results were satisfactory.

I have only to add, that this case of palsy and atrophy of half the tongue appears to me to be a very important one. I have never met with another example of it, and are not aware that other physicians have given an account of any similar complaint.

## CHAPTER XVI.

## ON BURNS.

*On their Causes, Different Degrees, Complications, Anatomical Characters, and Treatment.*—The subject which we are about to consider in this article, is one of those, which have been treated with most skill and success in the Hotel-Dieu of Paris.

Burns, formerly ill-defined as to their different degrees, their complications but little studied, their anatomical characters unknown, their treatment, either empirical or abandoned to the old routine, have since undergone an important reformation. Thus, the opinions of M. Dupuytren, are now generally adopted. It is these opinions we here intend to offer to the reader, with such recent remarks, as were suggested to the lecturer, by new cases since the commencement of the session.

Every year, but especially in rigorous winters, the surgical ward of the Hotel-Dieu, are filled with individuals affected with burns of more or less importance. Old women covered with rags, in the evening retire to their dirty garrets, narrow and without any chimney, and after having taken a dose of wine or brandy, place beneath themselves or the bed-cloths, foot-stoves or chafing dishes filled with lighted charcoal; the heat, the liquor, or the vapor of the coal, makes them drowsy; their cloths take fire, and often when they awake, the fire has so far progressed, that their whole body is burnt more or less. Porters and servants obliged to sit up late, and overcome by sleep in analogous circumstances, often meet with similar accidents. Old men, leaning against a stove, and clasping the pipe with their knees, fall into a kind of coma; their cloths are burnt, and with them, the skin, muscles, aponeurosis as deep as the bones. Add to these causes, a host of others, equally accidental and unforeseen, as conflagrations, or those arising from the business followed by so many workmen, such as blacksmiths, founders, glass blowers, brewers, &c. and you will not be surprised at the immense number of burns, which are yearly admitted into the hospitals of Paris, and especially the Hotel-Dieu.

The organic lesion, called burn, ustion, combustion, &c., is the effect of the action of concentrated caloric upon the living tissues. Its characteristic marks are due to this cause, and they distinguish it from every other kind of injury. They are always the same, whatever may be the part of the body affected, and partake at once of the nature of inflammation, of wounds, and of disorganization.

But these effects of the action of caloric present very great differences as regards their intensity or danger, according as they have been caused by the heat radiated at different distances, or the direct action of the flame; lastly, by the immediate contact of the ignited mass.

The pathological lesions, resulting from the radiation of heat, are more or less serious in the ratio of the intensity, and duration of its action. When moderate, but continued it thickens considerably the epidermis, hardens the

skin, blunts its sensibility, and renders it of a brownish color; such are its effects upon persons habitually exposed to the solar rays, or to large furnaces, as blacksmiths. We know that many of the latter class, can handle with impunity, iron even at a red heat. This thickness also, either natural or acquired, of the epidermis, and the insensibility of the skin, gives to men who pretend to be incombustible, the power of bearing, after some preparation, a very high degree of heat.

When more intense, it produces on the skin blotches of different shades, irregular, and marbled, cracks and ruptures of the epidermis; which often end in ulcers very difficult to heal; such as are seen on the legs of old men, who are always seated by a hot fire, and women who use foot-stoves and open chafing dishes.

When still more active, either on account of the quantity of caloric emitted by the ignited body, or its close approach, it may give rise to the phenomena, characterizing the first and even the second degree of burns. We have seen women, who, when excessively cold, having placed under them very hot chafing dishes, have had, in a few hours, the posterior and internal surface of the thighs covered with blisters.

Insolation sometimes produced the effects of serious burns, especially in hot countries. Cases are related of persons, who, sleeping exposed to the sun, have been severely burnt by its influence. Gangrene soon followed a violent inflammation, and they died in four or five days.

As regards flame, it not only burns instantaneously, but also tends to cause animal substances to partake of the combustion which has produced it. Under its action, they are soon dried, as it were boiled, become horny and are consumed by producing a new flame, which, added to the first, increases its activity, and its ravages. It is well known how deeply burning cloths will effect the subjacent parts; the lesion is often so great, that death is the consequence. To these species of causes, must also be added, the burns produced by the combustion of certain gases, and especially of hydrogen, by the explosion of steam-boilers, and of gunpowder. Generally, these gases produce merely superficial, but extensive burns, because they act instantaneously on large surfaces. Sometimes, however, they penetrate beneath the skin.

The degree of the burn, varies also, in proportion to the physical or chemical qualities of the ignited body, which comes in contact with living parts, that is to say, in proportion to their peculiar nature, their density, their capacity for caloric, and their facility in communicating it. Thus all boiling liquids do not burn to the same degree, because they do not all boil at the same temperature. On this account the action of greasy bodies, such as soup, oil, grease, tallow, &c. is much more energetic than that of water. But another difference is owing to the adhesive qualities of the former. If it be true that strong acids, and concentrated alkaline solutions, at the boiling point, produce more serious injuries than other fluids, it is, undoubtedly, because by being more dense, they have acquired a greater capacity for caloric.

Solid bodies give rise to deep burns if their combustion is very rapid, as in the case of phosphorus, sulphur, and the resins; in the contrary case, their effects are proportionate to the degree of heat, the length of contact, and the susceptibility of the tissues, &c. All things being equal, the burn is less

deep in parts habitually exposed to the air, than in those covered by the clothing, and where the epidermis is very delicate.

It results from what we have said, that the action of fire, according as it is feeble and momentary, stronger and prolonged, excessive, and a long time continued, has, as a general effect, either a simple inflammatory irritation which tends of itself to resolution, or an inflammation which must end in suppuration, or lastly the complete destruction of the vital properties of the parts. Under this point of view, authors have considered burns, in order to classify and divide them into a greater or less number of degrees. Thus, some, amongst them Hildanus and Boyer, reckon three degrees; others, as Hiester and Callisen, describe four; and a modern writer admits but two, those with inflammation, and those with immediate disorganization.

In all these divisions the intensity of the symptoms of the burn itself, considered in a general manner, has alone been considered, and not the nature of the organs affected, or that of the tissues injured or destroyed. It is, nevertheless, evident, that the effect is first upon the skin, and afterwards is extended to different depths; it is in the direct ratio of this depth, that the three orders of phenomena above enumerated are presented; and, therefore, if we wish to establish the classification of burns on exact principles, we must take as our base the different species of organs subjected to the action of the caloric.

These considerations have, for a long time, induced us to adopt another classification, and we have divided burns into six degrees, thus characterized: 1st, Erythema, or superficial phlogosis of the skin, without the formation of vesicles. 2d, Cutaneous inflammation with desquamation of the epidermis, and development of vesicles filled with serum. 3d, Destruction of a part of the thickness of the rete mucosum. 4th, Total disorganization of the skin as far as the subcutaneous cellular tissue. 5th, Sloughing of all the superficial parts of the muscles to a greater or less distance from the bone. 6th, Total carbonization of the whole thickness of the injured part.

The first degree is generally produced by the action of the radiated caloric, burning gases, or by the contact of bodies not very highly heated. The parts then appear of a lively red color, not circumscribed, similar to erysipelas, and disappearing under the pressure of the finger; the patient experiences a sensation of smart burning, as long as the disease lasts. Often in a few hours, always in a few days, the redness, heat, and pain disappear, and the inflammation terminates in desquamation of the part.

However slight may be the burn of this degree, we frequently, when it has extended over a large surface, find the pulse rise and become frequent, the tongue redden, and the phenomena of gastro-intestinal irritation developed. When the head is injured, the irritation may extend to the encephalon, cause insomnia, delirium, convulsions, coma, and even death.

The second degree is owing to a more active cause and an action of longer duration than the first. An acute and burning pain is felt, and sometimes at the same time, but mostly after some hours, one or several vesicles are formed over the surface, and filled with a clear and limpid serum; the pain then becomes a sensation of tension. The vesicles are opened, the serum discharged; the detached epidermis dries, and some days after desquamates, discovering

the rete mucosum covered by an epidermis of new formation but still reddish, thin, and delicate.

Sometimes the epidermis, instead of forming vesicles, is primitively lacerated and detached from the rete mucosum which remains exposed. The most acute pains result from this accident, which is *always followed* by a slight suppuration. But at last the denuded surface dries, and there soon remains nothing but a redness which spontaneously disappears, and leaves no trace behind.

Combustion of the rete mucosum and the papillar surface of the skin, which constitutes the third degree of the injuries of which we are treating, is evinced by the presence of grey, yellow, or brown patches, thin, flexible, insensible to gentle pressure, but which are very painful when roughly handled. They are formed by the rete mucosum deprived of vitality. The vesicles which generally cover the disorganized part, in this degree, ordinarily contain a lactescent brownish serum, sometimes covered by the blood; and this appearance is a good means of diagnosis. In these cases, sometimes the slough is separated in a mass at the usual time, sometimes it falls off in parcels, and discovers beneath ulcerations of more or less extent but superficial, whose cicatrices, always free, will almost always be conspicuous, on account of the white, dense, and shining layer, which replaces the destroyed surface of the skin.

To this degree belongs the greater part of burns made by gunpowder, of which the scars are blackened by the substances composing it, and, therefore, easily distinguishable from those produced by other causes.

Whatever form the burn may at first assume, in the course of a few days, the reaction takes place; an eliminatory inflammation is developed, the eschar separates and falls, and the wound soon dries leaving the white cicatrix of which we have spoken.

It is proper to remark here, that the pain of burns is much more intense, when the skin is only injured superficially, than when deeply affected; this fact is important as regards the prognosis.

When an ignited body is in contact for a length of time with living parts, an acute pain follows; but ceases when the cause of the burn is removed. The epidermis, rete mucosum, the whole thickness of the skin, and sometimes also a superficial layer of the subcutaneous cellular tissue, are killed and reduced to a deep yellow or blackish slough, dry, insensible to the touch, harder, and more tense in proportion to the darkness of its color. The sound skin surrounding it is wrinkled and puckered; the radiating folds it forms round the burnt spot, indicate the degree of incoination (*raccourcissement*) which the latter has experienced. After two or three days, the pain returns, an inflammatory circle is formed around the eschar, which generally falls off from the fifteenth to the twentieth day, the bottom of the wound is composed of the subcutaneous cellular tissue; the suppuration is copious, and the granulations vigorous. Such are the characters of burns of the fourth degree.

But here we must remark a phenomenon peculiar, as it were, to burns; it is the force with which the circumference of the wound is drawn towards the centre. However widely separated the edges may be, they constantly tend to come in contact. It is this tendency of the organic power which causes

all the vicious modes of cicatrization, which frequently engender impotency of the parts affected, but which may be almost always prevented by a proper course of treatment. These results never take place when the burn affects the posterior part of the trunk, because the motions of flexion being most natural, oppose the contraction. The same remark is applicable to the limbs, according to the situation the injury occupies.

Burns of the fifth degree differ from the preceding merely in reaching deeper seated parts, and may be followed by very serious consequences. Sloughs comprising the aponeurosis, muscles, tendons, and in which we sometimes find vessels and nerves which have resisted the destructive action of the fire, are sonorous, black, friable, and depressed, and require a much longer time for separation. When soft or caused by boiling fluids, they present a greyish, insensible mass, which may be depressed by the finger without pain. Suppuration is much more abundant, and the cicatrix in which the organs of motion have been included, remains deformed, adherent, and causes irremediable loss of motion.

The characters of the sixth degree are very easily recognized. The surface of the limb is then carbonized, hard, insensible, sonorous on percussion, easily broken, and the slough, after its detachment, leaves a more or less irregular stump, according as the fire has reached the different organic elements at different distances. MM. Roche, Sanson, and Begin, relate a case of a young man who, whilst crossing a foundery stepped into the trench which conveys the fused metal; and withdrew from this rivulet of iron, a limb wanting the foot and the lower part of the leg. He felt no pain, and had not perceived the horrible mutilation he had suffered.

Such is the most scientific and correct theory, based on the nature of things and the observation of facts, conceived and explained by M. Dupuytren, and now generally admitted. This classification differs essentially from those hitherto proposed, in as much as it distinguishes the shades of disorganization of the skin and subjacent parts, which the majority of authors had confounded in their third or fourth category; whilst the six degrees are established, as we have said above, according to the depths of the changes experienced by the living tissues; and each one may be recognized by peculiar phenomena which it is so important to distinguish in practice.

However, it must not be supposed, that in the different degrees of burns, we are to find only the phenomena peculiar to each. They are rarely found alone, and from the simple erythema, may be complicated from the most serious to the most trifling. Thus, from the point in which the slough is deepest, in which it may extend to the bones and the whole thickness of a part, it becomes gradually superficial, until at last it comprises only the rete mucosum and epidermis; the principal eschars are often surrounded by smaller ones; often between the disorganized parts or in their neighborhood, larger or smaller vesicles exist, and beyond these as well as in the intervals between the deeper lesions, we find only the erythematous redness of the first degree. Lastly, in general burns, we find commonly all the degrees in the different parts of the body.

We have still to remark, that the characters of these degrees of organic alterations produced by burns, although well determined, are, in many cases, very difficult to distinguish immediately after the accident. Thus, at the

same time, that the caloric has disorganized the parts on which its violence has been principally spent, it has always caused such injury to the subjacent tissues, that, without being entirely deprived of vitality, they cannot support the inflammation which must ensue, and must therefore die. It results, thence, that the greater part of burns appear, after the separation of the eschar, deeper and larger than they were at first thought to be. From these facts may be deduced an important principle in legal medicine; it is, that in burns of the third degree and beyond, we should always wait, in order to pronounce upon their danger, until the sloughs are separated, the extent of the disorder may then be ascertained.

Each of the different degrees which we have established may, according to its extent, be a purely local malady, or cause constitutional symptoms endangering the life of the patient. The latter are the immediate result of a general irritation determined by the action of the caloric, or the secondary effects of epochs of inflammatory reaction, suppuration, and discharge which succeed each other in the progress of burns, and they have on that account been divided into primitive and consecutive. Let us now examine them both.

The immediate and acute pain necessarily accompanying the action of concentrated heat on the animal parts, may be so intense as to cause instantaneous death, of this we have seen several cases. The nervous encephalic system is then the seat of a violent irritation. The greater part of the phenomena of congestion and engorgement of almost all the organs of the great cavities are observed. This sudden termination generally happens in children and nervous women, rarely in adults, and scarcely ever in old persons. It can neither be attributed to inflammation, nor any other disease that the burn can aggravate; it is a *death from excess of pain*. M. Dupuytren is of opinion that too great a loss of sensibility can destroy life, as well as too great loss of blood in hemorrhagies. The patient is in a horrible alternation of excitement and exhaustion and generally expires in this latter state.

But if the irritation of the skin, which is reflected upon the nervous system, and then on the circulatory apparatus, is not sufficiently intense to cause immediate death, other phenomena appear; sometimes we have excessive agitation, insomnia, spasms, convulsions, and intense fever; sometimes the patient is in a profound state of stupor and exhaustion; the pulse is small and rapid; the skin cold and pale in parts not touched by the fire; respiration is slow; the limbs are immovable; he answers your questions, either not at all, or but slowly and imperfectly. This kind of annihilation generally ends in a sudden death, and sometimes in a general re-action.

When the burn is superficial, and does not exceed the second degree, if it occupies a surface of but little extent, but especially if the subject be peculiarly irritable, the formidable symptoms enumerated are not observed, but a general re-action follows, analagous to the phenomena of erysipelas; the pulse becomes frequent and strong, the skin hot, and irritation of the digestive organs is evinced by the redness and dryness of the tongue, thirst, nausea or vomiting, want of appetite, &c. These symptoms generally yield to appropriate remedies.

In many cases of deep burns, of the third and fourth degrees, no remarkable symptom is manifested during the interval between the occurrence of the accident and the commencement of the eliminatory process. But at this period

generally on the fourth day, the inflammation develops pain acute, in proportion to the density of the skin, and the abundance of its blood-vessels and nerves. If it affects a large surface, we have then the symptoms of nervous and gastric irritation, already indicated in burns of the second degree, but much more intense, and sometimes resulting in death.

We have observed that the patients often labored under great oppression and difficulty of respiration. This depends on the injury at first done to the organs of circulation and respiration, and on the secondary development of an acute bronchial irritation, or a considerable pulmonary obstruction.

But this is not all. Should the patient happily escape all these accidents, he still incurs other dangers. Whenever burns are very large and deep, and consequently, after the separation of the slough, give rise to extensive wounds, the abundance and long duration of the suppuration, often exhaust gradually the strength, cause great emaciation, and lastly an incurable marasmus. This period of suppuration and exhaustion is, in burns characterised by phenomena, similar to those accompanying the last stages of all chronic diseases.

To these serious complications of burns, we must still add the appearance of erysipelas, and especially of diffuse phlegmon. All the phenomena characterising this complaint, are joined to the already serious symptoms of the primitive lesion; and if its progress be not arrested, abscesses form, the pus is infiltrated through the cellular tissue in the interstices of the organs; large desquamations of the skin result, an excessively copious suppuration follows, and amputation, our only hope, generally offers but a doubtful chance.

It then results from these facts, that when burns are too extensive or profound to cause merely local injuries, that the life of the patient may be endangered at four different stages, designated under the names of stage of irritation, stage of inflammation, stage of suppuration, and stage of exhaustion.

Besides the numerous and important improvements introduced by M. Dupuytren into this interesting branch of surgical pathology, he has, after having ascertained the sympathetic relations uniting the external tissues with the great viscera, defined the nature of the injuries which the latter secondarily experienced, and they explained the cause of the general symptoms which destroy the greater part of the patients. His numerous necroscopic researches have thrown great light on this subject.

Thus, it has been demonstrated by the examination of subjects, that when the individual has perished in a general conflagration, in the midst of the flames, or in a few moments after having been withdrawn, that inflammation has not had time to be developed in the digestive canal, but the evidences of a violent congestion, and considerable afflux are found there. The mucous membrane not only presents red blotches of greater or less extent, is, as it were, injected and gorged with blood, but its cavity contains a certain quantity of this fluid, effused in it by means of exhalation. The brain is deeply injected with blood; the serosity of the ventricle has taken on a red color, which is also often the case as regards that moistening the cavity of the pleura, pericardium, and peritoneum. The bronchial tubes contain also a bloody mucus, their mucous membrane is, in many points, of a lively red, and studded with injected capillaries. It seems as if the blood, driven internally by an irritation as general as sudden, has endeavored, under the influence of the excessive stimulation of the heart and vascular apparatus, to escape through all the free pores of the internal surface.

If some days have elapsed after the accident, if the patient, after having resisted the first effect of the fire, dies from the third to the eighth day, in the second stage, after having evinced during life all the phenomena of acute visceral irritation, we find, on opening the body, all the well marked signs of gastro-enteritis, ordinarily accompanied by inflammatory changes of the encephalon and lungs. These latter organs are often affected by latent inflammation, so well described by Stoll, and the more distressing, as, in the commencement they elude the observation of the physician. Lastly, if the patient dies at a more advanced period, during the course of the suppurative process and exhaustion, we find in the viscera, and especially in the digestive canal, profound alterations, attesting the long inflammation to which they have been subjected; the mucous membrane is studded with patches of a deeper or lighter red, ulcerations more or less profound; the mesenteric ganglia are generally engorged, &c.

After the preceding details, you will be able to conceive on what basis your prognosis should be founded. It should be evidently deduced from the extent of the injury, its depth, seat, nature of the cause, the age, constitution, and temperament of the patient. Thus, a burn caused by a poisonous caustic, which may be absorbed, is more serious than that produced by any other cause. Vigorous, sanguineous, and young subjects, are more exposed than others to the consequences of inflammation. A burn, even though superficial, which attacks a part or an organ of delicate texture, will be more serious than one seated in a less important part, or one more capable of resistance, either on account of its natural structure, or a disposition acquired by labor or habit. The vesication, tumefaction, and burns of the third degree, leave scarcely any traces; whilst those of the fourth, comprising all the thickness of the skin if left to themselves, cause shapeless cicatrices, vicious adhesions, especially if seated in the eyes, face, neck, hands, feet, &c., because they possess so great a tendency to contractions. Thus we often see the fingers reversed on the carpus, and united to it; the hand fixed to the forearm; the forearm to the arm; the head to the shoulder; the chin to the sternum; the ears to the corresponding parts of the head, &c. &c.

The disorders occasioned by burns of the fifth degree, are generally very serious, and it may be easily conceived when we examine the member and functions of the organs it affects. By the destruction of the tendons and the muscles the limb becomes useless; from the thickness of the tissues it has disorganized, an excessive suppuration ensues and threatens the patient with exhaustion; by exposing the bones to the atmospheric air, they are in danger of necrosis; by opening the synovial capsules of the joints, inflammation of these cavities follows; in one of the large joints the most favorable chance for the patient is a cure by ankylosis or amputation. The following is a case in point:

*CASE I.—Burn of the Knee of the Fifth Degree; Lesion and Copious Suppuration of the Joint.*—The man is a shoemaker of whom we have already spoken. On his admission into the hospital, he had on the inner side of the knee, a black, hard, sonorous, insensible eschar, as large as the palm of the hand, and apparently very deep. After repeated questioning, he informed us that he fell asleep whilst clasping tightly an earthen pot full of boiling water. He was probably drunk, and, therefore, only awakened by the pain

when the knee had been deeply burned. His clothes interposed between the part and the pot, were uninjured. This case should then be classed amongst those caused, not by the immediate application of an ignited body, but of a body completely saturated with caloric.

When the slough came out, it was seen to extend as far the patella and into the cavity of the joint. You have, indeed, seen ensue a copious suppuration of a greyish, grumous, fetid matter, and a discharge of pus, mixed with a certain quantity of synovia. However, his general health and the injured parts greatly improved. This improvement did not last; the patient grew weaker; we have a faint hope of effecting a cure by ankylosis, but he will probably perish from inflammation and suppuration of the cavity, as amputation appears almost impracticable. Lastly, this operation is the inevitable result of burns of the sixth degree.

A burn of the first degree of great extent, often produces death at the moment of the accident or in a few hours after; we will give some cases. But after the first twenty-four or forty-eight hours, resolution begins to take place, and the danger is over. When the burning mass has been very hot, and its application rapid, it may cause a kind of tumefaction of the epidermis; if it occupies a large surface, it constitutes a very serious injury. This sometimes happens in a bath which is too hot. About two years ago, the mother of a poet of our day, perished in this manner.

In burns of the second degree, the same accidents are to be dreaded; and, besides, the inflammation of the internal organs is more imminent, the danger of its development lasts longer, and ceases only when desiccation commences. We will here mention an important fact, never to be forgotten, when forming an opinion of the probable consequences of a burn; it is, that in all cases, women and children, nervous and irritable patients, bear less easily the pain inseparable from these injuries, than persons of blunted sensibility, and sanguineous temperament, than adults and old people.

In the third degree, the causes of pain and irritation following each other from the moment of the accident until its termination, the patient is exposed not only to all the dangers presented in the two first degrees, but also to all those which may arise from the period of eliminatory inflammation; in the former case, to a sudden death, caused by an excess of general irritation, to a primitive gastro-enteritis to nervous diseases as tetanus, spasms, convulsions; in the second to the same phenomena, and to all the symptoms of a violent secondary gastro-intestinal inflammation. Moreover, the more extended the more serious it is; and when it affects a large cutaneous surface, two or three feet square; for example, it is most commonly fatal at the period of the eliminatory inflammation of the eschars, or of the establishment of the suppuration; but the formation of the cicatrix is subject to none of the inconveniences of the fourth, fifth, and sixth degrees.

In burns of these latter degrees, the irritation and pain last only as long as the cause acts, but the patients during this time may perish. If they resist it, sometimes they are plunged into a deep stupor; an icy coldness attacks them, and they die some hours after the accident; sometimes they recover for a time, and are carried off, from the fifth to the ninth day, by the inflammatory reaction; lastly, sometimes the excessive abundance of the suppuration, the length of the disease, the invasion of hospital gangrene, or a malignant

fever, exhausts and kills them. Burns of the fifth degree, even when circumscribed, present always a real danger, on account of the reaction which inevitably follows. But what adds greatly to the danger of the case, are burns of almost all degrees which usually happen, exciting in the economy a disorder which cannot be remedied; fever comes on; diarrhea, redness of the tongue, and vomiting, soon indicate a gastro-intestinal inflammation.

Burns offer different chances of cure, according to the organs affected. If, for instance, they have attacked the organs of sight, and the injury has not extended beyond the conjunctiva, an acute ophthalmia ensues, runs its course, and in many cases terminates in albugo. But if they are still deeper, the cornea may lose its transparency, and the eye itself be entirely disorganized, either primarily or secondarily. When the cornea preserves its transparency in some points, sight may be restored by the operation for artificial pupil, as was done in 1811, on a man whose eyes were burnt by gunpowder.

We will now detail some examples of the numerous facts mentioned already; they will corroborate the principles which have been deduced from them.

*CASE II.—Burns of the Fifth and Sixth Degrees (from the Clothes taking Fire,) of the Whole Surface of the Body; Death during the Stage of Irritation.*—A child, three and a half years of age, named Leroy, was brought to the Hotel-Dieu, in the month of March, about eight o'clock in the evening, having just been rescued from a chamber in flames. His mother, who was a washerwoman, made a large fire in order to dry the linen, placed the child near the hearth, and went out leaving it alone. His garments having most probably taken fire, the little patient must have communicated it to the linen, and was soon surrounded by the devouring element. He uttered most horrible cries. Persons hastened to him, and were obliged to force the door in order to get to him. He was brought to the hospital by his preservers. He presented a piteous appearance; he was burnt from head to foot, and had on a few half consumed rags; sometimes he was stupid, and merely uttered some plaintive sighs; at others, excited, and cried most violently.

Except the toes and a portion of the feet covered by the stockings, there was not a spot of sound skin on all his body. A burn of the first and second degree was found on his back, neck, the anterior and superior parts of the chest; his hair and eyelashes were burnt, his cheeks covered with eschars; his arms carbonized; his skin deprived of life, black, sonorous, opened in some spots, and ready to crack in others; the thighs and legs more injured than the cheeks, the fingers contracted, and incapable of the least motion; the genitals nearly entirely destroyed.

There could be no hope of saving his life, and it was certain that he must soon expire. However, the rags which covered his neck and shoulders were removed, and he was put into a warm bath. His respiration at first embarrassed appeared to become more free. He was left in the bath for an hour; reacted slightly, complains of heat every where, and cried loudly for his mother. He was covered then with blotting paper spread with cerate, and wrapped up in a fine cloth. About eleven o'clock he fell into a profound stupor, and the next morning at two o'clock, six hours after the accident, death released him from his sufferings.

*Autopsy.*—The corpse appeared like that of a child who had been subjected to the heat of an oven at a very high temperature. The eschars were too numerous to be counted. On the arms, one alone might be said to exist, comprising the whole of its surface; and also the muscles, nerves, tendons, aponeuroses and bones. Some of the joints of the fingers were opened; those of the wrist, elbows, and shoulders were red, and filled with effused blood. The veins and arteries were empty. On the lower extremities the burn extended also as far as the bones, but on the thighs only as far as the muscles. From an examination of the genitals, the sex of the child would never have been discovered, they were entirely destroyed. In the cranium a peculiar dryness of the membranes was observed; the ventricles contained bloody serum, and the brain was injected. The same degree of dryness was observable in the pleura and pericardium. The lungs were gorged with blood, and the bronchiæ of a lively red color. The peritoneum resembled the pleura, pericardium, and the meninges. The stomach and intestines were of a well defined uniform redness. All the vessels were injected, the liver filled with black blood, and the bladder distended by a large quantity of turbid urine.

*CASE III.—Burns from the First, to the Fifth Degree of Almost the Whole Surface of the Body; Death from Asphyxia During the Period of Irritation.*—On the 4th of February about 11 o'clock at night, a portress, twenty-seven years of age, in the fourth month of pregnancy, had placed beneath her feet a chafing dish filled with live coals or lighted charcoal. Being fatigued she fell asleep; her clothes took fire; and she awoke only when nearly enveloped in flames. She immediately opened the door and rushed into the yard, thus increasing their violence. On her admission into the Hotel-Dieu, her clothes consisted of merely a few half-burnt rags, adhering to the surface of her body. Her stockings and feet had alone escaped injury. The face suffered less than the rest of the body. Her eyelashes and eyebrows were destroyed.

The greater part of the surface of the body was either covered with blisters (second degree), or stripped of its epidermis and rete mucosum (third degree). Such was the state of the anterior surface of the legs, and nearly the whole of the abdomen and thorax, which were of a lively red. In other places; the burns had reached the fourth and fifth degrees; here the eschars were soft and of a whitish color; there, they were hard, sonorous, and of a brick color; the left thoracic extremity, and the posterior part of the thighs, presented, throughout their whole extent, one or other of these changes.

The unfortunate woman was carefully stripped of her remaining rags, and placed in a bath of a temperature of 84°. On first entering it, she had a very acute smarting, but soon felt better, and afterwards complained of great coldness, which she attributed to the water which had been thrown upon her in order to extinguish the flames. This chilliness lasted about half an hour. On its leaving her, she became very sleepy. She was then taken out of the bath, covered with finelinen spread with cerate, and wrapped in warm clothes. She took an anodyne draught and some whey. The night passed tranquilly, and she slept a little.

The next morning, from the immobility of the face, and almost tetanic tension of its muscles, M. Dupuytren saw, before it was discovered, that she was affected with a general burn. He again prescribed baths, but the patient

opposed it so much, on account of her weakness and pain caused by moving her, that but one could be administered. The draught was continued. The day passed without very great pain, she slept continually and her intellect was unimpaired. In the evening she was again dressed. During the night a good deal of jactitation, but no delirium.

On the second day, she was found to be considerably exhausted; had suffered from cough, and inability to swallow. The attempt to swallow a few drops of fluid, was accompanied by a gurgling threatening apoplexy. Some moments afterwards her speech returned, and her intellect remained sound until her death, which took place about 11 o'clock, A. M. of that day; thirty-six hours after the accident, from asphyxia, that is cessation of the respiratory functions. The child of which she was pregnant, being only four months old, and therefore not viable, nothing was done as regarded it.

*Autopsy.*—Twenty hours after death.

Considerable rigidity of the body; almost the whole of the skin, scarified, hard, and coriaceous. The eschars were white on the anterior part of the trunk, black on the loins and back; on the posterior part of the thighs, the skin, cellular tissue and enveloping aponeurosis, had been deprived of vitality the muscles of this part were red and firm, but unchanged. The hair covering the pubis was burnt, and the skin of the greater labia carbonized. The pia-mater was highly injected, the arachnoid sound, but dry; the cerebral substance firm and equally dry.

The lungs free from adhesions were engorged with blood; the bronchiæ filled with mucus, and their mucous membrane deeply injected. In the left cavities of the heart, was observed a concentric hypertrophy already far advanced.

The stomach near the pylorus, presented a quantity of small ulcerations, almost miliary; some as large as a lentil, and of a greyish brown color.

The ileum throughout was of a deep red; the liver and spleen were engorged; the peritoneum very dry.

The bladder contained a small quantity of turbid and whitish urine; and a similar fluid was found in the pelves of the kidneys. The uterus, which ascended three inches above the pubis, contained a well formed foetus, about seven inches in length.

The heat was remarkably preserved in this region. A separation of three lines existed between the pubic bones; the sacro-iliac articulations were equally relaxed and movable.

*CASE IV.—Asphyxia from Charcoal; Burns of the First Four Degrees, or Several Parts, from Boiling Soup and Flame; Death During the Stage of Reaction.*—Bisson, Angelica F..., forty years of age, subject to epilepsy for many years, was seated near the fire, when being seized by a fit, she fell upon a kettle of boiling soup. The left side of the face, and the whole of the right hand, were burnt in the first two degrees; the left elbow and upper and lateral parts of the chest, which had come in immediate contact with the flame, were burnt in the third and fourth degrees.

The burn of the first degree, was marked by a very lively red color, that of the second by numerous blisters, and those of the third and fourth by large and deep eschars. Unfortunately they were all very extensive; the patient was in a state of general anxiety; and uttered piercing cries, caused

by horrible suffering. She was sometimes strongly convulsed; and at others delirious. (Copious venesection, anodyne draught, diluent drinks, diet absolute; dressings of fine linen, perforated and spread with cerate; charpie and poultices.)

For three days all went on well. On the fourth all the symptoms were increased, insupportable pain, delirium almost continual, erysipelatous redness over the whole body, tongue red and dry, extreme anxiety. She was again bled, but the symptoms were undiminished and she died during that day.

*Necropsy.*—The pia-mater and brain slightly injected; the gastro-intestinal mucous membrane inflamed in many points, and the internal surface of the veins, presented a remarkable redness.

*CASE V.—Burns of Different Degrees, from Inflamed Garments; Tetanus Produced by the Inflammatory Reaction; Death.*—Roger, J. B. thirty-three years of age, a day-laborer, was admitted into the Hotel-Dieu, for a large and deep burn, of two day's standing, produced by the combustion of his clothes, in a drunken fit. Assistance being near, his clothes were prevented from being entirely burnt. The burn occupied the posterior, inner, and outer sides of the thigh, extending from the fold of the thigh to the ham. The skin sphacelated over the greater part of this surface, was dry, hard, sonorous, of a faded white hue. Around the eschar the burn was less intense, and its different degrees could be distinguished, forming a belt of nearly two and a half inches in width. The pulse was sufficiently full, but the skin was cool. He was bled, and emollient poultices applied to the eschars.

Fourth day, the febrile reaction was more marked. (Baths, opiated poultices, anodyne draughts.)

Sixth day, the eschar had softened, an inflammatory swelling surrounding it on all sides, fleshy granulations could be perceived; but the patient experienced the most violent pain, and was unable to sleep; his pulse was very frequent.

Ninth day, pain in the forehead. Tenth, it became excessively severe; the lower jaw in close contact with the upper; the patient complains of difficulty in the motions of the neck and of stiffness of the right arm; abdomen tender, pulse frequent, corded. (Venesection in the arm, fifteen leeches behind the ears; anodyne draught with fifteen drops of laudanum.) In dressing the wounds, care was taken to expose them as short a time as possible to the air.

Eleventh day, the patient is worse; insomnia, greater stiffness of the jaw and muscles of the neck, the left arm begins to be rigid. The jaws are separated with great difficulty; copious perspiration. (Bled until he fainted, bath every three hours, opium by the mouth and by enema; opiated embrocations on the masseters and muscles of the neck.)

Twelfth day, the neck is thrown backward, muscles of the pharynx contracted, momentary aphonia.

Thirteenth day, a spoon can hardly be introduced between the jaws; the body strongly bent; perspiration copious; pulse corded, very frequent; no delirium. (The wounds are dressed with opiated cerate; six drops of laudanum in an enema, every two hours; continue the embrocation to the lower jaw, neck, and abdomen.)

The suppuration was not abundant, the granulations of a vermillion color;

pain in the neck, augmented on the slightest pressure; epigastrium very tender; respiration embarrassed; symptoms becoming more and more alarming. (Twenty-five leeches to the back of the neck.) Up to this time, the man continued to pass his water and fecal matter; his intellect remained perfect; the pulse almost imperceptible. He died at seven o'clock in the evening.

*Necropsy, thirty-six hours after death.*—Great rigidity of all those parts of the body which had not been affected by tetanus; but the muscles of the neck, shoulders, and in general all those regions in which the tetanic rigidity had existed, were completely relaxed. The skin of the thigh covered with eschars for the space of a foot square, was removed, and discovered a large and well looking wound.

The veins of the interior of the cranium were highly engorged with black blood. The arachnoid was of a slight opal color, detached with difficulty from the cineritious portion of the brain, which was the seat of a considerable afflux of blood giving it an uniform roseate hue. On squeezing it, there exuded drops of blood, without, however, diminishing its redness. Beneath the cineritious portion, the medullary substance was studded with blood; but at the distance of an inch from the gray matter, this discoloration diminished so much, that near the ventricles, the vascular injection completely disappeared. On each side of the surface of the central hemispheres there was a patch as large as the palm of the hand. The ventricles contained but a small quantity of serum. Injected vessels, in considerable number, were spread over the surface of the corpora striata, and the thalami nervorum opti-corum; internally these parts as well as their prominence, presented only a very feeble vascular injection; otherwise, the brain was pretty firm.

On opening the spine, the veins were also found filled with black blood. The spinal marrow carefully examined, appeared of ordinary consistence. The grayish substance found in its centre, was remarkably injected and red, especially a little below the cervical enlargement, and a few inches lower, on a level with the eighth or ninth dorsal vertebra; so that, in the spinal marrow, as well as in the brain, the cineritious portion was found injected, and of an uniform red color.

*Digestive Apparatus.*—There was some redness towards the great curvature of the stomach, for the space of two inches square, though but slight. The ilium was generally red; the ascending colon here and there discolored; the liver and spleen were healthy.

*Respiratory.*—The bronchia were sound, the lungs adhering posteriorly by some old cellular filaments, and were but slightly engorged along their posterior edge.

*Circulatory.*—Heart and vascular system healthy, the large veins filled with blood.

*Genito-Urinary.*—Nothing remarkable.

*CASE VI.—Burns from the First to the Third Degree; Diffuse Phlegmon, Ensuing in the Stage of Reaction, and followed by Symptoms of Gastro-enteritis, Meningitis; Death.*—Magin, a servant woman, sixty-three years of age, of a feeble constitution, and in bad health, was seated near a wood fire, alongside a furnace filled with burning charcoal. The gas of the coal stupified her, she fell into the fire, and was severely burnt in the right heel and thighs. Assistance was immediately procured. Being taken immediately to the Hotel-

Dieu, she exhibited no remains of asphyxia; but suffered a good deal in the parts burnt; on each thigh there was a large eschar, white, hard, sonorous, surrounded by numerous vesicles (third and second degrees); a lively, erysipelatous redness was diffused over the thighs, and posterior part of the body, (first degree.) Another burn was observed on the lower part of the right inferior extremity; above the heel was an eschar as large as a five franc piece; on the back part of the leg, an erythematous redness; in other places, vesicles filled with serum, (third, first, and second degrees.) Bath, dressing with linen spread with cerate, anodyne potion.

During the night the patient was tormented by frightful dreams, the next day she complained of a violent headache. (Venesection.)

Third day, acute pain in the burnt parts. As the patient habitually laid on her back, as is most frequently the case with old people, she was desired to remain constantly in the contrary position, on account of the seat of the burn. This precaution was very important, for the weight of the body often may increase the extent of the sloughs, as in certain diseases, it alone will produce gangrene.

Fifth day, the sloughs began to separate at their edges, and do not seem very deep. The patient demanded food, which it was thought improper to grant. During the evening she was seized with chills, fever, pain in the whole right lower extremity. The burn of the first and second degree had disappeared; but consecutive inflammation ensued, and an erysipelatous redness, accompanied by engorgement, spread itself over the limb.

Sixth day, this inflammation has taken on all the characters of diffuse phlegmon, and extended as far as the upper part of the thigh; the articulation of the knee was very painful. Twenty leeches were applied to the limb. The burn is doing very well; the sloughs almost entirely separated, suppuration not very copious.

The phlegmon appeared stationary during thirty-six hours; but delirium then ensued, the features were contracted, the tongue and lips became dry, the fever reappeared with increased intensity, the patient was attacked with vomiting and diarrhea, and expired on the eleventh day of the accident.

*Necropsy.*—Thirty-six hours after death.

*Cranium.*—The brain firm, presented no morbid appearance. The ventricles contained a large quantity of reddish serum. The meninges, especially the arachnoid, were inflamed.

*Thorax.*—The right lung was hepatized at its base; the bronchiæ deeply injected and filled with thick mucus. The pleura of the right side contained a slight effusion; heart large; dilatation of its cavities and thinness of its parietes. The pericardium presented internally some white patches, indicating former inflammation.

*Abdomen.*—The mucous membrane of the stomach was very red; the gall bladder contained about thirty small calculi. The mesentery was filled with hard tubercles. The liver very large.

*CASE VII.—Asphyxia from Charcoal; Burns of the Second and Fourth Degrees; Appearance of the Menses from the Wound; Different Occurrences After the Stage of Suppuration and Exhaustion; Death at the End of Eight Months.*—Marie Touchu, aged forty-two years, was boiling water on some

lighted charcoal, fell down in a state of asphyxia, and was severely burnt on the lower part of the back; the skin of the thighs was wasted and rendered similar to horn. After four or five days, large eschars occupied the whole burnt surface.

Eight days afterwards, her menses appeared. A discharge of blood took place at the same time from the ulcerated surface, (we will give hereafter another case of this deviation of the menstrual flux.) The pains were very acute, a copious suppuration came on, her pulse was weak and small, and the patient much prostrated. Tonics were presented. She was very patient and laid constantly on her abdomen. The suppuration was with difficulty diminished, the cicatrization remained stationary, and made no perceptible progress. A host of accidents followed each other; erysipelas, abscesses of the joints, symptoms of gastric irritation, &c. The patient fell into a state of marasmus and complete exhaustion, and died in *eight months and thirteen days after the accident*, at a period when the cicatrization although nearly completed, was not quite perfect.

This case presents the termination by death at one of the most distant periods at which it can happen.

*CASE VIII.—Burns of Both Feet, from the First to the Fourth Degree, by a Foot-bath; Diffuse Phlegmon; Death on the Seventh Day.*—A female lace-maker, seventeen years of age, enjoying good health, learning that her marriage with a young man to whom she was violently attached, was broken off, resolved to destroy herself, shut herself in a close room, filled two chafing dishes with burning charcoal, and fell into a state of asphyxia; how long she remained without assistance is not known. A person coming to see her heard some groans, broke open the door and found her apparently dead; she was carried to the Hotel-Dieu, after fruitless endeavors to restore her to animation.

The surface of her body was of violet color, respiration imperceptible, the pulse could not be felt at the wrist, but the temporal arteries pulsated very feebly. The patient was laid on a bed near an open window, and her body rubbed with hot vinegar, she then gave some signs of life. A vein in the arm was opened, from which at first only a few drops of blood flowed; but the fluid soon spirted out and twelve ounces were taken. She was much improved. A pediluvium containing mustard was prescribed; instead of making it of the ordinary temperature, the nurse of the ward plunged the feet of the unfortunate girl into a bath of boiling water; after half an hour, the patient began to converse, complained of the heat of the water and a sensation of numbness in her feet; she was carried back to her bed.

The next morning, she was greatly agitated and complained of violent pain in her legs; they were examined, and to our astonishment, we found a serious burn of both feet, extending three fingers' breadth above the malleoli; the skin of the toes was gone; yellow and hard eschars covered the dorsal aspect of the parts and the ankle joint; on the lower part of the leg, the limits of the burn were defined by numerous vesicles, filled with a reddish serum; higher up, on each leg, was seen a deep redness accompanied by slight swelling and intense pain.

On the third day of the accident no symptoms of the asphyxia remained; but the vital functions have been deeply injured; the pulse was small and

weak, the eyes lacking lustre, the cheeks flushed, the patient exhausted. The parts were wrapped in linen spread with cerate, laid in poultices, and placed upon pillows.

Fifth day, the inflammation of the legs has progressed considerably. (Thirty leeches to each and a bath.)

Sixth day, an obscure fluctuation existed in the right limb; the phlegmon has reached the knee and thigh. The patient's countenance changed, her mind wandered, delirium came on, and she died at two o'clock on the morning of the seventh day.

*Necropsy.*—The different degrees of the burn were distinguished; some deep sloughs were beginning to be detached at their circumference. All the articulations, and especially those of the foot and leg, were inflamed; the synovial membrane was red, injected; in the right tibio-tarsal articulation a considerable effusion of bloody serum existed. Above the burns the skin was separated for some distance, and on the right were two deep abscesses, of which the pus was effused between the muscles, which were dissected as far as the knee. Pus was also infiltrated into the cellular tissue of the thigh and the inferior and posterior part of the trunk. Every where the cellular tissue was of a lardaceous appearance.

The large cavities offered nothing remarkable, except a well defined injection of the meninges and the cerebral substance.

All the preceding facts have been selected from a large number of cases which have occurred in the hospital for many years up to the present date. We have designedly chosen unsuccessful cases in order to demonstrate the causes of death in the different stages of burns, and the appearances presented on dissection. We shall hereafter detail the treatment appropriate to this serious malady and its equally serious complications.

Let us resume the most striking, and at the same time the most instructive, of the foregoing cases. In all, the burns were severe, deep, and extensive. In the first two they occupied nearly the whole surface of the body, and penetrated through the skin. Thus these two patients (second and third cases) perished from an excess of general irritation; one, aged three and a half years, in a few hours; the other, thirty years of age, on the second day. A third patient (fourth case) could not support the inflammatory reaction, and died on the fourth day in the beginning of the stage of elimination, with symptoms of violent inflammation of the brain and digestive apparatus. The fourth patient was attacked in the same stage by tetanus, which carried him off on the twelfth day. Autopsy showed serious lesion of the organs of sensation, the brain and spinal marrow. In the sixth and eighth cases, diffuse consecutive phlegmon was developed with the eliminatous stage, producing large abscesses, the separation of the skin to a great extent, the inflammation and suppuration of the joints, which, after having sympathetically reacted upon the internal organs, caused death, in the first case, on the eleventh day, and in the second, on the sixth. Lastly, the woman, in the seventh case, experienced a host of bad symptoms for eight months; suppuration went on during all that period; cicatrization could not take place, and she died in a state of marasmus and exhaustion.—After these remarks, M. Dupuytren proceeded to treat of the therapeutics of burns.

Burns have been at all times subject to the most absurd attempts of empiricism. Every day has had its sovereign remedies, which, after having been more or less praised, have been superseded by others, and these in their turn have fallen into the oblivion of their predecessors. Nothing has hitherto been able, nor ever will be, to disabuse those who seek for an infallible remedy for burns. As obstinate as those who pursue the quadrature of the circle, they constantly are desirous of discovering this panacea. A remarkable circumstance, and one which imposes on the crowd, is the absolute confidence and assurance of the possessors of similar secrets.

CASE IX.—A few years ago a young woman was admitted into the Hotel-Dieu. The combustion of her clothes had produced a frightful burn, extending nearly from her head to her feet.

From the absolute insensibility of the parts burnt, the destruction of the epidermis, the disorganization of the rete mucosum, the tension, and brownish yellow color of the corion, it was easily seen that the whole thickness of the skin was injured. From the weakness of her voice and pulse, her immobility, cold and desperate insensibility, it was foreseen that her malady would be fatal; that if she escaped the dangers of this state of dejection, she could not be able to support the consequences of the eliminatory inflammation; and that in no case her strength would be sufficient for the suppuration, or the perfection of the cicatrix.

However, a lady, respectable on account of her age and behavior, had accompanied the patient, and desired to treat her under our inspection. She said she had inherited for more than four hundred years, from generation to generation, a secret by which thousands had been cured without a single exception.

I observed to her that the patient was affected with an incurable and mortal burn; and I vainly endeavored to persuade her, for the credit of the remedy, to wait for a more favorable opportunity. She, however, urged her request so vehemently that, after assuring us that it contained nothing hurtful, she was permitted to use it. Nothing could equal the zeal and devotion with which she anointed the patient several times a day.

There soon followed a reaction caused by inflammation, which she hailed as a salutary effect of her remedy. Circles of inflammation surrounded the injured parts, and she asserted that the disease would be cured. Large portions of the tissues separated every day, still she was of the same opinion. Lastly, death alone, which happened on the fifteenth day, seemed to throw a doubt on her mind as to the efficacy of her hereditary secret.

To what then is owing this unlimited confidence on the one hand, and on the other this blind credulity of the multitude, shared, it must be confessed, by so many well informed persons? It is because burns are considered as simple in their nature and phenomena, constant in their progress and effects, and which ought, therefore, to be easily cured by a remedy as simple and invariable as these.

Such is the foundation of all the hopes and promises of inventors of secret remedies. The destruction of so prejudicial an error is a service rendered to humanity. Far from being a simple disease; burns, on the contrary, are very complicated, whose numerous and various degrees constitute as many

affections presenting distinct characters, variable consequences, peculiar complications, and hence requiring different modes of treatment.

It will suffice to recall to your memory the numerous effects of caloric upon the living tissues, which we have described, in order to be convinced of these truths. Compare the immediate and material effects of the action of caloric to the secondary effects which ensue; to the eliminatory suppuration, and ulcerative inflammation; the local and general fever; the innumerable complications accompanying them; accidents of all kinds to which they give origin; pain, spasms, convulsions, tetanus, &c.; the care sometimes required by a cicatrix, whose cure must be retarded in order to avoid deformity, and sometimes hastened to avoid death; and you will be able to judge of the inefficacy of all secret and infallible remedies. It will soon be seen that profound knowledge, an exact acquaintance with the organization, and the alterations it may undergo, and lastly, a consummate experience in the means of restoring it to its primitive condition, can alone with certainty effect a cure.

The treatment of these injuries is based upon the following indications: 1st, to remove the cause; 2d, to arrest the inflammation, moderate and calm in the first two degrees, the pains and cutaneous irritation developed at this moment of the accident, and direct their effects from the internal organs; 3d, to limit the secondary inflammation which presides over the separation of the slough, and the establishment of suppuration; 4th, to favor and direct by proper means the cicatrization of the wounds; 5th, to oppose the formation of vicious adhesions which might embarrass more or less the movements of the parts, or even deprive them of their functions; 6th, and lastly, to subdue the general primitive or consecutive symptoms which may arise in the course of the disease.

The indication for removing the cause of the injury is seldom presented to the surgeon, except in cases of burns produced by caustics, when a portion, as yet unconfined, remains adherent to the wound. It is fulfilled by means of lotions made with reagents which will neutralize the offending substance, and which chemistry alone teaches us. In the majority of cases, water is quite sufficient.

In burns of the first and second degrees, unaccompanied by denudation of the epidermis, the practitioner should endeavor to subdue the inflammation, and prevent the formation of vesicles or eschars whose presence would increase the length and difficulties of the treatment. All means endowed with properties slightly astringent or repellant, sedative and not stimulant, appear to us to fulfil this indication. The immersion of the part in cold water, Goulard's lotion, alcohol and water, or water slightly acidulated; and when this immersion is impossible, fomentations long continued and frequently renewed with the same liquids, or with ether, alcohol, a solution of sulphate of iron, almuine, potash or ammonia, &c., produce very happy effects. But these latter substances cannot be used when the epidermis is removed, for then they would increase instead of calming the irritation, and give great pain. It is very important to preserve the skin over the burnt parts; and, therefore, the clothes should be removed very carefully, and even cut away. If vesicles exist, they should be opened by a simple puncture, with a needle or the point of a lancet, at their most depending part. If the irritation and pain are very considerable,

we will derive advantage from calming potions, and anodyne topical applications.

If the patient be young, vigorous, and sanguineous, the abstraction of blood, either local or general, will tend to restore tranquility and prevent inflammation. Moreover, the remedies will be more efficacious in proportion to their prompt use. In all cases the patient must be subjected to a diet severe in proportion to the seriousness of the injury, and should use mucilaginous, acidulated, and diluent drinks.

Lastly, if, notwithstanding all our care, inflammation ensues, it must be moderated, prevented from attaching the sound tissues, and by becoming excessive, from terminating in gangrene, or from reacting too powerfully on the internal organs, and giving rise to the formidable sympathetic accidents which we have described. Then we should quickly have recourse to emollient applications, poultices of a similar nature, local and general bleedings. Should the pain be very intense, we should add to the preceding, the anodyne balsam,\* laudanum, decoctions of hyoscyamus, solanum nigrum, poppy heads.

The same indication is presented in burns of the third and fourth degrees, in the commencement of the process of eliminatory inflammation. If too violent, this inflammation should be repressed, and excited if too tardy. But it must not be forgotten, that in these cases stimulants which are too powerful or long continued often cause an erysipelas, which commencing at the edges of the wound, attacks successively the whole body, and is frequently fatal. We have generally succeeded in arresting it by the application of a blister over the very part affected.

But other cares become necessary at this time. The burn should be covered with fine linen, perforated and spread with some unctuous substance, as simple cerate or Goulard's cerate, over which we place a layer of lint, in order to absorb the pus. Emollient poultices should be applied to the sloughs, to make them separate. When they are nearly detached, and are united to the bottom of the wound only by a few filaments, these last should be divided by the scissors as closely as possible. Sometimes, when the eschar is deep, as in burns of the fourth and fifth degrees, pus collects beneath them; of this we are informed by the fluctuation, and it should be immediately evacuated, so that it may not infiltrate in the adjacent cellular tissue. When, by the fall of very superficial eschars, or the separation of the epidermis constituting the vesicles, the derma, being exposed, is very painful, the opiated cerate, and saturating the dressings with a solution of the gummy extract of opium, are the most appropriate applications.

The dressings should be promptly applied, in order to prevent a long exposure of the parts to the air; and with care and gentleness, in order to avoid pain, which is sometimes dangerous. To do this, we should at first uncover a part of the wound, and dress it before removing the remainder of the apparatus; and for this purpose the bandage of Scultetus is far preferable to the roller.

\* Anodyne balsam. Take of the green leaves of hyoscyamus, cynoglossum, and nicotiana, each one pound; put them into three pints of wine, and boil down to two pints; squeeze in a strong cloth; add an equal quantity of olive oil, boil over a slow fire, until it is reduced to one half; let it settle, decant and preserve it.—Extracted from Foy's Formulary by the Trans.

After extensive burns, and especially burns of the fourth and fifth degrees, the suppuration is generally very copious, and two or even three dressings are required daily. But the patient is apt then to fall into a dangerous state of prostration and weakness; and his strength should be maintained by substantial food, and especially tonics, such as bark administered by the mouth, rectum, and topically.

In burns where a greater or less destruction of the tissues exists, cicatrices result, which are often unsightly, and sometimes embarrass the freedom of motion of the parts they occupy, and prevent the exercise of its functions. It is, therefore, important to prevent these deformities which are sometimes hideous, by taking care to give to the cicatrix nearly the same extent as the original skin, and opposing its contraction. This may generally be done, by carefully cauterizing with lunar caustic the granulations when too prominent, by position, well directed dressings, and by a firm apparatus. Thus the limb should not be kept flexed, if it be burned in the direction of flexion; nor extended, if injured in the direction of extension; we should introduce bougies, tents, canulas or sponges in natural openings, where contraction would have a tendency to diminish or close up. We must separate by means of compresses and pledgets, kept in place by bands of sparadrap, organs, such as the fingers, which might form unnatural adhesions. In the face of which the tissues are so movable and extensible, art does not always succeed in preventing deformity; we should endeavor to prevent it, as far as possible, by means of adhesive straps, and such other means as the nature of things may suggest. But in all cases, if a good cicatrix can be obtained, only at the cost of pain, which might be fatal to the patient, it must not be attempted.

When a limb, or part of a limb, is completely destroyed, amputation is indispensable. It substitutes a simple wound whose suppuration will be short and whose cicatrization will be regular and easy, for a slough which is long in falling, and which leaves after it an irregular solution of continuity, with a projection of the bones, and all the deep seated parts which have suffered less from the action of the fire. Besides, by removing the burnt parts, the patient is spared the secondary inflammation, which is not always without danger. Nevertheless, before deciding on this step, the surgeon must examine attentively the age, constitution and strength of the patient, and whether he is able to bear the eliminatory process. It is evident that, if the patient is in a state of stupor, as is frequently the case, or if the local inflammation has had sufficient time to be developed, if fever exists, &c. we must wait until these symptoms disappear, until suppuration is established, and then take as the rule of our conduct, the general state of the patient and that of the wound.

When the cicatrix is complete, the tissues preserve a rigidity which prevents the free use of the functions of the part. The patient should then use fomentations, frictions, oleaginous embrocations and local baths. On the other hand his exercise should be moderate, lest the cicatrices should break, as often happens, especially when they are seated on the inferior extremities.

It now remains for us to explain, in a few words, the general cases demanded by the patient according to the seriousness and different stages of the disease. A slight superficial and circumscribed burn, giving rise to no constitutional derangement, requires no internal remedies. But if although superficial it is very extensive, the patient should at first be kept on a strict diet,

diluent and refreshing drinks, placed in a remote cool place, far from any physical or moral excitement. The same means are proper for deep burns. Acute pain demands the free use of opium; fever and inflammatory symptoms may be subdued by venesection, especially if the patient is strong and plethoric; but bleeding is less required, when large and deep eschars threaten a very copious suppuration; for, weakened by this cause, the patient could not resist this suppuration, and would perish from exhaustion. Drinks, diet, and rest are here the only suitable means.

Suppuration being established and the fever removed, we may give some light nourishment, but in small quantity. In suppurations which are very copious and of long duration, threatening the patient with exhaustion and marasmus, the ferruginous preparations and the bark are very useful.

If symptoms of marasmus and colliquative diarrhea appear, we should give, three or four times a day, the following pill, composed of—the extract of opium half a grain, sulphate of lime one grain—a combination we have always seen attended with the happiest effects.

Lastly, if inflammation of the viscera of the great cavities takes place, it must be treated by appropriate remedies.

*CASE X.—Patient Affected with Epilepsy; Burn of the Third and Fourth Degrees of the Posterior Part of the Right Lower Extremities; Complete Cure on the One hundred and forty-fifth day; No Attack of Epilepsy During the Treatment.*—Lampet, D..., thirty-six years of age, epileptic from infancy, was shut up in a room with a chafing dish filled with burning charcoal. She soon fainted and fell on the dish, in such a manner that the posterior part of the right thigh was exposed for some time to the flame. There resulted thence a burn of the third and fourth degrees, extending from the superior third of the thigh as far as the middle of the leg, and involving more than half the circumference of the limb, especially on a level with the popliteal space; the skin, subjacent cellular tissue, and the surface of the muscles were consequently deprived of vitality.

The first treatment she received was the application of compresses spread with cerate, and antispasmodic drinks. She thus passed the first seven days at her own house. Already the inflammatory process had commenced; the line of demarcation was established between the living and dead parts, and extensive sloughs, divided into fragments, seemed to adhere to the limb only at a few points, when she was admitted into the Hotel-Dieu, on the twenty-ninth of April.

Perforated compresses spread with cerate, charpie, emollient poultices, and anodyne potions was the treatment followed here. After three days the eliminatory process was completed, all the sloughs had separated, and given place to a wound of a vermillion color, whose surface presented very healthy granulations.

The same dressing was continued; but in order to prevent contractions, which might have embarrassed and deformed the limb, it was placed in the apparatus for transverse fracture of the patella. The limb being thus forcibly extended, the cicatrization could go on in a regular manner.

The suppuration being very abundant the wound was daily dressed twice; but as it gradually diminished cicatrization progressed from the circumference to the centre, and the wound was soon considerably smaller.

However, as is often the case, this progress was retarded by the excessive growth of granulations. Although they were carefully repressed by a solution of nitrate of silver, they daily grew out again; and notwithstanding all our efforts, a complete cicatrix was effected only on the one hundred and forty-fifth day.

The limb had not lost any thing of its natural shape, and subsequently recovered the free use of all its functions. The patient left the hospital on the eighth of September. During her stay she had not had a single attack of epilepsy.

*CASE XI.—An Epileptic Patient; Burns of the First Four Degrees of the Whole of the Right Side of the Face, Neck, and Upper Part of the Chest; Dangerous Symptoms; Copious Suppuration; Cure on the Ninety-fourth Day; Twelve Attacks of Epilepsy During the Treatment.*—Floret. M., Forty years of age, of a delicate constitution, epileptic for many years, having already suffered five times from burns, in consequence of this affection, came to the Hotel-Dieu on the second of May, with another burn occupying the whole right side of the neck, and the superior anterior third of the chest of the same side. Having fallen, in an epileptic fit, into the fire, she remained for some time in contact with the coals. There resulted burns of the first four degrees on the parts before mentioned. The eschars were large, deep, black, and hard. The burns of the first two degrees were not extensive. The patient was in a state of great general excitement; delirious; her pulse was very small, corded, and rapid; respiration short and interrupted; mouth dry; great thirst; extremities agitated by convulsions.

We had at first recourse to a general bleeding, and the application of leeches to the back of the head; to revulsives and anti-spasmodics; sinapisms to the feet, and injections of ten drops of laudanum. The eschars were covered with large emollient poultices in order to hasten their separation; and the burns of the second degree were covered with fine linen spread with cerate and perforated in many places, above which a slight layer of lint was laid, intended to absorb the product of the suppuration.

The patient soon felt much improved. The eliminatory process began, and the dead parts were shortly separated. Nothing unpleasant occurred during this stage. On the separation of the sloughs there appeared a wound of healthy aspect. The suppuration being very copious it was dressed twice daily; but after some time it diminished, and the cicatrix began to form. A large number of granulations covered its surface; they were carefully repressed.

The cicatrix became daily more extensive; the suppuration was less abundant; the poultices were suppressed, and the wound was merely dressed with simple cerate, lint above that, some compresses, and a suitable bandage.

On the ninety-fourth day the cure was complete. There had been twelve attacks of epilepsy during the treatment.

*CASE XII.—Mental Alienation; Voluntary Burn of the Right Hand in the Fifth Degree; Cure of both Diseases.*—Chirard, a servant, thirty years of age, regular, and of a good constitution, became crazy on account of violent grief. An active treatment restored her to reason, but she remained always gloomy and dejected. She left her native country and came to Paris. Her employers soon discovered the state of her intellect; used her like a crazy

person, and threatened to discharge her. Being left alone on the evening of the seventh of November, she made a large fire in the kitchen stove and placed her hand upon the burning coals. Some one by chance came in; she appeared much agitated, but did not change her position. This, and the smell of burning flesh, declared her mental aberration. She was with difficulty removed from the stove and put to bed. She cried all night, and wished to be put to death by some friendly hand, as she alone could not effect it. The next morning she was taken to the Hotel-Dieu. The right hand appeared wasted as far as the bones; it was covered by black, thick, hard eschars, separated from each other only by a few cracks, from which issued no blood; on the dorsal surface they only extended as far as the middle of the metacarpus; the remainder of the hand was covered by a large blister filled with serum. A deep red circle surrounded the wrist. The motion of the radio-carpal articulation was free; the fingers and thumb were flexed upon the hand; two of the joints, namely, of the annular and little finger, were exposed. The patient was extremely agitated; her face animated; eyes immovable; delirium continuous; the strait waistcoat became necessary. (General bleeding, pediluvium with mustard in it, dressing with perforated linen spread with cerate, large poultice covering the whole hand, opening of the vesicles without laceration of the epidermis.)

Third day, same state. (Fifteen leeches on each mastoid process, pediluvia, enemata.)

Fourth day, no improvement. (Seton to the nape of the neck, purgative enema.)

Seventh day, the eliminatous process progresses; the sloughs on the palm of the hand, and the dorsal surface of the fingers, began to separate; fetid pus in small quantities was discharged. (The poultice continued, and two maniluvia daily.)

Eighteenth day, the cries and vociferations of the patient have ceased; she sings in a low voice, speaks in a whisper, and if her attention is strongly attracted she answers.

Thirty-eighth day, the mental alienation has entirely disappeared; and she is much grieved at what has happened, but remembers nothing, and was exceedingly surprised on learning the circumstances of her case. The extent of the burn is definitively fixed. The last phalanges of the little fingers have fallen off, as well as the sloughs. Cicatrization has commenced in some spots; small pieces of dead tendon have been removed; the flexion of the fingers is less. They were placed upon a splint in order to effect progressive extension, and they were dressed separately in order to prevent any improper adhesions between them.

From this time no accident interrupted the cure. Cicatrization went on slowly; the wounds were several times cauterized with a solution of nitrate of silver. It was perfect on the twentieth of February, one hundred and three days after the accident; no symptom of mental alienation remained; and on the fifth of March, the patient left the hospital entirely cured. She was advised to wear the seton, which we had placed in the back of the neck, for some time longer.

*CASE XIII.—Burns from the First to the Sixth Degree, of the Left Side of the Face; Of the Fifth Degree of the Outer Part of the Left Shoulder;*

*Destruction of a Portion of the Parotid; Salivary Fistula; Necrosis of Part of the Os Malæ and the Zygomatic Arch; Cure.*—A portress, forty years of age, of general bad health, and subject to vertigo, was seated, on the evening of the fourth of April, near a stove highly heated by means of charcoal. She does not remember what happened to her; but, probably, becoming asphyxiated, she fell against the stove, with which her left shoulder and the left side of her face remained some time in contact. She was afterwards extricated from this situation in a complete state of stupor, which had disappeared the next morning on her admission into the Hotel-Dieu.

Two deep burns existed in the parts mentioned; the first extended from the zygomatic arch to the base of the lower jaw, comprising the external angle of the eyelids; and from the commissure of the lips, as far as the meatus auditorius externus. All the soft parts included between these four points were transformed into a black, hard, sonorous scar, cracked on its surface, formed apparently at the expense of the skin; subcutaneous cellular tissue, a part of the parotid gland, and extending as far as the bone. A deep red circle circumscribed it. The angles of the lips and eyelids were drawn to the left and backward. The second burn occupied the left shoulder; its whole surface was scarified and black; and M. Dupuytren was of opinion that it had penetrated to the muscle. The patient had some fever; the remainder of the face was very red. She labored under cephalalgia, and acute pain in the parts not deprived of life. (Copious bleeding, stimulating pediluvia, enemata, anodyne draughts, diet.) But little change during the first few days; the pulse has maintained its frequency. (Another bleeding.)

Fifth day, the patient says she has a sensation of a dry and hard body on the inside of the cheek. It might be that the slough had destroyed all the soft parts; but by introducing the finger the mucous membrane was found to be uninjured.

Sixth day, the eliminatory process has commenced; a red line was observed separating the living and dead parts; a slight suppuration was established, and the edges of the sloughs separated.

Eighth day, considerable fever; swelling of the eyelids; appearance of erysipelas on the face; delirium. (Twenty leeches to the neck, emollient poultices.) The delirium ceased, and the erysipelas was discussed.

Twelfth day, the slough on the cheek has separated to a large extent.

That of the shoulder fell off in the beginning of May, that is, in about a month; there then remained merely a large surface covered with granulations of a healthy aspect; simple dressings, and a few applications of caustic, effected a complete cure in the early part of July.

The cheek did not progress so rapidly; the eschar did not entirely fall off till the sixteenth of May. A portion of the os malæ and the zygomatic arch were then exposed, and found to be necrosed, and a portion of the parotid destroyed; during the dressings there flowed from the wound an inodorous, transparent, ropy fluid, increased in quantity by mastication; it was saliva. This did not seem, in the opinion of M. Dupuytren, to increase the danger, and he said that this fistula would be cured by the cautery.

On the twentieth of May the osseous, necrosed parts, appeared to be in a state proper for their removal. A spatula, used as a lever, served to detach a portion of the malar bone and zygomatic arch, which were articulated together. A little blood followed this operation.

From this day the wound gradually diminished, but the salivary fistula remained. It must be remarked that it took place from the parotid, and not the duct of steno. It was first cauterized on the twenty-third of May with the red precipitate.

May 28th, the patient loses less saliva. Again cauterized on the second and fifth of June. Diminution of the discharge. Compression was then employed on the part of the gland furnishing the fluid; the wound is about as large as a five franc piece.

June 9th, the saliva merely drops. July 29th, the burn and fistula are entirely cured. There remained a large radiated cicatrix with depressions, a paralysis of part of the cheek, and a torsion of the angle of the lips, and external angle of the eyelids. She left the hospital on the thirtieth of July. But, a month afterwards, the cicatrix burst open at the point corresponding to the fistula, and the saliva again was discharged through it. She returned to the hospital, and, by the same treatment, was cured in about three weeks.

CASE XIV.—*Burn of the Fourth Degree of the Whole Upper Extremity; Copious Suppuration; Deviation of the Menses by the Wound; Cure.*—A cook, eighteen years of age, enjoying good health, fell asleep on the 23d of August near a candle. Her right sleeve caught fire and was entirely burnt. Awakened by the pain, she cried out violently, succeeded in stripping off her garment, and fell senseless. Carried to her bed she recovered, but suffered great pain. She had a severe burn, extending from the deltoid muscle to the fingers of the right arm, deep eschars occupied the forearm and lower back part of the arm, the hand was covered with vesicles filled with serum; there were also some on the left hand.

She was bled; put on the use of emollients, and the burns carefully dressed. The stage of irritation and the commencement of the eliminatory process passed over without any bad symptoms. But suppuration became so copious, after the separation of the eschars, that it was feared she would die from exhaustion. The bark was now given. Very soon the whole limb, with the exception of the hand, which quickly got well, was but one deep red wound. Her general health improved, but cicatrization advancing very slowly, the patient was admitted into the Hotel-Dieu, on the 11th of the following October, forty-five days after the accident.

The wound was still large, much inflamed throughout, suppuration copious, its numerous granulations were higher than the level of the skin; at the bend of the elbow there existed a newly formed cutaneous tissue. M. Dupuytren prescribed baths, large and thick emollient poultices, and absolute rest. Her menses have not appeared since the accident.

The inflammation soon disappeared. The wound was then dressed with a thick layer of fresh cerate, pledgets of lint applied upon that, and, above all, long compresses, easily renewed; the wound was daily touched with a solution of nitrate of silver, but only partially, in order not to excite inflammation; in short, all possible precautions were taken to avoid the contact of the air.

December 16th. The patient had fever, the wound changed in appearance, became red and covered with red clots of blood, having the color and odor of menstrual blood. This phenomenon coincided with that of the usual appearance of the menstrual discharge, which, as we have remarked, had not taken place since the accident. A few leeches were, therefore, applied to the vulva, for several days in succession. The fever soon disappeared, the wound no

longer discharged blood, and had recovered its vermillion color. But this new species of irritation increased considerably the suppuration, which did not diminish for nine or ten days.

From this time, cicatrization progressed favorably, but slowly; on the 15th of April, of the following year, there remained a wound of about two inches square on the inner part of the forearm. Otherwise, the girl was well, her appetite was good, and she slept well. The flow of blood from the wound was renewed twice; the menstrual discharge not being established, it was supplied by the loss of blood.

The phenomenon of the discharge of the menses from a wound in the arm, resulting from a burn, is too remarkable to be passed over in silence. Menstruation is one of the most simple functions; it is merely a sanguine exhalation. It is not, therefore, absolutely necessary that there should be an organ for this especial purpose; in the whole organism, there are exhalants or tissues permeable to the blood, when the *molimen* is directed towards them. It is otherwise with the secretions; this function is performed by means of special organs, whose structures becomes complex, in proportion as the humors separate from the blood, differ in character from this fluid. Here there are mucous follicles whose organization consists in a simple vascular fasciculus and a quantity of peculiar tissue, no nerves have been discovered in it. There, these are cryptæ of a more complex organization formed of a species of erectile tissue, and an expansion of a nervous filament; and we can discover the rudiments of an excretous duct. Lastly, these cryptæ unite and form a gland, of which there are different kinds. These anatomical details are sufficient. It follows, that secretions are complex functions, performed by a special organization more or less complicated; and that exhalations, on the contrary, are very simple functions, and may be performed wherever there are exhalant or pervious tissues.

There may, therefore, occur aberrations in the latter, which cannot take place in the former. How rare are deviations of the former and how difficult it is to supply them. The skin sometimes furnishes urine, but always imperfectly, we cannot *urinate* entirely by *the skin*. Menstruation may, however, take place from the skin and all the tegumentary surfaces. The interstices of the organs of females, may frequently be the seat of an afflux, and the blood being then far from the surface and unable to be discharged externally, combines with the tissues, and produces more or less dangerous inflammations.

If menstruation can take place in all the tissues of the system, in the normal state, it would certainly be more easy in tissues more or less inflamed, and favorable for the reception of the *molimen hemorrhagicum*. However, it is not so; the organic modification constituting inflammation, is not favorable to sanguine exhalation, much less to attract a physiological exhalation, and take the place of a natural function. This does not accord with the opinion of those who attribute disease in general to an exaggeration of health, and inflammation to a very exalted degree of excitement. Menstruation, from the surface of a wound is, therefore, a very rare and remarkable phenomenon, since nature must be deceived twice in order that it may occur.

We would have wished to conclude this article by a statistical table, on a large scale, from which general propositions might have been deduced, and the frequency of burns compared according to the age and sex of the indivi-

duals, their situation, their different degrees, causes of death, and result of the treatment. Being obliged, however, to confine ourselves to a single year, we have chosen that of 1828, a year most fruitful in accidents of this nature.

Number of patients admitted and treated for burns in the Hotel-Dieu, during the year 1828, 50.

Men, 10; women, 40.

Under five years, 2; from eight to ten, 1; ten to twenty, 8; twenty to thirty, 14; thirty to forty, 9; forty to fifty, 8; fifty to sixty, 6; sixty and upwards, 2.

Situation—Burns of the head, 8; of the neck, 4; right upper extremity, 7; left upper extremity, 16; of the thorax, 13; of the abdomen, 9; right lower extremity, 33; left lower extremity, 23.

Thus, supposing the body to be divided into two halves, one superior from the head to the epigastrium; and the other inferior, from the epigastrium to the feet, we have

Burns of the superior half of the body	-	-	-	-	48
“ “ inferior “ “ “	-	-	-	-	65

But these results are on many accounts very variable.

*Degrees.*—In many patients, the six degrees have been distinctly observed; in others, the different shades were mingled together; in the greater number, the different degrees were present from the lowest to the highest by twos and threes, &c. Which gives

Burns of the 1st degree.	(Rubefaction)	-	-	-	-	37
“ “ 2d “	(Vesication)	-	-	-	-	41
“ “ 3d “	(Eschars of the rete mucosum)	-	-	-	-	20
“ “ 4th “	(Eschars of the whole thickness of the skin)	-	-	-	-	4
“ “ 5th “	(Eschars as far as the bones)	-	-	-	-	2
“ “ 6th “	(Total combustion of any part)	-	-	-	-	1

<i>Result of the Treatment.</i> —Individuals cured	-	-	-	-	44
“ died	-	-	-	-	6

*Causes of Death.*—Of the latter, *three*, amongst them two children, three and a half years of age, perished from *excess of pain*. (Stage of irritation.) *Two*, from diffuse phlegmon and cerebral symptoms, during the process of elimination. *One*, from the consequences of an excessive suppuration and symptoms of enterites.

## CHAPTER XVII.

### ON THE DIFFERENT CAUSES OF PERMANENT CONTRACTION OF THE FINGERS, AND THEIR CHARACTERISTIC DIAGNOSIS.

It was remarked, in the chapter on contraction of the fingers, that many different causes may tend to produce this disease, and much stress was laid upon this observation, inasmuch as the same remedy is inapplicable in all cases. It is evident, for instance, that if contraction of the palmar aponeurosis were confounded with abnormal alterations of the tendons, a very great error would be the consequence. (See chap. I.)

In order to enable you to establish the characteristic diagnosis of different diseases which might be erroneously attributed to an affection of the palmar aponeurosis, we will present to your view, a large number of patients laboring under flexion of the fingers, produced by different causes.—The first is an old porter, seventy-four years of age, who has been for some years, a scavenger. Five or six years ago, he was wounded in the palm of the hand, by a piece of wood; but, it is only during the two last years, that he has perceived, the middle and ring fingers of the right hand beginning to contract, since then the disease has rapidly progressed. He refers it to cold, during a very severe winter. The fingers are now flexed one fourth of a circle, he is unable to straighten them. Two tense, projecting and hard cords, proceed from the middle of the palm of the hand, as far as the bone of the contracted fingers. Any effort to extend the latter, causes the cords to project still further, and the tendon of the palmaris longus can be seen tense along the lower part of the fore arm. I have selected this example of real contraction, in order that the presence of the characteristic sign, may serve as a standard of comparison, by which you may appreciate its difference, from diseases resembling it.

In other cases, one or several fingers may be flexed upon the hand, without any contraction of the aponeurosis; the cause may be a change in the phalanges. Such is the case in the two following individuals.

A boy, fourteen years of age, has lately been admitted for white swelling of the ankle-joint. He was also found to have a contraction of the little finger of the right hand. The finger was curved in the shape of a semi-circle, the first phalanx immovable on the second, and the second on the third. It was impossible to move them upon each other, but the articulation of the first phalanx with the fifth metacarpal bone was perfectly free. It can be strongly reversed, as well as if it were in its natural condition. On giving to the joint these different movements, no cord can be traced from the palm of the hand towards the base of the fingers. Here then is an affection of the phalanges, and not of the aponeurosis.

The second case presents precisely similar symptoms; thus in these examples the absence of the cord, the mobility of the metacarpo-phalangeal articulation, the immobility of the second phalanx upon the first, and upon the third are signs which characterize the disease, and point out an ankylosis of these articulations.

A cicatrix from a wound may resemble this cord, but it is superficial, and its cause is known. In the fourth individual under our notice, the two last fingers are constantly flexed towards the palm of the hand. They can, however, be easily extended; no cord exists; all the articulations of the phalanges between themselves, and those of the finger, with the metacarpus, are perfectly free. What then is the cause of this continual flexion? The man had received a sabrecut on the back of the hand; the extensor tendons of these fingers were divided, and never re-united; the flexors, therefore, meeting with no opposition, keep the fingers constantly bent on the palm of the hand. Consequently, we have here, not a contraction, but a passive flexion of the fingers, and an impossibility of extending them by a section of the tendons.

A contused wound may produce similar effects, as in the case now offered to your observation. This man has contraction of the little finger; the other

articulations are all movable; no cord can be felt in the palm of the hand; the flexor and extensor tendon of this finger are sound. The contraction depends in this case, on an affection of the skin, which was destroyed in consequence of a carriage wheel passing over the hand. The cure of the wound took place with approximation of its edges, and not by the production of a new cutaneous tissue. Thence there has resulted a narrow cicatrix, preventing the extension of the little finger.

Burns of the palm of the hand often produce this effect; when improperly treated, adhesions result from them, which greatly oppose the movements of the hand, and produce contractions; but in these cases, there are no projecting, hard and tense cords in the palm of the hand.

Contraction on account of deformity of the articular faces of the phalanges, caused by certain professions, is very common. Women, for instance, who knit constantly, are obliged to keep their little finger separated from the rest and bent in order to hold the thread, or yarn, are often affected with a contraction of this finger. Caused by an alteration in its articulation. This deformity was formerly more frequent than now. It is, however, said to be common in Germany, where the ladies of Berlin and Dresden, walk out with their knitting needles in their hands.

Here we see, a strong healthy young girl, a lace maker, in whom the last four fingers of each hand are contracted. This is incurable, for it depends on a change in the articular surface of the extremities of the first and second phalanges, produced by the kind of business the girl was employed in.

Here again, is another case of flexion of the finger, altogether independent of any affection of the aponeurosis. This man is a tailor. Persons of his trade are obliged to have the fingers of the right hand constantly flexed. He is unable to extend the ring-finger, the attempt gives him great pain; but nothing indicates any affection of the palm of the hand. The cause of the disease is in the articulation of the second phalanx with the third; a serous tumor has been formed of the same nature as those called accidental synovial cysts; the nature of this affection is obvious; it is, therefore, impossible to confound this flexion of the finger with that produced by any other cause.

Contraction resulting from wounds of the flexor tendons, might, at first sight, be mistaken for a real contraction; but the projection formed by the tension of the aponeurosis is much more superficial, and yields to no effort of extension. Whilst in the disease of which we are speaking, by attempting to extend the fingers, the tendon of the palmaris longus is depressed, and the projection almost entirely disappears.

You have before you a seventh patient, affected with contraction of the medius. This finger is curved to a demicircle; from its tips there extends a cutaneous cicatrix under the form of a membranous prolongation, and in which may be felt a round, hard, resisting cord; this is the tendon. The patient had a whitlow, and his surgeon made a deep incision into the medius, and opened the sheath of the tendon, thence ensued displacement and contraction of the finger.

The wound of a joint is also among the numerous causes of contraction. Such is the case in this eighth patient. He has flexion of the right fore finger. It consists in a strong inclination towards the palmar face of the third phalanx upon the second. The joint is entirely incapable of motion. The ankylosis

is complete. The man had been wounded by a cutting instrument, which opened the articulation; inflammation and suppuration ensued, and it has remained fixed.

An engraver, living in Paris, received a pistol-shot from a robber, in the forearm. The ball passed through the flesh, without injuring the bone. The ulnar nerve was divided, and the inner part of the forearm, as well as the two fingers to which this nerve is distributed were paralyzed. Being called immediately, I enlarged the wound in order to prevent any strangulation, and applied a simple dressing; the cure was complete in a month. The paralysis alone remained, accompanied by contraction of the two last fingers towards the palm of the hand, on which they rested. The joints of the fingers and phalanges are very movable; but it is difficult to extend the fingers, the patient complains of great pain, and considerable tension in the cicatrix. The flexor muscles having not much of their substance have contracted, and produced a permanent and unnatural flexion of the last two fingers of the hand.

Thus in the cases first shown to you, with the intention of establishing a characteristic diagnosis between the different kinds of contraction of the fingers, we have some produced by a corrugation of the palmar-aponeurosis, by an alteration in the articular surfaces of the phalanges, by the division of the extensor tendons, by a cicatrix of the skin, the destruction of the fibrous sheath of the tendons, and lastly, by the loss of substance of the flexor muscles of the fingers.

I had wished, continued M. Dupuytren, to exhibit to you a pathological specimen, which should leave no doubt in your mind, as to the seat of the disease of which we are speaking; and have been fortunate enough to procure the arm and forearm of an individual, affected, to a remarkable degree, with this malady. It has been carefully dissected, and you shall yourselves judge of the correctness of the opinions I have advanced. The tendon of the palmaris longus and the palmar aponeurosis, have been separated from the subjacent parts; and I now call your attention to the effects of the experiments I am about to make. For instance, if the flexor muscles had any agency in the production of this disease, by pulling them, as I now do, they would certainly increase this contraction; such, however, is not the case; for no perceptible change can be effected. On the contrary, if I extend the phalanges, upon the back of the hand, the cord in front of the two last fingers, becomes well marked, the flexor tendons, however, obey but slightly this movement. Moreover, if the flexors had any influence in this disease, their section above the wrist would put an end to the contraction of the fingers; but this, you see, does not take place. The same result is obtained from the section of the tendons of the palm of the hand. But if the tendons do not influence the contractions of the fingers, it is not so with the aponeurosis palmaris; for, you perceive, that the slightest traction upon this, increases the curvature of the fingers; on extending the fingers the cord becomes stiff, tense, and is formed exclusively by the aponeurosis; the latter is completely isolated, so that it is easily observed, that it is the only impediment to the extension of the fingers. You must be all convinced; but should any doubts exist, another experiment will dispel them; it is the section of the aponeurotic expansions going to the fingers. This section is, indeed, scarcely performed,

when the flexion disappears, and the fingers recover nearly their natural position. It is evident, that in the living patient, the apparatus I employ would effect a complete cure.

On the first opportunity, I shall treat of contractions of the toes, which are also caused by a corrugation of the aponeurosis plantaris.

## CHAPTER XVIII.

### ON A PARTICULAR KIND OF FIBRO-CELLULAR ENCYSTED TUMORS,

*Known under the Name of Nervous Ganglia or Tubercles.*—The remarks we have to offer to day, shall be devoted to the subject of those fibro-cellular encysted tumors, so vaguely treated of by authors, and which have been improperly attributed to certain affections of the nerves.

Every accidental membranous production, in the shape of a closed sac, containing a foreign substance, and developed in the interior of the body by some morbification is called a *cyst*. There are two grand divisions of cysts; one including all those which become organized around a liquid or solid foreign body; the other, such as are formed spontaneously, and previously to the substance contained within them.

Among the substances which may form the nuclæ of the first sort of cysts, are effused blood, grains of shot, bullets, urinary calculi, fœtuses developed in the fallopian tubes or ovaries, and hydatids. In the second sort, which exist before the matter contained in them, we reckon serous cysts, synovial, meliceric, steatomatous, atheromatous, fatty, mucous, gelatiniform, and a small hydatid tumor, described by ourselves, and which has hitherto been observed almost solely at the articulation of the wrist, on the pulmar side; sometimes, though very rarely, in the neighborhood of the articulation of the instep; but always in connection with synovial membranes or tendons.

There is a third class in which are ranged fibrous productions, characterized by a dense, whitish, and rather tough tissue, most frequently exhibiting a linear structure, and many of which are composed of membranous pouches of the fibrous or fibro-cellular kind.

It is with this last class that the little encysted tumors we are about to describe appear to have the greatest analogy. They cannot be confounded with either of the preceding classes, in their nature, shape, seat, or results; for they are fibro-cellular, nearly round in form, seldom larger than a pea, situated for the most part beneath the skin, along the limb, and terminating in a cancerous softening.

At first sight, it would not seem very obvious to consider this little tumor, which the eye can scarcely distinguish, as the cause of violent pain, and as the origin of one of the most grievous affections of the body, cancer; yet, observation warrants us in forming that opinion; and such is the conclusion at which we have deliberately arrived.

Several authors have described pretty accurately the nature of these tumors, but they have supposed them to be formed in the tissues of the nerves,

or in the course of these organs more especially. Thus, Antoine Petit, in his Essay on Pain, after stating that the ramifying extremities of the nerves are more sensible than their trunks, says: "The nervous ganglia are very little understood; we see them in the shape of small bodies about the size of a bean, very hard, movable, colorless, making their appearance in places which have been injured, and often without any apparent cause; giving rise to cruel pain on the slightest touch, or when smartly moved, or on a change of temperature. No application relieves them, and they are cured by extirpation alone. Dissection displays a white tubercle, enveloped in a fibrous membrane, commonly attached to the skin, liberally surrounded by cellular tissue, which is observed to be connected with nervous filaments, of which it is the termination and development. Most of those on which I operated were in the legs; one only was in the arm."

Cheselden (Anatomy 10th edition, p. 136) after describing the structure of the skin, adds, that he had twice seen beneath the cutaneous integument of the tibia a small tumor about the size of a pea, excessively sensible and hard; from the pain in both instances, it was supposed to be of a cancerous nature; but was cured by extirpation.

Camper follows Cheselden in describing this malady, in his Anatomico-Pathological Demonstrations, book the first, p. 11. "It is not unusual," says he, "to notice in the cutaneous nerves small hard tubercles, which are true ganglia, though they do not exceed a pea in size; day and night they occasion lancinating acute pain, and must be removed with the scalpel. I have frequently met with them in the human subject; they are white internally, elastic, as hard as cartilage, and seated in the tunic of the nerves.

Chaussier, in his Synoptical Table of Neuralgia, thus speaks of them: "Nervous tubercles or ganglia are seldom larger than a bean, often smaller, oblong, flat, hard, cartilaginous, whitish, sometimes brownish on their surface, and within. Enveloped in a fibrous membrane, movable in the cellular tissue, they seem to be attached merely by nervous filaments. The pain which accompanies them is sharp, more or less permanent, and renewed by pressing on the tumor, or moving the part in any manner, and often without any apparent cause. They are seen most frequently in the leg, but are observed sometimes in the back. They are found in the substance of the skin, or in the cellular tissue, in the track of a nerve. The pains to which they give rise radiate from the tumor as a centre, and extend to a greater or less distance, according to the distribution and connections of the affected nerve. Excision is the only remedy." Finally, in a Dissertation on Local Affections, defended in 1822 before the Faculty of Paris, the author observes, in speaking of these little tumors, which he calls, as the English do, '*painful subcutaneous tubercles*.' "They are developed beneath the skin; they are ordinarily surrounded by cellular tissue, and not adherent, except by nervous filaments. In other instances, they are situated in the body of a nerve, the filaments of which are distended, and spread around them."

Thus we find all these authors speaking of the nervous nature of these tumors, without founding their assertion on any positive fact. Some of them, no doubt, say they have remarked on the surface, one or two nervous filaments after extirpation; but they give no anatomical proofs.

By this rapid glance at the works of preceding authors, you will see that

the history of fibrous encysted tumors is far from being complete. But repeated and numerous observations have convinced me, that they have nothing whatever to do with the nerves. I have dissected several of them, with the greatest care, in the dead body; and, the better to assure myself of their nature, I have sometimes, in removing them from hardy persons, taken along with them a sufficiently large quantity of cellular tissue, and I have never found the smallest nervous filament adhering to their surface. Their structure is evidently fibro-cellular, a little albuminous, and in time they may become scirrhus.

Nor are these tumors, as authors have said, confined to the limbs; I have seen them in the breast. They have the form of grains of wheat, coffee, or peas, and are sometimes oblong; they are also lenticular, flattened, and never larger than a Windsor bean; smooth on their exterior, opaque, and hard. If suffered to fall from a height on an even and resisting surface, they rebound as an elastic body.

This tissue is homogeneous, of a dull white color, without any vestige of cavity or cells; their consistence is fibrous, fibro-cartilaginous, or cartilaginous simply. If the nail be pressed into their substance, a slight crackling is heard; their envelope is dense, opaque, and fibro-cellular, forming a true cyst, which opposes their further growth, giving rise, as it would seem, to the sharp pain felt by the sufferers.

These tumors have never been found affected with inflammation, nor even redness. The cellular tissue surrounding them presents no unusual appearance. The skin about them is in general sound, without any attachment, in the greater number of cases, and preserving its color; it is, however, occasionally altered in texture, violet and strongly adherent to their surface, so as to render them immovable. No nervous filament can be found in their substance, any more than on their exterior; they are, in fact, quite independent of the nerves. Here is an illustrative case:

CASE I.—A woman came to show herself to me, complaining of dreadful pains in the cheek, which had distressed her for several years; they were supposed by some to be rheumatic, by others, to be owing to sub-orbital neuralgia. Leeches, bleedings, blisters, Meglius's pills,\* had been tried without effect. One of her medical advisers had been so confident that the sub-orbital nerve was affected, that he divided it at its egress; but this instead of doing any good, only aggravated the pain; it was insupportable, when we saw the patient for the first time. Tracing the seat of the pain with the fingers, we felt a small hard tumor, movable beneath the skin, which was not altered in its color. Pressure on it excited the severest pain. I extirpated the tumor, and the patient was immediately relieved; she has been perfectly well ever since.

It is evident that had the tumor in this case been connected with any

\* Meglius' Pills.

R.

Ext. Hyoscyam: Nig.

Ext. Valerianæ: Officin.

Ext. Fumariz: Officin.

Zinc. Oxydi

ana ʒj

Mix and divide into pills each containing 4 grains.

Dose.—One daily, increased gradually to six or eight. Given in neuralgia of the face.  
—[F. Foy.]

TRANS.

nervous filament belonging to that branch of the fifth pair which had been cut, the division of the nerve would have removed the pain at once, whereas it only continued the more obstinately, and disappeared only with the tumor.

The description given in books of the first stage of cancer, or scirrhus, is exactly similar to that of the tumors in question. M. Cruveilhier in his *Pathological Anatomy*, says, in treating of scirrhus, that it is formed of fibrous or cellular tissue, penetrated with albumen. These tumors, moreover, become softened; like scirrhus, too, they are painful in the greatest number of cases, while they remain indolent in others.

CASE II.—A woman, about seventy years of age, had a small tubercle of the shape and size of a flattened pea, superficially situated beneath the skin, a little above the inner front of the right knee. It was circumscribed and very movable; and the skin above it was in no wise altered. The patient said that the pains caused by this little body were excessive, and made her life burdensome to her. Eighteen years had elapsed since she first noticed the presence of the tumor; and its volume had not in all that time increased. It was only during the last eighteen months that she suffered from it. The part was removed, and the pain ceased immediately, never to return.

Had this tumor been formed in the track of a nerve, or in its substance, would it have remained insensible for nearly seventeen years? The case is well suited to show the correctness of our opinion on the subject; but there are others equally conclusive.

CASE III.—A woman, aged fifty-nine, had a small tumor immediately beneath the integuments of the anterior of the forearm, just in front of the radius, and about three inches above the wrist. This tumor, which was moderately movable, and about the size of a large pea, felt hard to the touch, and was exceedingly sensible. The patient, however, suffered only when pressure was made upon the part; and the pain then spread from the part towards the trunk, and not towards the fingers. It grew larger insensibly during seven years, and then was stationary for a year. Extirpation was performed; and it presented all the characters of an *encysted* tumor.

The slow and chronic progress of these bodies is explained by their firmness, and the nature of their envelope. Lastly, their tendency to *ramollissement*, after a longer or shorter period, is another proof of their scirrhus nature. After becoming degenerated, even should they be removed, the disorder spreads to the neighboring lymphatic glands. I removed one which had been already softened from the upper part of the arm. In the course of some time the glands in the axilla enlarged, and the complaint was renewed.

The age and sex of the patient seem to have an influence on the development of these tumors. Women are more subject to them than men; and they are most frequently met with in persons of from thirty-five to sixty years of age. Their existence is most commonly attributed to blows, or falls received on the parts affected. In some cases they seem to have been produced by punctures.

CASE IV.—A shoemaker pricked his finger with his awl. Not long after he felt a sharp pain in the part, and noticed the growth of a small tumor. In the course of seven years he suffered more and more acute paroxysms. Caustic was applied in vain; but extirpation was successfully practised; and the

patient suffered no more inconvenience. The tubercle was small, hard, of cartilaginous firmness, and contained in a cyst.

On some occasions these tumors have been observed to arise under the influence of rheumatic affection, and to disappear as soon as the principal malady is relieved.

**CASE V.**—A medical student slept in a bed which was laid in a damp alcove. In a short time after he suffered from an attack of inflammation in the joints of his great toe; and presently there grew beneath the skin covering the internal saphena and the nerve, a hard tumor about the size of a grain of wheat, which, whenever it was touched, caused pain like that of an electric shock. The pupil having procured a better sleeping place was in the course of a few days cured of the tubercle and the neuralgia.

In general, the occasional causes of these tumors are very obscure, and most frequently their origin cannot be discovered. Fibrous encysted tumors usually grow in the extremities, and especially in the lower ones. They have also been noticed in the back, the scrotum, face, and breast. They are mostly solitary; when several exist together, they are perfectly distinct from each other.

Pain is most usually felt in the affected part long before any enlargement or tumor is perceived. Soon the least rubbing of the clothes, or the slightest pressure on the skin, gives rise to darting pains. At the end of a period, which is generally very long, they are detected beneath the integuments, which they sometimes elevate, and then they are readily seen. Most frequently they are movable, hard, and the least pressure is insupportable. The skin preserves its natural color in the majority of cases. The pain returns at irregular intervals in most instances, and is sharp and darting as in cancer. That occasioned by pressure is like the effects of an electric shock; it often radiates from the tumors; but this is when they are situated in the neighborhood of a considerable nervous trunk, and act mechanically. At other times the anguish is continual, and allows the patient little rest; and the health suffers from want of sleep. When the pains affect the lower limbs, they hinder and positively prevent locomotion. Some irritable individuals during the paroxysms are affected with regular convulsive spasms. I was consulted by a young woman who had for a long time a tubercle about the size of a pea on the upper and back part of the thigh. She suffered dreadfully from the time it made its first appearance; the least pressure on it threw her into convulsions. It was removed, and from that moment all her pains ceased. In numerous cases they remain indolent, and are unaffected even by pressure during many years.

**Diagnosis.**—When fibro-cellular encysted tumors are so small as to be invisible, the pains to which they give rise have often been confounded with those from rheumatic or neuralgic affections; and on the latter supposition patients have been tortured in vain by leeches, flying vesicatories, and even more violent remedies. The two women, whose cases I shall presently notice, suffered leechings and blisterings along their limbs, although the tumors were very perceptible, both to sight and touch.

In neuralgia the pains are sharp, and extend all along the nerves affected; they return generally at stated and regular periods: hourly, daily, or weekly,

and pressure has no effect in producing them. But the pains from fibro-cellular encysted tumors do not recur at regular intervals; they are sometimes continual; they do not always extend in all directions; pressure renders them intolerable; and by pressure, alone, very frequently the patients are warned of their existence. It is seldom several hours elapse without a paroxysm.

The fact of their being called ganglia by some authors, might occasion their being confounded with those tumors which grow in the sheath of tendons, most frequently at the wrist, and which have been called by the same name. But the indolence of the latter, their situation, their mobility during the action of the muscles, their immobility beneath the skin, the existence of a cavity in them, lined by a synovial membrane, and filled with a fluid like that which lubricates the joints; all these characters are fully sufficient to enable us to avoid an error which, after all, would perhaps be of no great consequence.

Small *lipomas* have sometimes been seen, which, after undergoing carcinomatous alterations, give rise to very severe pains. But their softness, and especially the cellular structure which thus present, containing a yellowish, fatty matter, lardaceous in some points, fibrous in others, serve to afford us the means of diagnosis. M. M. Sanson and Begin, in their last edition of Sabatier *Medicine Operatoire*, mention the case of a woman affected with a lipoma which gave her such pain as materially injured her health. Finally, it might perhaps be more easy to confound these fibro-cellular encysted tubercles with those tumors which affect the nervous tissue, and are called *neuromas*. The latter, however, possess a cavity filled by a substance more or less liquid; whilst the former have neither cavity nor cells. *Neuromas* may attain a considerable bulk; fibro-cellular encysted tumors, on the other hand, acquire but little volume. *Neuromas* most usually exist in the great nervous trunks; the others are almost always sub-cutaneous, and remote from the large nerves; the former are commonly numerous in one place; the latter are in general solitary.

*Prognosis.*—This is favorable, where the tumor is movable, the skin covering it natural in its hue, the situation remote from important organs, such as a vessel or nerve of some size; where, in short, the tumor is simply sub-cutaneous. If, on the contrary, it be immovably adherent to the skin, which has become violet-colored, and it begins to soften we cannot expect a favorable issue; for the malady has a tendency, as we have said, under these circumstances, to propagate itself to the lymphatic glands in the vicinity, and the patient soon presents all the symptoms belonging to the cancerous diathesis.

*Treatment.*—Caustics have sometimes been used, with a view to destroy these tumors; but they only favor the softening, while they do not remove the disorder. The practice in some rare cases would seem to justify the application of narcotics, in treating some individuals who dread the use of the knife. A female sixty years of age, had one of these tubercles in the inner and posterior part of the knee. She would never consent to any operation, notwithstanding the severity of her sufferings. By the steady application of narcotics to the part affected, the pains were assuaged and they have not since returned.

Extirpation, however, is the surest, readiest, and least painful method.

When these tumors are very small, a simple longitudinal incision, made along the spot which they occupy, will be sufficient. If they be somewhat larger, the size of a large pea, for instance, a T shaped incision will be necessary. In either case, we must seize the tumor, after exposing it, with a double hook, and then with a bistoury, separate it from the cellular tissue which attaches it to the surrounding parts. The lips of the wound are then brought together, and kept in contact by means of sticking plaister.

If the skin above the tumor be bluish and adherent, both must be removed together; if the tumor be already softened, we must on no account whatever meddle with it.

I shall conclude this lecture by relating some cases illustrative of the principles I have advanced.

CASE VI.—Maria Hareng, aged fifty-nine, married, came to the Hotel-Dieu, on the 18th of October, 1828. She complained of pains, which were sharp and continual, with exacerbations at irregular intervals. Her constitution was good, she traced this disorder eighteen months back; being obliged to expose herself to cold and moisture, she thought she had contracted rheumatism; and for this supposed affection had undergone all the methods of treatment which are usually employed. The pains persisted, and were aggravated by the least fatigue. They presented two principal features; first, their continual severity; and second, their repeated attacks, recurring about four times in the four and twenty hours, and continuing at each period from a few minutes to an hour. These crises would be brought on by pressure of the parts, or by a blow on a tumor which was situated on the right inner and upper part of the thigh. They consisted in darting and numbing pains, directed from the upper part of the thigh towards the knee. So severe were they, that the woman could not answer when spoken to; she was agitated, uttered cries, and said she felt the parts torn from her where the pains were situated. On examining her, I soon found there was no rheumatism in the case, but that there was a fibrous sub-cutaneous body. I removed it on the 20th of October, by making a T incision over it, when the tubercle was found imbedded in fat; it was white and readily removed with the bistoury. The pains immediately ceased, and the wound was dressed with a little sticking plaister. The patient left the hospital on the 8th of November, radically cured.

CASE VII.—An old soldier, otherwise in good health, came to consult me, in February last, about a small tumor, which he had on the outer and upper part of the right leg, just over the articulation of the tibia with the fibula. He could not recollect the origin of the tumor, it was only of a few month's standing; but the pains were of the most acute character; they darted from the tumor towards the neighboring parts. Having no doubt about the nature of the case, I removed the morbid part by excision. The pains ceased, and great was the astonishment of the soldier, when he saw what a little substance had proved so great an enemy to his peace.

CASE VIII.—Madame P——, the wife of a wine merchant, suffered excruciating pains in her right leg for about three years. They came on three or four times a day, and at last every recurrence was attended with syncope. Much medical advice was followed, and all imaginable methods of treatment were employed in vain. I was at length consulted, when I found on the middle and anterior part of the leg, on the crest of the tibia, a small fibrous

tumor, of about the size of a cherry kernel. I cut down upon it, and pressed it out. It was of a fibrous structure, and enveloped in a fibro-cellular cyst. The pains vanished at the moment. An erysipelas continued about the little wound, but yielded to a few laxatives. The lady was quite well in ten days, and has never since had the slightest recurrence of the disorder.

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## CHAPTER XIX.

### ON STRANGULATION AT THE NECK OF THE HERNIAL SAC.

It was for a long time believed, that all cases of strangulation in inguinal hernia, were owing to a constriction exercised by the ring upon the intestine. This erroneous opinion has more than once led to fatal consequences. Acting upon this principle, surgeons enlarged the inguinal ring, and restored the parts into the abdomen, thinking that they had removed the strangulation; but the bad symptoms persisted, became aggravated, and the patient perished without any evident cause for his death.

These unfortunate results, soon attracted my attention, and became the subject of reflection; presently, I was induced to think that the abdominal ring was not the only seat of stricture; and dissection has since proved to me, that, in a great number of cases, the neck of the sack is the cause. Time has corroborated my views, and I believe that I may now affirm, that out of nine cases of strangulation, eight are owing to a constriction exercised by the neck of the sac. This remark applies particularly to inguinal hernia; for this disposition is rarely met with in crucial and umbilical hernia. The structure of the parts explains the difference.

In order to be correctly understood, let us explain what we mean by strangulation. Nothing, in our opinion, gives a more correct idea of it, than the action in any part of our bodies, of a foreign or natural body which presses with more or less force upon the bodies which are in the sphere of its power. The consequences of this pressure may be easily inferred, the action of the parts is increased, the vital functions are altered, or they are extinguished and gangrene takes place. Strangulation may take place at all points, but is most frequent when openings exist in which the parts may become engaged; such are particularly the inguinal ring and crural arch.

Some strangulations are external, others internal. I have seen fifteen cases of the latter kind; but it must be confessed, that in general, the greater number is external. Art has a positive power only on external strangulations, and is nearly useless in the internal species. But between these two species, there is another which may be called *mixed*, and is such as results from the reduction in mass of a hernia. Some years ago, the body of a female was brought to our dissecting rooms; externally, nothing remarkable could be observed; but on opening the abdomen, we found behind the crural arch a tumor formed by the intestine, and about as large as the fist; of a livid red color; a portion of the epiploon was contained in the hernial sac. On examination of this tumor, it was perceived that a fold of the gut had become

gangrenous. The stricture was at the neck of the sac. I was afterwards informed, that two days previously the woman had had symptoms of strangulation; the taxis was successfully employed, and the hernia supposed to be reduced when all the symptoms suddenly reappeared, and the patient died in a few hours.

I have seen other cases, in which the cause of strangulation was primarily in the abdomen. In a man affected with strangulated hernia, I performed the operation, but only found a portion of epiploon in the sac; I drew out the intestine and found the stricture was on the inner side of the pubis; it was divided and the man did well.

But how does strangulation of the neck of the hernial sac occur, and what are the anatomical dispositions which favor it? When the intestine inclines forwards, it carries before it the peritoneum which forms a species of funnel of which the apex is directed downwards, and the base or mouth upwards; but however small may be the progress made by the tumor, the aspect of things is changed, and the base descends. This change is owing to the situation of the ring. As the hernia increases in volume, the neck of the sac is wrinkled and thrown into folds by the weight of the tumor, by the tendency of the displaced peritoneum to return upon itself, a tendency which sometimes produces obliteration of the tunica vaginalis, the form of the epiplocele then on the side of the ring, voluminous at the bottom of the sac. But the principal cause of this circular groove, this contraction of the neck arises from the application of a bandage over the hernia; the compression it exerts on the neck of the sac, corrugates, contracts, and even inflames it, and also the cremaster muscle and the cellular tissue; whence there results a contraction and a stricture, if not fibrous, at least one which gives it a great degree of resistance. The neck may also become cartilaginous.

The diameter of the neck and its anatomical structure contribute also to the strangulation. Generally, the aperture is not more than three or four lines in diameter; its edges being thin, cutting, and formed by the folded peritoneum, render strangulation more dangerous than that of the ring which acts less forcibly on the intestine; but, moreover, an anatomical reason increases the facility of strangulation at the neck; it is the state of persons in whom the testicle has descended at a late period, and who labor under scrotal hernia; for the word congenital applies only to that form occurring at birth. Examine a scrotal hernia, and you will always find the following state: The orifice by which the parts have protruded is very narrow, its edges are very sharp; below, you perceive the neck, the inguinal ring being of its usual dimensions, and the kind of bag in which the portion of the protruded intestine is contained. If, then, you pull the intestine in the sac, strangulation takes place spontaneously, and you can understand what takes place during life.

We have first proved that strangulation generally takes place at the neck of the sac; it is important to determine whether this neck is fixed or movable.

Observations prove it to be always movable, because the elements composing it, are joined to the neighboring parts by a very loose cellular tissue. The slight adhesion of these parts, their delicate union with the aponeurotic openings, explain the ease with which the hernia protrudes and is restored.

Do symptoms of strangulation at the neck of the sac exist? We answer without hesitation in the affirmative. We will even add that there are

different kinds of symptoms. Large external herniæ are less subject to strangulation at the neck than cylindroid herniæ. But congenital herniæ, more frequently than any other species, present this disposition.

*Diagnosis.*—Whenever the strangulation is at the neck, we can return in mass, and without noise, the whole, the third, or fourth of the hernia on the abdominal side, and cause it again to protrude; but, in order that it may so return, it must be cylindroid, the canal must be large, and the peritoneum not adherent. I have in more than forty cases, seen the hernia returned in mass, without a cessation of the symptoms. If the tumor were at the ring, in the canal, or the superior orifice, this movement could not be given to it, because these parts are nearly inflexible, whilst the neck, on the contrary, enjoys great freedom of motion, on account of the looseness of the parts. I should add, before proceeding further, that we should particularly guard against this apparent reduction which has deceived many practitioners, because then the consequences of strangulation always remain. When called to a similar case, we should endeavor to draw the tumor out by all means in our power; if they are fruitless, the ring must be enlarged, and the gut drawn down. I have been obliged to do this operation in this hospital more than ten times, and always with success.

In this kind of cases, the tumor preserves its tension, and on touching it, we can generally recognize a painful spot corresponding nearly to the seat of the hernia. Thus, for instance, after the operation, we are enabled to point out the spot by a tenderness more marked at that place. Hence, the tumor and painful point, announce that here then exists a hernia reduced in mass.

When the strangulation takes place at the external ring, the tumor, formed by the hernia, does not extend above this point; the whole extent of the inguinal canal is empty, soft, and not tender to the touch; the ring appears contracted, hard, and tense. On the contrary, when it occurs at the neck of the hernial sack, that is to say, at the height of the upper orifice of the inguinal canal; the latter is always full, hard, painful, and communicates the sensation of a cylindrical tumor, directed from below upwards, and from within outwards. It is even sometimes possible to insinuate one's finger between the displaced parts and the ring, so far is the latter from being the cause of stricture.

In some persons the strangulation exists throughout the whole length of the canal, which must be opened from one end to the other. Sometimes there are two strictures instead of one to remove; a slight contraction exists at the ring, and at the same time a stronger one at the neck of the sac.

When the sac possesses great mobility, the strangulation ascends more or less above the inguinal canal. It may exist still further from the ring when the hernia has been reduced in mass. We are here led, by a natural transition, to say a few words concerning strangulation in the abdominal cavity itself. The danger in this case is much greater. The reason of it is evident; the seat of external strictures is known, and the disease follows a well known course; there can be, therefore, no error in the diagnosis; whilst internal strictures, on the contrary, have no fixed situation. They do not depend on constant organic dispositions, but on accidental and very variable circumstances. There is, however, species to which we have given the name of mixed, and which is the most frequent and easily known; it is that which

results from the reduction, within the abdomen, of herniæ strangulated by the orifice of the neck of the sac containing them.

It may be objected that these distinctions are useless; our answer is simple. I suppose that an individual has stricture at the neck of the sac, the inguinal ring is divided, the same thing will happen, that I once saw occur; the ring being divided, the parts were instantly restored. I should here state that I thought the success of the operation doubtful. The symptoms of strangulation continuing, the surgeon took it to be peritonitis. The patient died, and an examination showed the neck of the sac to be the cause of the malady. The ring had been divided, and still the parts were not the less strangulated. You can hence perceive how important it is to ascertain exactly the seat of the stricture. To do this, we must draw out the gut, and carry the finger along the protruded portion, in order to ascertain the nature of the obstacle.

Does strangulation, occurring at the internal ring, differ from that seated in the lower part of the canal? Yes, it differs from it evidently, inasmuch as, in the first case, the parts become gangrenous much sooner, because the edges of the upper orifice are so thin that they exert a strong compression on the neck of the hernial sac, whilst the edges of the inguinal ring being blunt, and its aperture larger, strangulation takes place more slowly, and the gut is less strongly pressed upon.

As strangulation at the neck of the hernial sac soon occasions disorganization of the parts, we should operate immediately, because the hernia returns incompletely, and with difficulty; and because the sharp edges of the neck are a constant cause of gangrene. The resistance of the tissues here deserves attention; the peritoneum sustains pressure for a long time; but the mucous membrane is soon cut through; if the strangulation has lasted two or three days, the cellular membrane, in its turn, gives way; lastly, in some cases the peritoneum itself is divided, so the least effort suffices to separate the ends of the intestine, and thus produce gangrene. We see then that in operating on similar hernia, the gut should not be drawn out before having freely enlarged the passage, for we might draw out only one end, and thus occasion effusion into the abdomen.

I shall now relate some cases in support of the doctrine I have endeavored to establish:

**CASE I.**—*Inguinal Hernia Strangulated at the Neck of the Sac; Operation; Peritonitis; Death.*—A man, about forty years of age, of small stature, and pretty good constitution, came to the Hotel-Dieu on the eleventh of January, of this year, for a strangulated hernia.

He had had for four or five years a tumor in the right groin. He gave the following account of the origin of his disease; he was carrying a bag of flour tied in the middle; the anterior portion being the heavier pitching him forward, he threw himself violently backwards in order to prevent his falling; he immediately felt in the left side of the chest an acute pain proceeding from the extension of the muscles. This got well; but in a short time he perceived a small tumor in the right groin, which returned when he was lying down, but protruded on his rising; on the left side another tumor of the same character appeared. They were two inguinal herniæ, the first larger than the second. He then used a double truss, by which means he escaped, for some time, any

accident. Yesterday he removed it to make water. Probably he used inordinary effort, for the hernia of the right side became larger than usual, hard, incarcerated, and irreducible. From this moment the patient had colic, nausea, anorexia, and vomiting; and, besides, an obstinate constipation. Some efforts at reduction were uselessly made. He was put into a bath, and the taxis again employed, but as fruitlessly as before. What was to be done; wait for a spontaneous reduction? If this happy termination does sometimes occur, how often are not gangrene, peritonitis, and death, the consequences of an operation too long delayed. I have been always more successful in patients on whom I have operated in the first twelve hours, than after that period. Moreover, strangulation at the neck of the sac is a powerful motive to hasten the operation, for we know that of ten cases of this nature, scarcely one is reducible. The softness of the tumor has no doubt some influence in its reduction, but, in the present case, it was hard and tender to the touch.

The operation being imperiously required, I did not hesitate to perform it. The patient was carried to the operating theatre, and the operation done in the following manner: the skin covering the upper part of the tumor being raised, and laid in a transverse fold, which I held myself by one end between the thumb and finger of the left hand, giving the other to an assistant. I made an incision into it, and passed the bistoury from one end to the other. The incision was then extended upwards and downwards. The layers of the subcutaneous cellular tissue were then successively divided. A small artery having been cut, it was secured. On reaching the hernial sac, I found, fortunately for the operation, that it contained a good deal of fluid. The sac was scarcely opened, when this fluid gushed out, and the intestine was seen of a violet red color; some spots more highly injected seemed to show that the attempts at reduction had been accompanied by some violence; the intestine was then drawn slightly out of the belly, and the discoloration found to have ascended into the abdomen. The finger introduced into the wound confirmed the truth of the diagnosis; the hernial sac was drawn down, and its neck being divided upwards and parallel to the meridian line, the strangulated portion was immediately returned; he was dressed in the usual method. Enemata, administered immediately after the operation, brought away very copious discharges.

On the following days, the belly became tender. He was ordered an infusion of camomile; discharged a great deal of flatus and was relieved.

On the fourth day of the operation, he appeared to be doing extremely well. The dressing was removed, the wound was healthy, the sub-peritoneal cellular tissue a little swollen. (Diluent sweetened drinks.)

Fifth day. The patient was suddenly seized with delirium without fever or heat of skin. An anodyne draught was administered; and an enema with ten drops of laudanum. The cerebral symptoms left him, and had not re-appeared on the seventh day; he did well, and until the 1st of February, nothing peculiar was observed. At this time, the nineteenth day of the operation, on examining the wound, and carrying the hand above the iliac fossa, we found a hard, resisting tumor, in the centre of which was a fluctuating point. What was its nature? a stercoraceous abscess? but the hernia had been strangulated only twelve hours, when it was reduced. There was reason to think it was inflammation developed in the cellular tissue surrounding the

hernial sac, and thence extending into the thickness of the abdominal parietes. If left to itself, it might cause an internal effusion. If seated in the abdomen, and opened before adhesion had taken place between its parietes and the abscess, a fatal effusion might result. I have seen in more than twenty cases, these abscesses discharge themselves through the inguinal canal; and sometimes have assisted it by the introduction of a female catheter, as far as the abscess. Therefore, on the 3d of February, I followed this plan in the present case, but could not reach the abscess with the catheter or even the stylet; I then determined to wait some time, in order to observe the attempts of nature, and to aid her. Soon, suppuration approached the skin. Certain then, that adhesions had formed sufficient to prevent all effusion, on the 20th of February, I made an incision into it. At first, only a little healthy pus issued, but plunging the bistoury in more deeply, and enlarging the incision, a copious discharge followed, but the engorgement had not entirely disappeared. A fine bougie covered with cerate, was introduced into the wound. 21st, much more pus was discharged; 22d, it had diminished slightly, the man was better. 24th, he was suddenly attacked, during the evening, with pains in the belly, nausea, colic, and vomiting. (Leeches to the abdomen.)

On the next visit, the symptoms had abated a little, but the patient's face was clayey, his eyes sunk, and his countenance cadaverous. 25th, he was dead.

*Autopsy.*—There was nothing remarkable in the head and chest. The peritoneum presented evident marks of inflammation. There was a small quantity of pus between the circumvolutions of the intestines, which were slightly adherent to each other. A fistulous orifice was perceived near the external ring, situated between the peritoneum, and an abscess in the parietes of the abdomen. Another perforation corresponded to the external opening in the integuments, but was closed by intimate adhesions of the cœcum. The abscess seemed to have originated in the inguinal canal, and afterwards reached the abdominal parietes; it was bounded, internally, by adhesions of the intestines to the parietes of the belly, and externally by the cicatrix. It appeared as if the adhesions had been torn, and effusion taken place through the first fistula of which we have spoken.

This case gives rise to several important remarks. Persons laboring under hernia are anxious to use a truss; but think they may lay it aside occasionally, either to evacuate the bowels, or to sleep. In the former case it often happens that a violent effort causes the protrusion and strangulation of the hernia; in the latter, it also takes place whilst getting into bed; we cannot then enforce too strongly upon such persons the necessity of constantly wearing their truss.

In the above case the hernia was inguinal and voluminous; a large fold of intestine appeared strangulated, but the external ring, and the canal, exerted no constriction upon the intestine, which could be made to move and easily ascend to the upper part of this canal; the stricture was then, at the cutting edge, formed by the peritoneum, at the commencement of this sac; the operation proved the correctness of the diagnosis. Every circumstance announced a favorable termination, when the occurrence of one of those abscesses which so frequently take place in the cellular tissue surrounding the neck of the sac, complicated the disease, and occasioned a fatal peritonitis.

The following case is one of those to which I have given the name of invaginated.

CASE II.—*Invaginated Inguinal Hernia, Strangulated by the Neck of the Sac.*—Fournier, Abel, twenty-three years of age, thin, of a lymphatic temperament, has had since his infancy, an inguinal hernia on the right side, which he was not in the habit of guarding against; a slight exertion caused its strangulation, hiccup, nausea, vomiting and colic supervened; the patient endeavored in vain to reduce it; forty-eight hours after the occurrence of the symptoms, he was brought to the Hotel-Dieu in the following state:

The hernial tumor was about the size of a small hen's egg; capable of a partial reduction; but when left to itself, regaining its ordinary volume; a long and very hard body occupied the whole length of the inguinal canal; the belly was swollen, tense, and tender; the man vomited incessantly a bilious matter; was tormented with colic, could not evacuate his bowels, pulse small and very frequent. He was put immediately into a bath and the taxis tried in vain. The operation was the only resource. It was proposed to the patient who refused to submit; he was bled several times, kept in bath several hours, and during the day a large number of leeches applied to the anus and abdomen. On the second day, the symptoms were aggravated; vomiting of sturcoraceous matter; pulse frequent and corded, greater tension of the abdomen, much thirst; the patient was requested not to drink a great deal in order to keep up and even increase the vomiting, and to be satisfied with wetting his tongue with slices of an orange.

Third day, increased tenderness of the abdomen, extreme prostration, general paleness; still he refused the operation.

Fourth, pulse almost insensible; great weakness; deceptive relief; slight remission of the symptoms; on touching the hernia, a kind of crepitation is felt shewing that the parts within are gangrenous. Fifth day, the hiccup which had almost ceased the previous evening, returned with greater violence; the extremities grew cold.

Sixth, continual hiccup, pulse insensible, coldness of the whole body. The next day, the patient demanded the operation, but the visit was scarcely finished, when he had ceased to exist.

*Autopsy, twenty-four hours after death.*—The abdomen was not quite so tense as during life; no rigidity of the body. I performed the operation, as though he had been living; the soft parts being divided successively down to the sac, the latter was opened at its anterior inferior portion. A brownish serum, of a gangrenous smell escaped; a fold of a small intestine three and a half to four inches in length, of a grey slate color, was softened, and crushed between the fingers like a piece of white paper. Above the intestine, the anterior extremity of the testicle was perceived; the finger can be easily introduced into the ring and carried as far as the upper part of the inguinal canal to the seat of stricture, which was caused by a falciform circular neck, adhering anteriorly and posteriorly to the intestine, in the extent of about a line. Above the strangulation, there was a perforation of the intestinal canal, towards the upper end of which the gangrene had ascended for three inches. To this, succeeded a violet color, which could be traced as far as the stomach. The lower portion, distant only six inches from the cœcum, was folded upon itself, as well as the whole of the large intestine, which was scarcely as large as that of a child, of six years of age.

The upper portion contained a large quantity of liquid fecal matter, which

would have been effused into the abdomen through a small aperture in the gut, had it not been for an adhesion formed at this spot. On dividing the stricture, there was seen a well marked circular depression on the intestine, which internally, appeared to be deprived of its inner membranes. The adhesions of the intestines by means of recent false membranes were very numerous. The lower pelvis contained a good deal of pus. On opening the abdomen, there escaped a quantity of purulent serum, and a very offensive inflammable gas. The lungs were slightly engorged posteriorly; the remainder of the organs healthy.

The escape of inflammable gas on opening the abdomen confirms this important fact, that inflammation of the membranes, produces a remarkable change, not only in the quantity, but also the nature of their secretions. The gas, in this case, was probably carburetted hydrogen.

We have shown, that internal strangulation resulting from the reduction in mass of herniæ strangulated at the neck of the sac, may be almost always recognized, both by symptoms of the previous existence of a hernia primarily situated externally, and by existing symptoms. It is, however, sometimes difficult to ascertain it, especially if we were not present at the reduction of the hernia. The uncertainty is still greater, if the patient labors under a double hernia, reduced at the same time, and of which neither present any mark of strangulation.

*CASE III.—Double Inguinal Hernia; Strangulation at the Neck; Operation; Cure.*—Geoffroy, (T.), a blacksmith, forty years of age, was affected with two inguinal herniæ, the left, for twelve years; the right, for three; he had for seven or eight years worn a truss on the left side, but never any on the right. One day, whilst walking, he felt his truss give way; carrying his hand to the part he found the tumor painful, and increased in volume. On his return home, he endeavored in vain to reduce it, and experienced all the symptoms of strangulation. The next morning he prescribed for himself two grains of tartar emetic, and sent for a surgeon, who, after some attempts succeeded in reducing it; but the symptoms continued, and, on the fifth day he was brought to the Hotel-Dieu. The next morning, I examined him very carefully; the abdomen was painful, he had attacks of hiccup, stucoraceous vomiting, and constipation.

The symptoms of strangulation existed; but a peritonitis might be feared; the diagnosis was rendered more difficult by the reduction of both herniæ, which presented no tumor behind the inguinal ring. We had, besides, no other data of the previous existence of these herniæ than the dilatation of the rings, and the contradictory accounts of the patient. I hesitated performing the operation before being assured that it was his only chance; but on the next day, his death appearing to be fast approaching, it was determined upon.

Observing a tumor in the right inguinal region, and the patient suffering more pain on that side, I was induced to seek there the cause of the stricture.

An incision was made into the skin in the direction of the axis of the hernia; under it was a small tumor which might, at first, have been taken for the spermatic cord, and afterwards for the hernial sac, on reaching a smooth cavity whence escaped a large quantity of serum. It was a serous cyst, placed in front of the true sac. The latter was small and contained neither intestine nor

omentum, but merely some albuminous flocculi, floating in a little serum. The finger introduced into the abdomen distinguished adhesions of the intestines either amongst each other, or to the abdominal parietes, certain symptoms of peritonitis. I immediately performed the operation on the other side; the layers covering the tumor were divided carefully; a sac was opened containing a fatty substance, which I at first thought was omentum; but perceiving beneath a fibrous layer, and desiring the man to cough, I saw this layer rise, as also some subjacent ones. Immediately a bloody serum escaped, and I felt assured that the stricture was on this side. A small reddish fatty mass was found in the sac, and recognized as swollen omentum. On introducing the finger a circular stricture was felt pretty high up. The sac was drawn out, and with it a small portion of inflamed intestine; whilst an assistant fixed the edges of the incision in the sac, the probe-pointed bistoury was carried along the finger, and the stricture divided upwards and outwards. The patient was then dressed, and put to bed; he spent a pretty comfortable day. He was ordered whey, and small enemata fomentations to the belly; his countenance was red, pulse accelerated, tongue coated with a brownish fur. (Venesection.)

On the next day, the vomiting had ceased, colic still frequent, pulse accelerated, face purple; he was bled several times during that day and the following. In short, the pains in the abdomen ceased entirely, and the patient was perfectly cured.

CASE IV.—*Double Inguinal Hernia; Strangulation at the Neck; Operation; Cure.*—A man was brought, on the 27th of September, to the Hotel-Dieu, in apparently a dying condition; his extremities were cold; face discolored; pulse extremely small, scarcely perceptible; abdomen tense and painful, especially at the inferior portion; he had, besides, hiccup, vomiting of inodorous matter; he could scarcely state that he had for a long time been laboring under double inguinal hernia, and that he could not tell when they had become painful. He was put in a bath. From his condition, we were reduced to the existing symptoms which could not indicate positively his disorder; was it the peritonitis, or an internal strangulation? I prescribed an enema and venesection. During the evening he had a copious evacuation, and also others in the night; the vomiting ceased, but the hiccup was almost continuous.

The next morning, pulse quickened, face red, belly flaccid, the patient was rational, and gave the account of his disease. He had had, for nearly eleven years, two hernia which followed each other at an interval of six months. He wore a bandage with a double cushion, they sometimes protruded in spite of this, but were easily reducible. They had never given him any uneasiness, except on the evening before his admission, when he made some violent exertion; they both protruded and became painful; he himself reduced the right hernia, and sent for a physician who reduced the left, and prescribed some chamomile infusion. The symptoms of strangulation increasing he was then brought to the Hotel-Dieu. What was to be done? Most of the symptoms of strangulation were present; but he had no vomiting of fecal matter; the alvine evacuations were easily effected. He was desired to walk; the left hernia protruded, but was soon reduced.

The operation does not seem to be required. Evening, same condition;

the patient's bowels had been freely opened; no vomiting or hiccup; belly soft and sensible on pressure, especially in the hypogastric and iliac regions. Persuaded of the great advantages of the operation, if there is strangulation, I determined to perform it; and chose the right side, because the hernia, which, according to the account of the patient, came out more easily on this side than on the other, when he was in health, had not re-appeared on account of the walk.

An incision two and a half inches in length was made in the skin, in the direction of the ring; and there immediately appeared a kind of cylindrical cord which had been felt through the integuments. It was cautiously opened, and the hernial sac reached; on introducing the finger, I recognized, at the upper part of the cyst, a cul-de-sac; a catheter carried in the same direction, penetrated the cavity of the abdomen, and caused the flow of a bloody serum. The opening in the sac was enlarged; this latter was drawn out, and its neck found to be corrugated and contracted as if by a kind of cicatrix. The neck was divided, and I could then discover no longer any strangulation. The patient recovered without a bad symptom.

These two cases are highly important, and deserve the greatest attention; and afford me the opportunity of developing more fully, the general notions I have previously advanced. Indeed, you may easily conceive the embarrassment experienced by a physician who is called upon to relieve a patient laboring under a strangulated hernia which has been reduced in mass. The first difficulty consists in determining, in the absence of all appearance of hernia, whether there is a strangulation, or not; and when its existence is proved, the second arises from the difficulty of getting at the strangulation, which having retired into the abdomen, is beyond the reach of surgical instruments. But are these symptoms by means of which, after the reduction of the hernia, we can decide whether stricture exists or not within the abdomen? Observation has answered the question in the affirmative, by shewing that both the antecedent and existing symptoms almost always point out the lesion. The former consists in the large size of the ring, the mobility of the consequent hernia, the reduction in mass which has been its result, and the want of remission in the symptoms. But perchance these may not have been carefully observed; we must then have recourse to the existing symptoms already mentioned, but to which I again call your attention on account of the difficulty of the diagnosis; they are, a fixed and circumscribed pain in the epigastrium, which is felt behind the opening through which the hernia has protruded and receded, and a tumor more or less apparent in this region. Let us consider, for a few moments, this last symptom, which has many interesting peculiarities. When the hernial tumor has been reduced in mass, it cannot wander about in the abdomen, because it is composed, at least in part, by the peritoneum, which, although movable, remains always in the region to which it belongs, and therefore confines the tumor. The hernia is thus constantly behind and within the aperture through which it protruded. Surrounded by the cellular tissue which connected the peritoneum to the parietes of the abdomen, and which was displaced in order to receive it; it is covered besides, by a second layer of peritoneum, being that which it has detached from the posterior surface of the abdomen; so that to penetrate into the hernial sac, by an incision into the parietes of the abdomen, the peritoneum would be cut twice, and its cavity

opened before reaching that of the sac, unless we follow the steps of the operation for the ligature of the external iliac artery, by raising and separating this serous membrane.

This might be done, but I never have had recourse to it. There is fortunately a simpler and less dangerous method; it consists in seeking and drawing out the hernia, through the opening by which it has passed into the abdomen, for we are certain to find it applied to the inner surface of this opening, to be able to seize it with forceps and draw it out, either with or without dividing the ring. If we examine the tumor through the cavity of the peritoneum, we will find it lodged in the iliac fossa, in crural hernia a little more outwardly, in inguinal more deeply and inwardly. It presents a narrow and tight aperture, in which are engaged extremities of intestine, forming a fold in the cavity of the sac. It is at this point, that the intestines are compressed, contracted, thinned, strangulated, and gangrenous, the upper end more frequently than the lower; the former much dilated, and on the eve of rupture; the latter thin, empty and similar to those of a child.

Having made known the anatomical relations of the tumor, let us pass to the other symptoms. The pain and tumor are not the only ones indicating strangulation in the abdomen; by pressure on the abdominal parietes, we meet with greater or less resistance either at the ring, or by introducing the finger into that opening, or by desiring the patient to cough; the effort of the tumor to protrude, by dilating the canal, and sometimes raising the skin covering it, should also be taken into consideration. But a still more characteristic mark, is the continuance and especially the nature of the vomiting. Nausea does not establish the existence of internal strangulation. To dispel all doubt, copious vomitings are necessary, presenting a peculiar character. Mucous or bilious matter would indicate an irritation, gastritis or enteritis as well as a strangulation; but vomiting of a gleatinous, yellowish matter, of a fecal odour, leaves no uncertainty; when this symptom is added to the preceding, we will be convinced that the hernia has re-entered and been strangulated internally, as it previously had been externally.

We will conclude these cases by the account of one, which was admitted into the Hotel-Dieu, towards the latter part of March of the present year. The patient, about forty years of age, of middle stature, and a pretty good constitution; had had for fifteen or twenty years, a tumor in the right groin. At first it spontaneously protruded and retired.

About eight years ago, he laid aside his truss, the tumor did not completely retire, even in the horizontal position, and when he endeavored to reduce it. On the 24th of March, 1832, after having eaten largely of beans, the tumor became tense and more voluminous; nausea and vomiting soon followed with all the symptoms of strangulation. The taxis was employed in vain. He was then brought to the Hotel-Dieu. He was put into a bath, the taxis again attempted, but with no success. Leeches were applied to the tumor, the bath again used, without any improvement; on the morning of the 25th, twenty-four hours after the strangulation, I ordered him to be bled, and carried to the amphitheatre in order to undergo the operation. The hernia was in the following state: it had descended into the scrotum on the right side; at its lower part, was soft and transparent, indicating the presence of some fluid; above the ring a hard tumor could be felt; and I gave as my opinion, that the

strangulation had taken place at the neck of the sac, in which my colleague M. Sanson coincided. An incision about three inches in length was made over the tumor, and the layers covering the hernia successively divided; several branches of the external pudic artery were cut, but immediately secured. Having reached the sac, I opened it very carefully, at first a little serum escaped; the opening was enlarged, a bloody fluid issued, but in smaller quantities than I had anticipated; the sac, however, was distended by an enormous portion of omentum, which appeared to have passed into it entire; the intestine was red, but exhibited no sign of gangrene; the stricture was at the middle of the neck, and easily removed; but there remained to be reduced this mass of omentum, which fortunately was free from any adhesions, I was obliged to make the opening still larger, the reduction of the omentum was difficult, and I feared impossible, but was at last successful. You know, that in similar cases, we are advised to remove a part of the omentum, but the partial ligature of the arteries is very tedious, often we do not secure them all, and there is danger of hemorrhagy; if the whole mass be included in a ligature, inflammation, suppuration, and very grievous symptoms may arise; besides, the omentum often forms adhesions with the wound, which are very troublesome and painful. It is, therefore, better to attempt to restore it to the abdomen.

Inflammation is indeed to be feared, but the heat of the abdomen frequently is sufficient to prevent its occurrence. Moreover, it may be subdued by local and general bleedings, emollient applications, baths, &c.

Before proceeding to the consideration of the treatment, I beg leave to occupy your time with one more remark relative to strangulation of the neck of the hernial sac. Although this cause of stricture exists more frequently in inguinal hernia, I have also seen it in crural hernia; I could give you many examples of it, but as they resemble so closely those already treated of, it will be unnecessary.

I shall now proceed to consider the general rules of the *treatment* of these diseases which are so common and generally so serious.

It will be perceived that there must exist many modifications, according to the seat of stricture. Should it take place at the lower orifice a simple incision is sufficient to dispel the symptoms; but this cannot be the case, when they are produced by the neck of the sac; for if the ring alone were divided the hernia would be reduced, but the stricture still remaining, the patient would shortly perish. The finger must then be introduced into the sac, and carried as far as its upper extremity. But this is not always easily done, we must then enlarge the aperture, the finger then slips with facility and reaches the upper part of the sac, which represents a species of vault, there is no orifice and the stricture is recognized. In this case we are obliged to operate on the parts removed from sight. In order to do this the surgeon takes a probe pointed bistoury, carries it on the flat side along his finger; having reached the opening, he makes the enlargement forwards and upwards, as if he were making the simple incision. Some persons use a director, but I have often seen accidents result from its employment, as the bistoury may slip from its groove and wound the intestine, giving rise to peritonitis; and after death you will find a small opening in the healthy portion. This accident is not to be feared when the finger is the guide. The shape of the bistoury is of no

importance; but it is absolutely indispensable for safety, that it should be probe-pointed. At what height are we to look for the stricture?

No positive answer can be given to this question. In some cases it is on a level with the internal ring, sometimes lower; we have shown that it is also, sometimes higher up. We should, in order to be more certain, attempt to draw out, with all the caution and dexterity possible, a portion of the intestine, in order to be well assured that no impediment remains. Sometimes I have found the stricture as high up as the finger could reach, without being able to draw it down; but in these cases, a probe-pointed bistoury, covered throughout, with the exception of two or three lines of its edge, was sufficient to remove the cause.

It is useless to observe that when the hernia is reduced, we must endeavor by all the means in our power to make it again protrude; the patient should be desired to cough, to walk, &c. in short, the reappearance of the hernia should be facilitated as much as possible.

## CHAPTER XX.

### ON THE CYSTS WHICH APPEAR IN THE BONY TISSUES, AND OF THEIR DIFFERENT SPECIES.

I long ago, said M. Dupuytren, demonstrated for the first time, that there are often developed in the bones, tumors generally of a fibro-cellular nature, which by increasing, raise and lower the bone, so as to reduce it to a mere lamella, resembling a plate of metal which has been beaten out with a hammer. On examining the bone after death, we frequently find in it a cavity, containing a fibro-cellular matter. This is, apparently, a newly formed tissue; but what is remarkable, the bone is neither swollen, nor softened, but only widened and thinned; this as will be hereafter seen, is an important remark as regards the diagnosis.

The following case will furnish some accurate notions of the disease, and serve at the same time as an introduction to a knowledge of our ideas of cysts of the bones.

CASE I.—A young girl about seven years of age, was admitted into the Hotel-Dieu, in June, 1832, for a tumor in the superior maxillary bone. She stated, that having received a blow upon the cheek, she was, after some time, attacked by pain in that spot, which was followed by tumefaction; when we saw her, the swelling was as large as one's fist. The right nostril was obstructed and flattened, the palatine vault thrust aside and upwards, the eye driven forwards. During the last month she has become much emaciated.

At first sight, said M. Dupuytren, this disease might be mistaken for an osteo-sarcoma. Indeed it is formed at the expense of the superior maxilla, which appears softened, and it is known that a peculiarity of cancerous affections is to enlarge and soften the bones. However one symptom which I shall presently point out, created some doubt in my mind, and induced me to think that something might be done towards her cure. I remarked that by pressing

the anterior superior part of the tumor, I depressed a small lamella, which by alternately yielding and projecting, gave rise to a rumpling noise like that of a sheet of parchment; the same crepitation is observable in the palatine vault, and I hence infer that the tumor is a bony cyst.

If the girl be so fortunate as merely to labor under a development of a fibrous body in the superior maxilla, it is our duty to divide the mucous membrane down to the tumor, and endeavor to extract the foreign body. Hemorrhage may take place, but it can be arrested by plugging the part with lint. I should not be surprised, if the nature of the tumor be changed, for fibro-cellular bodies are very liable to disorganization; the case is then very embarrassing.

Crepitation is not the only sign which should guide our conduct. The displacement of the organs is owing to the development of the cyst. It would have been, undoubtedly, much better, had we seen her seven months ago; but on account of the enormous development of the tumor, no time is to be lost. Again, if the disease be abandoned to nature, it would degenerate into carcinoma.

Two days afterwards an incision was made over the tumor, a puncture then made with the bistoury, and immediately a large quantity of blackish blood gushed out. The bleeding soon stopped; the operator on introducing the finger into the tumor, instead of a fibro-cellular body, found a soft substance easily lacerable, which had gradually distended the bone, but was not confounded with it. Carrying the finger in different directions, he discovered a cyst with bony parietes, hard in some spots, thinned in others.

The next day the patient was carried to the operating room, and an incision made internally in the most dependent part of the tumor, about two ounces of blood escaped. M. Dupuytren detached with his finger, a part of the body filling the cyst. No hemorrhage occurred during the day; ten days after the operation she was much improved, the parietes of the cyst were lessened, as also the tumor; should the cyst continue to close, and the child not swallow the pus, there is a chance of a cure.

The products contained in these cysts, added M. Dupuytren, vary greatly; they are either solid or fluid. Generally, they are formed by a fibro-cellular matter; but we also find serosity, either alone, or united with fibro-cellular matter, mucosity, adipoceros matter, hydatids, pus mingled with serum, a gelatinous substance, teeth, &c.

*CASE II.—Solid Products.*—Some years ago a young man was admitted into the Hotel-Dieu, for an enormous tumor distending the cheek. M. Dupuytren examined it carefully, and was convinced that it was seated in the right horizontal branch of the inferior maxillary bone. By pressing on its parietes, a slight crepitation was heard, similar to that produced by the rumpling of paper, or rather a piece of very dry parchment.

The absence of fungus and lancinating pain, the high state of health of the young man, his earnest desire of its removal, and the conviction that it was merely a cyst with osseous parietes, induced M. Dupuytren to attempt its extirpation.

The angle of the lip of this side was freely divided; an incision made along the ramus of the jaw; the cyst opened, a little reddish serosity escaped, and a fibro-cellular mass was seen, which was partly extracted; suppuration attacked

the remainder of the tumor, and by means of repeated injections the cure was soon perfected. The sides of the cyst were gradually closed, and a very slight deformity remained, a slight projection, and a small cicatrix.

I have said that these cysts may contain teeth. The following fact, communicated by Dr. Loir, leaves no doubt on the subject. This gentleman presented to M. Dupuytren, a bony cyst developed in the palatine process of the left upper maxilla, of which the parietes were formed by the two compact laminæ of this process; the immediate cause was evidently a reversed tooth. Indeed, the left canine tooth, instead of penetrating the corresponding point of the alveolar edge of the jaw, had opened a passage in the inner part of this bone, and created a cavity of at least triple its size, in the diploic tissue of the palatine apophysis, where it had grown as it would have done externally; the root of the tooth was therefore supported by the outer part of the alveolar edge.

*Liquid Products.*—These cysts may also contain liquid products. The following is a case in point.

CASE III.—During the latter part of April, 1828, the sister of a physician in the vicinity of Tours, consulted M. Dupuytren concerning a tumor, of the size of a hen's egg, and situate in the right horizontal ramus of the lower jaw. The patient thought she labored under osteo-sarcoma. M. Dupuytren examined her, and from the absence of every symptom of cancer, such as lancinating pain, varicose degeneration, &c., added to the crepitation distinctly perceived by pressing on the parietes of the cyst, he was induced to form a favorable prognosis. The lady then earnestly requested the performance of the operation.

The tumor projected more on the inside of the mouth than externally, thrusting aside the tongue. It appeared to have been produced by the incomplete extraction of a carious tooth. An incision was made on the inside of the mouth, and the cyst opened, when a large quantity of bloody serum escaped. At the bottom of the cyst a solid mass was perceived and extracted by means of a scoop, and found to resemble precisely adipocire. This mass was undoubtedly owing to the adipose transformation of some of the animal parts of food, which had penetrated the cyst through the cavity left by the extracted tooth. A few injections and poultices upon the cheek, venesection and diet for a few days completed the cure. There remained no swelling nor deformity.

The *causes* of this disease are mostly very obscure. It sometimes proceeds from external violence. In one case a blow of the fist seemed to have produced the tumor; in another it arose from the incomplete extraction of a carious tooth. Changes of the roots of the teeth give rise to serous cysts which generally are developed in the alveoli of the superior canine teeth, and sometimes become very large. I have seen on the upper maxilla a large cavity open in front which might have been mistaken for the maxillary antrum, with which, however, it did not communicate. If you then examine the diseased tooth, its extremity will be found changed, circumscribed by a bony bulb, bathed in a fluid contained in a cyst, united on the one side to this bulb, and on the other to the bottom of the alveolus. This cyst generally follows the tooth where it is extracted. If left in the alveolus, it gives rise to a long continued suppuration; it contains a fluid sometimes very thick, sometimes

serous, its inner surface is as smooth as that of serous membranes. In other cases the origin of the disease cannot be ascertained.

The first *symptoms* of the existence of osseous cysts, are uneasiness and pain. The pain sometimes dull, sometimes acute, is seldom accompanied by lancination. After a longer or shorter time, tumefaction may be traced, though sometimes but slight, it may be as small as a musket ball, or as large as the fist. This swelling of the bones is owing to the separation of their laminæ, by the presence of the foreign body; it follows that they become thin, and but slightly resisting, yield to the pressure of the finger, and communicate the sensation of a piece of parchment, or rather a slight crepitation, which I regard as a pathognomonic sign. The sign is deserving of strict attention; should any doubt exist, we should make an exploring puncture; this puncture and crepitation are two tests which leave no doubt, as to the existence of a cyst of this nature.

These tumors we have said, are seated in the thickness of the bones; they are found in the ends of the long bones, in the bodies of the vertebræ, most frequently in the bones of the face; thus, for instance, they are met with in the horizontal ascending rami of the lower jaw; the alveoli, antrum, and nasal fossæ of the upper maxilla; their shape is generally ovoid, sometimes oblong, they may be flattened. Their volume is not uniform, and may vary from the size of a musket ball, to that of the fist. Their parietes are formed at the expense of the very bones in whose cavity they occur.

The *diagnosis* of osseous cysts, demands great practice and experience, but the difficulty is partly removed, when no osteo sarcoma exists. It will be, therefore, proper here to expatiate on the diagnosis of this species of tumor, and above all to establish the differences which exist between them and osteo sarcoma, with which a superficial examination might confound them, and from which it is so important to distinguish them.

Osteo sarcoma is marked from its onset, by lancinating pains, a varicose swelling, and simultaneous alteration of the surrounding soft or hard parts; then fungous disorganization and numerous inequalities. In bony cysts on the contrary, the surrounding parts do not participate in the disease; their surface is smooth, equal, and their increase indolent. Osteo sarcoma grows rapidly; the growth of the latter species is always much slower; the interior of an osteo sarcoma is traversed by scales, and fragments of bone, which are never found in the others.

As to the crepitation, which is not observed as we have described it, in osteo sarcoma, and which is a pathognomonic sign of the tumors in question, it resembles strongly that which I have observed in tumors divided into two portions above and below the palmar carpal ligament, with this difference, that in the latter case, the crepitation is owing to the concussion of the tumors, which are in our opinion, merely hydatids. To crepitation must be added the exploring puncture which is of very great importance. We have hence three orders of signs, by which osseous cysts may be distinguished from osteo sarcoma.

The following practical consequences may be deduced from this distinction. 1st, osteo sarcoma, and osseous cysts are essentially different from each other. 2d, osteo sarcoma is the cancerous degeneration of the bone, the bony cyst is merely the development of the bone, owing frequently to the presence of fibrous

bodies, like those of the uterus; 3d, when there is no degeneration, we may, by an incision, reach the tumor, remove it, and have no fear of its return; such is not the case in osteo sarcoma; extirpation is here useless, for the disease is of a cancerous nature.

The progress of bony cysts is generally slow; some however attain a large size in a few months, whilst others are stationary for many years. After a longer or shorter time, they degenerate into cancer, especially those of which the products are fibro-cellular.

The material of a cyst is easily re-produced, sometime once or twice, until they are entirely destroyed.

CASE IV.—A young man, 15 years of age, consulted me on the 6th of July, 1832, for a tumor of the anterior portion of the alveolar edge of the upper jaw bone. On examination I perceived a sensible crepitation, and judged that it was a cyst with osseous parietes. A puncture gave exit to a flood of fluid matter. I then made a large incision, for the following reason. An operation had been recently performed upon the boy, and according to his father's account, a large quantity of water was discharged, and yet the disease returned. Why? because the part giving rise to the secretion, had not been destroyed, and a new product had been formed. What was to be done? Destroy the cyst by exciting in it inflammation and suppuration. This would have been done by means of lint and irritating injections, if the young man had not gone away immediately after the operation.

CASE V.—In 1813, a young man, of the same age as the foregoing, came to the Hotel Dieu with a tumor on the lower jaw. This tumor occupied the whole of the right side of the body of the bone, and appeared to extend into the thickness of the ramus of the same side. It was about as large as a goose's egg, exceeded the base of the jaw, had pushed the teeth inwardly and was constantly progressing. M. Dupuytren decided on its removal. The little patient full of courage, earnestly solicited the operation. It was performed on the inside of the mouth; an incision made into the mucous membrane, at the level of the base of the tumor; this base removed by the gouge and mallet; a thin lamella of bone divided; and it was soon found to form a shell inclosing a tumor of a different nature. On removing this shell a fibrous substance was seen; a large portion of it was removed, and the patient being exhausted by fatigue put to bed. The remains of the tumor grew rapidly, as it was soon as large as before. That which appeared was a second time removed, and a red-hot iron applied. But it again was re-produced. The professor then decided on a third operation, and this time in order to repose the whole of the base of the tumor, he divided the lower lip from its free edge as far as the os hyoides; turned the flap aside, removed with forceps a fibrous, round, lobulated free body, filling an enormous cavity in the ramus of the maxilla, and then cauterized all the parts of the bone from which the tumor grew. The patient was radically cured, the fibrous bodies removed in the three operations were precisely similar to those found in the uterus.

The *prognosis* of bony cysts, continued M. Dupuytren, is favorable, all are cured by the operation. They may be re-produced, when they have not been entirely removed; it is therefore sufficient to know this tendency to relapse in order to prevent and overcome it. This is not the case when the fibrous substance has degenerated into cancer, and the surrounding parts are

implicated; the termination is then fatal. Hemorrhage may be feared in some cases, the exploring puncture, furnishes the means of avoiding it, and arresting it when it occurs. If the tumor has caused much deformity, the most skillfully performed operation, will leave some evidence of the disease, but this is not to be compared with the consequences of the disease if left to itself.

The nature of osseous cysts being known, the best way to cure them, is to destroy the disease. This should be done as follows: In the greater number of cases, an exploring puncture is to be made, in order to ascertain the kind of product contained in the cyst; an incision is then made over the tumor; when in the face, this incision should be made on the inside of the mouth. Having reached the centre of the malady, it should be extirpated, especially when the product is solid, and here the actual cautery will sometimes be useful. The effects of the disease being removed its cause should be attacked, for there is a tendency to its re-production. With this intention lint should be introduced into the wound, and emollient or irritating injections, according to circumstances, thrown in. These means almost always cause an inflammation of the parietes of the cyst, and consequently the destruction of the lining membrane; the parietes then come in contact, and the cure is complete after a longer or shorter time. In some cases a counter-opening must be made and a seton passed through the two wounds.

CASE VI.—A man had at the left angle of the lower jaw a tumor, which was recognized as an osseous cyst. A puncture was made on the inside of the mouth, and a liquid matter escaped. M. Dupuytren enlarged the aperture, and as it could not be expected, that this opening which would admit the saliva, food, &c., would suffice for the cure, a counter-opening was made externally and lower down. The finger then introduced, discovered a semi-fluid matter, a seton was placed through the wounds, and in a month after the operation, the tumor was reduced one half. It was then of little moment, how much time was occupied in its entire removal, the most important point being to ascertain whether it was formed by a cyst of this species, or an osteo sarcoma.

After the operation, a poultice was applied to the tumor, and the man ordered to be dieted. Several bleedings are often required, to subdue the inflammatory symptoms.

CASE VII.—A young woman was admitted into the Hotel-Dieu, in July 1828, for a tumor in the lower jaw. It was ovoidal, of the size of a hen's egg. Its progress had been slow, without lancinating pain, appearance of fungus, or change in color of the skin; it projected more externally, and its position required a different mode of operation. Crepitation was evident. On the 11th of July, the patient was taken to the operating room; a new examination confirmed the first; and the crepitation, which had momentarily disappeared, on account of the depression, from too frequent handling of the bony parietes of the cyst, was manifest, the return of it being undoubtedly owing to the retrograde force of elasticity of these parietes.

An incision, about an inch in length, was made along the posterior edge of the masseter muscle, starting a few lines below its middle, in order to avoid the lesion of the vessels and facial nerve. This incision extended as far as the angle of the jaw; the edges of the wound being separated, the operator

could more easily see and feel the parietes of the cyst, surrounded by a membrane apparently of a serous nature, soft and velvet-like to the touch; no fungus or inequality could be felt on the surface of the cyst, which was perfectly smooth and equal.

An incision was then made across its anterior portion, and there immediately gushed out a quantity of reddish and bloody serum; no solid substance could be perceived. A pledget of lint was then introduced through the lips of the wound and cyst, in order to prevent their union; emollient injections thrown into the sac, and emollient poultices applied to the cheek. Venesection was recommended, should, as probably would be the case, this simple incision of the soft parts and the parietes of the cyst, give rise to local or general symptoms sufficiently intense to require it.

When suppuration is once established in the interior of this sac, said M. Dupuytren, if the pus collects and the upper aperture is not sufficient for its discharge, a counter-opening must be made in the most dependent portion, and this is the worst the patient can expect, in order to be cured of a disease which was long thought incurable, and of which, in two months scarcely a vestige will remain.

We will no longer occupy your time with cases of osseous cysts; what has been said of these symptoms, characters, and treatment, demonstrate sufficiently, that this point of pathology, although new, has been clearly explained by the professor. Experience will undoubtedly reveal new products; but it is doubtful whether a more efficacious plan of treatment can be substituted for that which he has recommended.

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## CHAPTER XXI.

### OF SEROUS CYSTS CONTAINING SMALL WHITE BODIES, CALLED HYDATID CYSTS.

#### *Of their Diagnosis and Treatment.*

The history of serous cysts containing small white bodies of the nature of hydatids, said M. Dupuytren, was but little known before the observations of M. Cruveilhier in his essay on pathological anatomy. This distinguished physician first published my researches on this species of disease, of which the existence has since been proved by very numerous cases.

In those which have fallen under my notice, I have observed, that these cysts, almost always appear at the wrist, on its palmar surface, under the anterior annular ligament of the carpus; I have, however, seen them on the instep, under the anterior annular ligament of the tarsus; but in all cases, I found them around synovial membranes and tendons. In some rare cases they have been seen on the olecranon, above the acromion, on the tuberosity of the ischium and outside of the great trochanter.

Blows, falls, pressure, distension, and repeated friction, are apparently the most frequent causes of the development of these serous cysts, although they not unfrequently occur without any appreciable cause.

Those on the foot generally arise from the use of too tight a shoe. Add

again the causes developing hydatids in other places, and they must then be sought either in the kind of life, dampness of location, or the delicate and lymphatic constitution of the patients. Some years ago, I saw in the Hotel-Dieu, in the case of a young girl, a blow of a whip on the forehead give rise to a true encysted tumor which I opened, and from which issued a true hydatid filling it entirely. Their growth is generally very slow; and they frequently are stationary for many years.

CASE I.—M . . . ., was admitted into the Hotel-Dieu on the 2d of November, 1800, for a tumor situated on the palmar face of the wrist. He attributed the disease to an attempt to lift a very heavy paving stone, when he was twelve years of age. He felt at that moment acute pain and immobility of the wrist. In a few days a tumor appeared which at first small, increased gradually for six months: it then remained stationary, and caused but slight inconvenience.

M . . . ., became a goldsmith and worked at this business for three years, when fearful of the further progress of the disease, he determined to enter the Hotel-Dieu. At that time the tumor was seated on the palmar surface of the wrist: or rather, there were two tumors, one projecting above the anterior annular ligament of the carpus, the other below, and communicating under this ligament. Pressure upon one raised the finger applied to the other and the displacement of the contained matter communicated to the fingers a sensation of friction as if small solid bodies were striking against each other or against the parietes of the cyst.

It was then ascertained that a communication existed between the tumors. Pressure continued for two days caused the matter contained in the upper one to pass into the lower. An incision was then made in the latter, and by means of slight pressure, a quantity of small whitish bodies, of different forms, choroidal, cylindrical, and lenticular were extracted; the largest of about the size of a large pear-seed, the smallest not larger than a millet-seed, and all with smooth surfaces.

This little operation was followed by the consequences which were expected; suppuration ensued, at first of a bad quality, then healthy, and cicatrization took place. The cure, however, was only temporary; the cyst had merely been emptied, its vitality still remained. Nothing had been done to excite inflammation in it, and consequently the tumor soon re-appeared.

The patient, then twenty-six years of age, unable to pursue his business, was a second time admitted in the hospital, on the 12th of March, 1813. The tumor presented the characters already described, and its nature was clearly pointed out by the concomitant circumstances.

Two days after his admission, M. Dupuytren made a puncture below the annular ligament; at first a little serum escaped. A female sound, introduced between the approximated flexor tendons, extracted a small white body, resembling a pear-seed stripped of its epidermis. The next morning, the puncture was enlarged, and a quantity of similar little bodies escaped. A counter opening was made, and a seton covered with cerate passed through the wounds.

Two hours after the operation, a chill came on, followed by heat and perspiration; the pulse was strong, the night restless. The next morning, suppuration had begun; there was some tumefaction. Emollient poultices and

strict diet were prescribed. Third day the swelling increased, the pus collected above and below the apertures. It was dressed twice daily and pressure applied which expelled pus mingled with white and perfectly formed bodies. Fifth, An abscess which had formed on the back of the hand, was opened. Sixth, Two other abscesses were opened, one on the course of the radial artery, the other on the ball of the thumb. Eighth, Severe chill after the dressing, followed by internal heat. The tongue became covered with a yellowish coat, the pulse accelerated, fever very high, the countenance changed, and became shrunken, the patient began to despair; the swelling of the hand was considerable; suppuration copious and fetid; the least motion was painful and productive of a crepitation giving rise to a fear of disorganization of the ligaments and caries. These symptoms lasted for two weeks. After this time, they diminished, as well as the swelling and suppuration, the patient was able to walk about; his appetite and strength gradually returned, the openings ceased to discharge pus, some closed, others remained open longer, an abscess formed on the back of the hand; but he at length was discharged cured, with the perfect use of his fingers and wrist.

Before the serious accident which happened after the second opening, M. Dupuytren had conducted the patient to M. Bose, a member of the Institute. Seven or eight of these bodies were extracted in his presence. When examined by a powerful microscope, they did not appear to move. Forcibly compressed between two pieces of glass, they were reduced to a transparent membrane, having no appearance of mouth nor organs of suction. M. Bose having learned from experience, that demi-dessication is a very favorable state for minute examination, it was done, but with no better success. He hence concluded that they were not hydatids but fragments of the adipose cellular tissue floating in serosity. M. Dumeril performed the same experiments, with a similar result.

The mistake of these learned gentlemen may be easily perceived. Indeed, these bodies did not stain any substances with which they came in contact. When pressed for a long time between pieces of blotting paper or clean silk, no appearance of grease was left upon them. Again these naturalists were obliged to admit an apparently, individually, independent existence. These considerations and the attentive examination of these bodies which possess a shape nearly always similar, and a very apparent lamellated structure, have led me to conclude, that they were distinct from the being in whom they were found; in a word, they were true hydatids. If they were not organized, how could they remain uninjured several days floating in pus? I also think that I have several times distinguished motion in them.

When examined after the opening of the tumor they are found to be whitish, opaline, transparent, wrinkled in the direction of their long diameter, forming a species of sac, of which one extremity ends in a large round cul-de-sac, and the other is contracted like the neck of a bottle; they are evidently composed of laminæ and resemble pear-seed; they are sometimes cylindrical, sometimes conoidal, sometimes lenticular. Their consistence is almost cartilaginous. They seem to have passed through many stages before reaching their complete development; sometimes, I believe, a cavity has been found within them. These white bodies are surrounded by a thin, smooth, yellowish, and serous cyst, containing a transparent serosity.

The situation and shape and the first symptoms indicate the existence of these tumors. We have already spoken of the former of these signs. Their shape has been compared to a kind of bug. Indeed, wherever they may be situated, they are always divided into two parts of more or less equality. By pressure the fluid may be driven from one to the other, and during its passage a crepitation may be distinctly heard, a noise similar to that produced by pouring grains of half-boiled rice from one bag into another. This sensation is the pathognomonic sign of the disease. When it is felt the nature of the tumor may at once be decided upon. A few years ago, continued M Dupuytren, I was called to see a patient with a tumor on the wrist. I recognized this symptom, and instantly pronounced it to contain small white bodies, which I considered hydatids. Several gentlemen who were present, looked upon my diagnosis as rather hasty; they however agreed in opening the tumor. On the day fixed for the operation, I brought a small phial in order to collect these bodies to analyse them. This excited the mirth of the surgeons who had not concurred in my opinion. The opening was scarcely effected, when a large quantity of these little white bodies gushed out, and confirmed my diagnosis.

Generally without pain, or change of color in the skin, unless the latter be from any cause whatever secondarily inflamed, these tumors may increase to such a size as to impede the freedom of motion of the joint, near which they may be situated, and by thus preventing the patient from following his ordinary occupation, require to be extirpated.

CASE. I.—During the year 1829, a man consulted me, for a tumor on the fore-part of the wrist joint. This tumor was hard, resisting, about the size of a pigeon's egg, projecting above and below the anterior annular ligament of the carpus. The color of the skin was unchanged, and no engorgement existed in the surrounding parts.

Founding my opinion on the position of the tumor, on its division into two parts communicating with each other, and especially on the crepitation, I pronounced it to be a hydatid cyst containing a quantity of whitish bodies. A puncture having been made in the lower tumor, some serum and a considerable number of white bodies gushed out, some round, some elongated, of the size and shape of a pear-seed. A grooved sound was introduced into the aperture, passed under the anterior annular ligament of the carpus, and a counter opening made at the lower part of the fore-arm. A pledget of lint was placed in both openings in order to determine the inflammation, suppuration and adhesion of the serous sac. A small artery was divided in the wrist, but I did not tie it until the man had lost eight or nine ounces of blood, and I prescribed also the repeated application of emollient baths and leeches, if the symptoms of inflammation should require them.

The inflammatory stage ran very high, but was soon subdued by an energetic antiphlogistic treatment. In a month he was cured, with merely a slight stiffness of the joint.

Physicians have frequently erred in the diagnosis of these cysts. Thus, they have sometimes been taken for white tumors or chronic abscesses. In order to distinguish them, we should attend 1st, to their situation on the anterior part of the wrist or instep; 2d, to their sacciform shape; 3d, to the crepitation above pointed out.

Let us now consider the treatment:

Experience has taught me the fruitlessness of external agents, in the treatment of encysted tumors; whilst their efficacy has often been apparent in those which are not encysted. The opening of the cyst, and suppuration of its parietes, are, in the former case, the only means of cure. But in tumors of this nature, however small they may be, this remedy is not always without danger. I have seen very serious symptoms ensue, and even known the patient to sink under an inflammation which has extended to the hand and fore-arm.

CASE III.—In December, 1812, a carpenter, thirty-six years of age, sprained his right wrist, of which he was soon cured. In two or three months afterwards, a small tumor appeared in the palm of the right hand below the annular ligament of the carpus, and soon after another above this ligament. They soon became so large as to impede the motions of his hand. He consulted me on the 7th of June, 1814. An examination of the tumor soon convinced me of its nature. The next day, an incision was made in each tumor, and a quantity of small whitish bodies discharged; the aponeuroses of the hand and fore-arm were freely divided, in order to prevent inflammation with strangulation; a seton was introduced, and an emollient cataplasm applied to the hand. During the evening and night following the operation the pain was intense; on the 2d, 3d, and 4th days it increased with the swelling; a grayish, flakey pus was discharged from the wound; on the 5th day the seton was removed, the inflammation extended to the arm, and even to the armpit. The constitutional irritation was very great. Eighth day, the gangrenous aponeuroses were removed, and an abscess which had formed between the first and second metacarpal bones was opened, and the pus, which had infiltrated the fore-arm and hand, was expressed. Tenth and eleventh days, chills with chattering of the teeth, lasting ten minutes; pus extremely fetid, general debility, resisting the most powerful stimulants; death took place on the 15th day of the operation.

Experience and reason, have taught me, that when the opening of these cysts is determined upon, a large incision should be made in each half of the tumor. It suffices, indeed, to recollect the anatomical structure of the parts. On the instep, but especially on the palmar face of the wrist, the cysts are developed under aponeuroses, in the midst of tendons, vessels, numerous nerves, and a fibro-cellular tissue. Hence, if a small opening be made, the swelling, produced by the suppurative inflammation of the parietes of the cyst, almost always causes strangulation; this extends more or less to the surrounding parts along the fibro-cellular sheaths, covering the vessels and tendons, whether in the palm of the hand, or in the fore-arm and arm. Thence result numerous abscesses, and sometimes a phlegmonous inflammation of the whole limb, and even death, as was seen in the last case. By opening immediately and freely the two halves of the cyst; we avoid certainly the cause of these inflammations; no strangulation can then take place, suppurative inflammation sets in, and generally ends favorably.

After the incision, a pledget of charpie should be introduced between the lips of each incision. I have sometimes passed a seton through from one opening to the other; but have of late abandoned this method, believing it useless and dangerous. Indeed, it is sufficient to keep the edges of the wound separated, and thus oppose their union, in order to excite inflammation and

suppuration of the parietes of the cyst. The seton excites too acute an inflammation which may easily extend very far, and also communicate with the cavity of the joint, and thus become the origin of ankylosis. Were the seton only useless, it should be rejected: but it is dangerous, and should *à fortiori*, be abandoned.

Incision and suppuration of the cyst are therefore the only means of curing these tumors. It would be impossible to extract them entirely both from their position, and the knowledge, that they adhere firmly to all the surrounding parts. But since the suppuration of the cyst is not always without danger, and that notwithstanding the rules I have laid down, as regards the incision, and means of preventing secondary accidents, these accidents are sometimes to be feared, and may endanger the life of the patient; since, on the other hand, these tumors are never painful, and merely embarrass the motions of the joint, we should not have recourse to the operation, except when the size of the tumors, prevents the patient from following his ordinary avocation in life. On the contrary, the surgeon should advise him to bear his inconvenience with patience; and if he positively demand the operation, the risks and danger should be explained to him. When it has been performed, we should endeavor to confine the inflammation to its proper limits; and when too intense, antiphlogistic remedies must be immediately employed.

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## CHAPTER XXII.

### ON INVERTED TOE-NAIL.

I had always been struck, said Mr. Dupuytren, with the frequency of inversion of the nail of the great toe, and the reproduction of the disease, notwithstanding all our efforts. Persuaded that, for its successful treatment, a careful study of the causes producing it was necessary, I examined many patients laboring under this deformity, and at last discovered that there were two important varieties of the disease demanding entirely different modes of practice. Let us now proceed to consider this subject.

The first variety mentioned by writers, consists in the ulceration of one or both lateral edges of the nail; generally, however, found on the outer edge.

Call to mind the shape of the nail, the flattening of its body, the direction of its angles, its situation in the skin by which it is covered, and you will easily perceive that a tight or badly made shoe, by keeping up a constant pressure on the nail, will forcibly depress the angles of the nail, upon the skin on which it rests. Gradually these angles, always more or less acute and cutting, sink into the skin, the more easily as it thrust upwards and outwards, and tends to cover them; lastly, the irritation produced, will cause a very painful inflammation. Such, indeed, is generally the cause of inversion of the outer edge of the nail of the great toe.

The disease generally commences at the angle formed by the junction of the anterior with the lateral edge. This seems to be owing to this circumstance, namely, that as the prominence formed by the flesh, impedes the action of the scissors when we wish to cut the nail, we mostly desist before having

removed the whole of the anterior edge, and especially the angle formed by its union with the corresponding lateral edge. This disposition, allows the angle which has not been touched, to grow; it forms an acute point which punctures and divides the flesh, and soon becomes the signal of an ulceration which rapidly extends along the corresponding edge of the nail. This fact is so constant, that this point is always found. Having pointed out its causes, let us now study the phenomena of the disease.

Scarcely has the nail scratched the skin which it covers, than the pain becomes very acute. The patient can hardly walk or even stand; a serous, or sero-purulent matter escapes from the injured spot; and the whole foot becomes tumefied after exercise. The pain increases, the discharge is more copious, the sanious pus exhales an odor rendered still more fetid by the perspiration of the feet. The patient exhausted by the pain, endeavors to raise the nail, cut it from behind, which although productive of momentary relief, far from curing the disease, adds to the difficulty of the treatment. Lastly, if the disease be abandoned to itself, the ulcer resulting sometimes becomes cancerous, is sometimes covered with enormous vegetations, and not unfrequently the inflammation extending to the periosteum, gives rise to caries and necrosis of one or several phalanges.

This affection may sometimes be mistaken for other diseases. The marquis of C.... had suffered in this way for eight years, and during that time had consulted several physicians who treated the disease as gout, without the least benefit. He then consulted M. Dupuytren, who pronounced it an inversion of the nail, which would be cured by the removal of the cause. The patient consented to the extirpation of the nail, which was divided by a single stroke of the scissors, and each portion removed with the forceps. A simple dressing was applied, and the patient cured in a few days.

When left to itself, inverted toe-nail is never cured, on the contrary, the disease advances. Besides the intolerable pain, it may be productive of very serious consequences; prudence and experience therefore require its early cure.

Many plans have been adopted to disengage the nail, and give it a new direction. A portion of the nail, or of the diseased flesh has been removed. These means generally inefficacious, are ordinarily merely palliative. If the flesh on the side of the nail be destroyed, it is partly reproduced; and in walking the toe is flattened out and forms a fleshy tumor on the side of the nail, which, preserving its original direction, may again be driven into the flesh. If instead of removing the flesh, a portion of the inverted nail be cut away, a temporary cure follows; but when it grows, it again takes a wrong direction. For this reason, Desault's plan, which consisted in separating the nail from the flesh by means of a small piece of tin, although at first sight, it might appear preferable, was in reality not long successful. What becomes of the nail, thus forced laterally beyond the flesh? It tends constantly to roll inwardly on itself, and whether it be cut off on a level with the flesh, or permitted to grow and descend on the inner side of the finger, it frequently happens that it again penetrates the flesh. It may be asked, to what is owing the success obtained by physicians, by such different methods? Generally, whenever the determining cause has been purely accidental, and the structure of the nail itself has not occasioned the disease, the success of these methods depends on the

period at which the treatment was commenced. For instance, if a regularly formed nail has been compressed by a tight shoe, or contused by any external violence, and Desault's plan be applied in a few days after the accident, the subjacent flesh will not be sufficiently irritated to be much injured by the compression, and the nail being diverted from its wrong course, there is no reason why the disease should be reproduced. But, I repeat, whenever the cause of the disease is in the nail itself, all the plans hitherto suggested will generally be found unavailing.

Struck by these results, continued M. Dupuytren, and reflecting on the cause of the disease, I have for a long time preferred the entire extirpation of the nail.

This I perform in the following manner: when the general state of the inflammation of the limb has been somewhat reduced, and the time for the operation appears suitable, I introduce under the middle of the free edge of the nail, the point of a very sharp, straight and firm scissors; carry it by a rapid motion to the root, and divide the nail by a single stroke, into two nearly equal portions; seizing then the part corresponding to the ulceration with a dissecting forceps, I tear it off by twining it from within outwards; if necessary the same is done with the other. When the fungus in the vicinity of the wound, is too elevated, I apply the actual cautery, and thus secure, as far as possible, the cure of the disease. After this operation the skin under the nail dries, the ulcerated part withers, and cicatrizes in 24 or 48 hours; so that in five or six days the patient may resume his ordinary avocations. Generally the nail is not re-produced in old, but it is sometimes in young persons.

This might be supposed, at first sight to be a very painful operation; yet the patient scarcely utters a complaint. When the nail has been completely removed, the disease returns no more; and only re-appears when a piece of it has been left in the wound.

CASE.—*Inverted Toe-nail, Extirpation of its External Half.*—R... S..., 16 years of age, of a good constitution, was admitted into the Hotel-Dieu on the 18th of June, 1821.

For the last six months, he had been wearing shoes which were thicker and smaller than usual, his feet were compressed so that he limped in walking; the external angle of the right great toe was turned inwardly, plunged into the adjoining flesh, which was much tumefied. It was very painful and made him very lame.

On the 3d, of July, after a rest of a few days, baths, and emollient applications, he was carried to the operating room, and M. Dupuytren extirpated the inverted portion of the nail. It was divided with a pair of strong straight scissors; the outer part seized with the forceps, turned on itself and torn off; the hard skin covering it removed by the scissors. A little blood was lost. The wound was dressed with cerate, lint, a compress and bandage.

July, 4th, 5th, and 6th, he is doing well; dressing continued. 7th, the cicatrix is complete, the patient was discharged cured, and advised to wear a larger shoe, and wrap his toe in a piece of linen spread with cerate.

The second variety of inverted toe-nail, said M. Dupuytren, had for a long time been confounded with that we have just described; and I first pointed out the distinctions between the two species. In the latter there is no change

of rotation between the parts; the ulceration does not begin along the edge of the nail, but at its base; the disease is located entirely in the skin which produces the nail, and the change in the latter, instead of being the *cause* of that of the soft parts, is merely the *consequence* of it.

You will easily understand the mode of formation of the second species, after having examined the anatomical structure of the nail. Its adhering extremity, the only one we need here study, is fixed in the skin in a peculiar manner; the latter after passing over the nail, on its dorsal surface is reflected upon itself; having reached the posterior part, it separates into two parts, the epidermis which covers the whole of the superficial layer, and the derma which passes under the nail and is continuous with the skin, covering the free extremity of the fingers. The cul-de-sac into which this part of the nail is received, is known by the name of the *matrix*. It is hence very important to understand this disposition of the organ, which explains perfectly, why inverted nail is, in many cases, produced only by the doubling of the free extremity in the cul-de-sac. This change may take place in consequence of a severe contusion of the great toe. When this is the case, the patient complains at first of pain in walking, which gradually increases; the kind of cul-de-sac containing the base of the nail, reddens and becomes inflamed, as well as the bottom of the folds, which receive its lateral edges; ulceration soon appears and rapidly progresses; its shape is semi-lunar with elevated and hard edges, the bottom of it red, violet-colored and livid. The nail is shortened and reduced to one-half its extent; sometimes, indeed, it totally disappears, and in place of it, we see here and there small spots of a horny substance; a part of the nail is also often hidden under fungous flesh. This fungus may seem to distinguish the disease which results from a primary alteration of the skin, from that which is the consequence of inverted nail. When the disease is produced by the nail, the fungus is found before and on the sides of this nail; when the disease, on the contrary, proceeds from an affection of the skin, the fungus is always opened at the base of the nail.

In the cases of which we are now treating, the color of the nail is gray and black; in some cases it no longer preserves its natural adhesions; the wound is generally bathed by a sanious or sanguinolent suppuration, and extremely offensive. If the patient walk or even stand erect, the fingers bleed; all kind of covering is insupportable, and the least friction is very painful.

These symptoms are nearly constant; sometimes, however, the skin occupies particularly that part of the skin immediately under the nail. Little tumors are then developed which raise the nail, and are painful in proportion to the pressure. These tumors may be of different natures, fibrous, cartilaginous, osseous or vascular; and as a proof that their development is entirely owing to the alteration of the skin covering the nail; it will be observed that if they are removed without also removing the skin from which they arise, the latter generally again becomes diseased, ulcerates, and sooner or later requires to be radically extirpated.

After what has been said concerning this disease, it will be perceived that the treatment applicable to the first species of inverted toe nail, is useless in the second. The skin is here affected, and if the nail be removed, the seat of the disease has not been attacked, and many cases have proved to me, that such affections never are cured. If caustic be applied after the avulsion of

the nail, that part of the skin only immediately subjacent to the organ, is destroyed, and not that enveloping the root, and sometimes covering it to a great depth.

These considerations, added M. Dupuytren, have induced me to remove with the nails, not only all the ulcerated surface, but also the fold of the skin from which it derives origin and nourishment. In order to perform this operation, the patient is seated on a chair or bed, and seizing the toe with the left hand, I make a deep semi-circular incision, three lines beyond the fold of skin which supports the nail at its root; I then dissect off the flap, and remove all the skin which relates to the nail, and assists in its production; every vestige of diseased tissue is very carefully separated. All the white and fibrous parts which are seen in the bottom and angles of the wound, should be scrupulously extirpated, for these parts are the rudiments which could reproduce the nail, and keep up the disease.

This operation is very painful, but of very short duration. The toe is immediately enveloped in a rag spread with cerate, a thin layer of charpie, and a compress, complete the dressing. The patient is put to bed, and the leg supported by a pillow, kept in a state of demi-flexion on the thigh.

The patient generally suffers some pain during the few first hours after the operation; this, however, soon passes away, and at the first dressings, after two or three days, a healthy pus is mostly found covering the wound. The simple dressing is continued, healthy granulations soon appear, which are to be repressed if too elevated by lunar caustic. Should any portions of horny fibre reappear, they are to be torn away, and the skin producing them to be removed; in a majority of cases, about the 15th or 18th day the cicatrix is complete, and the patient cured. If the cicatrix be examined some time after, it will be found to be formed by a smooth, thick skin, having no nail, but sometimes assuming a corneous consistency.

It is needless to multiply the number of cases, and I will therefore merely recapitulate the different doctrines advanced, and present them under a form which may be understood at a single glance.

1st, Generally speaking, when the nail is altered, it assumes an improper direction towards the flesh surrounding it and this disease constitutes incarnation of the nail. Nothing but its removal will cure this affection.

2d, The disease characterised by primary inflammation of the skin, which seems as a matrix to the nail, is entirely distinct from the preceding species, in its symptoms, results, and the mode of treatment required. The removal of the whole of the diseased skin should be preferred to all other methods; it is the more prompt, and by far the most certain.

3d, We should never neglect to use all other remedies, of whatever nature, in order to spare the patient, an operation which is always exceedingly painful.

## CHAPTER XXIII.

## ON LUXATIONS OF THE HUMERUS.

*Reflections on the Most Important Pathological Points of Scapula-Humeral Luxations; Old and Recent Luxations, Reduced by a Plan hitherto New in France.*

A celebrated writer has remarked, in speaking of these luxations, that there were but few diseases in the treatment of which, the science of surgery had approached nearer to perfection than in these. In the course of this chapter it will be seen, with how little reason, the remark, at that period, was made. Indeed, many questions of high practical importance were never suggested, or are still without solution. Modern authors admit the primitive occurrence of these luxations in three directions, of which that which takes place *downwards*, below the glenoid cavity, is the most frequent. It had been established that in the orbicular articulations, the luxation is always *complete*: M. Dupuytren has proved by cases that in the scapula-humeral articulation it may be incomplete. The distinguishing marks of luxation and fracture of the upper extremity of the humerus were but very loosely pointed out, and in many cases the surgeon was unable to distinguish between them; recently the professor has had an opportunity, of characterizing with so much precision these injuries, that error can now be imputed to ignorance alone. In many and especially in old luxations, the plan of ordinary reduction, which he has so happily modified, was yet insufficient in the hands of the most skillful operator. M. Dupuytren did not hesitate to try recently a method but little known, and in several cases he has been eminently successful.

CASE I.—A beggar woman, forty-one years of age, was admitted into the Hotel-Dieu on the fifth of last August. According to her account, on the ninth of the preceding month, she was walking at a late hour of the night in the ditches surrounding the Champ-de-Mars, and was attacked by several individuals. She resisted as long as she could do so, but was struck down by a blow from a stick, and rose declaring that her arm was out of joint. Being taken to Saint-Lazare, some days afterwards, four successive attempts at reduction were made, with no other effect than that of increasing the pain she already suffered. Since these attempts, she has complained of a numbness in the fore-arm and fingers from which she had been previously free.

She was admitted into the Hotel-Dieu a month after the accident. She then presented the following symptoms; projection of the acromion, flattening of the deltoid, the elbow permanently removed from the side, inability to elevate the arm to the head, lastly in the arm-pit a projection evidently bony. These symptoms indicated a luxation; but they are also the symptoms of fracture. The crepitation and mobility of the fragments characterizing the latter injury, indeed, were not present; but they might have disappeared during the interval which had elapsed since the accident. On the other hand, the fracture might have resulted from the blows of the stick, as also the luxation might have been effected by the manner in which the patient struck the ground

when she fell; again, the bony projection in the armpit had not the feel of the round head of the humerus.

You will see, therefore, that if we be guided only by the rational symptoms hitherto laid down by all authors as the distinguishing characters of luxation and fracture, it would be impossible to pronounce *à priori* on the present case.

We will, however, attempt the reduction, taking care to avoid the injury which might be done to the patient, if perchance there be a fracture; for it must not be forgotten, that, when the latter is mistaken for a luxation, it may, indeed, be reduced, but when left to itself, the muscular action gradually reproduces the displacement: and on the contrary, when a luxation is mistaken for a fracture, it is seldom perfectly reduced. In all cases the patient remains more or less crippled. Before proceeding to the operation, the patient will be prepared, according to our usual custom by venesection the application of cataplasms around the joint, baths, and the administration of a few grains of the aqueous extract of opium.

On the appointed day, the reduction was attempted. The patient complained bitterly. In order to divert her attention and thus suspend the action of the muscles, M. Dupuytren told her that she was accused of having been marauding on the night of her accident, and reproached her severely. This plan, however, like many others, was unsuccessful. Notwithstanding, it was thought that the flattening of the deltoid was less marked. This circumstance and the fruitlessness of the attempt at reduction gave more probability to the idea of a fracture; the diminution of the flattening might have arisen from the callus as yet tender being pushed out by the efforts of extension, and in order to increase this tendency, a large pad was placed between the arm and the body, the elbow brought as near the latter as possible by means of a bandage. At the end of four days, however, the bandage has been of no effect.

The fact just laid down, gives rise to three important questions. 1st, The signs already enumerated being insufficient, how shall we establish the diagnosis? 2d, Supposing there be luxation and not fracture, and the means which we have hitherto constantly used with success, proving unavailing, by what means can we effect the reduction? 3d, Does the interval elapsed since the accident, contra-indicate the operation? or, in other words, after what length of time is it possible to reduce a luxation?

The difficulties of the present case rendered it one demanding our most careful investigation. At the same time, a young surgeon, Dr. Malgaigne communicated to us some ideas which had suggested themselves to his mind, and which appeared remarkably well founded. The following was the result of our examination: In the first place, there was considerable elongation of the injured limb. Now in all fractures of the long bones, if there be no displacement, the limb preserves its ordinary length; if there be displacement, so as to occasion overlapping, the limb is shortened. This symptom alone, was an undeniable proof of luxation: again, M. Malgaigne pointed out other signs, which we will now notice. The first, which is a consequence of the preceding, consists in an increase of elevation of the anterior fold of the axilla; 2dly, the head of the luxated bone ought to form, in his opinion, a projection in front, where the sub-clavicular depression is usually seen and the different appearance resulting from this on the two sides of the chest is especially evident in thin persons, as was

the case with our patient. 3d, lastly, said M. Malgaigne, by applying the fingers immediately beneath the acromion, the deltoid may be easily depressed, if there exist a luxation. Depression, on the contrary, is impossible in cases of fracture.

The nature of the injury being now ascertained the question arose whether its long standing did not contra-indicate an attempt at reduction. M. Dupuytren adduced many examples from his own experience, tending to disprove this position; it was therefore decided upon, and his attention turned towards finding the most effectual means of reducing the luxation. M. Malgaigne here submitted to his consideration a plan hitherto unused in France, which consisted in making extension, the arm being strongly raised up and consequently shortened, instead of the usual manner. It is merely, said this young surgeon, the application to the present case, of a general principle applicable to all nations, namely to dispose of the bones in such a manner, that they may overlap each other, and that extension may restore to the limb its lost length.

We will now, said M. Dupuytren, be enabled to judge of this method by its application to the present case. You should, however, understand that it is not to be condemned, should it not succeed in a case which has baffled our ordinary plan; if, on the contrary, it should succeed, it may be supposed to possess some superiority.

The patient having been properly prepared, the reduction was attempted on the 14th of August. Being placed in a supine position, a cloth folded transversely was placed over the acromion, the ends carried to the feet and held by assistants. The extending band was placed in the usual manner and given to two assistants, the luxated arm elevated as much as possible, so as to make it parallel to the axis of the body, and extension then attempted. The first extension gave but little pain, the head of the bone was very apparent in the axilla, it gradually rose towards the cavity to which the extension drew it, and the folds of the axilla, which hitherto had been effaced, presented the hollow which usually separates them. The head of the humerus was pressed by the fingers and palm of the hand, in order to assist it in regaining the glenoid cavity, the arm brought down to the body, but twice this plan failed.

M. Dupuytren here took charge of the operation, and pressing strongly with the palm of his hand on the head of the bone, whilst extension was made parallel to the axis of the body, he desired the assistants to lower the arm and approximate it to the body, at the same time keeping up the extension. The first attempt failed, the second succeeded entirely, the humerus returned to its place *without the least noise*. The shoulder recovered its roundness, the elbow could easily be brought to the body, the motions of the joint were executed with facility, the projection in the axilla had disappeared. The patient was carried to bed, a small pad was placed in the axilla, and the elbow fastened to the side. In a few days the pad was removed, and the elbow merely confined by a bandage; every thing went on so well, that M. Dupuytren did not hesitate to predict a complete cure.

CASE II.—A washer-woman, 69 years of age, small and very thin, fell backwards down the trap-door of a cellar, and rolled along a dozen steps. The accident occurred at 8 o'clock on the morning of the 27th of last October; she came immediately to the Hotel-Dieu. M. Dupuytren recognized it to be a

luxation *downwards and forwards or sub-coracoidal*. The reduction was immediately attempted. An assistant grasped the wrist of the luxated side, raised it parallel with the axis of the body, and drew directly upwards. Another assistant pressed on the scapula in order to make counter-extension. M. Dupuytren, being seated, directed the head of the bone with his thumbs. At the first trial, the reduction was effected easily and nearly without pain. The arm was carefully brought down, applied to the body and kept so by a bandage. In 12 days the patient was well.

CASE III.—The third day after the operation on the preceding case, a woman of about 40 or 45 years of age, thin and tall, came to the consultation of M. Dupuytren, to receive advice concerning a luxation of the humerus downwards and forwards. She was laid on a bed, a folded cloth passed over the shoulder, the ends being carried towards the lower extremity of the opposite side and given to two assistants to make counter-extension; two other assistants raised the arm parallel to the axis of the trunk and made extension, whilst M. Dupuytren pushed the head of the bone upwards. The luxation was reduced at the first trial, and the patient immediately began to laugh. She did not remain in the Hospital.

In the two last cases, the circumstances were of the most favorable kind; the luxation was quite recent, the patients then weakened by age, and without much muscular energy. Our usual plan would have been equally successful. Nevertheless it must be remarked, that it was unnecessary to use any precautions, the patients were not fastened to the ring in order to make extension; the reduction was easily effected, and with remarkable ease and promptness. I think, therefore, that it would be unjust to attribute all these advantages to the age and constitution of the patients, and deprive the method of the share of credit to which it is entitled.

We will apply it again to other cases of luxation of the humerus which may fall under our notice; and in the meanwhile, request your attention to some other questions of not less importance.

If clinical observation had not established the frequency of these luxations, the anatomy of the joint, would render it very evident. The joint enjoys its remarkable mobility, only at the expense of its solidity. The elements of the articulation are, as you know, a cavity protected by an osseo-fibrous vault, a bony head received in this cavity, a capsule enveloping them, and a number of muscles communicating motion to it. But the disproportion existing between the head of the humerus and the glenoid cavity, the laxity and thinness of the capsular ligament, the situation and motion of the arm, expose it daily to the influence of external violence, and constitute circumstances more or less favorable to its displacement. They would be still more efficacious if the scapula which accompanies the humerus in its movements, did not also extend the limits of the relations of these bones.

There is perhaps no subject in surgery with regard to which authors are more divided than with respect to dislocation of the arm. This is not the place to enter into a history of those differences, and I shall, therefore, content myself with reminding you that experience and observation have convinced me that the arm may be dislocated in three principal directions: viz. 1st, downwards, on the axillary border of the scapula; 2d, inwards and forwards into the sub-scapular fossa; 3d, outwards and backwards into the

sub-spinous fossa. The presence of the acromion and coracoid processes, united as they are by a strong ligament, and the situation of the humeral extremity of the clavicle, are opposed to direct luxation upwards; nevertheless Sir A. Cooper admits a partial luxation in this direction, the upper part of the capsule being lacerated, and the head of the bone resting upon the posterior edge of the coracoid process.

The dislocation of the humerus downwards, the only one which, according to some authors, is primarily possible, is undoubtedly the most common. It is generally produced by a fall on the elbow, and still more on the palm of the hand, the arm being extended and projecting directly from the body. The humerus is then inclined on the glenoid cavity in such a manner as to form with it an acute angle. The head of the bone, thus slipping from above downwards in the articular cavity, comes to be pushed against the lower part of the capsule; this pressed in a contrary direction by the weight of the body, is torn, and suffers the head of the humerus to escape. This is then placed on the inner edge of the anterior border of the scapula, between the subscapular muscle which is before, and the long portion of the biceps which is behind. The pectoralis major and corresponding muscles act like a lever, the point *d'appui* of which is at the elbow, and the resistance to which is at the shoulder joint. The luxation downwards, may also, according to some authors, be produced by a violent blow on the external part of the shoulder beneath the acromion. But then it is often complicated with fracture of the scapula or humerus. It may also be caused by mere muscular action in a violent effort of the arm to raise a burden, or in an epileptic fit. The symptoms of this luxation are—a lengthening of the arm, its oblique direction outwards, the elbow separated from the trunk, with inability to approximate it, the head and body bent to the affected side; the fore-arm semi-flexed; impossibility of the spontaneous movements of elevation or rotation; pain on attempting these; deformity of the shoulder, projection of the acromion, with a depression under it, a hard round tumor in the axilla.

The luxation inwards or forwards supervenes upon a fall on the elbow, when separated from the body, and carried backward. The evidence of this situation when the patient is raised; the presence of a tumor formed by the head of the humerus, beneath the clavicle and before the shoulder, which is less deformed than in the preceding case; lastly, the impossibility of bringing the elbow forwards without giving great pain, leave no doubt as to the existence of a luxation of this kind. It is much more rare than luxation downwards; it is also seldom primary, but almost always consecutive upon the first.

A fall upon the elbow, carried powerfully forwards and upwards, may cause dislocation outwards and backwards. This displacement is extremely rare, and would perhaps be impossible without a vicious disposition of the glenoid cavity, such as its being inclined backwards and considerably elongated. In this dislocation, the arm little separated from the breast, is directed forwards and inwards, the shoulder is merely flattened at its anterior part, the head of the humerus is driven beneath the spine of the scapula, towards the external border of the anterior angle of this bone.

I have thought it right to enter into these preliminary details, in the first place, particularly with a view to the modifications which I wish to introduce, of the theories generally received on this subject, and which I shall give you a

*resumé.* 1st The oblongation of the limb in the dislocation called downwards, is not a fact newly observed. I have seen it in all those whom I have attended in a very long practice. But does this elongation take place in all dislocations of the humerus as some assert, or, on the contrary, is the arm at one time longer, and at another shorter, according to the kind of luxation, as others maintain? 2d, Can the humerus be luxated primitively in one direction only, and are the other varieties only consecutive? 3d, If it be true that there is but one kind of primitive luxation, in what direction is it? 4th, Can dislocation only take place with laceration of the capsular ligament; or is it sufficient that this be stretched and distended? 5th, The capsule being torn, can it, by exercising constriction round the dislocated bone, oppose the reduction as maintained by Desault? or are we to agree with Sir A. Cooper who holds this obstacle to be entirely imaginary? Lastly, there exists disagreements with regard to the anatomical structure of some of the modes of union of the articulation, each explaining according to his own views the mechanism and frequency of dislocation of the humerus. It is thus that some, and I agree with them in opinion, admitting that the lower part of the capsule is most feeble, have considered dislocation downwards as the most common; whilst others maintain that this part is the thickest, and only rank dislocation downwards, in the third degree of frequency. It would be easy for me to adduce facts from my own experience, which would settle most of these opinions, but I shall confine myself to directing your attention to the various points where cases illustrative of them occur to us.

It is generally stated that luxations of the orbicular joints are always *complete*: but pathological anatomy has proved the contrary, by presenting us with *incomplete* dislocations of the arm and thigh.

CASE IV.—In 1824, the surgeon in chief of one of the hospitals of Paris, presented to the academy a pathological specimen taken from a man who died eight months after a luxation of the humerus, which had never been reduced. It showed a false articulation made, on the one side, by the glenoid cavity of the scapula, and a small portion of the surfaces of the ribs; on the other, by the head of the humerus hollowed into a groove in order to receive the anterior edge of the glenoid cavity, like a kind of ginglymus. During life the arm could only be moved slightly backwards. In a case of a spontaneous luxation of the femur, the same surgeon has seen the head of the bone arrested on the anterior edge of the cotyloid cavity and fixed there by means of an indentation. Here are two authentic cases of incomplete luxation of true orbicular articulations; a luxation of which the possibility, difficult indeed to accredit, has been universally denied by authors.

We have already observed the symptoms peculiar to each species of scapula-humeral luxations; we have also shown that these symptoms belong also to fractures of the upper extremity of the humerus, and that in many cases the diagnosis between these accidents becomes very difficult.

Every one, continued M. Dupuytren, affected with luxation or fracture of the upper part of the humerus, will be found to have fallen on the side of the injury; but the position of the limb, at the moment of falling, is not the same in any two cases; and this difference usually decides the kind of lesion which results, and furnishes the means of recognizing it. If the arm being separated from the body, and carried forwards or outwards with a view to break the fall,

there be displacement, then such displacement will be a luxation of the head of the humerus without fracture. If, on the contrary, the arm has been kept close to the side (this patient, for example, having his hand in the pocket of his pantaloons) it is the ball of the shoulder against which the weight of the body impinges; and then, if there be displacement, it is as the result of fracture, or crushing of the head or the upper part of the humerus.

In both cases there is acute pain at the top of the shoulder, and the patient always thinks that the fall has taken place on the seat of his suffering. But when it is the result of luxation, the fall having occurred on the palm of the hand, this last is generally soiled, or bruised and excoriated; if, on the contrary, the pain is caused by fracture, we observe that the fall has taken place on the shoulder itself, by the absence of all marks about the hands, by the soiling of the clothes, or even of the skin of the arm, which is also frequently bruised or wounded.

In luxation, the pain depends on the laceration of the fibrous capsule and neighboring tissues; in fracture it results from the contusion of the upper part of the shoulder and the injury done to the soft parts by the broken bone. There may be ecchymosis about the arm in either case; but in luxation it is produced by laceration about the inner part of the joint, and in fracture by the contusion of the outer part; and thus the seat of such appearance is different, being on the inner side in the former case, and on the outer part of the arm in the latter. Besides, ecchymosis is less common in dislocation, but almost constant in fracture.

In both lesions the acromion is salient, the deltoid flattened; there is a void at its inner margin, and in the hollow of the axilla there is now a projection: but an exact analysis of the symptoms removes the doubts which a superficial examination may have produced. In fact, the projection of the acromion is more considerable, and the flattening of the deltoid greater in luxation than in fracture, when this muscle appears swollen. In luxation we feel, at the inner side of the deltoid, a very great hollow produced by the displacement of the head of the bone; this hollow is less in fracture. The prominence in the armpit in consequence of luxation is very considerable, while in fracture it is much less; and in the former case its shape is round, while it is uneven in the latter.

Neither mobility nor crepitation are present in luxation, while they are easily observed in fracture. In short is the humerus luxated? Motion of the member is vainly attempted, though it may move indeed with the shoulder itself, as if it were one and the same piece. Is it fractured? There is an unnatural mobility on a point in the upper extremity of the bone, a mobility which is usually accompanied by crepitation, perceptible on attempting to rotate the bone about its axis. In fine, what above all other things distinguishes luxation from fracture is, that the former is more difficult of reduction; but once reduced, requires only to have the arm secured to the breast; whilst in fracture an apparatus is indispensable, in order to keep fragments in contact, to prevent the muscles from reproducing the displacement, and to obtain a cure without deformity.

It sometimes happens that, when the fracture consists merely in a simple solution of continuity without displacement, it may be confounded with a violent bruise of the shoulder. Our only means of assuring ourselves of what

has actually happened, is derived from the diagnosis afforded by crepitation and mobility. We must, however, not let ourselves be deceived by a false crepitation, which consists in a crackling which is sometimes met with, arising from a violent contusion of the shoulder, and which is the result of the inflammation of the articular surfaces, and of the want of synovia. The following are some cases calculated to exemplify our views.

*CASE V.—Fracture of the Neck of the Humerus, with Slight Displacement of the Head of the Bone, simulating Luxation.*—An old soldier, at present a shoe maker, aged 62, while walking along an inclined plane received a fall, in which the weight of his body came down on the left thoracic member. He was taken to the Hotel-Dieu the day after the accident, when there appeared a considerable swelling around the scapular humeral articulation; a contraction of the deltoid with increase of thickness and length of the muscle, which, notwithstanding was perceptibly pitted; projection of the acromion more marked than usual; inability to bring the arm in contact with the trunk; a crepitation and mobility, though very obscure; a rounded tumor, resembling the head of the humerus, in the arm-pit; and a sort of prominence at the internal part of the shoulder beneath the pectoralis major. These were complicated symptoms, but M. Dupuytren pronounced without hesitation the existence of a fracture. The apparatus was applied, but two days after the swelling was augmented, and it was perceived in dressing the patient that the deltoid muscle was not so large, thick or contracted as it appeared at first; that it could be depressed; that there was a hollow below the acromion, which was itself less prominent than it had been; in fine the absence of all mobility, and the presence of a perfectly rounded head in the axilla, gave reason to pause before finally adopting the opinion of its being a fracture.

Some attempts were made at extension. A pad filling the arm-pit was managed as in fracture of the clavicle; the arm applied to the pad was then fixed, by several circular folds of a roller, commencing at the lower part of the limb, and encircling the trunk, and so applied as that the inferior third of the humerus, covered by the roller, was directed a little forwards and inwards, whilst its superior extremity was turned a little backwards and upwards, resting meantime on the cushion. In five days the swelling had subsided and was nearly gone; crepitation was easily discovered, and the fingers introduced into the arm-pit could feel the inferior fragment which was very rough, and seemed to be composed of several pieces slightly movable. The head of the humerus could also be felt: it was displaced, and turned a little forwards and inwards. The *apparatus* was reapplied, and renewed at first every three days, afterwards, every five or six. On the fortieth day it was removed altogether: there was no more mobility or crepitation, the limb had resumed its ordinary length, and the deltoid and acromion their proper condition.

*CASE II.—Luxation of the Right Humerus upwards and forwards, consecutive on a Luxation inwards.*—Hamlin, twenty-six years of age, a glass-cutter, was assisting at a fire, and while walking hastily along the roof of a house, five stories high, fell into a yard, breaking his fall by striking against a wooden shed eight feet from the ground. Upon reaching the Hotel-Dieu, there were found on him a luxation of the humerus, and several grievous bruises. The arm was placed on a pillow, the contusions were fomented, and a bleeding performed.

Next day, the patient lying on his back, his arm was laid on the pillow at a right angle from the body; the palm of the hand was turned forwards, there was detected within and beneath the pectoral muscles a projection formed by the head of the humerus, separated by only a few lines from the clavicle. By pursuing the examination after this manner, a luxation forwards and upwards consecutive on a luxation inwards was readily recognized. The patient was again bled, to syncope. On the following day, before the process for reduction was begun, M. Dupuytren observed that it would probably be a laborious business, for they had to deal with a strong, robust, and muscular man; and this sort of luxation was attended with much more difficulty than when it was downwards and inwards. This proved to be the case. The reduction was not accomplished until after severe and protracted exertions, and turning off the patient's attention repeatedly by anxious and multiplied questions. The arm was then placed and kept in a semiflexed position, and attached to the trunk by the aid of a towel. Fomentations were applied to the shoulder. In the course of twenty days the patient was allowed to move the parts: but it was long before he could recover the full use of his arm.

Luxation of the humerus is sometimes attended with fracture of the neck of the bone. In such cases even the combination of nature and the resources of art can do but little; yet a good diagnosis is of great value, in order to direct the proper applications. In order to distinguish the existence of fracture in such circumstances, M. Dupuytren's rule is this: Restore to the limb, by suitable methods, its natural form and length; then revisit the patient in about seven or eight hours, and if you find the shoulder deformed, you may be sure that there is fracture.

We have seen, continued M. Dupuytren, how difficult it sometimes is, to distinguish luxation, even when recent from fracture of the humerus. This, however, ought only to stimulate you to acquire precise notions respecting the nature of the injury; for mistakes on this head are commonly only among persons ill taught, and little accustomed to practice. In this hospital we have often had to treat patients laboring under luxations or fractures, which had been mistaken by practioners in town, although the characteristic symptoms were quite clear. But in old luxations the distinguishing signs are much more difficult to ascertain. The symptoms of fracture, if ever they existed, may have disappeared; there remain of course, those common to both injuries; but there are, besides, the peculiar symptoms of luxations, which time does not efface. These last, it behoves us to make out clearly in doubtful cases.

For this purpose we must attend to the diagnostic signs given in the preceding observations, namely, 1st, the lengthening of the arms, a sign by no means *new*, as we have already said, but of which hitherto all the importance has not been appreciated; 2d, the lengthening of the anterior limit of the axilla; 3d, the deformity of the shoulder, and the easy pitting of the deltoid under the fingers. As to the projection which is observed in front, beneath the coracoid process, and the pectoralis major, and which is independent of the osseous projection in the axilla, we must not attach more importance to it than it really deserves; for it is likewise observed in cases where the fracture is attended by a slight displacement of the bone.

In the latter part of this chapter, M. Dupuytren noticed that subject which may be considered altogether new in his hands, and which nobody, he said,

had fully discussed before himself, namely, the question as to how long a period shall have elapsed after the occurrence of a luxation, before we are justified in abandoning its reduction. The difference which exists in the possibility of reduction of fractures, is greatly modified by this standing. After several days, the bone and soft parts have contracted habits of position. The ligaments and muscles surrounding a disturbed articulation, acquire a stiffness which does not readily yield to reductive processes; and it may happen that the cicatrices after the rupture of the orbicular ligaments, may have already rendered the return of the bone into its cavity impossible.

It is only by repeated, and multiplied experience, observed M. Dupuytren, that any approach can be made to the solution of the question. The ancients thought it improper to attempt the reduction of a luxation after it had existed for some days; and this rule of conduct was long prevalent in the medical world. Benjamin Bell professed it, though he was well acquainted with the success which other English surgeons had obtained by contrary practice; his authority, however, influenced even Desault; but if we may believe Bichat, experience soon led Desault to a bolder method of proceeding; in fact the success which he met with in treating luxations of from fifteen to twenty days standing, led him to try what could be done after five and thirty. Bichat adds, that he has even assisted Desault, in the last two years of his life, in reducing luxations of two, three, and even four months duration.

A memoir containing six cases, by M. Flaubert of Rouen, and published in the *Repertoire d'Anatomie et de Chirurgie* would give little encouragement to practitioners desirous of reducing old luxations. In five of the said cases, the attempt at reduction gave rise to some serious accidents: the tearing of a large artery, and nerves and muscles. These accidents, says M. Flaubert, are the more to be dreaded, the longer the luxation has existed, and as it may have been accompanied with more or less swelling, and other inflammatory affections. But Dr. Marx, in the same journal, has treated the subject with his usual ability, and arrives at a conclusion altogether different from that of M. Flaubert. Whence, then, the difference? Is it founded on the age, sex, &c. of the different patients? Is it the different mode of reduction? Not this, certainly, for at Rouen, the process is exactly the same as that employed in the Hotel-Dieu. The whole difference, in short, seems to be this, that M. Flaubert was unfortunate in his cases, he was more unlucky than other surgeons in the cases selected for examples.

Of thirty-three cases of luxation brought forward to support the views of M. Dupuytren, twenty-five are of the shoulder in different directions, five of the femur, and three of the fore-arm: the following is a tabular view of them:

5 were reduced from the 5th to the 10th day.					
6	"	"	10th	"	20th "
4	"	"	20th	"	30th "
5	"	"	30th	"	40th "
5	"	"	40th	"	50th "
2	"	"	50th	"	60th "
2	"	"	70th	"	80th "
2	"	"	80th	"	90th "
1	"	"	90th	"	100 "

1 After two years.

Of the last case an account is given in the *Memoirs of the Academy of Surgery*, Vol. 5; it was a displacement of the thigh which occurred in the person of a young lady, 22 years of age, at the moment of parturition. M. M. Forestrer, Tissot and Cabanis of Geneva, saw the case and recognized the luxation; yet it is but fair to add, that doubts have been entertained by high authorities touching the real nature of the injury.

The tabular view just presented demonstrates, that the reduction of old luxations may be attempted and even effected, without, in general, incurring the risk of the serious accidents which appear to be so much dreaded. Should we wish only to proceed upon facts, we will conclude that an attempt at reduction, may be made in luxations of 90 days standing, as proved by the operation performed by M. Sanson. But if the attempt be safe at that period, there is no reason, I think, to suppose that it may not prove successful even at a more advanced period. Let us hope that facts will hereafter justify this supposition.

The *treatment* of luxations of the humerus, like that of luxations in general, may be divided into three principal stages; the preparatory treatment, the reduction and consecutive treatment. Although generally simple, luxations of the arm, may be complicated with œdematous engorgement of the limb, paralysis, injuries of the axillary artery, emphysema, inflammation more or less violent of the joint, symptoms which become the object of special indications. The engorgement is generally found, in the luxation downwards, rarely in other cases. It is caused by the pressure exercised upon the lymphatics and veins of the arm, by the head of the humerus; it generally disappears after the reduction, or should it remain, it soon yields to the application of a roller, soaked in some resolvent fluid, around the arm. The inflammation should be treated according to its intensity, by general and local bleeding, baths, emollient applications and fomentations. The partial or general paralysis of the muscles of the arm, happens when the circumflex nerve alone, which is most common, or all the nerves of the brachial plexus are distended or contused by the head of the humerus at the moment of its escape from the glenoid cavity. Simple compression is generally curable if attacked immediately by antiphlogistic means and afterwards by rubefacients, by blisters, and even the application of moxa above the clavicle, over the origin of the brachial plexus. When on the contrary the nerves have been disorganized, there is no hope of cure: the patient remains affected with paralysis of the deltoid muscle alone, or of all the muscles of the arm and fore-arm. Therefore we should not carry too far the treatment recommended for simple compression, should it prove without effect. It should always be tried, as it can never be determined *à priori*, what is the cause of the paralysis. The lesion of the axillary artery is very rare, it more frequently happens in the efforts of reduction, than at the moment of the occurrence of the luxation.

It is here proper to mention the precautions which M. Dupuytren never omits, in order to assist the reduction of old luxations. The patient makes use for a longer or shorter time of baths: the affected joint is covered by emollient poultices, rendered narcotic or stupifying by laudanum, extract of aconitum hyoscyamus or belladonna. If the patient be young, strong, and vigorous, he is to be bled once or several times.

In order to *reduce* luxations according to the plan adopted by M. Dupuytren, the patient is seated on a chair; the middle of a band made by a napkin folded like a cravat and having its ends twisted and brought together towards the palmar face of the wrist is fastened above the dorsal face of the same. This extending band is fastened by some turns of a roller. We then place in the hollow of the arm pit a pad large enough to prevent the counter extending band from compressing the great pectoral, dorsal, and teres muscles: this counter extending band is made like the other, its middle part applied to the pad, the ends brought one before the other behind the chest crossed over the sound shoulder and fastened to a ring in the wall, and intrusted to an assistant.

A number of assistants proportioned to the degree of power required, take hold of the extending band, and the surgeon by a sign indicates when they are to commence pulling.

If the luxation be downwards, they first draw in the direction of the displacement, the arm is then brought downwards and forwards, whilst the surgeon, with his breast bearing against the outer side of the elbows brings the head of the bone upwards and outwards.

If the luxation be inwards, extension is made outwardly and backwardly, and the arm is restored to its natural direction. When the head of the humerus is free the operator pushes it outwards. If the luxation be in the infra-spinal fossa, extension should first be made from behind forwards, and as the head of the bone becomes freed, the operator pushes it in the same direction, and extension is then made more directly outwards.

Much difficulty is sometimes met with, especially in old luxations, which proceeds principally from the resistance of the muscles.

Formerly, different machines and methods were used, as dangerous as they were useless. M. Dupuytren has ingeniously substituted another plan, which consists in diverting the attention of the patient, generally rivetted on his accident, from the pain he suffers, or from that which he dreads.

The professor with whom this idea originated finds it daily of great advantage, as well as others who have tried it. A practice of twenty-five years shows his number of unsuccessful cases to be about *one* every two or three years.

The noise made by the head of the bone returning to its cavity, the restoration of the shape of the joint, the facility of the different movements of the limb, show that the luxation is reduced. The arm is then bandaged to the side, the elbow and fore-arm being supported by a sling. The accidents which sometimes complicate luxation, and of which we have spoken, may also arise from the reduction, and especially that of old luxations. Nevertheless, they are much more rare than is generally supposed. The chance which gave to M. Flaubert, in the short period of three or four years, some of the most serious accidents resulting from reduction was very extraordinary, and the cause was undoubtedly owing to some circumstances unknown to us. *Emphysema* of the chest seen by this surgeon has also been observed by M. Dupuytren. In similar cases the tumor should be covered with resolvent lotions assisted by regular compression by a bandage, which, at the same time, keeps the arm fixed against the body.

## CHAPTER XXIV.

## ON THE VITAL AND MECHANICAL DILATATION OF THE URETHRA.

Strictures of the urethra have given rise to the most diversified opinions, and the most opposite plans of treatment. To be convinced of the truth of this remark, we need only examine the long list of authors who have written on this subject. It is not our intention to give you a history of these diseases, but to point out, in the case of the man now under your observation, some improvements which we have introduced into this branch of the healing art.

This man, about 40 years of age, of small stature, is a coachman, and was seated on his box, when the horses suddenly started. Being off his guard he fell astride of the wheel. He immediately experienced great pain in the perineum, and discharged a considerable quantity of blood from the urethra.

Unable to follow his business, he entered the Hotel-Dieu, (March, 1832,) laboring under the following symptoms; tumefaction of the contused parts, very acute pain along the whole course of the canal, skin of the penis, scrotum, and perineum, highly ecchymosed. He could not pass water; on questioning him, we found that he frequently had a wish to do so, that he often had had blennorrhagia, and that for a long time he had been tormented by a desire to urinate.

There could be no doubt as to his case; a sound was introduced, but only entered about three inches. A bougie with a very delicate point was substituted for it with equal success.

There then existed two lesions, a stricture and laceration of the canal of the urethra; the former must be dilated or destroyed; and in the latter case if the disease was left to itself, the cure was nearly certain, but stricture inevitable. It was an exceedingly perplexing case; I have seen twenty or thirty similar and have always met with some obstacles in their treatment. In order to prevent contraction, the cicatrix should be formed over a sound of the largest size.

About five months ago an individual having had a quarrel with another, carried a pair of small pistols in his pocket. He fell accidentally; one of them had discharged, the ball passed through the urethra and testicle, and lodged in the thigh. If ever any one was in risk of a stricture, this man was most assuredly; a sound was introduced into the urethra, in three months the wound had perfectly healed, and he has since made water as before. The testicle became atrophied. Let us now return to our former patient. It is evident that the stricture required dilating, and that the laceration also required a sound. This was attempted, but the instrument could not enter; I advised it to be tried every hour. The next day the sound had advanced, the patient could pass water; in three days a middle sized sound could be introduced into the bladder,

For a long time it was thought that when there was stricture, the obstacle should be forcibly removed, in order to allow the patient to urinate; such was the practice of Desault; there was at that period a kind of self-love in overcoming all obstacles, I affirm, that of ten individuals subjected to this

practice, one half suffered from laceration of the urethra, tumefaction of the penis, infiltration of urine, and that even death frequently followed. This plan is therefore improper, inasmuch as it is not only painful but dangerous.

Whenever on account of a stricture, there is dysuria, catheterism by main force should be abandoned. What is then to be done? Experience has proved to me that is better to temporize. Violence should be used only when retention can give rise to ruptures, infiltrations, inflammations, and endanger the life of the patient. But what is the proportion of these cases? Facts daily observed at the Hotel-Dieu allow me to establish, that it is not necessary to have recourse to forced catheterism more than once in thirty cases. For eighteen years I have followed this opinion and always with success.

Observe now what has happened to the patient under our notice; he had had three or four blennorrhagiæ giving rise to stricture, the contusion of the perineum and laceration of the canal, caused retention of urine. Was the least force used? No. Yet we succeeded in reaching the bladder; this morning, the third day after his admission, a middle sized sound was introduced, whilst on the first day the most delicate pointed bougie could not pass. What took place? the contact of the sound caused a copious secretion of mucus, the next day it was still more copious, and on the third day, a sound of which the extremity was ten or twelve times as large as that used on the first day, overcame the difficulty. As a general rule, when we can wait a few hours, forced catheterism should not be used; and *a fortiori* when we have some days before us. We should then be satisfied with introducing a bougie or sound, as will be explained hereafter, and fasten the instrument when it will no longer advance. This plan I have called *slow dilatation*, *dilatation by disengorgement*, *vital dilatation*.

We will here remark that when there is contraction without laceration, and the urine flows between the sound and the parietes of the urethra, the symptom is favorable, as it proves that the urine tends to increase the dilatation; in order to assist this process, the end of the catheter should be closed. But if there be laceration of the canal, the passage of the urine may cause infiltration, urinary gangrenous abscesses, no water should therefore be left in the bladder.

The plan which consists in overcoming stricture patiently and slowly, is the only one suitable to a large majority of cases. This dilatation is not alone effected by the method of which we have spoken; there is another called for distinction *mechanical dilatation*. We will explain it hereafter.

From many cases we will choose the following, the more curious, as it may be considered as the origin of the plan.

About eighteen years ago, said the professor, I was called to a wealthy man, very nervous, and endowed with great vivacity of mind, and prodigious susceptibility. He suffered exceedingly from dysuria. I advised him to wear a bougie in the urethra. This advice alone alarmed him greatly, he magnified the pain and inconvenience of this treatment, being certain that a bougie would hurt him, and that if the urine came only drop by drop from the effect of the disease, for a still greater reason it would not come at all when a solid body occupied all the stricture. After some explanation, he consented to the introduction of a bougie with a blunt end, but it had hardly entered the urethra, when all his apprehensions were renewed. It was with difficulty I

could induce him to retain the sound. I did more, and introduced it as far as the obstacle, but meeting an insurmountable difficulty in its progress, I was obliged, on account of the fear of the patient, to desist, and renew the attempt in a few hours; and in order to avoid new difficulties, I determined to fasten the bougie, at the spot it had reached that is in front of the obstacle. As I had promised, I returned in a few hours; the patient had passed water easily, and the bougie could be easily engaged in the impediment; some hours after, it was introduced farther, and before the expiration of the day it had reached the bladder. In a few days a larger one was introduced. The treatment was then continued without difficulty, and the dilatation rapidly increased. In fifteen days the patient urinated freely, without pain, and in a large and strong stream.

This fact, added M. Dupuytren, was not lost upon me; I saw that it was not necessary that a bougie should penetrate the stricture in order to effect the dilatation, and also all the advantages of this method in pusillanimous patients, and in cases in which we are not obliged, from the importance of the injury, to surmount the impediment immediately by the introduction of a sound or a bougie.

CASE II.—*Stricture of the Urethra, Dysuria and Incontinence of Urine, Catarrh of the Bladder Symptomatic of Stricture (Vital Dilatation).*—C . . . . 49 years of age, was admitted on the 20th of February, 1827. He complained of making water merely drop by drop, although he made great efforts, which were frequently followed by an involuntary flow of urine. He felt violent pain in the hypogastric region, the perineum, and urethra especially at the time of urinating; the pain he compared to the presence of a red-hot iron in the canal; it did not persist after the flow of urine. The fluid on cooling deposited a mucous and purulent sediment. This man had had blennorrhagia eleven times; the last was of four years continuance, it had ceased two months since, and then he perceived for the first time, the difficulty of passing water; in three years he could not urinate at all; he was treated by dilatation, and remained well for six years. Six months ago, the dysuria reappeared. He entered the Hotel-Dieu laboring under the symptoms already pointed out. A bougie was introduced as far as the bulb of the urethra, where it was arrested by a hard and resisting stricture; it remained free in the canal, was kept there for twenty four hours, and then entered the bladder with facility; a small sized gum-elastic sound was introduced in its place immediately; the patient suffered no pain. Four sounds gradually increasing in size to the largest, were successively left in the urethra, and after thirty-two days, C . . . . left the hospital entirely cured of his stricture, and catarrh resulting from it.

CASE III.—*Stricture at the Commencement of the Membranous Portion, accompanied by Remarkable Spasm of the Urethra and Incontinence of Urine (Vital Dilatation).*—C . . . ., thirty-six years of age, of a good constitution was admitted on the 6th of February, 1827; he had had blennorrhagia but once; but it had lasted ten years; since seven or eight years when it ceased entirely, the flow of urine began to diminish, and for four or five months it passed away guttatim, and he has labored under incontinence of urine. On the 7th of February, a middle sized sound was placed in the canal and penetrated as far as the membranous portion; there it was arrested by a hard

stricture. The bougie was left, the patient withdrew it an hour afterwards. In the evening it was attempted to be re-introduced, but unsuccessfully, the urethra was in such a state of spasm that it would not pass beyond the fossa navicularis, and was so tightly grasped by the parietes of the urethra, as to require some force to withdraw it. On the 9th of February, M. Dupuytren endeavored to introduce a middle sized, and then a smaller silver sound, but both were arrested at the fossa navicularis and grasped with as much force as on the preceding trial. A portion of a sound, rounded at its extremity was introduced and fixed in the fossa, it advanced but slightly at first, but had penetrated in twenty-four hours; it was immediately replaced by a middle sized gum-elastic sound; this was kept in and the dilatation continued for twenty days. Three sounds were successively used, the last being of the largest size; the patient urinated freely and in a large stream.

Vital dilatation, continued M. Dupuytren, is so powerful, that the sound frequently enters the bladder in two or three hours. This action may be assisted by turning it from time to time in the canal. This method does not require an instrument of peculiar shape; a silver, gum-elastic sound, or a bougie, with the point either large or small, may be indifferently used. However, I prefer a gum-elastic bougie, terminating in a sound, blunt extremity, and of a length proportioned to the depth of the obstacle.

Whatever instrument may be used, it is introduced and carried down to the obstacle, and there fastened by any appropriate means.

It is not necessary to engage it in the obstacle for its prolonged stay in the urethra will effect the desired dilatation. Indeed, in a few hours, and in less fortunate cases, in a few days, it will overcome the difficulty without exertion, laceration, or loss of blood. The dilatation is such, that the sound or bougie, sometimes spontaneously enters the stricture, in other cases, it may be made to pass by the slightest effort, and again the dilatation will permit the stricture to receive the end of a conoidal bougie, it should then be treated by the mechanical means of which we are about to speak.

I think, said M. Dupuytren, that there is nothing mechanical in the action of these bodies, I am convinced that we must admit some vitality. I have already pointed out to you, that a secretion takes place which facilitates the passage of the sound. Let us examine this subject, and first observe the phenomena of the contact of foreign bodies with the entrance of a vital canal, the puncta lachrymalia for example. The first effect of this contact is so great a contraction of the edges of these puncta, that a very delicate probe cannot enter; but if it be repeated or continued, they no longer contract; but dilate sufficiently to receive the probe, and at that moment, a mucous secretion is generally seen around the punctum.

The same thing takes place in stricture of the urethra, the first touch of the bougie, causes the canal to contract so much that it is with difficulty disengaged; this soon ceases, and in a few hours the bougie can be freely moved about. To this dilatation is added more or less copious secretion of mucus, and sometimes of purulent matter, which sometimes gives alarm to the patient, but which always disappears, either spontaneously or on the withdrawal of the sound. From these two causes, the stricture dilates, and in a few hours, or a few days, the canal which at first would not admit the twentieth of a line, now receives a line.

Vital dilatation is not the only one used to overcome stricture; we have recourse to another species of dilatation which consists in introducing a very fine bougie with an extremity as it were silken, and then to engage it in the obstacle. This foreign body dilates, separates, by pressure, the tissue forming the stricture; this *dilatation* I call *mechanical*.

The instruments I generally use are conoidal bougies, formed of silk, covered with a layer of gum-elastic, and terminating in a very fine and almost filiform extremity. They then gradually increase to the other end which forms the base of the cone. These bougies are introduced in the following manner: The gland is seized by the thumb and forefinger of one hand, the penis being slightly elevated and elongated, a bougie previously oiled, is held between the thumb, fore, and middle fingers of the other hand, it is then introduced by slight pressure, accompanied by a rotary motion on its axis. It soon reaches the obstacle. When it is arrested, it bends on itself, but becomes straight when freed from pressure. These signs are sufficient to prove to a skillful hand that the bougie has not been able to pass the impediment and this part of the instrument is so delicate, supple, and flexible, that it cannot, in any case, produce perforation, laceration, nor injury to the parietes of the urethra.

But when the filiform extremity has penetrated the stricture, the instrument is gradually felt passing more deeply into the urethra, that is, until the bougie of which the size insensibly increases, fills the opening left by the stricture, when the bougie bends before the obstacle which it could not pass; it always tends to spring out of the urethra when becoming straight, and the slightest traction will withdraw it. In the contrary case, it not only has no tendency to escape, but is so much pressed and withheld by the spasm or contractibility of the tissues that some exertion is required to extract it.

When the bougie has overcome the stricture, or has been introduced sufficiently far, it should be fastened, either around the penis, to a suspensory or some other kind of bandage.

By fastening the bougie, I propose to keep it in its place until it become possible and necessary to introduce it further, or make it keep up continual pressure against the sides of the stricture. In the first case, I do not attempt to introduce it deeper, and leave between the string and the obstacle a length of the sound exactly proportionate to the extent of space indicated. In the second case, I press on the bougie, bend and tie it higher up, that is, nearer its base, so that this body, which on account of its elasticity, tends always to become straight, keeps up constant pressure on the obstacle to be overcome, and to dilate the stricture.

The *modus operandi* of the bougie is easily understood. The mechanism is that of a wedge, fixed in parts which it is intended to widen and separate; but whilst the latter acts on inert bodies, the bougie acts on living parts, and its action is composed not only of the thickness of the bougie, but also of its vital action on the parietes of the obstacle.

As to their effects, experience teaches us that, whenever the filiform extremity will enter a stricture, the rest of the bougie will certainly follow. It may in some cases be introduced immediately; in others, we must wait some hours or days; and that, much less on account of the degree of stricture, or the size of the bougie, than the variable extensibility of the tissues forming the stricture. This extensibility is sometimes great, sometimes very feeble.

The mobility which the bougie acquires in a few hours or days, is one of the most remarkable phenomena, and one of the most appropriate to prove, if it could be doubted, that every thing which takes place in living bodies, even when apparently produced by mechanical causes, depends more or less on their vitality; or, in other words, that in these bodies, the vital are mingled with the mechanical phenomena which they change, or modify according to rules which cannot be submitted to calculations purely physical. We will detail two cases of the use of these means.

CASE IV.—*Contraction of the Urethra, Dysuria (Mechanical Dilatation).* D . . . . , aged 61 years, of middle size, and spare frame, was admitted on the 19th of February, 1827. He complained of a difficulty in passing water of two years duration; sixteen years ago, he had contracted a blennorrhagia which still existed at the time of his admission; the dysuria had increased, and the flow of urine after gradually diminishing ceased entirely; the urine passed guttatum, and required considerable effort; the urethral secretion was copious. A bath was administered; the urine carefully examined, deposited no sediment, and from the symptoms he was supposed to labor under stricture. On the 23d of February a bougie was introduced, but stopped at first at the membranous portion of the urethra; it soon, however, by a delicate pressure passed on, and was engaged in the obstacle, and although compressed by it, it still progressed, and thus was commenced a purely mechanical dilatation of the stricture.

The bougie after 24 hours was re-placed by a small gum-elastic sound, the scrotum held up firmly, the dilatation continued for 39 days; five sounds were used, gradually increasing in size, the last being of the largest; the whole of the urine passed between it and the canal; it was withdrawn on the 4th of April; the jet of urine was easy and large, and the patient freed from his complaint.

CASE V.—*Considerable Contraction of the Bulb of the Urethra, Dysuria (Mechanical Dilatation).*—P . . . . . , 42 years of age, of a good constitution was admitted on the 28th of February, 1827. He labored under dysuria which he had first experienced ten years ago; it followed two attacks of blennorrhagia; the first contracted at 20 years of age, lasted three months, and was suppressed by a drastic purgative; the second which occurred two years afterwards, still existed; and a white, opaque mucous discharge, owing to the pressure from behind forward. This discharge had lasted 22 years, and may be considered as the cause of the contraction; however, the dysuria, began with a chill, a sensation of contraction of the urethra at the moment of passing water; the jet diminished, became tortuous, flowed by drops, especially after drinking any spirituous liquor. During the three months preceding his admission, the dysuria had considerably increased. On the first of March, a fine pointed bougie was introduced into the canal: at the bulbous portion, it became engaged in a stricture, which grasped it so firmly, that a considerable traction, raising the penis at the same time, could not disengage it; the bougie was left, and eight hours afterwards, with a slight pressure, it entered the bladder. On the 4th of March, a middle sized gum-elastic sound was introduced, and in 22 days the patient passed his water freely and in a large stream.

We will end this chapter, with some reflections on the different modes of dilatation.

In every case, at the end of ten or twelve days at most, we may increase from the smallest to the largest sized bougie; or, in other words, effect the greatest dilatation of the worst contraction, by a gradual increase of size of the sounds and bougies.

The more promptly dilatation is effected, the less durable it is; so that instead of hastening, it should rather be retarded; for it is durable in proportion to the slowness of its operation.

There are other objections to the rapid dilatation of stricture; these are, pain, laceration, acute inflammation, gangrene, and the greater or less destruction of the canal, accidents which I have also seen follow forced catheterism. It seems that the tissue forming the stricture like all other tissues of the animal economy possesses a certain degree of extensibility, beyond which it is not safe to pass without risk of laceration, and that it may be developed almost *ad infinitum* when affected slowly and almost imperceptibly.

Whatever may be the precautions taken to effect the dilatation of strictures of the canal, it is generally merely temporary, and has a great tendency to relapse. This relapse has induced me, continued M. Dupuytren, to introduce from time to time, a bougie in the urethra. It should be done every 10, 12, 15, or 20 days, and left in the canal two, four, or six hours, or even during the night, according to circumstances; this plan will have very great influence in preventing the return of the disease.

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## CHAPTER XXV.

### ON CLUB-FOOT.

Among the imperfect conformations presented in the organization of man, congenital malformation of the foot is one of the most frequent. This deformity had attracted the notice of the ancient surgeons, and we find in their works, descriptions of machines for curing it. But in modern times alone has any real light been thrown on the subject. The anatomical history of the parts was unknown; all was mere conjecture, because the nature of the disease was veiled in obscurity.

The most ordinary congenital deformity is that designated by the ancients under the name of *varus*. The toes are turned inwards and the foot reversed, so that the patient walks on its outer edge, and sometimes even on part of the dorsum of the foot. The second variety is that in which the foot is turned outwardly, called by the ancients *valgus*; this is more rare. There is still another variety, in which the point of the foot is turned backward, and the foot so reversed that the patient walks entirely on its dorsal surface.

The essential cause of this irregularity is the luxation of some of the bones of the tarsus, the ligaments and muscles merely assume consecutively the unnatural arrangement which they present. The causes determining or favoring such deformity in the womb of the mother are unknown. It has been attributed to the irregular shape of the tarsal bones, in the want of equilibrium in the

muscles moving the foot, in a want of length of some of these muscles, or an unnatural insertion of their tendons, lastly, to the singular tendency of the feet of the fœtus to turn inwardly.

Aside from these explanations, congenital club-foot is a defective conformation in which the foot is strongly turned inwards, bent slightly in the direction of its length and concavity. Sometimes it is smaller than natural; there is a change in its nutrition. The patient is obliged to walk on the outer edge and when the deformity has reached its acme, he leans on the external malleolus.

These external symptoms have been well described by Scarpa; other authors have treated of internal deformity elucidated by dissections: but no one had paid any attention to one of the most important consequences of club-foot, that is, the change of nutrition and atrophy of the limb.

Congenital club-foot may occupy one or both feet. If, in the former case, the child be examined soon after birth, we will find, as has been said, the diseased foot generally smaller than the other, but the legs of equal length. When it exists in both feet, they are generally equally developed.

As the patient increases in years, the atrophy is easily recognized, and its cause may be pointed out. Indeed, the child leans instinctively on the sound foot; it follows hence, that its nutrition is more active; whilst the diseased foot, remaining inactive, must necessarily waste away.

But this atrophy should be distinguished into two species, hitherto confounded together, and which it is very important to separate: 1st, atrophy of the thickness of the limb; 2d, atrophy of its length. The first species affects chiefly the muscles, whence results the thinness and weakness of the limb. The second acts on both muscles and bones: but its action on the skeleton is most serious and important; for the atrophy of the thickness may always be remedied, when the club-foot is corrected by muscular exercise; whilst no remedial means are of any avail in shortening of the limb.

The difference of length increases with years; not apparent at birth, in a few years it becomes very evident; at ten years of age, I have always observed a remarkably shortening. Examine a man twenty years of age, and you will find a much more considerable inequality, and so far above the power of art, that a cure of atrophy of the length can never be effected. The shortening of the muscles and tendons, generally less serious, should nevertheless be attended to, for it becomes incurable after a certain lapse of time; thus the tendon of Achilles, at twenty years of age, has lost so much of its length, that even when the foot is restored to its natural position, the heel remains elevated, and the patient is obliged to wear a very high heeled shoe.

Guided by these principles, said M. Dupuytren, I have requested parents always to attend very early to this affection, and I have seen children of a tender age cured in a month or six weeks, and almost immediately afterwards begin to use the foot. I have sent to an orthopedic establishment, children of six weeks, one, two or three years of age; the cure was almost more easy in proportion to the youth of the patient. This may be easily understood. In a child newly born, the foot can be restored to its normal position easily and without pain; a few months increase the difficulty. From ten to twenty years of age, we must have recourse to machines, which at a late period become

useless ; this is owing to three principal causes : the suppleness of the ligaments and muscles which diminishes with age ; the increase of the deformity and the vicious conformation in which the bones are developed.

It may be laid down as a rule that the cure of club-foot is prompt and certain, in proportion as the treatment is commenced soon after birth. These advantages deserve the attention of practitioners ; for, when children are old, a year or two is often necessary to the cure.

This deformity is sometimes cured without the assistance of art. A case is related by Dr. Holtz, of a boy born of indigent parents, with a very well marked inversion of the foot. Without any attempt at treatment, he was perfectly free from the deformity at twelve years of age. He endeavored himself to turn his foot outwards, and as he was obliged to work hard, and carry heavy burdens, he was forced to lean heavily on the ground. Exercise restored the equilibrium of muscular action, and now at the age of twenty years, he would not be supposed to have ever suffered from club-foot.

## CHAPTER XXVI.

### ON THE CENTRAL LACERATION OF THE PERINEUM DURING PARTURITION.

Nothing is more common than laceration of the posterior commissure of the vulva, extending more or less on the perineum during delivery.

It is one of the most simple accidents, rarely requiring surgical assistance. But this laceration sometimes reaches the lower extremity of the inferior paries of the vagina, throughout its whole extent, even comprising, to a greater or less degree, the sphincter ani and the anus itself ; it then becomes a most serious injury, to the treatment of which we will hereafter devote a particular chapter. At present, we shall treat merely of the central perforation or laceration of the perineum, without lesion of the commissure of the vulva or the sphincter ani, and subsequently of the passage of the contents of the uterus through this anormal route. Numerous examples are related, yet very distinguished writers, considering a delivery of this nature as mathematically impossible, on account of the disproportion between the perineum and the head of a child at full term, have hence inferred these examples to be unworthy of confidence. Indeed, it is difficult to conceive, at first sight, how a part generally merely of eighteen lines in extent, can become so much dilated as to admit a body as large as the child's head. But this reasoning is almost an outrage to nature ; how many phenomena do we not daily observe, of which the causes and mechanism are unknown to us ? If the fact exist, the examination of the means she uses becomes only a secondary object, from which, however, science should reap some advantage. A case of recent occurrence, and whose history will be detailed, will leave no doubt, I think, even in the most prejudiced mind, and will corroborate the assertions of ancient writers, whose veracity has been questioned. The oldest fact on record, does not belong to the human species, but was observed by the immortal Harvey, in a white mare belonging to the queen of England. On account of its exquisite beauty, the vulva had been closed in

order to prevent the caresses of the horse. But whether this precaution was taken too late, or in spite of it, the mare was impregnated. The term of gestation being at an end, the colt could not escape through the vulva, and was forced through the perineum. (*Exercitationes de generat. animal.*)

In 1778, Nédey, a surgeon of Besançon, sent to the Academy of Surgery a memoir on the rupture of the central portion of the perineum, through which, he said, a child at full term had passed without laceration of the fourchette or sphincter ani. This fact, which excited the astonishment of the academy, appeared doubtful, said Baudelocque, only to those who knew not how much the perineum would dilate towards the conclusion of a delivery.

The following is extracted from the well known case of Contonly. On the 13th of January, 1788, this celebrated accoucheur, was sent for to a lady, whom he had delivered during the preceding year of twins in the fifth and half month of pregnancy. This lady, says Contonly, appeared on the very eve of being delivered. The head in the lesser pelvis, pressed so strongly against the perineum, which was greatly distended, that all my attention was directed towards preventing its laceration. But the precaution was useless, the central portion of the perineum was torn; the head pressed with the same violence against my hand; I was forced to give it passage, and extract by the same route a child at full term, as well as the placenta which followed immediately. I then examined what had taken place. At an inch above the anus, towards the centre of the perineum, there was a fringed aperture, from which departed two lacerations; one following the direction of the raphe, had stopped at a short distance from the vulva, the other turned towards the right side, forming a wound represented nearly by the letter Y. The sphincter ani, rectum, and fourchette, were not included in the laceration. The wound was healed in five weeks. Thomas Denman, in his *Introduction to the Practice of Midwifery*, relates a similar case, in which the child passed through the part of the perineum contiguous to the anus, the anterior portion and the anus remaining unhurt. The parts united in six weeks, and the woman was afterwards delivered per vias naturales.

On the 14th of December, 1812, Dr. Foubert was called to a lady, 23 years of age, in labor with her first child. The head of the child presented in one of the three last positions. The labor was tedious, and terminated by the rupture of the centre of the perineum. The child passed through the wound. The cicatrization was complete in five weeks. This lady was safely delivered of a second child, three years afterwards.

Meckel, in the *Neues Journal für die Chirurgie* (vol. 4, 1811,) relates a case of central laceration of the perineum and delivery by this passage without injury of the fourchette or sphincter ani. Another case is to be found in the *Annales de la Médecine Physiologique* (July 1825). Merriman, in his *Synopsis of the Various Kinds of Difficult Parturition* (4th ed, 1826), details a case which occurred to him in 1812. The history of a similar fact witnessed by Dr. John Douglas, is mentioned by him in the *Dublin Hospital Reports*, (vol 3, 1822.) On the 3rd of May, 1824, M. Marter of Königsburg, was suddenly called to a woman, 25 years of age, in labor with her first child. The midwife told him the child was passing through the rectum, and indeed it seemed that the anterior paries of the rectum and the posterior paries of the vagina had been lacerated at the same moment with the perineum, and thus the child was about

to be expelled through the hiatus. The vertex presented at this abnormal opening, nearly as it presents at the os uteri; it was impossible to restore it to the vagina. A strong contraction forced the child through the wound, without injury to the vulva; the after birth followed by the same route. Upon examination, M. Marter found the sphincter and rectum uninjured; immediately in front of the anus, there was a rupture extending in the direction of the raphe as far as an inch from the vulva. To this rupture corresponded that of the posterior paries of the vagina; terminating also at an inch from the vulva in the middle of the perineum were two transverse ruptures, so that the wound was of a crucial shape. A fleshy bridge, of the thickness of one's finger, was between the posterior commissure of the vulva and the anterior extremity of the longitudinal rupture of the perineum. A copious hemorrhage followed the delivery, but was soon arrested by cold applications. The perineum became enormously swollen, but it was reduced in fifteen days. On the 6th day two stitches of suture were used in order to bring together the four angles of the wound. The cure was tedious, the woman suffered from a vagino-perineal fistula, through which the menses flowed for more than two years. In 1827, she was safely delivered, *per vias naturales*, of another child.

In a case related by Moscheuer, the child was expelled through the perineum, in consequence of the gangrene of this part, caused by excessive and prolonged distention; the vulva being at the same time exceedingly narrow.

The following case from the practice of M. Evrat, and reported by M. Moreau, who had charge of the patient from the moment of the accident until her recovery, is worthy of being given in its most minute details.

Madame D . . . . ., 19 or 20 years of age in labor with her first child, sent for M. Evrat on the 3d of March, 1815. The head presented in the fourth position, engaged without difficulty in the cavity of the pelvis, but when about passing the perineal strait, it experienced considerable difficulty in arising under the arch of the pubes. During a severe pain, M. Evrat, thought that the centre of the perineum against which the palm of his hand was applied, lost its thickness and elasticity, and sensibly yielded to the pressure of the head of the child. He was reflecting how to prevent a laceration, when a violent pain expelled the child, but in such a manner that the head, instead of opening *per vaginam*, passed through the centre of the perineum. The irregular wound resulting from the perforation, extended to the right in the direction of the ascending ramus of the ischium and the descending ramus of the pubes; passed in front beyond the posterior commissure of the vulva, and behind encircled slightly the anus, then extending from right to left, between the anus and the vulva, near the tuberosity of the ischium on the left side. The placenta was expelled through the same passage. By introducing his finger into the rectum, he ascertained that that intestine was uninjured.

M. Evrat being obliged to go to England, M. Moreau took charge of the case, together with the professor Desormeaux. The treatment was very simple. The patient was laid on her side, the legs and thighs approximated, and demi-flexed, the wound dressed with lint; a strict diet ordered; the bowels kept open by enemata and gentle laxatives, lest the expulsion of hard fæces should break up the cicatrix as fast as it formed. In five weeks she was perfectly well.

No one, we think, will dispute the truth of the details of the above case. We will now relate an analogous case, and one not conclusive, which has lately occurred under the care of M. Dupuytren, in the wards of this hospital.

Madame B. . . . ., 38 years of age, married about a year, and pregnant with her first child, was taken in labor, on the morning of the 3d September, 1832. The head presented in the first position, the labor progressed rapidly, and was arrested only when the occiput appeared at the vulva, which was very narrow. Four hours after the appearance of the first pains, the patient had two very violent, and the midwife felt at the same moment a laceration of the perineum, which she was supporting with her hand; almost at the same moment the head and body of the fœtus, passed through the anormal opening. The midwife highly alarmed at first, sent for an accoucheur, but seeing that the patient was doing well, and was ignorant of the accident, she told the physician that all was over, and did not inform him of the laceration.

Every thing went on well for two days; but an enema which was administered, passing away immediately, the midwife feared a laceration of the anus, and even thought that a part of the enema had passed out through the wound.

On the tenth day, M. Guersent was consulted. After trying several remedies, he had recourse to the quilled suture, by which the edges of the wound were brought together. In five days the wound appeared healed, except a small fistulous point, towards the rectum, and the suture was removed. The reunion lasted two days, but was destroyed by some exertion on the part of the patient.

She determined on account of this occurrence, to enter the Hotel-Dieu. On examination she presented the following condition: the skin of the abdomen showed the marks, and was of the color peculiar to women recently delivered; the pelvis was of ordinary dimensions; the sexual parts free from swelling. On separating the labiæ, the opening of the vulva was seen very far forward: this observation is important; it explains why the patient experienced difficulty in sexual intercourse. Behind this opening there was another irregularly round, admitting the ends of three fingers and situated a little to the left. Between the openings there was a commissure rather smaller than the end of the little finger; behind this second opening was the anus, and lastly could be seen the projection of the coccyx, which was not much prolonged forwards, as described by some accoucheurs in laceration of the perineum.

Here is a case, said M. Dupuytren, ✱ which all the minutiae are well authenticated.

Contently, one of the most illustrious men in our science, relates a similar case, and it has even been said that he was embarrassed. But admitting that such a man could be embarrassed, it must have been undoubtedly after, and not before the accident.

But it will be said how can such a fact be conceived? Of what consequence is it, provided it exists? Again is it so difficult to explain a delivery by the laceration of the perineum. All who have seen a first labor, in which the vulva dilates with so much difficulty, and in which there is so great a tendency in the perineum to become expanded, and then have more than once dreaded the appearance of the head of the fœtus, through it. Hence we are induced to believe that the passage of the head through the perineum, occurs more

frequently than is generally supposed, only in the majority of cases, the vaginal commissure is ruptured, and the accident is called laceration of the fourchette.

Let us now inquire what may be the causes of an accouchement of this nature.

The anatomist and accoucheur frequently finds the external orifice of the vagina, placed high up under the pubes, whilst the perineum presents from before backwards, a considerable extent. The vulva in these cases is very narrow, and individuals who have not taken into consideration this state of the parts, consider the vagina as badly formed, and dread the chances of delivery. But such is not the case; the narrowness exists only at the vulva, the vagina is of a natural size. This narrowness is caused by a kind of prolongation of the perineum, which closes a fourth, a third, and sometimes even one half of the orifice of the vagina.

This unnatural conformation is very inconvenient. Sometimes the husband is obliged to have recourse to a physician, to remove the obstacle. The menses flow with difficulty from the vulva, the blood remains behind the barrier formed by the perineum; this is also the case when leucorrhœa exists. The inconvenience is more severely felt at the time of delivery, or in case of the necessity of an operation upon the neck of the uterus. The head of the child meets with the greatest difficulty in passing the inferior strait; it impinges against the perineum; and if the posterior commissure of the vulva, offer less resistance than the centre of the perineum, the child cannot pass through the orifice, without a more or less extensive laceration, which the accoucheur, with all his skill, cannot prevent. If, on the contrary, the commissure resist strongly, the centre of the perineum yield, is ruptured, and the child passes through the unnatural opening.

This malformation may be congenital or accidental, that is to say, the result of the union of the soft parts, in consequence of a burn, or laceration caused by previous delivery, or from any wound whatsoever. The only remedy is to divide the septum to a proper distance, prescribe rest, and prevent re-adhesion between the edges of the wound.

This should be done in the first pregnancy, provided the cicatrix have time to be perfectly formed before delivery; it should even be performed during labor, if there be no other means of preventing a serious laceration or perforation of the centre of the perineum.

Another cause, which possesses not less influence over the extension of the perineum, is the position of the woman during labor. Indeed in the case related by Nédey, the midwife finding the pains slacken, and the patient desiring to evacuate her bowels, reversed a wooden chair, placing between the legs of it a chamber-pot, and then seated the patient on this species of easy chair. In such a situation the head of the child pressed downwards and backwards by the arch of the pubis, must impinge more forcibly against the perineum. It is moreover proved by observation, that when a woman is delivered in a perfectly horizontal position, the child presents much more favorably at the inferior orifice of the vagina. We may, says M. Moreau, include amongst these causes, a too great curvature backwards of the inferior extremity of the sacrum and coccyx. This formation, by increasing the coccyo-pubic diameter of the perineal strait, and directing lower down and

more backwardly the axis of this strait, by diminishing the inclination of the plane, which should direct the head of the child from behind forwards, under the symphysis pubis, makes it bear more perpendicularly and with greater force against this part. Again, with as much reason, we might assign *a priori* to these accidents a host of others, depending on some malformation of the pelvis, or wrong position of the head; but it is much better to reason from facts alone, and it is to be regretted that the authors of the cases which we have enumerated, have not given all the circumstances relative to the mother and child, which might tend to resolve this question.

We will now discuss that part which most particularly interests us, namely the *treatment*.

In the patient now in our wards, an attempt at re-union was made by means of the quilled suture. Why did it not succeed? Because it was removed too early; for it was not applied until the tenth day. In recent wounds re-union may take place in four or five days; but in those which suppurate, unless the secretion of pus be diminished, or the granulations be properly developed, a longer time is required.

A still longer time is, *a fortiori*, requisite in a similar case, in which the flow of the lochia incessantly opposes the process of adhesion.

I have frequently, continued M. Dupuytren, used the suture in suppurating wounds; but in order to accomplish the union, a much longer time was requisite than in recent wounds. The following case which recurs to my memory, is not without interest.

I was called some years since, by M. Gardieu and another physician, to a young lady, who had been delivered secretly, out of her father's house; there was a complete rupture of the perineum extending to the anus. Several days had elapsed since the accident. I advised and used some stitches of interrupted suture; to-day I should prefer the quilled suture. In a month the union was not quite complete; I advised the suture to be left in its place, persuaded that a cure would be effected. The advice was followed, and I heard no more of her.

In the case under treatment, what is to be done? Shall the parts be left to themselves, or ought the edges of the wound, after being pared off, to be brought together and kept so by the quilled suture? Is it necessary to divide the septum separating this opening from the vulva? Before deciding this question, we ordered the woman to be kept on her back, the thighs fastened together by a bandage, and her position on no account, to be altered. Since the ten days that she has been in the wards, we have observed a sensible diminution in the diameter of the anormal opening, the free edges adhere at some points. We have, therefore, a right to hope, that a complete union will be effected without an operation.

Indeed, on the 30th of last November, she was discharged, completely cured.

The whole perineum was cicatrized. There still exist, undoubtedly, observed M. Dupuytren, some points of division on the surface of the vagina, at its junction with the perineum, but these divisions will entirely disappear.

This case confirms the opinions of different authors, as to the possibility of curing this accident without an operation, and merely by the means we have employed. We have seen cases cured in a month or five or six weeks; such, indeed, was the time of treatment of this woman. I advised her, to abstain from

laborious employment, to walk as little as possible, especially to avoid coition, and every thing which might tend to destroy the adhesions which as yet have not acquired their perfect solidity.

## CHAPTER XXVII.

### ON ORIGINAL LUXATIONS OF THE OS FEMORIS.

*Anatomical Characters; Symptoms; Distinguishing Marks; Causes; Treatment.*—Some years ago, M. Dupuytren published a memoir concerning original luxations of the thigh; a case which recently occurred in the Hotel-Dieu, again induced him to treat of this affection. The individual in question, was a man about seventy-four years of age, laboring under extention of urine. Several physicians in the city had been unable to sound him. M. Buschet succeeded the first time, and failed the second. I may here remark to you, said M. Dupuytren, the propriety of always carrying the sound along the upper surface of the urethra, in order to avoid false passage, strictures and obstacles which almost always exist on the inferior surface. I wish, however, particularly to direct your attention to the injury of the joint in this case; the heads of the thigh bones are evidently luxated, there is a marked projection of the hips, and the patient is unable to separate his thighs. The simultaneous occurrence of the affection on both sides, indicates a congenital malformation. Should he die, as is to be feared from his present weak state, a faithful examination of the parts shall be made.

The event predicted took place, and the body was minutely examined; it was impossible to separate the thighs, except by causing the extremities to describe the arc of a large circle; the trochanters were much closer to the cristæ of the ilia, and more elevated than natural; the head of the femur situated higher up, the knees turned inwards, the thighs shorter; there was a complete change of relation and a marked difference in direction and length. Hence it followed, that the cavity destined by nature to receive the head of the bone, was nearly obliterated, and the head of the bone was deformed. The upper part of the thigh was increased in size, the trunk bent backwards, the abdomen carried forwards, the pelvis instead of being oblique was nearly transverse, the thighs shorter, the buttocks soft and flaccid, which was explained by the approximation of the insertion of the glutei maximi muscles, and their state of relaxation. The gluteus medius, on the contrary, was distended and elevated, the gluteus minimus destroyed, the pyramidalis, instead of being placed obliquely as in nature, was perfectly horizontal; the gemini and quadrati muscles distended, and the adductors shortened.

On the left side, the great diameter of the original cavity was not more than an inch; it was shallow, rugose, filled with a fatty substance, yellow and nearly of the consistence of oil; it was nearly of an oval shape. The external iliac fossa showed in front of the sciatic notch a large shallow depression, covered by a thick shining periosteum, having nearly the appearance of articular cartilage; this spot was destined to receive the head of the femur. This

head smaller than natural, flattened, unequal, without any vestige of the insertion of the round ligament, was incrustated by an articular cartilage, which was thinner than in the normal state. The articular fibrous capsule formed a complete envelope which was inserted in the upper and lower edges of the former cavity. This capsule was in place of an osseous cavity on this side, and from its length, permitted the ascent of the head of the femur into the depression of which we have spoken. The space over which it could pass was about three inches. The thickness of the capsule was considerable; its density nearly cartilaginous.

On the right side, the original cavity was somewhat larger; internally it presented the same appearance as the other. The external iliac fossa, instead of presenting, as on the opposite side, a simple depression, shewed in front of the great sciatic notch, on a level with the space comprised between the anterior superior and the anterior inferior spinous processes of the ilium, a large and deep cavity with bony edges, strongly marked, rugose, and unequal. The head of the femur larger than that of the opposite side, had somewhat preserved its shape; it was like the other surrounded by an imperfect articular cartilage, and the interior of the articulation lined by a synovial membrane. The orbicular ligament was thinner than on the left side, although its extent was not confined merely to the circumference of the abnormal cavity. But on this side, the head of the femur having reached the bony edge, met with a solid support, whilst on the left, the extreme strength of the fibrous capsule, limited the ascent alone of the limb, by its resistance to the weight of the body.

There existed, moreover, an extraordinary mobility of the articulation of the sacrum, with the last lumbar vertebra; by pressing on the inferior extremity and holding the pelvis firm, the vertebral column could be made more erect by nearly a foot. The relaxation alone of the cartilage was supposed to be the cause of this singular mobility.

We rarely have an opportunity, continued M. Dupuytren, of examining after death this curious species of luxation. For, as it is of no injury, and constitutes merely an infirmity, incapable of destroying life, I have only been able to observe it in a small number of individuals, who perished accidentally or by diseases foreign to the affection of the hip. I have generally seen the following condition obtain; the muscles inserted above and below the acetabulum, are all raised towards the *cristæ* of the ilia. Some of them are remarkably developed, others are diminished, or, indeed, slightly atrophied. Some of the latter are reduced to a kind of yellowish fibrous tissue, without the least semblance of a muscle.

The upper portion of the femur preserves its natural dimensions and relations; sometimes the internal anterior side of the head of the bone, varies slightly from its spherical shape, which arises apparently from the friction against the part not organized to receive it. The acetabulum is either entirely wanting, or is merely an irregular osseous projection, without a trace of articular cartilage, or synovial capsule, surrounded by a firm cellular tissue, and covered by the muscles inserted into the lesser trochanter. Once or twice, I have seen the round ligament elongated, flattened, and as it were worn out, in certain places, by the pressure and friction of the head of the femur. The latter is found lodged in a cavity, analagous to that which is developed in

accidental and unreduced luxations of the upper part of this bone, upwards and outwards. This new cavity is very superficial, and almost without any margin, is situated in the external iliac fossa, that is, above and behind the acetabulum, at a distance proportionate to the shortening of the limb, or the ascent of the head of the bone. As a result, we find in these persons, what is seen in cases of spontaneous, or very old, accidental luxations, with this difference, however, that in the cases now under consideration, every thing seems to be of older date, and to have originally had the same disposition.

This original, or congenital displacement of the head of the femur, of which we have just sketched the anatomical characters, has not been pointed out by French writers.\* By calling your attention to it, it is not my intention to swell the already too numerous catalogue of human afflictions, but to spare the practitioner serious errors of judgment, and the patient a treatment dangerous as it is useless.

This alteration consists, therefore, in a transposition of the head of the femur, from the acetabulum to the external iliac fossa, a transposition which takes place from birth, and seems to result from a defect in depth of the acetabulum, rather than from disease or accident. This displacement is of that species constituting luxations of the femur, upwards and outwards. Two varieties are known, accidental luxation, and consecutive, spontaneous or symptomatic luxation. Therefore, in order to distinguish from those two species of luxation the one now under consideration, we have called it *original luxation*.

The following is a case of this double disease.

CASE II.—Paquier (Joseph), 49 years of age, by trade a weaver, was admitted into the Hotel-Dieu, on the 31st of June, 1831, for a chronic ophthalmia, with which he had been affected since his infancy. Now and then it became worse, and this induced him to apply for relief. Venesection, a blister to the right arm, stimulating pediluvia and purgative enemata cured him in two weeks. When about to leave the house he asked for a truss to support a large scrotal hernia. He of course was examined, and M. Dupuytren was not a little surprised on seeing the arrangement of the upper extremity of the femurs; it consisted in a transposition of the head of the bone from the cotyloid cavity, into the external iliac fossæ. This transposition was characterised by the shortening of the lower limbs, the ascent of the head of the femur into the external iliac fossæ, the projection of the great trochanters, the retraction of the muscles of the thigh towards the cristæ of the ilia, &c., the disproportion between the upper and lower parts of the body was very remarkable: the trunk was well developed, whilst the lower limbs were short and shrunken. When erect, the patient leaned the upper part of the body backwards, the pelvis was placed nearly horizontally upon the thigh bones, and he touched the ground with the toes alone. His walk was painful and tottering at each step, the head of the femur supporting the weight of the body could be seen rising in the external iliac fossæ, and the pelvis depressed, a circumstance arising from the defect of fixedness of the head of the bone, and which the patient remedied by means of a girdle. When in a horizontal position, the marks of his infirmity were less evident. In this position the affected limbs could easily be lengthened or shortened with ease. All this was effected without the least

\* Paletta, a surgeon of Milan, has published in his *Adversaria Chirurgica*, some observations on this disease, but they are by no means complete.

pain, which left no doubt as to the absence of disease, as well as of a cavity capable of receiving and retaining the head of the femur. This patient, like the former one, declared that he was born thus deformed, and that from his earliest recollection he had always walked in the same manner.\*

In addition to this characteristic case of double original luxations of the femurs, we will detail another very curious fact, tending to prove that this malconformation may be transmitted through several generations of the same family.

There is at present in the town of Nautua (says the author of this communication) a family of which several individuals have been, and are affected with original luxation of the femurs; the oldest one is a female of 80 years of age, named Margaret Gardas, from whom I obtained the following history.

Two of her aunts, on the maternal side, who lived to 60 years of age, had been lame from infancy; their hips were high, large, suddenly projecting, and they walked with their elbows drawn back, and waddled like ducks.

Margaret's father had a sister, lame from birth, on the right side, who died at the age of 80. Another sister well made, had a daughter with a shortened leg.

Margaret herself, is a large and robust woman, very fat, and apparently of great activity during youth. The disease did not appear in her until her 30th year, and the symptoms are those of spontaneous luxation of the femur. The affected limb is one fourth less in diameter than the other; and three or four lines longer. She has a daughter who labors under a congenital shortening of the right limb of nearly three inches. This girl was married to a well formed man, but whose father had congenital luxation of both femurs; she has had four children, of whom two presented this hereditary infirmity.

The characters of this luxation, as of all those in which the head of the femur is carried upwards and outwards, are: the shortening of the affected limb; the ascent of the head of the bone into the external iliac fossæ; the projection of the great trochanter; the retraction of almost all the muscles of the thigh towards the cristæ of the ilia, where they formed around the head of the femur a kind of cone, of which the base is at the ilium, and the apex at the great trochanter; the almost complete denudation of the tuber of the ischium deserted by the muscles; the rotation of the limb inwards, and the consequent turning of the heel and ham outwards, of the point of the foot and knee inwards; the obliquity of the thigh from above downwards and from without inwards, an obliquity which increases with age and the size of the pelvis, and from which there results a tendency in the thighs to cross below; an acute and re-entering angle in the upper internal part of the thigh where it unites with the pelvis, the emaciation of the whole of the limb, and especially of its superior part.

The motions of a limb thus formed, are generally very limited, and those of abduction and rotation, particularly so; whence follow innumerable difficulties in standing, walking, and the different exercises in which the lower extremity are required. This affection may be distinguished from others, analagous to it in symptoms, but different in origin, nature, and treatment, by means of the following characteristics; the absence of all pain, engorgement, abscess, fistula, or cicatrix; in the majority of cases, the simultaneous occurrence of a luxation on each side; I say in the majority of cases, for sometimes

\* We are acquainted with a gentleman of considerable distinction in the literary world, who labors under a similar malformation. The heads of the femora being thrown back into the iliac fossæ, he is unable to sit on his nates, and he is obliged to write leaning over a table or desk, or in a horizontal position. EDS. REG. & LIB.

the luxation is confined to one side alone. In twenty-six cases, the luxation was found on one side in only one or two individuals.

CASE IV.—Miss F....., 8 years of age, of a feeble constitution, and lymphatic temperament, came to the public consultation, at the Hotel-Dieu, on the 31st of August, 1821.

The parents said that, as soon as the child began to walk, they perceived she was lame. No accident had happened to her. Divers remedies had been used, without avail. When the child stands erect, the thinness of the left leg is immediately perceived, as also the difference between the shape and size of the thighs, the projection of the great trochanter upwards and outwards, and the oblique direction of the femurs. The vertebral column is exceedingly curved; the head is carried backwards, as if to compensate for the effects of the transposition from the centre of motion. The belly projects, the knee and toe are turned inwards, the heel and ham outwards. This child evidently labors under original luxations of the femur. The case is remarkable, merely inasmuch as the deformity exists only on one side.

CASE V.—Miss T.... de J....., was born on the 5th of January, 1812. At her birth no deformity was observed in her lower extremities. At the age of 14 months, it was attempted to teach her to walk, and then for the first time perceived that in walking she rolled from one hip to the other; the weight of the body, instead of resting on the whole sole of the foot, rested merely on the toes, which were turned inwards, as well as the knee, whilst the heels and ham were raised and turned outwards; the feet were with difficulty raised from the ground, and the little patient could scarcely separate her thighs.

From this time, the parents consulted several physicians, by whom a host of various remedies were prescribed, without the least advantage. The little patient increased in size, and the affection also progressed; the lumbar vertebræ projected forward, and impelled by this deformity, the abdominal viscera became more saliant.

In 1821, M. Dupuytren saw the child for the first time; she then presented the following appearance:

The lower extremities, turned inwards, were remarkably short and emaciated, having an oblique direction, separated at their upper extremities, and approximated below. The great trochanters projected upwards and backwards; the foot strongly bent; the chest and abdomen projected forward, the upper part of the body inclined forward. No deformity could be discovered in the body or pelvis.

The above symptoms are observed in the erect posture; but when in bed, the weight of the body resting no longer on the femurs, they fall to their right place, and the symptoms disappear. It is a very remarkable fact, that Miss T.... can walk, run, and jump, as well as any other child.

To the symptoms just enumerated, must be added the history of individuals affected with this luxation; the appearance of the symptoms at the earliest attempts to walk, and the progressive development of these symptoms in proportion to the increase of weight of the upper parts of the body.

Individuals laboring under original luxation, experience no pain in the hips or knees; and only feel fatigue and numbness, after too much exercise; there is no engorgement around the osteo-femoral articulation, the projection of the

great trochanters, and large size of the flesh surrounding the neck of the bone have no characters of it; they proceed from the ascent of the head of the bone, along the external iliac fossa, and the retraction of the muscles towards the cristæ of the ilia; there is no abscess, nor fistula around the joint; no mark of a cicatrix, and consequently, nothing from which we can infer any previous disease of the part; lastly both hips, or that alone which is affected, present always the same change of figure; a circumstance so rare in disease of the superior articulation of the thigh bones, that it may be regarded as characteristic of the disease at present under consideration.

These proofs are more valuable when added to the history of individuals affected with original luxation; they assure us that they never have suffered any pain in the articulation of the hip, or at the knee, nor, in a word, any of the symptoms of the painful and dreadful disease, which generally terminates in spontaneous luxation of the thigh.

The history of these patients proves also in a positive manner, the first symptoms, progress, development, and effects of congenital luxation of the femur. Called early to children affected with it, we find, from the moment of birth marks of this conformation, such as immoderate size of the hips, projection of the trochanter, obliquity of the femurs, &c.; but as it generally happens, this malformation attracts the notice of parents only when children are beginning to walk and our attention is then first directed to it. Then children can walk, run, or jump, only with great difficulty; sometimes it happens, that parents think the child only slow in learning to walk, and do not perceive the disease until three or four years of age, that is, when the defects and imperfections in the form and functions of the parts become so striking, as no longer to be attributed to a tardy development of the parts or their movements.

The disease becomes more evident when the pelvis begins to enlarge, then the balance of the upper part of the body on the pelvis; its inclination forwards, the curvature of the spine, the projection of the abdomen, the circular movements of the extremities of the transverse diameter of the pelvis, the want of fixity of the head of the femurs, the alternate elevation and depression of this bone along the external iliac fossa, become very manifest, but the cause and nature of the disease being unknown, it is attributed to some external agency, during the period of infancy, such as a fall, or too severe traction on the leg, as when a child is lifted by the leg or thigh. Some persons attribute it to a scrofulous affection which during pregnancy, or after birth, has caused the destruction of the edges of the cotyloid cavity, or of the head of the femur, and consequently, the displacement of the latter. It must be confessed that the lymphatic constitution and rachitic aspect of these individuals give some weight to this opinion; and if we have adopted a contrary opinion, it is because we have observed the affection in children of a diametrically opposite constitution, at the moment of birth, and without any sign of disease; and also from dissections which have excluded all idea of any actual or even anterior disease.

At the period, in which the characteristics of the sexes begin to appear, the increase of the pelvis, more rapid and larger in girls than in boys, renders also the malformation more evident in them; but when the pelvis acquires its greatest size, and the upper parts of the body their greatest weight, the effects of the original luxation increase rapidly, so as to give rise to the fear of

disease of the hip-joint. This increase is marked by the gradual inclination forwards, of the upper part of the body, the curvature of the loins and the projection of the abdomen, &c.; and if we may be allowed the expression, by the disarticulation of the femurs, every time they are obliged to support the weight of the body. It should be observed, that the phenomena existing on the exterior of the pelvis, has no influence over the development of its cavity; the viscera contained perform their functions, and the person is as able to receive and transmit the product of fecundation as the most correctly formed individual.

What is, then, the cause of this displacement? Does it arise from some disease of the foetus in the womb of the mother, and cured before birth? Does it arise from some violence which has thrown the head of the bone out of the cotyloid cavity? and has the latter been obliterated without disease, and only because it has been without use, and consequently, idle? has nature forgotten to establish a cavity, for the head of the femur? or has this cavity, resulting from the junction of the three pieces composing the os innominatum, become imperfect on account of some obstacle to the evolution of the bone, as is the opinion of M. Breschet? Without attempting to resolve any of these questions, we will be satisfied with offering a few remarks.

Pathological anatomy has demonstrated that the foetus, during pregnancy, is subject to many diseases, which may run their course and end in recovery or death, before birth. Hence, a disease of this nature might produce spontaneous luxation of the femur; yet many circumstances oppose this explanation; and, in the first place, all the individuals in whom it has been observed were born healthy, which does not permit us to suppose that they had suffered from so severe a disease; again, neither at birth, nor at any subsequent period, have there been observed the engorgement, abscesses, fistulas or pain which accompany and so generally follow this species of disease. Does not this displacement rather depend on some violence, which has forced the femur from the acetabulum? In a word, would this displacement be accidental and analogous in its nature, did it not depend on some special cause, or some cause occurring during life, in consequence of falls, &c.? But what, in such a case, would be the degree of violence sufficient to produce such a displacement? Let me here make a remark which may give some probability to the explanation. It is, that the position of the limb of the foetus, whilst in the womb, is such, that the thighs are strongly flexed on the belly; the head of the femurs constantly presses against the posterior inferior part of the articulation; and this continual pressure, of no injury to well formed children, might be productive of serious effects in others less strong and whose tissues were less firm. Admitting this fact, it will be easily perceived that the posterior inferior parts of the capsule being obliged to yield and allow the passage of the head of the femur, permit the occurrence of a luxation; and then to understand the displacement upwards and outwards, it will suffice to call to mind the strength of the muscle surrounding the joint which tend incessantly to cause an ascent of the head of the bone.

What is the treatment proper for this affection? At first sight, palliative remedies appear most reasonable, and I confess are those which I have preferred. If we remember the natural tendency of the head of the femurs to ascend along the external iliac fossa, and that the cause of this ascending movement is, in the weight of the body which constantly contributes towards

it, we will understand on what indications the palliative treatment is founded. As far as possible, the weight of the body should be prevented from bearing on an articulation which has no cavity, and also muscular action upon the femur should be moderated as far as is in our power. Rest is hence a most important means, and the sitting posture is preferable, as in it, the weight of the body rests on the tuberosities of the ischia. Individuals affected with this infirmity, cannot, however, be subjected to constant rest. Some method, therefore, of lessening the inconvenience of standing or walking must be devised. Hitherto, experience has pointed out to me, but two; the first consists in the daily use of a bath, either of fresh or salt water, extremely cold, for three or four minutes, at each immersion. The second is the constant use, or at least during the day, of a girdle around the pelvis, embracing the great trochanters and keeping them at a proper height, and which shall constitute, out of these weakened parts, a more solid whole, and prevent the continual vacillation of the body on the joints.

I have succeeded, by these means, in arresting the increase of the inconveniences of the luxation, and thus render tolerable the evil which I could not cure. Some patients have afforded to me, the most irrefragable proofs of this assertion; wearied by the pressure of the belt, they abandoned it, but soon again returned to its use, convinced that without it, they possessed no solidity in their hips, or confidence in walking.

It was at first supposed that extension of the lower limbs would be useless; for, even supposing that the limbs could be brought to their natural length, as the head of the femur met with no resistance, would it not be evident that, when left to themselves, they would lose all the length they had gained?

This opinion has been modified by the labors of M. M. Lafond and Duval. These distinguished physicians, in their private hospital at Chaillot, subjected to continual extension, a child of eight or nine years of age, affected with congenital luxation on both sides, and M. Dupuytren has certified, that after a treatment of some weeks the limbs had recovered their length and straightness; and after three or four months treatment, he saw, with great surprise, the greater part of the good effects of the remedy still persist. No conclusion can be drawn from a single case, but still it is important, and may be more so, as regards the consequences which may arise from it.

We will now quote a case from the work of M. Talade Lafond, on the deformities of the human body.

Miss A . . . . ., nine years of age, was admitted into our establishment, in the year 1828, in the following condition: she was of ordinary size, well formed, and enjoyed good health. The curvature of the loins, the projection of the thighs backwards, the lateral balancing of her body, caused her walk to resemble that of a duck. She stood and walked with but very little confidence. On examination of the hips the following phenomena were observed; the buttock projected, the great trochanter approached the anterior superior spinous process of the ilium, and when the foot was turned outwards, a tumor, evidently formed by the head of the femur, could be felt in the external iliac fossa; in the usual position the limb preserved its ordinary straightness, and could exert the movement of rotation outwards.

On attempting to extend the limb, the great trochanter was depressed, as well as the whole of the upper extremity of the femur, giving a distinct sound

of crepitation resulting from the friction over hard and smooth surfaces. These phenomena were observed on both sides.

The ease with which the limbs could be lengthened, suggested to us the idea of keeping, by means of gentle extension, the head of the bone on a level with the cotyloid cavity; a belt round the hips, pressed the head of the femurs downwards, which was assisted by extension at the feet, at the same time that the upper part of the body was fixed to the extending bed; when standing or walking the body was always supported by crutches. We were induced, hoping to succeed, to continue this treatment for sometime; but failing in our hopes, and the patient being very intractable, the treatment was discontinued. We may add, however, that she walked much better when she left our establishment. This improvement was probably owing to the cold, salt and sulphur baths, and the use of gymnastic exercises of which she was passionately fond.

Original luxation of the femurs, said M. Dupuytren in conclusion, is not so rare as may be supposed. I have seen it twenty-five or twenty-six times in the course of twenty years. One remarkable and interesting fact is, that persons affected with this luxation are generally females: indeed, of the twenty-six I have seen, only three or four were males. Therefore, it cannot be admitted that chance alone is the cause of this disproportion; but supposing it constant, why is the female sex more prone to this luxation than the male? I confess, I am unable to give a satisfactory reason; I can at most give a general one, it is that deformities in general, occur much more frequently in women than in men.

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## CHAPTER XXVIII.

### ON LACHRYMAL TUMORS AND FISTULAS.

#### *Treatment of M. Dupuytren, and its Results.*

The disease which produces fistula lachrymalis appears under two very distinct forms which depend on its successive degrees of development, and which are, in ordinary language, erroneously included under the same name. As long as there is no opening externally of the lachrymal sac, there can be no fistula; but the sac is then more or less considerably dilated, constituting the lachrymal tumor; this is the first stage of the disease: the perforation of the sac or fistula is the second.

Ordinarily the lachrymal tumor arises and increases in an almost imperceptible manner. It is at first a scarcely appreciable tumor, situated within and below the greater angle of the eye, below and behind the straight tendon of the orbicular muscle of the eyebrows. Circumscribed, without change of color of the skin, free from pain, at the commencement, the tumor is easily emptied by pressure, either by the reflux of the contained matter through the puncta lachrymalia, or through the nostril.

The epiphora accompanying its first appearance, becomes daily more serious,

and at last the tears pass entirely over the cheek. The eye of the diseased side is constantly red, the conjunctiva slightly injected, the eyelids evidently swollen, especially at the free edges, which in the morning are found glued together by a tenacious yellow matter, furnished by the irritated gland, of Meibomius.

The disease may exist a long time in this state, without exacerbation; but a period arrives when the parietes of the tumor grow thin; it is no longer emptied by pressure; there is redness and pain in the spot it occupies; and its surface becomes inflamed. The inflammation frequently extends to the eyelids, cheek, nose and even the forehead. The eye becomes red, the fluid which bathes it, becomes hotter and more acrid. The tumor presents the appearance of an acute phlegmon, fluctuation is perceptible, and it opens externally. At this period, in the majority of cases, the epiphora diminishes, the tears finding a passage through the unnatural opening of the sac.

The fluid discharged by the fistula presents a mixture of tears and purulent mucus. In many cases, the continuance of the phlegmasia causes the disorganization of the affected tissues, and the extension of the disease to adjacent parts. Granulations appear in the fistula, whose edges become callous; the mucous membrane of the sac, and nasal canal softens, becomes fungous and even perishes to a certain extent, and the periosteum partaking of this destruction, the os unguis and adjacent parts of the maxillary bone at the bottom of the fistula are exposed and become carious. This caries sometimes takes place before the disease has reached the degree of which we have just spoken; sometimes it is seen even before the lachrymal tumor has been perforated, and consequently before the existence of the fistula.

From what has been said, the diagnosis of this disease will be very simple. We will, however make a few remarks on the cause of the primary injury of the lachrymal sac, which is the origin of the disease. Scarpa places it in the discharge from the eyelids, thus considering the affection of the lachrymal sac as always secondary to the inflammation of the eyelids. According to him, the purulent fluid, carried into the lachrymal ducts, irritates and inflames them; afterwards the sac or nasal canal ulcerates, the disease extends and terminates in disorganization of the adjacent parts. But more recent researches have proved that the lachrymal ducts, like all other excretory canals owe the majority of their diseases to some affection of the mucous membrane which lines them. Some point of this membrane is inflamed, immediately the external fibro-cellular tissue becomes the seat of an active congestion, which proportionably diminishes the area of the internal duct. This structure becomes of itself a permanent cause of irritation, the afflux of blood is increased, the inflamed tissue softens, then ulcerates, and the fistula is established. The duct of Steno, the urethra, rectum, cæcum, œsophagus, &c., furnish the most conclusive proofs of this species of etiology. All causes, therefore, productive of a permanent irritation of the eyes, eyelids, or mucous membrane of the nasal cavities, are also the remote causes of lachrymal tumors. Thus we frequently see them occurring in leucophlegmatic, pale persons, whose conjunctiva is habitually injected, and the edges of whose eyelids are red and bleared; they often follow rubeola, variola, scarlatina, which so frequently leave the eye and eyelids in a state of irritation; and that repelled eruptions, an old venereal affection, a scrofulous state of the body, by favoring the development

and continuance of oculo-palpebral inflammation, occasion also that of the lachrymal ducts, and, consequently, the appearance of tumors and fistulas which result from it. A purely mechanical cause may lead to the same termination.

It follows, therefore, from the pathology of lachrymal tumors and fistulas, that the antiphlogistic treatment should be used in the commencement of the disease. Indeed, it should not be forgotten, that they result, as we have observed, from an inflammation either of the eye or eyelids, or the mucous membrane of the nose, extending to the sac and canal which are the seat of the disease. This treatment is frequently successful without any operation.

At a more advanced period, when the disease is yet simple, and there exists but a moderate dilatation of the canal, or a recent perforation unaccompanied by callosity, fungous granulations, disorganization of the mucous membrane, caries of the adjacent bones, the antiphlogistic treatment aided by revulsives, fumigations, &c., will effect a permanent cure; and even if the disease have reached a degree requiring the operation, still a preparatory antiphlogistic treatment is necessary, should there be any inflammation of the eye, eyelids, or surrounding tissues.

The attention of the surgeon should not be alone directed to the local affection, he should carefully investigate the remote causes, the constitution of the patient, any previous venereal affection. Should it depend on scrofula, venereal, &c. the proper remedies should be used at the same time that local applications suited to the disease are required.

In hospitals, we seldom can employ any other remedies than the operation. Generally, the patient asks for advice, only after having labored under the disease for a long time, or when the tumor conceals so serious an affection as to require the nasal canal to be opened, and freed from its obstruction.

In order to perform this operation, according to M. Dupuytren, the surgeon merely requires a bistoury with a narrow blade and firm point, a canula, such as will be hereafter described; the patient should be seated on a low strong chair, opposite a bright light, the head thrown back and supported by an assistant. The surgeon, then, before proceeding any further, ascertains exactly the situation of the maxillary edge of the orbit near the inner canthus of the eye. This edge is sometimes found more elevated or depressed, than was at first supposed.

Again, the straight tendon of the orbicularis palpebrarum muscle should be carefully examined, as its direction is not always constant. Between this tendon, which must be left uninjured, and the maxillary edge of the orbit below which a sac is no longer found, the instrument is introduced. These elementary principles should not be forgotten, as on them the success of the operation depends.

CASE I.—Chalon, (Alexandrine,) thirty-six years of age, of a lymphatic temperament, was admitted into the Hotel-Dieu for a fistula lachrymalis on the left eye. The disease, for which she could assign no cause, had existed for upwards of six years.

During the first five years, there was a continual discharge of tears, and, consequently, great obscurity of vision, dryness of the corresponding nostril, and aphalalgia of the same side. At the end of this period a small tumor appeared at the inner angle of the eye; it was compressible and could be made

to disappear by pressure. An erysipelatous redness soon appeared which spread to the adjacent parts; the tumor burst and emptied itself. The opening, however, closed, and a second tumor larger than the first appeared; it also opened, and permanently established a fistula.

The tumor was of the size of a small nut and presented in its centre a fistulous opening which established a communication between the lachrymal sac and the exterior, and by which the latter was entirely emptied. There was considerable weeping, the eye extremely sensible and very red, the corresponding nostril dry, the head painful on the same side, the lower eye-lid elevated, and covering more than one half of the eye; the surrounding parts highly inflamed, and the cheek was marked by furrows made by the tears.

From these symptoms the nature of the affection was very evident. After a few days of rest and the use of antiphlogistic remedies, M. Dupuytren performed the operation in the following manner; the patient being seated, the operator divides the lacrymal sac to the extent of a few lines, plunges the bistoury into the upper part of the nasal canal, the blade of the instrument being gently elevated and directed backwards; introduces and passes in front of the anterior surface of this blade the free and smooth extremity of a small canula on its mandrel, then withdraws the bistoury, and passes the canula by means of gentle pressure into the nasal canal, which it should entirely fill, so that its upper extremity may be concealed by the inferior portion of the lachrymal sac. The mandrel is then withdrawn, and the canula left in its proper situation. This operation, as may be seen, is one of the most simple, easy, and rapidly performed that can be imagined.

In order to be certain that the tube is properly placed, the professor closes the nostrils of the patient and desires him to make the effort of blowing his nose. The air introduced into the canula by its lower orifice passes through its base by the opening in the lachrymal sac with a hissing noise; and should the patient discharge a little blood or other matter from his nose, it proves most satisfactorily that the communication is entirely re-established between the upper part of the canal and the nose. A contrary result shows that the operation has failed.

In the case under consideration the operation was so successful, that, in four days, it would have been almost impossible to say there ever had been a fistula. The small wound in the sac had healed; there was no tumor, weeping, nor embarrassment in the vision. In twenty days she was discharged perfectly cured, and in good health. The canula used by M. Dupuytren, is made of gold or silver, and always expressly for the patient on whom he is to operate; it is about eight or nine lines in length for adults and five or six for children, a little larger above than below, having at its upper extremity a circular and thin projecting plate. It has a slight curvature anteriorly, in order to suit better the direction of the nasal canal, and its inferior extremity. The instrument is mounted on a mandrel made of iron wire, bent at a right angle. The part entering the canula should fill it entirely, the remainder serving as a handle may be longer and shaped like a spatula. We have already explained how the canula should be introduced into the nasal canal.

CASE II.—Galan, F. L. A., fifteen years of age, of a good constitution, was admitted for a fistula lachrymalis of the right eye. Seven years previously, without any known cause, she had perceived an unusual flow of tears. The

discharge become daily more copious and inconvenient; a blister had been applied to the nape of the neck; and also others to the arms, but without any improvement.

Two months previous to her entrance into the hospital a tumor appeared at the inner canthus of the right eye, at first soft, easily compressible and free from pain, it soon became tense, hot, and painful.

The inflammation extended to the adjacent parts, an opening formed in the centre of the tumor giving issue to tears mingled with pus. Then the swelling diminished, as also the weeping, and the patient seemed improved. The opening having closed, the tumor again formed and became larger than at first, the inflammation increased and a new fistula was formed, which existed at the time of her admission. The eye was then highly inflamed, discharging tears; an acrid and burning matter, formed of pus and tears, flowed over the cheek.

After three days of preparatory treatment, the operation as above described, was performed; and in eighteen days she left the hospital entirely cured of her troublesome disease.

Although the operation of M. Dupuytren, is undoubtedly the best hitherto employed, and fulfils every indication, nevertheless, some inconveniences, caused by the presence of the canula, have been represented as essential faults. Far from denying them, the professor himself was the first to point them out, and give some cases, in order the better to explain the means by which he has succeeded in obviating them. Among these inconveniences, is observed, principally, the ascent of the canula into the lachrymal sac, or its descent into the nasal fossæ, at the lower extremity of the nasal canal. The former accident, after some time gives rise to inflammation, ulceration, and abscesses, requiring the extraction of the canula. This was remedied in the following manner: A small steel mandrel, similar to that introduced into the canula was made, having the portion which passes into the canula, divided into two portions, which separate on account of their elasticity. Each division is terminated by a small hook, of which the points turn outwards. At the time of being introduced, they are held together by a small ferule, which can be withdrawn at pleasure. As soon as the lower extremities pass beyond the end of the canula, they separate by virtue of their elasticity, the little hooks bear on the edges of the canula, and the mandrel cannot be withdrawn without also withdrawing the latter.

The enlargement of the upper portion of the canula, is intended to prevent its descent into the nasal fossæ. Still this accident sometimes occurs, and then the instrument irritates and inflames the mucous membrane of these cavities, ulcerates and destroys it, and even perforates the palatine arch. In such cases it should be pushed from below upwards into the nasal fossæ, and extracted through the nostrils with the forceps.

CASE III.—A woman had been operated upon according to M. Dupuytren's mode, and had worn the canula for eighteen months. During that time, she felt nothing of a disease of which not a vestige remained. But a few days since, pain and swelling accompanied by redness, appeared at the inner angle of the eye. By pressure on this spot, fluctuation and a foreign body were discovered; it was the canula which had ascended into the lachrymal sac. An incision was made below the tendon of the orbicularis palpebrarum, as in the ordinary operation for fistula. The canula was felt, exposed, and easily extracted.

The affection soon disappeared, and she was completely cured in a few days.

On the other hand, the accidents of which we have spoken, and which are said to be very frequent, are, on the contrary, very rare, and can in nowise affect the results of the operation.

In the second place, this affection is often the effect of general causes, as a venereal or scrofulous taint, &c, and if the surgeon, ignorant of these causes, because the patient is silent concerning the disease with which he may have previously been affected, does not add a general to a local treatment, or if the patient neglect the general remedies, which most frequently happens, it is evident that the failure of the operation cannot be attributed to the manner in which it was performed. Again, the want of success owing to the imperfect manner in which some practitioners perform the operation, cannot be urged as an objection to the operation itself. Thus, it has happened that instead of placing the canula in the nasal canal, it has been introduced into the orbit, or the maxillary sinus, after having perforated the inferior wall of the orbit, or into the soft parts and in front of the sub-maxillary bones. The following is a curious case of the kind.

CASE IV.—A man had been operated upon in the city, according to M. Dupuytren's method. No improvement took place. On examination it was found that the canula had been passed under the skin, in front of the inner angle of the eye and on the side of the nose. The operation was re-performed, and the patient cured in a few days.

Hitherto, we have treated only of simple lachrymal tumors and fistula; frequently, however, complications exist requiring a special treatment. Sometimes the orifice of the fistula, is surrounded by small fungous granulations; these are to be removed by caustic or the scissors.

If the puncta lachrymalia are closed, the operation does not remove the epiphora, and the tears continue to flow over the cheeks; they may be easily separated by means of Anel's probe, if the obstruction be but slight; but this complication is nearly incurable, if it result from an extensive adhesion of the sides of the puncta lachrymalia.

Should there exist a simple denudation or caries of the os unguis, after having cleared out the nasal duct and placed the canula, the cavity of the sac is to be dressed with charpie and the external wound kept open, until the surface of the bone be covered or exfoliations take place.

It is not our intention to describe the different operations, adopted by surgeons since the last century, some have been abandoned, others yet want the test of experience, but over all, that of M. Dupuytren possesses immense advantages. We will finish this chapter with a short sketch of the disease which has just occupied our attention.

This affection was known to Hippocrates, Celsus, and Galen. Their ideas concerning it were but vague, owing to their want of anatomical knowledge of the parts. The disease was first accurately described in the 16th century by Fallopius and Louis.

The causes are of three classes; general, such as scrofula, herpes, syphilis &c; local, but not seated in the lachrymal ducts; local, and situated in the ducts.

The tumor is generally developed beneath the tendon of the orbicularis

palpebrarum muscle, sometimes both above and beneath, so that making two projections, it appears strangulated by the tendon, and as it were, bilated. The progress of the disease is divided into two periods—the period of the developement of the tumor, and that of the formation of the fistula.

The diagnosis is based on symptoms which do not allow it to be mistaken for other diseases, such as hernia or dropsy of the sack.

The antiphlogistic treatment is proper when the contraction of the canal is owing to inflammation, should it be insufficient we must have recourse to revulsives.

General causes, such as scrofula, herpes, or syphilis, must be treated by the appropriate general remedies.

Lastly, as to the local treatment, the operation of M. Dupuytren is superior to all others, as we have previously stated and demonstrated by the results of his practice, and it fulfils all indications.

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## CHAPTER XXIX.

### ON FISSURE OF THE ANUS.

The diseases which affect the anus and its vicinity demand all the attention of the surgeon, as well on account of their frequent occurrence, as of the serious accidents which may arise from an erroneous diagnosis. The same danger does not exist in fissure of the anus, but it is generally accompanied by such violent pain, that immediate relief is of the highest importance. The pain is of a peculiar character, gradually increasing and lasting some time after defecation; sometimes lancinating, generally of a burning kind; the patient is at a loss for words to express his agony. Generally he compares it to a red-hot iron in the rectum, and dreads so much the expulsion of the fœces that we frequently find him resist as long as he possibly can this imperious desire, and even abstain from food in order to avoid the necessity of it.

These peculiarities throw abundant light on the nature of the disease, and were we to study carefully the special characters of the different diseases of the rectum, we should there often find most valuable distinguishing symptoms.

Consisting in an extended and superficial ulceration, which is developed towards the margin of the anus, in the radiated folds of the mucous membrane of the part, fissure of the anus demands an attentive examination. On opening the orifice and desiring the patient to force down the gut, we will perceive a narrow slit, red at the bottom, and of which the edges are slightly swollen and callous. In order, however, to recognize its full extent, it is often necessary to introduce the finger. We find that it is more generally situated either on the sides or back part of the anus than in front; a circumstance favorable to the operation, especially in women, in whom this aperture is separated from the posterior commissure of the vulva, only by a thin partition. The ulceration seldom interests the whole thickness of the mucous membrane.

The severity of this affection depends, therefore, chiefly on the painful

spasm of the constrictors of the anus; the fissure is merely accidental, as is demonstrated by the existence of painful constriction without a cleft, which, according to celebrated surgeons, is to the other case as one to four. This spasm is so violent that the introduction of the smallest body cannot be borne; and the resistance opposed by the anus to all attempts at effecting it, is another symptom characteristic of the affection.

The causes of anal fissure are numerous; the constipation and spasm produced tend particularly to it, hardened matter, by destroying the mucous membrane, and over-distending the gut may give rise to it; the administration of enemata by unskillful hands; it is met with in persons laboring under hemorrhoids; the venereal virus, either deposited immediately on the margin of the anus in *coitus contra naturam*, or having flowed back from the genital organs of women, is a very frequent cause of the disease.

The known insufficiency of all local applications in this afflicting disease, has caused the successive abandonment of the majority of remedies which had been considered either as curative or palliative, and we now generally have recourse to an operation always safe, it is true, and followed by success, but which is exceedingly painful, and to which patients do not readily consent, namely, the *incision* of the sphincter ani, or the cautery of the fissure by nitrate of silver.

The discovery of a cure for this disease, without an operation, would be an invaluable benefit to mankind. If the plan of which we are now about to speak is not always successful, it has succeeded so frequently in the hands of M. Dupuytren, as to be deserving of more frequent trial.

We have stated, that the disease actually consists in spasmodic contraction of the sphincter; the fissure is only a secondary phenomenon. By overcoming the spasm the patient is cured.

The application of belladonna, under the circumstances, is naturally indicated. M. Dupuytren first used it, and has derived great advantages from it; by combining it with the acetate of lead. The following is the formula he prefers.

℞ Extr. Belladonnæ  
Acetat. Plumbi. ā ā ʒi  
Axungia ʒvi

A small sized bougie is covered with the ointment, introduced into the rectum, and gradually increased until it becomes as large as the index finger.

The following case, selected at random proves the occasional efficacy of this mode of treatment.

CASE I.—A young woman strong and of a good constitution, began to feel a few months after delivery, acute pains in the anus. The agony was intense when she went to stool, and especially if the fœces were consistent and indurated. At first they lasted for only a few minutes; but gradually increased to a duration of several hours.

On her admission into the Hotel-Dieu, the anus was carefully examined, and by drawing out the end of the rectum, a very superficial fissure was discovered. The constriction of the anus was considerable, the little finger could hardly be introduced, and not without the most excruciating pain. Strips of lint covered with a thick coat of this cerate were introduced into the anus, and renewed several times during the day. The pain was

instantaneously relieved. In fifteen days she was discharged perfectly cured, without a bloody and painful operation.

Before treating of the other means of treatment used by the professor, it will be proper to examine the differences presented by the fissures on account of their situation. Those which form *below* the sphincter ani, affecting merely the cutaneous tissue and not the anal mucous membrane, occasion a greater or less pruritus, but interfere very slightly with the process of defecation, causing no contraction of the sphincter, and, consequently, but little pain. They are generally caused by some venereal disease.

Fissures which are seated *above* the sphincter affect the mucous membrane; the eye can only discover them by means of the speculum. By introducing the finger in the rectum, we find a knotty hard cord, exceedingly painful on pressure. The fæces discharged are covered with a puriform mucus, and bloody on the side corresponding to the fissure. They are generally the product of the ulceration of internal piles during the passage of hardened fæces. Lastly, fissures on a *level* with the sphincter are more severe than the former; and in this species we observe the painful constriction of the sphincter, and the other symptoms above described.

Fissures of the first two species are generally cured without any operation, some by means of lint, covered with simple or opiated cerate, pomatum of curcumis, unguentum populeum,\* mercurial preparations, &c.; others by emollient and narcotic lotions, made with decoction of althæa officinalis, poppy heads, solanum, hyoscyamus, belladonna, stramonium, &c.

But in that form, accompanied by severe pain and spasmodic constriction of the anus, seated on a level with the sphincter muscle, the most prompt and efficacious plan is the operation introduced by M. Bryer, and which requires for its performance only an ordinary and a probe pointed bistoury.

CASE II.—A man of 30 years of age, had suffered for more than four months with pains in the anus, which were much increased by defecation. Latterly, the performance of this function was accompanied by most horrible agony, which increased after excretion, and lasted four or five hours. He had undergone various modes of treatment without relief, and at last entered the Hotel-Dieu. There was a small excrescence on the margin of the anus, a spasmodic constriction of this opening with a fissure on the left. The excrescence was removed by the scissors, and an incision made in the anus at the fissure itself. A piece of lint covered with cerate was introduced into the rectum and placed between the lips of the incision.

M. Dupuytren here pointed out the importance of the incision at the fissure, instead of at some distance from it. Indeed, the *debridement* of the anus, relieved the pain instantly, permitted the fissure to cicatrize, and thus effected a certain cure. A case occurs, however, in which the fissure cannot be incised, namely, when it is seated in front towards the urethra in man or the vagina in the female.

When this disease, simple of itself, is of long standing, it becomes compli-

\* *Unguentum Populeum*.—This ointment is composed of, five pounds of lard, one pound of the fresh buds of the populus nigra, four ounces of the fresh leaves of the black poppy, as much of the leaves of the belladonna, hyoscyamus, and solanum nigrum.  
—TRANS.

cated with more or less severe local disorder, and so great a change in the constitution of the patient as may endanger his life.

CASE III.—Delahage (A), 24 years of age, of a good constitution, regular, having had several children, was admitted into the Hotel-Dieu for several fissures of the anus, with excrescences. The disease had existed for several years. At the date of her admission into the hospital the anus was contracted, several fissures existed in its circumference, and also a considerable mass of excrescences, but not of an unhealthy appearance. The alvine evacuations occurred but seldom, but were accompanied by dreadful suffering, lasting several hours after the evacuation. The fecal matter was generally mixed with a large quantity of blood and mucus.

The patient was growing weaker, she was pale and bloated, especially in the face, and frequently had fevers. She denied ever having had syphilis, and was unable to assign any cause for the disease. After two or three days of preparatory treatment, M. Dupuytren performed the operation. Each tumor was seized with a dissecting forceps and removed by a pair of curved scissors at one blow; then with a straight probe pointed bistoury, introduced into the rectum, he made several incisions in different directions, of three or four lines in depth. A pledget of lint of the size of the finger was placed in the anus in order to prevent the reunion of the incisions. On the same day a copious evacuation took place, accompanied by considerable discharge of blood, but without the horrible pain felt before the operation. Another pledget was introduced into the rectum. This dressing was renewed every day and after each evacuation. The patient became tranquil, recovered her flesh, and on the 22d day was discharged perfectly cured.

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## CHAPTER XXX.

### ON RANULA.

I am now about, said M. Dupuytren, to excise two small tumors which a young man has under his tongue, near its apex. What is the origin and nature of these tumors? Do they belong to the species known by the name of *ranula*? I doubt it. In the first place, ranula rarely arises under the apex of the tongue, but is generally seen under the base of its free extremity, and it is precisely on this account, that its diagnosis is frequently difficult, and that it is often confounded with other tumors of entirely a different nature. Tumors similar to that under which our patient labors, arise in the following manner: The skin is furnished with a considerable number of follicles which secrete an oily matter; this secretion, slight in man, is copious in animals having wool; in birds, especially the aquatic, in which it preserves the beauty of their plumage, and protect it from the water and dampness. Still more copious in fishes: it covers their whole surface with a viscid and glutinous fluid. The same takes place in the mucous membranes lining the internal surface of our organs. The follicles are there innumerable, and pour out constantly mucus destined

to moisten the surface. These follicles, like all the other tissues of the animal economy, may become diseased; their secretion is then suppressed, or modified in its nature or quantity; sometimes it becomes exceedingly viscid; at other times, the mucus may be changed into an oily substance. The apertures of these follicles are sometimes closed; the contained fluid accumulates, and distends them; they inflame, and become of considerable size. The tumors may be known by their projecting, their transparency, their indolence, and, especially, the glutinous serosity, with which they are covered. Rarely isolated, generally numerous and in groups, they adhere to each other by means of this glue. They are generally met with on the inner side of the cheeks, in front of the gums, or beneath the tongue. These tumors are, therefore, *mucous cysts*, developed at the expense of the follicles of that name, or *sero mucous*, formed in the excretory ducts of the mouth. It is important to distinguish these facts, until we ascertain, in a positive manner, what is to be understood by *ranula*.

According to the most general opinion, *ranula*, of which the name recalls, either the shape of the tumor, which somewhat resemble the back of a frog, or the change in the pronunciation caused by its presence, is a tumor resulting from the accumulation of saliva in the excretory ducts of the sub-maxillary gland, and sometimes in those of the sub-lingual glands, but the latter is rarely the case.

Whatever may be the true state of the case, as yet we possess no anatomical demonstration of the seat of *ranula*, and it is desirable to discover, whether it be really situated in the excretory canals of the sub-maxillary salivary glands; or whether it consist simply in a cyst formed by a membrane analogous to the serous tissues, and containing a watery fluid; or lastly, whether we must always recognise in it the characters presented by the tumors under consideration. It is, indeed, probable, that tumors belonging to one of these three series have been indistinctly confounded, according to their situation, under the name of *ranula*, by numerous authors, both ancient and modern, who have treated of them, and even thus designated affections entirely distinct from them. Thus Celsus considered this disease as an abscess of peculiar character, and Ambrose Pare, has fallen into the same error. Actuarius pretends to have cured the disease by opening a vein, on which account Camper thinks that we took the tumor for a dilatation of the vessel. Fabricius ab Aquapendente placed *ranula* among encysted tumors, and compared it to *melices*. John Murmicks thought that we had demonstrated it to depend on the accumulation of saliva in the ducts which open by a principal canal under the tongue; the credit of the discovery of which, is unjustly assumed by Warthon, who published his work in 1656, while Berenger de Carpi, who wrote in 1521, spoke of it in a clear and precise manner; and even Galen, Oribasius, Rhazes, Avicenna, Avenrhoes, were not ignorant of its existence. According to some authors, children are peculiarly liable to *ranula*, and it is even congenital according to the observations published in the commentaries of Leipzig, and in the work of Vogel. But may not *ranula*, properly so called, have been confounded with those sub-lingual serous cysts which are sometimes very large and descend upon the sternum? M. Breschet, who has published an account of the disease in the *Repertoire d'Anatomie*, gives five cases of this pretended *ranula*, and has seen that in the bodies of newly born children they were merely simple serous cysts distinct

from the thyroid, or tumors of the same kind, developed in the tissue of this glandular body. Camper has observed on a very young girl two large tumors of this nature; he has also seen ranula on each side of the frænum linguæ in women and several men; but states never to have met with it in children.

The occlusion of the orifice of the external canal of the sub-maxillary gland, may proceed from inflammation of the sublingual mucous tissue, of the same tissue of the tongue, from aphthæ and ulcerations about this orifice. In division of the frænum linguæ, the excretory ducts, which open on each side of this membranous fold, may be cut, and their obliteration result from the cicatrization of the wound. Small calculi in the ducts, may oppose the flow of the saliva. It is difficult in practice, to determine the cause of the disease, as it grows easily, and the patient seldom requires the surgeons attention before it has made considerable progress.

In general the symptoms of ranula are so distinct, that we may very readily recognise the affection. It is a soft whitish tumor, regularly round or oblong, seated under the tongue, presenting fluctuation, without pain, redness or the other phenomena of inflammation, yielding slightly to the finger and recovering its shape on the removal of pressure. At first scarcely apparent, but gradually increasing, it seldom exceeds in size a walnut, or pigeon's egg, although it has been seen as large as a hen's egg.

As it increases, the tumor thrusts the tongue backwards, displaces or unroots the teeth, alters the voice, embarrasses the articulation of sounds, prevents children from sucking, and others from eating and swallowing.

It depresses or thrusts aside all the parts with which it may be in contact, and at last appears outwardly under the jaw and anterior part of the neck.

The cause and nature of the disease being well known, its cure is apparently simple, yet we find that this has but seldom occurred.

The most usual method is to puncture the tumor where it appears in the mouth, with a lancet or trocar. If the matter contained is fluid and not very viscid, and no concretions exist, this species of paracentesis may empty the tumor and give temporary relief, for soon after the operation, the aperture closes, the saliva re-accumulates, and the tumor again appears. T. L. Petit relates a case in which this operation was performed ten times without entirely removing the disease.

Indeed, the result to be desired, is not only to empty the tumor after having punctured it, but also to prevent a new accumulation of the fluid, and, in order to effect this, the aperture must be kept open. This can be better done by the *actual cautery* than by any other means; this, however, does not always succeed, as we have learned from our own experience, and that of Sabatier and other distinguished surgeons. It is surprising that an opening made in a sac, distended by a fluid constantly flowing into it, should be insufficient, and that this continual flow should not prevent the closing of the orifice. This is, however, a well known fact, and it would seem to prove that in the formation and maintenance of fistulas, there is something more than the mere flow of a fluid, since a simple, or one with loss of substance, cannot produce a fistula in the duct of Warthon, by which the ranula would be cured; or else the return of the tumor, after having been opened, indicates the existence of a serous cyst, rather than of a ranula formed by the dilatation of the excretory canals of a salivary gland.

The *excision* of a part of the parietes of the tumor has been proposed and executed; but in many cases it has merely delayed the relapse without effectually preventing its recurrence. The loss of substance renders the cicatrization slower, but it as necessarily follows as in a simple incision. The excision should be performed when the tumor is of considerable size, and its parietes are thick, strong and resisting. The wounding of nerves or important vessels is not to be feared, and astringents will generally arrest the slight hemorrhage.

Such is not the case in *extirpation*. This has been proposed but never attempted. What could be the design of this operation? Were we to remove the tumor alone, we would undertake a difficult and delicate operation, without being certain of preventing a reproduction of the disease. The gland itself should be removed.

Could the *injection* of some irritating fluid into the sac, cause the inflammation and consequent adhesion of the parietes of the cyst? The functions of the gland would then be rendered useless; the fluid which it continues to secrete, finding no exit, would gradually distend the ramifications of the excretory ducts lodged in the interstices of the lobules composing its substance, and might cause swelling followed by acute pain, inflammation, suppuration and an outward fistula; lastly, the inflammation produced by the irritating fluid, might extend to the tongue, larynx and other parts. In fine, if the disease be seated in the external canals of the salivary glands, the treatment by injection is irrational and useless; if, on the contrary, ranula is merely an encysted tumor, containing a serous or albuminous liquid, injection may be of service.

The *catheretism* of the excretory canals of the sub-maxillary glands is difficult, and as ranula is owing less to a contraction of these ducts than to their obliteration by inflammation, or by the presence of some foreign body, it appears to me that the employment of small sounds or bougies is entirely useless.

The use of the cautery will be found to have existed during the earliest days of dogmatic medicine. This mode of practice was adopted by Hippocrates, Celsus, and Fabricius ab Aquapendente, Severinus and Tulpinus, recommended the use of the actual cautery, but only according to the latter, when the tumor is hard and its parietes very thick. Ambrose Paré is of the same opinion, and thinks that the tumor should be opened with a red-hot iron.

The potential has been represented as preferable to the actual cautery, incision, and extirpation; but there is a danger of being unable to limit the action of the caustic, and preventing the destruction of the duct of Warthon itself. Camper says he has succeeded by opening the tumor, and then touching it with nitrate of silver, but confesses that he was obliged to repeat the application several times.

It follows, therefore, from the foregoing statements, that the curative indications of ranula, consisting in giving exit to the contained fluid, and preventing the closing of the orifice, in order to guard against a return of the disease, have been known to the majority of writers on the subject, but that none of them has had the desired effect. All the methods of which we have hitherto spoken, are liable to insurmountable objections; the following, first practised by M. Dupuytren, is simple in performance, and certain in effect, and has been used by him several times successfully.

This surgeon imagined, that the most certain method of obtaining a radical cure of ranula, would be to keep the orifice constantly open, by means of a foreign body introduced and left in the cyst; in short, to treat the disease in the same manner as he has, for 20 years, treated fistula lachrymalis.

In order to effect this, he caused to be made, a small hollow cylinder, of four lines in length, and about two in breadth, through which the saliva was to flow. Each extremity terminated in a small ovoid plate, slightly concave on one side and convex on the side adhering to the cylinder; one of these plates was to be placed inside of the tumor, the other outside, that is, in the mouth. The instrument resembles precisely, the double-headed button, still used by some persons to fasten their garments with.

It may be made of gold, silver, or platina, but the latter metal is preferable, as being less liable to damage from the animal fluids.

The following is the first case in which it was tried.

CASE I.—Duchateau, 24 years of age, a drummer in the Imperial Guard. of a bilious temperament, has had for the last three years, a small tumor under the tongue. It increased slowly without any pain, but impeded greatly the motions of the tongue. Wishing to be relieved of it, he came to the Hotel-Dieu on the 14th of October, 1827. On the sides of the frænum, there was a small oblong, demi-opaque tumor, extending in the direction of the canal of Warthon, and apparently produced by the dilatation of the excretory duct of the sub-maxillary gland. Different remedies had been tried, but with only temporary relief.

M. Dupuytren performed the operation in the following manner: an opening was made in the sac, with curved scissors; then, by means of dissecting forceps, he introduced the little instrument into the opening, so that one of the plates was left free in the mouth. From that time the tumor daily diminished, the incision healed over the cylinder of the instrument, and in 15 days, he left the hospital perfectly cured.

M. Dupuytren, after this operation, devised some improvements in the instrument. The plates were made smaller, of an elliptic form, and reversed, so that their concave surfaces looked towards each other; the canal in the cylinder was considered useless, and therefore closed and made much smaller, so that its size was reduced to three lines in length, and one or one and a half in breadth.

In the following case, detailed by Dr. Marx, the success was perfect although the instrument had not undergone the modifications just mentioned.

CASE II.—Tellier, V., 24 years of age, was admitted into the Hotel-Dieu on the 27th of October, 1820, having labored for several years under a tumor on the left side of the frænum linguæ, as large as a small hen's egg. It embarrassed greatly his pronunciation, mastication, and respiration.

The professor seized it with the forceps, and made an incision in it with the curved scissors. A quantity of mucous, ropy, and limpid fluid escaped, and the tumor collapsed. The instrument was introduced into the orifice and there left. The patient came to the consultation 11 days after the operation, the saliva flowed freely between the edges of the wound and the instrument. Some months afterwards, the instrument was still in its place, and the tumor had not re-appeared.

The following is a very interesting case, inasmuch as it affords a comparison on the two methods, practised on the same person, affected with two tumors of this kind, independent of each other.

CASE III.—The woman Pic, 43 years, of age, came to the public consultation at the Hotel-Dieu, on the fifth of July, 1824. She had a soft tumor of the size of a small hen's egg on each side of the *frænum linguæ*. Her voice was changed, respiration and deglutition performed with difficulty; an examination showed the tumors to be independent of each other. They had existed for three months, and been punctured three times, but as often re-appeared.

M. Dupuytren here took occasion to compare his method and the simple incision. He, therefore, introduced his instrument on the right side, and simply made an incision on the left. The latter re-appeared, was operated upon in the manner of the first and entirely cured.

CASE IV.—T. G. Vilcoq, 49 years of age, a worker in cotton, had felt for two months some uneasiness under the left half of his tongue. He then saw a small elongated tumor which, from that time, had increased insensibly. On the 21st of October, 1821, he came to the Hotel-Dieu. On the left side of the *frænum* of the tongue, there was an ovoidal tumor, having its great diameter directed from behind forwards, and slightly from without inwards. The long diameter was about fifteen, and the smaller not more than six. The tumor was soft, fluctuating without change in the color of the mucous membrane, heat, or pain, on pressure. It elevated the left side of the tongue and thrust it towards the pharynx; from which resulted a considerable embarrassment in speech, mastication, and even deglutition.

The next morning, M. Dupuytren, with a bistoury, made an incision of about two lines in length, at the distance of an inch from the apex of the tongue, very near the spot where the mucous membrane of the mouth is reflected over the under surface of the organ; he then introduced, as usual, his instrument into the cavity of the tumor. A clear, viscid, ropy liquid, which only partly escaped at the moment of the incision, continued to flow. The tumor became completely emptied.

On the 3rd day, Vilcoq was perfectly easy, the instrument retained its place. On the 25th the instrument had fallen out the evening preceding, and the tumor begun to appear. By pressure a quantity of fluid as at first escaped. M. Dupuytren endeavored to re-introduce the instrument, but the thickened lips of the incision would not pass between the two plates. A new one was made, on the plan of the first, but having a stalk two lines longer. This was easily introduced on the next morning.

All went on favorably until the 15th of January following. At that time some uneasiness began to be felt around the wound. A small tumor soon appeared, situated immediately on the back part of the plate which projected into the mouth. This second tumor was similar in character to the first, and in ten days became as large as a hazel nut.

The professor having examined it, found it to be independent of the first, and declared that this secondary ranula was multilocular. He made a small incision in the sac, by which a quantity of viscid fluid escaped free from taste or smell. This evacuation was followed by the disappearance of the tumor, and of all embarrassment in the motions of the tongue.

From the cases just related, it will be perceived that if the tumor be large, and its parietes very thick, it is better, before applying the instrument, to make a large incision in the sac, and even to remove a portion of it, and introduce the instrument, only when the wound being nearly healed, presents an orifice just large enough for its admission. It will be seen by the following case, how rapidly this cicatrization takes place.

CASE V.—Devaux, 40 years of age, a gardener by trade, has had for ten days, some pain in the mouth under the left inferior part of the tongue. He soon perceived a small tumor growing at this spot. It increased rapidly, and when the patient came to the consultation at the Hotel-Dieu, it was as large as a small walnut, situated on the left side of the lower part of the mouth, extending to the right and separated in this spot by the frænum. Larger in front than behind, soft, fluctuating, of a violet-red color, demi-transparent, it was without pain, but embarrassed considerably the movements of the tongue, and gave the voice a peculiar tone. The patient said that when he talked, the tumor vibrated, and caused a buzzing, that extended over all his head. His general health was excellent.

M. Dupuytren performed the operation in the following manner: the head was held by an assistant, the left angle of the mouth drawn downwards, the tongue thrust out of the mouth, and turned to the right; the tumor became more apparent. An incision was made in its apex, and a quantity of transparent, ropy fluid escaped. The canula was then introduced, but the incision being too large, it fell out. Several attempts were unsuccessful, and its introduction was postponed until the following day. The wound was then found to be nearly closed, and required dilatation with a fine probe, the canula was introduced, held down by a pledget of charpie, and kept in place by bringing the jaws together.

The success obtained by M. Dupuytren, in many other similar cases, with this little instrument, has been the same, and it is needless to multiply them. This easy and ingenious method, differs entirely from all others, without excepting the bougies, canulas, setons, &c; for experience has shown, that when these foreign bodies were withdrawn, the orifice closed, and the disease was re-established. But the professor has not forgotten under these circumstances, that in the treatment of other affections, every method of cure should be appropriate to the nature of the cause of the malady, and that the experienced practitioner acknowledges no exclusive plan of treatment. We have observed in the course of this chapter, that inflammation, by attacking the excretory ducts of the sub-lingual and maxillary glands, may give rise to ranula.

In these cases, the formation of the tumor is sudden, its development rapid, and the tension, pain, and redness of the parts, distinguish this species from that produced by any other cause.

Here the retention of the saliva is merely the effect of the inflammation, and will cease on the removal of the cause. Local bleeding, either by scarification or leeches, should precede the operation. Ranula in such cases may be compared to a retention of urine, caused by the inflammation of the bladder or its appendages.

The following case will support these remarks.

CASE VI.—Engrot (M.), 21 years of age, irregular in her menses, had under

the lower jaw on the right side, a hard tumor, formed by the sub-maxillary gland. Since its first appearance, six years ago, it has increased to the size of a hen's egg. It was painful when handled, and the slightest pressure caused a jet into the mouth of a mixture of pus and saliva. On the other side, there has been forming, for three weeks, another tumor caused by the accumulation of saliva in the duct of Warthon. It was divided into two equal parts by the *frænum lingæ*, hard and resisting; her pronunciation was impeded, and her voice had that peculiar sound from which the disease takes its name. Respiration and deglutition were difficult.

On examination, M. Dupuytren supposed the tumors to be of an inflammatory nature. His diagnosis was founded on the pain, redness, and resistance of the dilated duct. He, therefore, prescribed leeches, emollients and revulsives, with such success, that in twenty-four hours, there was a decided improvement, and in six days the patient left the hospital entirely cured of her unpleasant malady.

We have said, elsewhere, that ranula may be *simulated* by tumors developed at the spot in which it generally occurs, or in its vicinity. Indeed the inflammation of the sub-lingual and sub-maxillary tissues, may develop tumors of which the external appearance is analagous to it. Such are abscesses, the serous and sero-mucous cysts of which we have already spoken. The diagnosis frequently becomes very difficult.

The case with which we shall close this chapter, is exceedingly interesting, on account of that very difficulty.

CASE VII.—A seamstress, 69 years of age, was admitted into the Hotel-Dieu. For the last four months, she has had an indolent tumor below and on the left point of the tongue, which organ has been gradually thrust aside by its increase, latterly it has gone beyond the floor of the mouth, and projected on the upper and left side of the neck. Several physicians whom she consulted, pronounced it to be ranula. On her admission into the hospital, four months after the appearance of the disease, the tongue was raised and thrust to the right, by a tumor of the size of a pigeon's egg, indolent, soft, and fluctuating. It extended across the muscular floor of the mouth, as far as the upper part of the neck. There it swelled again and formed a new tumor, as large as an ordinary apple. Indolent like the first, this also presented an appearance of fluctuation. Otherwise, the patient's health was good, but it was observed that she possessed great physical and moral irritability.

The mode of origin of the tumor, its shape, and consistence, might mislead as to its true nature. It might be ranula, or a lypoma. In order to remove all doubt, M. Dupuytren made a deep incision into it with a bistoury; no fluid escaped, but fatty flocculi projected through the lips of the wound, and evinced the lipomatous character of the tumor. It was extirpated on the 4th of July.

Although this case presented some difficulty in the diagnosis, there still existed some peculiarities, which, independently of the puncture, might have led to a knowledge of its nature. Its size inside of the mouth, was less than it generally is in ranula of long standing, which descends to the upper part of the neck. Before thus pushing before it the muscles forming the floor of the mouth, the tumor formed by the distension of the duct of Warthon,

acquires a considerable size in the buccal cavity, and the more easily, as the tongue offers less resistance than the muscles of the supra-hyoid region.

Another character of this tumor, which is not remarked in ranula, is the species of strangulation which is presented at its middle, and at the point where it passed from the mouth to the upper part of the neck. When ranula extends thus far, it forms a more rounded tumor, which continues more uniformly with that part of itself which raises the point of the tongue.

Such are the symptoms from which *à priori* its true nature might be known.

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## CHAPTER XXXI.

### ON ABSCESSSES OF THE RIGHT ILIAC FOSSA.

Last year, a man was admitted into the Hotel Dieu, laboring under the symptoms of a disease to which M. Dupuytren has already called the attention of surgeons, and which has been very ably described in the essays of M. M. Husson, Dance, and Meiniere.

The individual in question was about 40 years of age: he had pain and a circumscribed swelling in the right iliac fossa; leeches, emollient poultices, and mild laxatives produced a most happy effect upon the tumor which was perfectly cured.

Long ago, said M. Dupuytren, I have shown that tumors which have apparently an intimate connection with the cæcum are developed in the right iliac fossa. These tumors are generally accompanied by remarkable disturbance in the functions of the large intestine; in many cases they terminate by resolution; sometimes by copious suppuration; and again they are the centre of inflammation extending over the whole surface of the peritoneum. Therefore under these different aspects, they appear deserving of accurate investigation. One of the first questions which naturally arise is, why they form almost always in the right iliac fossa? Why do we rarely see them in the left fossa? It is owing to the configuration of the intestine and surrounding parts alone. Buried in a mass of cellular tissue, the cæcum presents at its junction with the small intestine, so remarkable a contraction, that at that point (the ileo-cæcal valve) we frequently find a mass or foreign substance which may of itself become the cause of these abscesses. This is not the case with the left side, the sigmoid portion of the colon, presents at its points of union no contraction, and the division of the intestines is perfectly natural. Lastly, the anatomical structure of the parts will explain this fact; on the right side the cæcum is free posteriorly from any peritoneal covering, presents at this point less resistance to the pus, and its parietes being thinner, when ulcerated soon give away. On the contrary, on the left side, hermetically enclosed in the peritoneum, protected by this membrane and the aponeurotic expansion of the iliac muscle, the pus, in order to reach the intestine, must raise up the mesocolon and unfold its duplicatures. A more easy exit is offered; it travels towards the crural arch and inguinal ring; and here we might be misled, if we were

not well acquainted with the distinguished marks of hernia or abscesses by conjection with which this disease may be confounded. Again, at this point the alimentary matter takes on the excrementitious character, and is obliged to move in opposition to the laws of gravity; and, lastly, in this portion of the intestinal canal, we frequently meet with inflammatory alterations in a majority of diseases. Hence, all these circumstances, whether natural or morbid, are favorable to the production of these engorgements exterior to the intestine, and explain their frequency in the right iliac fossa.

These tumors are often preceded by symptoms which announce the approaching development of the disease. After some error in diet, a constipation or diarrhœa of longer or shorter duration, more or less habitual colic, sometimes without any of these causes, the patient suffers from violent colic and pain in the bowels, with a tendency to concentration in the right iliac fossa: it may also extend towards the large intestine, or over the whole abdomen. This colic is generally accompanied by constipation, and sometimes vomiting. Such are the symptoms by which we may predict the occurrence of the tumor. They are of very various duration, sometimes lasting for a month or more, sometimes for a few days only. They are of course merely relative, as they frequently exist, without any appearance of an iliac tumor.

The symptoms peculiar to the disease, are fixidity of pain in a circumscribed spot in the iliac fossa, and tumefaction at that spot. In examination, we will find it more tense, resisting, and frequently a tumor of variable size, possessing more sensibility than any other part of the abdomen, and apparently reposing on the cæcum. The patient complains of constipation, colic, difficulty in discharging the stercoral gas. The fever is sometimes high, but there is generally not much severe constitutional irritation, unless the disease be complicated. Thus the fever and anorexia belong to the gastric affection; the constipation and diarrhœa, depend, either on the same cause, or on the size of the tumors.

The predisposing causes are various. Adult age has considerable influence. Of sixteen cases, carefully collected, eleven were under 30 years of age; more than two thirds belonged, therefore, to a period of life in which gastric affections are predominant. The accounts in the Hotel-Dieu, show that the affection occurs principally in the male sex. It is difficult to account for this singularity, but such is the case both in hospital and private practice. The season of the year does not appear to have any direct influence over the appearance of the tumors; they have, however, been observed to be more frequent in the latter part of summer and beginning of autumn; this coincides perfectly with the greater frequency of abdominal affections, and supports the opinion of those who think it originates in lesion of the mucous membrane. The exciting causes are numerous and important. The profession of the patient influences very much its appearance; painters, grinders of colors, turners of copper, constantly exposed to the dust and exhalation of certain irritating metals, suffer from colic, or diarrhœa, which, after sometime, give rise to the formation of the tumor. Persons leading a sedentary life are also liable to be affected after having been laboring under much disturbance in the digestive functions.

The place of residence cannot be considered as unimportant; for we have many patients recently arrived in Paris, who evidently owed their sufferings to a residence in that city. The food of poor workmen is so bad, even in good seasons, that a great portion of those who enter the hospitals with severe

gastro-enterites, may trace their disease to that cause. Therefore, all causes which can produce irritation of the intestinal mucous membrane, may determine phlegmon of the iliac fossa. Those persons, also, who have indulged in the use of alcoholic liquors rendered irritating by the addition of some acrid substance, are much more liable to it. The progress and termination of these tumors is not always the same: the most fortunate and frequent is by resolution. This generally, is effected slowly, and for a long time a hardness remains, indicating the seat of the engorgement.

In other cases, a pulsatile pain is felt in the side of the tumor, which increases, softens, and at last opens into the intestine. This favorable termination is announced by an irresistible desire to evacuate the bowels, followed by the discharge of purulent matter, coinciding with a decrease of size in the tumor. The cure generally soon follows. These abscesses do not always terminate by opening into the cæcum; sometimes they open at once into the cæcum and bladder, or into the vagina, and sometimes externally. This is generally an unfavorable termination, for as the opening in front is at the most elevated spot, the evacuation of the pus is slow and incomplete. In such cases, I advise the patient to rest on his belly, so that the opening in the abscess may become the most depending part.

These abscesses have this remarkable character: that the purulent matter may appear in the intestine, without any effusion of fæcal matter into the cavity of the abscess. This may depend on three reasons. First, the abscess is *gradually* emptied; the pressure of the abdomen prevents a vacuum being formed, by which the fæcal matter might be introduced. Secondly, the obliquity of the opening; and thirdly, the separation of the intestine, which acts as a valve.

Lastly, in some cases, fortunately rare, inflammation extends rapidly from the iliac engorgement to the peritoneum, sometimes, at the same time to the port-peritoneal cellular tissue. Probably, in some cases, the inflammation, attacking primarily but locally the peritoneum, is merely propagated from the iliac fossa to the rest of this membrane. Death may result from this extension of the disease, and it demands our most earnest attention.

Having laid down these ideas, let us detail a few cases tending to support them.

CASE II.—A young man, 23 years of age, of fair complexion, delicate, scrofulous diathesis, and subject to hard work, experienced in December (1828), some symptoms of enterocolitis, which at first were neglected, but afterwards treated by purgatives. He never would attend to his diet. A phlegmonous tumor having appeared in the right iliac fossa, it was treated by emollients. The patient came to the Hotel-Dieu just when the tumor was about opening; a bistoury was plunged deeply into it, and a copious discharge of pus took place. Although the depending position of the aperture ought to have prevented the stagnation of the pus at the bottom of the abscess, the latter was not completely emptied, and the tumor situated inside of the crural arch, continued to increase. A counter-opening was made, but this double issue to the pus, did not improve the state of the patient. His strength diminished, the right leg became infiltrated, diarrhœa and hectic came on, and the man died in the fifth month of the disease.

The autopsy displayed a large abscess situated in the cellular tissue;

surrounding the cæcum, and extending in the direction of the psoas and iliacus muscles. The bones were denuded in some places. The cæcum did not communicate with this abscess, but was evidently much thinner posteriorly; its mucous membrane was thickened, of a slate color, and softer than natural. There was also found a chronic pleuritis and incipient hepatisation in the lower lobes of the lungs. The other organs were free from any alteration.

CASE III.—A tailor, 24 years of age, was admitted into the Hotel-Dieu, having in the right iliac region, several fistulous openings, discharging pus and faecal matter. The primary disease treated in the hospital at Orleans, was a phlegmonous tumor, neglected at first by the patient, but afterwards treated by local emollient applications. He discharged pus by stool and his health was partially restored. The young man came to Paris to complete his cure, but found the disease to increase; the engorgement augmented, and the abscess opened above the crural arch. The malady was accompanied by considerable emaciation; cough, diarrhœa, œdema of the lower limb and several times, since his admission, he has been at the point of death.

However, after a treatment of some months, his general state improved, and after a large number of *douches* and baths, the patient was discharged cured.

CASE IV.—A man, 28 years of age, was attacked with vomiting which lasted six days, a phlegmonous tumor was then perceived in the region of the cæcum.

An emeto-cathartic was prescribed, which increased the disease; leeches, emollients. At the end of three weeks the pus passed into the cæcum, and was discharged *per anum*. The tumor preserved its size, and the surgeon, desirous of giving exit to the pus, opened the abdominal parietes without finding the abscess, and thus reached nearly to the cæcum. The wound was healed. His health soon began to decline; he had fever, diarrhœa, general emaciation. At the end of six months, after a journey in a very rough carriage, an abscess appeared under the cicatrix, and opened spontaneously; a quantity of pus and faecal matter was discharged.—By proper means he was cured in eight months.

CASE V.—*Inflammatory Engorgement in the Right Iliac Fossa, terminating in an Abscess opening into the Cæcum.*—A young man, 20 years of age, admitted into the Hotel-Dieu, on the 16th of September, 1827, has had for fifteen days the following symptoms: frequent desire to go to the stool, like dysenteric tenesmus, but without any evacuation whatever; transient colic, accompanied by borborygmi and pain in the bowels; pain with circumscribed swelling in the right iliac fossa, without fever or general disturbance. In the beginning some nausea, and later, some pain and difficulty in passing water.

No particular cause had preceded the development of these symptoms, the patient was not subject to constipation, had committed no excess, and had merely had diarrhœa two days before the attack. (He was bled in the city, and thirty leeches applied to the iliac region.)

On the day of his admission into the hospital, the patient had a pretty copious purulent evacuation; 17th and 18th, several of the same nature; on the 29th there was still some pus mixed with the faecal matter; the iliac tumor had decreased in size, the stools were of more natural aspect, the colic had ceased, and on the fourth day after the opening of the abscess, the patient was convalescent.

Reflecting on these engorgements, their symptoms and terminations, we see

that they are true phlegmons, developed in the vicinity of the cæcum, exterior to the cavity of the peritoneum, but capable of communicating inflammation to this membrane.

The *diagnosis* appears to me, said M. Dupuytren, of sufficient importance to arrest, for a short time, our attention.

In the right or left iliac fossa, inflammatory engorgements are often indistinctly seen, apparently having the same situation as the preceding; but they really exist in the cellular tissue uniting the fibres of the psoas and iliac muscles, and beneath the aponeurosis known by the name of iliac fascia. This disease is called by writers *psoitis*.

After delivery, engorgements frequently appear in both iliac fossæ, but in the thickness of the round ligaments whose course they follow, or they arise in the cellular tissue, interposed between the broad ligaments of the uterus, and may extend thence to the whole adjoining cellular tissue, and appear in the iliac fossæ. These abscesses sometimes open into the uterus, and sometimes into the vagina.

Under certain circumstances, the iliac fossæ are the seat of purulent collections, whose origin is sometimes far distant, such are abscesses, symptomatic of caries of the bones, or inflammation of the adjacent ligament. The pus then travels along the psoas and iliac muscles, is deposited in the iliac fossa, and the tumor is soft and fluctuating from its first appearance.

Errors in diagnosis may nevertheless take place. Thus have I seen this inflammation give rise to the belief of the existence of internal strangulation, hepatitis, metritis and even peritonitis. In the two last cases, the exact restriction of the disease to the right iliac fossa, the retention of fæces, the comparison of other symptoms, rectified the mistake; and the evacuation of the pus *per anum*, almost on the day predicted, confirmed the diagnosis.

The prognosis is generally favorable, since of sixteen cases, observed under different circumstances, one alone perished. When the symptoms yield promptly to the remedies, the stools become natural, the fever disappears, and the size of the tumor diminishes, we may anticipate a speedy cure. When, on the contrary, the symptoms continue, and the tumor becomes the seat of fluctuation, at first obscure, afterwards more apparent, and the pulsations are accompanied by lancinating pains, we must expect to see the pus discharged *per anum*, and here the prognosis is still favorable, because experience has often shown the cure to be not less complete when the disease terminates by resolution. Should general peritonitis, occur, a fatal termination is to be feared, because the development of this disease is the signal of the rapid increase of the primary affection, and their combination is beyond the power of human skill.

The *treatment* should be preservative (*preservatif*), and we may nearly always, when called in time, if not prevent the formation of the tumor, at least arrest its progress; when pain in the iliac region is accompanied by alternate diarrhœa and constipation; when we find on examination a deep and illy circumscribed hardening of the tissues, local bleeding, emollient, and gentle laxatives, or enemata will subdue the symptoms. Absolute rest and frequent bathing are very efficacious; strict diet is also indispensable. If the tumor have already attained some size, local and general bleeding are necessary to arrest its increase. If the patient be robust and have fever, he must be bled

immediately, and the tumor be covered with leeches, and afterwards with a large poultice; emollient enemata morning and evening, and also veal broth, containing sulphate of soda or magnesia. The oily juleps should be given at night, and the leeches repeated according to circumstances.

The diminution of pain, and decrease of the tumor, announce the commencement of resolution, and we must be satisfied to aid it by emollient applications, rest, and diet. If, on the contrary, the tumor preserve its size and sensibility, in spite of the remedies, fluctuation will soon manifest itself. Absorption should then be assisted, by continuing the antiphlogistics, if the state of the patient will allow, or the topical emollient, until the opening of the tumor. In this case, some patients have derived advantage from the use of mild laxatives, which stimulate the contraction of the intestine, and promote the evacuation of the pus. Lastly, if inflammation of the peritoneum should occur, it must be treated by the proper means, which it is not our intention to discuss here.

## CHAPTER XXXII.

### PRACTICAL REFLECTIONS ON THE USE OF CAUTERIES AND MOXAS.

The application of cauteries and moxas is followed by the most happy results in diseases of the bones and articulations. Their immediate effects are, more or less severe pain, the formation of a dry or humid eschar, produced by the disorganized tissues, combined or not with the cauterizing matter. The secondary result is a revulsive irritation produced by the pain produced in the skin. Soon after an inflammation, which I have called eliminatory, takes place, followed by loss of substance, and a copious suppuration from the subcutaneous cellular tissue. In six or seven hours, the action of the cautery is exhausted, and the eschar is formed. The latter is of a deep brown or yellow color, moderately red at its circumference, swollen and painful. In a few days the swelling ceases, and the separation of the eschar generally takes place from the eighth to the twentieth day, and the sore thus produced may be easily kept up.

I do not intend, said M. Dupuytren, to treat minutely of the places proper to establish an issue; it will be sufficient to remark, that we should prefer points well furnished with cellular tissue, remote from osseous projections, tendons, and the centre of the muscles. In the arm, we generally select the slight depression existing between the inferior insertion of the deltoid, and superior insertion of the brachialis internus muscles. In the thigh, the cautery is almost always placed at a few fingers' breadth above the internal condyle of the femur, on the cellular line which bounds in front, the internal portion of the cruræus, and behind, the adductor magnus and gracilis muscles. The best spot in the leg, is the space comprised between the inner edge of the tibia, and the corresponding side of the gastrocnemii muscles, below the tendinous expansion formed by the sartorius and plantaris muscles.

In many cases, it is useful to produce the slough in the skin slowly, in order that the irritation produced by the continued action of fire, may be more severe and penetrating. The most convenient plan for effecting this, is by moxa.

The two varieties of cautery of which we have spoken, cause a wound, which suppurates for a longer or shorter time, and which at last cicatrizes. In order to prevent this termination and keep up the suppuration, foreign bodies, such as orange seeds, issue peas, &c., are introduced.

This, is sometimes a good plan, but I have often seen it produce serious symptoms, and even aggravate those it was intended to relieve.

The extreme irritation caused by the presence of the foreign bodies, extends to the joint and diseased parts of the bone. Fever, thirst, insomnia, attack the patient, and disappear only on the removal of the foreign bodies. Practitioners, supposing that these phenomena are owing to the presence of these bodies, fear to use them again, and thus deprive themselves of a valuable remedy. For many years I have ceased to use them. After having applied the cautery and the moxa, I permit the slough to separate, and the ulcer to suppurate without stimulating it. When it has healed, I apply another cautery in the vicinity of the preceding, until I have obtained the desired effect. In this manner I obtain all the advantages of these powerful revulsives, without any of their inconvenient accompaniments.

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## CHAPTER XXXIII.

### ON HYDATID TUMORS DEVELOPED IN THE MUSCLES AND VISCERA.

I have frequently seen, said M. Dupuytren, in the course of the muscles, hydatid tumors, whose development impeded more or less the functions of the parts in which they were situated. Their effects are singularly various. In general, these cysts seem to act on our organs like foreign bodies, thrusting aside or compressing the parts with which they are in contact; and hence are frequently confounded with several other affections, especially ordinary encysted tumors, containing merely serum, or albuminous matter of various aspect.

The cysts of the acephalo cysts situated in the extremities are particularly difficult to be distinguished during life, from mere membranous cysts. The following case is a proof of the remark.

CASE I.—A man, 27 years of age, was admitted, in the early part of January, 1833, into the Hotel Dieu. He was of a good constitution; lymphatic temperament, by trade a printer. Having used more than usual exertion, he felt, according to his account, acute pain in the left arm, opposite the body of the biceps; and on feeling it, discovered for the first time, a tumor. On his admission, a few days afterwards, it was as large as a small hen's egg, without heat, change of color in the skin, immovable, and still the flexion of the fore-arm upon the arm apparently made it diminish in size. The patient declared, it had only existed 8 or 10 days at farthest. But it was certainly

of older date. Was it produced by a rupture of some muscular fibres? The patient felt no pain in the muscle. Was it caused by effusion? The skin did not present that violet color, distinguishing ecchymosis. Had the artery been wounded? The tumor was free from the dilatation and contraction synchronous with the pulsations of the heart, and which are the essential symptoms of aneurism.

Its existence was, therefore, anterior to the accident which occurred to the patient. Could it, therefore, be considered as a scirrhus production? The absence of lancinating pain, and the existence of an obscure fluctuation refuted this opinion.

By a more attentive examination, I was led to suppose, that it was formed by a hydatid cyst; and this idea appeared the more probable, from my recollection of an analogous case. A young girl consulted me, many years ago, for a tumor in the temple, supposed to have proceeded from a blow. I made a small puncture into it, when a jet of serous fluid, immediately escaped. By enlarging the opening, and pressing on the sides, a large white sac was expelled: it was a hydatid in the belly of the temporal muscle.

A similar plan of treatment was pursued, in the case under consideration, after having used, without any benefit, resolvents and astringents for fifteen days, and in eight days he was discharged perfectly well.

Acephalo cysts have long been confounded with all the other species of morbid vesicles. Pathological anatomy, however, demonstrated, that there was a great difference between membranous vesicular tumors, firm, and strongly adherent to the tissue of the organs, and softer vesicles, which, free from all adhesion, roll in accidental cavities, which are generally covered by the former. The former are membranous cysts, whose texture is analogous either to that of serous, or fibrous membranes, &c., the latter, on the contrary, are true vesicular worms. The acephalo cyst is one of the most simple of all animals. It appears under the form of a membranous bladder, of the consistence of semi-concrete albumen, and in which the eye cannot perceive, even with the aid of a microscope, any distinct organs.

The structure of the cysts in which these animals are lodged is rather complex; their existence is constant, and they can *always* be found. We discover in these cysts a fibrous tissue, composed of fibres interwoven in different directions, and often very irregularly. The interior of the cysts is sometimes white and smooth, but never presents so polished a surface as the serous cysts. Its appearance is fibrous, and resembling the aponeuroses. The acephalo cysts are generally found in numbers in one cyst. These worms float in a fluid which sometimes entirely resembles pure water, and which is also sometimes yellowish, turbid, puriform, and of greater or less density. Whatever may be the nature of the fluid contained in the cyst, that of the cavity of the acephalo cysts is almost always transparent and resembling water.

A cyst rarely contains one single worm. The acephalo cyst is generally very large, and contains several others in its cavity. Sometimes, however, cysts are found containing only one acephalo cyst. It is probable that cysts, in this condition, are of but recent origin.

There is no well authenticated case of the development of acephalo cysts in the natural cavities of the body. They are always found in a cyst imbedded in the tissue of the organs. It is true, that they have been seen proceeding

from different natural cavities, but there are strong reasons for believing, that this took place only after the rupture of the worms contained in these cavities.

Acephalo cysts have been observed in almost all the parts of the body; in the thyroid gland; the duplicatures of the peritoneum; the lungs; in the different parts of the cellular tissue exterior to the peritoneum; between the coats of the intestines; in the tissue of the liver; in the kidneys; ovaria; in the uterus, when it constitutes the greater number of vesicular moles; in the os tinæ; the parietes of the abdomen; the intermuscular cellular tissue of the back, neck, thigh, shoulder, and many other parts.

The acephalo cyst is not the only worm met with in man. Many years ago, I discovered the cysticercus in the peroneus longus muscles of an individual whose case I will hereafter detail. This worm is always enclosed in a cyst or bladder, and is solitary. The cavity of the cyst, covered by a membraniform layer, contains besides the cysticercus, which is free, a serosity of the same nature as that contained in the candel bladder of the worm. The cysticercus generally inhabits the muscles, or rather the cellular substance uniting the different bundles of fibres composing the muscles.

The development of the cysticercus in hogs, becomes the cause in them of a very serious disease, commonly known by the name of *measles*.

CASE II.—About thirty years ago, I found in the peroneus longus muscle of a man, a vesicular worm. It was immediately recognized as the *cysticercus finnis*, presenting some remarkable peculiarities, in regard to its size, and the cyst containing it.

The ovoid cyst, about eight lines in length, adhered firmly on its external surface to the muscular fibres, the fat, and surrounding cellular tissue; internally, it was coated, throughout nearly its whole extent, by a yellowish matter, not very abundant, pretty firm, friable at certain points, and at others firmer, whitish or slightly red, and very similar to the fibrine of the blood. The proper membrane of the cyst was evidently fibrous, and presented a strength and firmness analagous to the lateral ligaments of the articulations. Still the fibres were more transparent, more united together, and for this reason resembled strongly the milky hue, and homogeneous texture of the cartilages, from which they differed on account of their greater pliability. This membrane was of unequal thickness, and in some places, not exceeding half a line. Its fibres were tinged, throughout part of its extent, of a reddish color resembling blood.

The vesicular worm contained in this cyst had a body enclosed in the candel vesicle, about five lines in length, and formed by thin, equal membrane, without fibres, more firm than hardened albumen. It was, nearly throughout, of a reddish tint, which rendered it more opaque, and which seemed to proceed from blood which had tinged a part of the cyst. I sought, on the outside of the vesicle, the small aperture through which the body is expelled, and developed internally. I could not, however, find it, owing probably to the worm having been immersed for sometime in spirits of wine. I then opened the candel vesicle. The body which it enclosed appeared under the form of a slightly elongated tubercle, of a yellowish white color, opaque, and about the size of a cherry-stone. It adhered to the parietes of the vesicle by means of a white, opaque, humid substance, which on pressure distilled

some drops of a milky hue. This substance was without form, tuberculous externally, and nearly as large as the body to which it adhered. It appeared to have left the body in the same manner as we frequently see in the long worms, such as the crino, and ascaris lumbricalis.

Hydatids are frequently met with in dissection, but rarely in the living body; and even when their existence is well ascertained, it is exceedingly difficult to treat a tumor without heat or redness and which is attributed by the patient to an entirely recent cause. We should in such cases, ascertain whether there exist any contraction or expansion, and then make an exploring puncture, as the best means of avoiding any mistake.

Muscular hydatids cannot be confounded with those developed under the annular ligaments of the carpus and tarsus; their situation, nature, and symptoms, present well marked distinctions. As to visceral hydatids, their symptoms are generally so obscure, as not to disclose them during life. In a few cases the diagnosis may be established. M. Recamier has even cured a hydatid cyst of the liver by puncture and the use of caustic potash and injections of stimulating fluids. The case is so curious that we will make an extract from it.

CASE III.—A man, 20 years of age, a painter by trade, was working in his shop, when the floor gave away, and he fell into a cellar ten or twelve feet deep, stunned by the fall. The next morning, a yellowish tinge spread over his face, and soon over the rest of his body.

Three days afterwards, he felt a dull heavy pain in the right hypochondrium; and was unable to lay on either side.

On the 3d of May, the 7th day of the accident, the patient entered the Hotel-Dieu. In the right hypochondrium there was a rather irregular tumor, extending from the ensiform cartilage as far as three fingers' breadth below the umbilicus. An obscure fluctuation was felt, as also several bodies which appeared immovable, pretty hard, projecting and unequal.

In order to ascertain the nature of the tumor, a puncture was made into it with a fine trocar; a cup applied over the canula, and a few drops of very limpid fluid exactly resembling that of hydatids escaped through the aperture.

On the following days, a large piece of caustic potash was applied over the most projecting point in the tumor and in the vicinity of the false ribs. On a renewed application of the potash, the tumor on the abdomen opened spontaneously through the wound, and discharged a yellowish and limpid fluid, mixed with a great number of hydatids. On the same day a mixture of barley water and honey was injected into the cyst, in order to prevent the admission of air. Afterwards, were used injections of salt water, decoctions of barley and cinchona, and a solution of chloride of lime. The abscess gradually diminished, and when the patient left the hospital, there remained only, a narrow fistula; discharging a small quantity of greenish fetid pus. Some fragments of food and stercoraceous matter had been discharged by the wound.

The intention proposed in giving to the caustic potash a preference over the knife, was to give rise to inflammation, and consequently to adhesion between the parietes of the cyst and those of the abdomen, and thus establish a continuous canal from the interior of the cyst externally, and thus prevent all effusion into the abdominal cavity. Therefore, the parietes of the cyst were kept in the greatest possible state of tension in order to preserve their immediate

contact with those of the abdomen. The injections prevented the introduction of air into the cavity, and the inflammation resulting therefrom.

We have said, that in a great majority of cases, the presence of visceral hydatids could not be detected in the living subject; the following are some of the symptoms which have been observed in persons laboring under this affection; their presence in the external cellular tissue of the peritoneum, or in that uniting the coats of the stomach or intestines, gives rise to disturbance in the digestive functions; and they sometimes compress so strongly the intestinal canal as to determine a true iliac passion.

Cysts, situated in the tissue of the liver, occasion various morbid phenomena, which become serious in proportion to their size. The most frequent are: a sensation of weight, rarely of acute pain, and sometimes a visible tumor, more or less circumscribed in the right hypochondrium; sometimes great distress on respiration; anxiety, a kind of restlessness compelling the patient incessantly to change his position; sometimes jaundice, vomiting, epistaxis, diarrhoea or obstinate constipation. There is in some cases a trembling compared to the motion of jelly when shaken. Acephalo cysts in the kidneys are rarely evinced but by pain in this region. Those of the ovaria have precisely the same effects as membranous cysts, or encysted dropsy, properly so called, of these viscera.

The effects produced by hydatids of the uterus are very various, according to their situation in this viscus; when deeply seated, in the thickness of the parietes of this organ, they occasion a sensation of weight there; but when developed between the internal membrane and the uterus, they dilate the latter, its neck flattens and widens, and all the phenomena usually attendant on pregnancy are present; the acephalo cyst then constitutes the affection known by the name of vesicular mole.

Hydatids of the lungs give rise to more or less dyspnoea, of which it is often impossible to suspect the cause.

CASE IV.—A young man, born of healthy parents, was attacked, at the age of 18, with a peripneumonia, of which he was perfectly cured. At 24 years of age, he had a very violent and obstinate cough, accompanied by acute pain in the left side, preventing him from laying on that side. This pain ceased with the cough, but both re-appeared on the slightest cause.

In the month of July, 1800, the pain in the side and a dry cough returned, and so violently as to prevent the least exertion on his part. He soon began to complain of a small tumor seated, in right hypochondrium. The tumor at first was scarcely perceptible, but soon became perfectly evident. At that time the dry cough returned anew, accompanied with momentary suffocation.

In May, 1803, the patient was in the following state: much emaciated; the tumor on examination was so large, that the hand could scarcely cover one half of it, and so firm as not to yield to the finger; its surface smooth; it was movable and easily displaced either to the right or left. The pulsations of the heart were so violent in the epigastric region, as to be perceptible to the eye.

The patient complained of continual dyspnoea, and a species of strangulation on ascending a flight of steps. He had frequent fainting fits, occasional cough, sometimes spitting blood, and was in a continual state of agitation. These symptoms were aggravated by cold weather. The pulse presented no remarkable irregularity.

Such was almost constantly his situation until January, 1804, when the distress in respiration increased considerably, as well as all the other symptoms. About the beginning of June, he had two very violent attacks, in which he was nearly suffocated. Finding his health growing worse, he came to Paris for advice. He had traveled ten leagues in a carriage. On his arrival he felt pretty well, and took a light supper. A few hours afterwards, he had another attack of strangulation, in which he perished.

On an examination after death, we found in the left lobe of the liver, a cyst partly hidden in the substance of this viscus, and partly projecting into the abdominal cavity, and resembling a bladder which could be displaced at will. The parietes of the cyst were thin, yet fibrous. The cavity contained: 1st, a certain quantity of yellow fluid; 2d, a number of small hydatids, the greater part not larger than a pea: one or two were of the size of small walnuts.

The parietes of the hydatid cyst situated without the liver, adhered firmly to the lesser curvature of the stomach, and yet there was no mark of a cicatrix on the external membrane of that organ.

The chest was of considerable size, and so exactly filled, that the heart, thrust downwards, corresponded to the upper part of the epigastrium. The two lungs compressed, flattened and reduced to a thin plate, were thrust towards the anterior part of the chest, behind the cartilages of the ribs. The remainder of the pleural cavity was occupied by two very large tumors, extending from the summit of the thorax to the diaphragm, adhering closely to the sides of the whole mediastinum, and had pushed the heart out of the cavity of the chest. These tumors, equally tense and fluctuating, had a white, fibrous, thin but strong envelop, and each contained an enormous hydatid. These hydatids filled exactly each cyst, and seemed to adhere to it by means of a glutinous matter. The quantity of fluid contained in each, was five and a half pints. Their length was about eleven inches.

**CASE V.**—A woman was admitted in 1811, into the Hotel-Dieu, for an inflammatory tumor at the umbilicus. I did not wish, at first, to meddle with it; but fluctuation becoming evident, and the skin being about bursting, an incision gave exit to a large quantity of pus, and some hydatiform cysts. The woman died, and on examination, there was found a communication between the umbilicus and the cavity of the lung, by means of a canal through the diaphragm between the liver and the abdominal parietes. The cavity of the lung contained a quantity of hydatid cysts. This organ had evidently been the primary seat of the disease.

It will be seen, from the foregoing remarks, that the symptoms of acephalo cysts in many parts of the body, are precisely similar to those of many other affections. The absence of the characters of other diseases better known, is often the only sign announcing the existence of these worms; but sometimes we may be entirely sure on this point, namely, when some of the cysts containing these worms, burst into some of the cavities lined by mucous membranes, or appear outwardly, as when they are discharged through an abscess formed in the abdominal parietes.

The rupture of the cysts of the acephalo cysts into the cavities lined by mucous membranes, is generally followed by a favorable termination. Art has sometimes imitated with advantage this method of nature. It would

appear that the disease is sometimes cured without any natural or artificial rupture; in such cases, the acephalo cyst probably perishes spontaneously; and then the thinnest part of the fluid, in which it floats, is absorbed. The cyst closes upon itself, like an aneurism, after the performance of Hunter's operation, and after a certain time, nothing remains but a small mass of matter, commonly turbid and yellowish, in which may be seen some fragments of the acephalo cyst.

Visceral hydatids, developed in the cavity of the abdomen, may be mistaken for a host of tumors too numerous to be detailed here, and which have, moreover, been carefully studied; but there is still one to which I deem it right to call your attention, I mean the development of a foetus in the mesentery of a boy of 14 years of age.

Amédée Bissieu, was born in 1790, of a young woman, healthy, and the mother of another child, which was well made and of a good constitution.

During the night in which his mother supposes he was conceived, one of those alarms then so common in France, caused great commotion in the town and called the inhabitants to arms.

During pregnancy, Mad. Bissieu experienced some distress and frequent indisposition; nevertheless, her delivery was without accident. It was remarked that during the labor, a great quantity of water escaped from the vagina. Immediately after birth the child was given to a nurse, who, on account of its weakness and ill health, despaired of its life for some time; brought back to his father's house, he began to complain, as soon as he could lisp a word, of pain in the left side of the chest and belly. This latter part was so large, as to lead to the supposition of his having *tabes mesenterica*; but, on the other hand, its size was so variable, that it was determined to lace his pantaloons in order to suit these variations. As he grew, the fears of *tabes* disappeared, but he still was delicate, his face thin and wan, constantly complained of pain in the side, his appetite was irregular and capricious, and he was subject to frequent indigestion. One day, when dressing him, it was observed that the two lower left ribs were higher and more projecting than the other, which was attributed to a habit of sucking the thumb of the right hand, and inclining his body to the same side. Little attention was paid to this circumstance, as the child was remarkable for his gaiety and precocity. He was sent to a boarding school at Rouen. After a residence there of eighteen months, he was suddenly attacked with an acute pain in his side and left hypochondrium, continued fever with exacerbation and a sensation of oppression; great tumefaction of the belly, in the part where formerly had existed the projection, and continual pain. The patient was bled and purged. The fever continued; the swelling increased. On the 7th day of his disease, his physician, M. Blanche, felt distinctly, in the abdomen, a hard and very painful tumor, extending from the false ribs to the spine of the ilium, rounded and as of the size of a large melon. Emollient applications and soothing enemata were made use of. The pain, however, still continued until a copious discharge of purulent and foetid matter took place. The release from suffering and the decrease of the tumor did not arrest the emaciation of the patient, and falling into a state of marasmus he was sent back to his family. On his arrival, MM. Guérin and Bertin Desmardelles recognized this hard and large tumor in the left hypochondrium, but, in spite of their efforts, the disease still progressed. To

a continual and obstinate cough with purulent expectoration, there was soon added a diarrhoea of foetid matter, in which was found, six weeks before his death, a small ball of hair. At last death closed the scene, and this young man perished in the 14th year of his age, and six months after the first appearance of the symptoms of the disease.

An autopsical examination having been solicited by his parents, it was performed on the next day by his physician. He found in the left hypochondrium, below the spleen, a very large membranous sac, thick, adhering to all the surrounding parts, and particularly to one of the large intestines, which they presumed to be the colon, and in this sac, in the midst of a purulent, thick, and yellowish matter, two principal masses of nearly equal size, situated transversely in front of the vertebral column, in close contact with each other, and yet distinct. The lower of these masses was composed of a large quantity of matted hair, around this were two small balls of hair similar to that which had been discharged by the patient before his death; the other, situated higher up, was an elongated, fleshy, and bony mass, covered with skin. There was discovered in it a badly formed head, with hair, teeth, the rudiments of a nose, and kind of orbit on one side, and of ear on the other; and on the opposite side an appendage like a limb terminating in divisions having each a nail. Lastly, from the middle of this mass, which seemed to hold the place of chest and belly, a thick and short ligament extended and was inserted in the parietes of the cyst. MM. Guerin and Desmardelles deeming it worthy of further research, removed without injury, this fleshy mass, and also the stomach, spleen, and part of the large intestine. They stated, that there existed neither externally nor internally, any trace of female organs, and that the sex of Amédee Bissieu was purely male. Lastly they found on dissection, 1st, that the liver was large, although it had been compressed and thrust into the right hypochondrium; 2nd, that the lungs were whitish, and contained pus infiltrated throughout their substance.

So extraordinary a case attracted much attention, the preparation was brought to the Faculty of Medicine at Paris, and I was appointed, to make a report on this singular production of nature.

The first fact which I ascertained, in relation to the position of the foetus, was, that it was lodged in a cyst of the transverse mesocolon, which had at a very late period, communicated with the cavity of the intestine, from the destruction of the separating partition. Continuing the examination, I found that the organized mass contained in the transverse mesocolon had many points of resemblance with a foetus, but also many peculiarities, some, owing essentially to malconformation, and others apparently depending on the changes induced by time, and its stay in the cyst of the mesocolon.

I then dissected the mass with great care, and found traces of some of the organs of the senses; a brain, spiral marrow, large nerves, muscles, which had degenerated into a kind of fibrous mass, a skeleton composed of a vertebral column, head, pelvis, and the rudiments of nearly all the limbs; lastly, an umbilical cord, very short, and inserted into the transverse mesocolon, outside of the cavity of the intestine, an artery and vein ramifying at each extremity towards the foetus, and the individual to which it was attached.

The existence of the preceding organs, was sufficient to establish the

individuality of this organized mass, although it wanted the organs of digestion, respiration, for the secretion of urine, and generation.

It would be necessary, in order to complete our labor, to determine the degree of importance of this phenomenon ; but, for that purpose, its true cause must be known ; then alone could we judge of its importance, by the greater or less degree of light thrown, as well on the natural process of generation, as on the irregularities of this function. However, looking upon it merely as one extraordinary case, it does not deserve the less attention, on account of the very great rarity of its occurrence.

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## CHAPTER XXXIV.

### ON FRACTURE OF THE LOWER EXTREMITY OF THE OS HUMERI, SIMULATING LUXATION OF THE ELBOW BACKWARDS

The diagnosis of fractures and luxations cannot be studied too minutely, for how frequently do we meet in hospitals with cases which escaped the skill and observation of great men. How many mistakes occur in affections of the hip joint, luxations of the shoulder-joint, fractures of the lower extremity of the humerus radius, and in general, all solutions of continuity in the vicinity of articulations.

Nothing is more common, than to see a fracture of the lower extremity of the humerus, immediately above the elbow joint, mistaken for a luxation backwards of this joint ; it is, however, highly important to distinguish them, as incurable deformity may depend on their mal-treatment.

Suppose the fracture transverse, and situated immediately above the condyles ; the olecranon is drawn backwards and upwards by the triceps extensor muscle, the upper fragment is carried forward and resembles the lower articular surface of the humerus. The projection formed by the olecranon is so great, that by comparing the two joints, this apophysis of the affected side, extends twelve or eighteen lines beyond the other. Lastly, the antero-posterior diameter of the arm near the elbow is sensibly increased, and you have apparently all the symptoms of luxation. On this supposition, extension and counter-extension are made, and generally the reduction is very easy. A bandage is applied, and we congratulate ourselves on our success. Soon, however, the displacement is reproduced, and at the end of five or six days, we find something that is unnatural. This is attributed to some want of care on the part of the patient. The reduction is again effected, but the deformity follows, with considerable swelling. The surgeon feels secure, as long as it does not diminish ; but when it disappears, in a month, six, or eight weeks, he finds his mistake, but too late, the patient is crippled for life. Even if the error be discovered in twelve or fifteen days, nothing can be done ; the swelling is an unsurmountable obstacle to a complete reduction, and the deformity is incurable.

**CASE I.**—*Fracture of the Extremity of the Humerus, Mistaken for Luxation; Malformed Callus, Embarrassment of the Movements of the Elbow-joint.*—Towards the latter part of December, 1832, a child was brought to me, which had, a month previously, fallen from an ass on which it was riding. Two physicians supposed a luxation to have occurred, and treated it accordingly.

It appears that the second physician was consulted for a recurrence of the deformity. On examination I found a tumor in front, presenting inequalities, and evidently formed by the inferior condyle of the humerus; the olecranon projected backwards. It is very probable, that on account of the youth of the patient, there was merely a separation of the epiphysis; the fragments had united by a mal-formed callus. What was to be done? It was dangerous to break up the callus; but remarking that the chief inconvenience was the impossibility of extending the arm, I applied a machine to effect gradual extension; this partially succeeded, but deformity must forever remain.

Crepitation is the best distinguishing characteristic of fracture from luxation, and to this may be added, that moderate extension and counter-extension soon restore the parts to their natural position. Still, it must be confessed, that, of all luxations, one of the most easily reduced, is that of the elbow-joint.

Crepitation, exists very obscurely, and even may escape the ear of the surgeon, if any swelling have taken place. Then, it is true, the reduction of the displacement is always more easy than in luxation, and the mobility greater. But who would dare to decide from such symptoms? There happily exists a pathognomonic sign which may take the place of crepitation. Take hold of a fragment with each hand, the thumb in front and directed towards the fracture, and attempt the reduction. This simple means, will generally suffice, especially in the first four and twenty, or six and thirty hours after the accident. After having effected the reduction, move the forearm backwards; if there be luxation, the reduction remains; if fracture, the displacement returns immediately.

Dr. Malgaigne, who published in the *Gazette Medicale*, some observations on this kind of fracture, thinks, that other means of differential diagnosis may be added to those already enumerated. In luxation, says he, the articulation is destroyed, and flexion and extension are impossible; in fracture it is uninjured, and probably these movements are partly preserved. This can only hold good very soon after the occurrence of the accident; but at any period whatever, there is an anatomical sign which appears to me infallible, whenever it can be discovered; this is, whatever may be the projection of the olecranon backwards, it is never more separated from the condyles of the humerus than in the natural state, if there be fracture; and much more separated, if there be luxation. Also, in the latter case, the anterior projection is rounder and not so wide; in the former case, it is as wide as the articulation itself. There can be no error; the diagnosis is as certain as anatomy.

**CASE II.**—D. 27 years of age, tall, and of very robust constitution, fell into a ditch on the left elbow, and was admitted immediately into the hospital, for a luxation of the elbow, according to the opinion of the surgeon who first saw him.

On his admission, there was deformity of the left elbow-joint; an enormous swelling occupied the lower extremity of the arm, which was tense and very

painful. The forearm was semi-flexed; on examining the tumor, there could be distinguished, notwithstanding the tension of the parts, a hard, slightly unequal, rough projection, occupying the bend of the elbow, and raising the brachialis internus and biceps muscles; posteriorly, the olecranon projected under the skin, and was slightly elevated above the level of the condyles; flexion and extension were totally impossible, and an attempt to effect them gave the patient intense pain. Indeed, the patient labored under every symptom of luxation of the elbow backwards; and, without a familiar acquaintance with fractures, we may be easily imposed on by these signs, and see only a luxation of the elbow. However, by moving in contrary directions the lower part of the arm, and upper part of the fore-arm, an unnatural mobility and distinct crepitation were perceived. No doubt could then exist of its being a fracture of the lower extremity of the arm, at a very short distance above the condyles. In fact, it may be easily conceived, that the continuity of the humerus being interrupted, its inferior articulating surface no longer presenting a solid support, the olecranon should obey the contractions of the biceps, which would tend to draw it upwards; and again, on account of this ascent (which explains at once the projection formed posteriorly under the skin by this process, and the forced demi-flexion of the fore-arm), the lower fragment of the humerus, intimately united to the ulna, participates in the traction experienced by the latter; by virtue of their reciprocal direction, it necessarily experiences a vibrating motion, by which its upper extremity is carried forwards, and projects under the brachialis internus and biceps muscles which it raises up.

On the day of the accident, complete reduction could not be effected on account of the pain and tumefaction of the parts. The limb was merely placed in a state of semi-flexion on a horizontal plane of pillows, covered with compresses soaked in Goulard's solution. The man was bled in the other arm.

The next morning the reduction was accomplished; the shoulder of the affected side was held fixed, whilst an assistant made extension on the demi-flexed fore-arm. I seized with both hands the lower extremity of the arm, on a level with the fracture, pushing the olecranon forwards, and the lower fragment backwards.

The reduction being effected, the arm on the plane of pillows, in a position between flexion and extension, was laid on the ordinary bandage of Scultetus; and some graduated compresses applied around the lower extremity of the arm, so as to correspond to the bony projections, and take the place of the fingers which made them disappear. Two long compresses were then placed on these, and lastly, two lateral cushions, folded on themselves at their inferior extremity, so that by tightening the apparatus, the splints should bear particularly on the graduated compresses, and drive continually in a contrary direction, the olecranon and superior extremity of the inferior fragment.

On the 45th day D. . . . left the ward, able to perform with ease the movements of flexion and extension, and free from deformity.

CASE III.—P. . . ., 23 years of age, enjoying good health, was admitted into the Hotel-Dieu, on the 18th of October, 1821, for an injury of the inferior extremity of the left humerus, near the elbow joint, with considerable displacement, and a wound on a level with the olecranon.

The accident had been produced by a fall on the pavement. At the moment acute pain; inability to execute any movement; the limb was carefully examined soon after.

From the displacement and other symptoms, one might have supposed it was a luxation of the elbow; but the mobility of the fragments, their crepitation, and especially the integrity of the articulation, soon pointed out, in its true character, the kind of lesion which actually existed.

The fracture was oblique and situated about an inch from the joint. The wound had been produced by the pavement, and did not communicate with the fracture. The case was, however, a serious one. Inflammation might extend to the joint, and give rise to serious consequences.

The reduction of the fracture was effected by means of extension counter-extension and co-aptation.

The wound of the elbow was dressed with simple cerate; and I then proceeded to apply the apparatus necessary for the fracture.

The whole arm was covered with wet compresses, and in order to prevent the tendency of the fragments to separate the bandage of Scultetus was applied, with graduated compresses on the anterior and posterior surfaces of the arm, cushions folded at the lower end, and over all, splints nearly as long as the arm.

The limb was laid in a semi-flexed position on a pillow covered with a cloth folded several times. A copious bleeding was performed, absolute rest and strict diet recommended, with diluent drinks; the patient felt pretty well. That evening she took in four ounces of *looch blanc*\*, half an ounce of syrup of diacodium, which procured her several hours sleep during the night.

On the 54th day, the patient left the hospital perfectly cured, having already partly recovered the use of the limb.

It has been said, and the celebrated Cooper has remarked, that this fracture is much more frequent in children, than in persons of more advanced age; it will be seen, however, by the two cases detailed, to which we might add others, that it is met with at different periods of life.

This being the case, what should be the conduct of the surgeon? If he be called to a patient presenting the symptoms of a fracture of the inferior extremity of the humerus, or of a luxation of the elbow joint, he takes the fore-arm in one hand, and the arm in the other, and generally restores (when there is fractures and no swelling) the parts to their natural situation with great ease; but on the least movement of the patient, the displacement is re-produced as much in front as posteriorly. Let him be then convinced that there is consecutive displacement in consequence of fracture. If one physician should say, there was a luxation, and another a fracture, he should side with the opinion of fracture, because, by that means he incurs no risk of deformity, loss of power, swelling and consecutive affections. The incon-

\* *Looch Blanc.*

Rx	Blanched sweet almonds	-	-	-	No. 12.
	do. bitter do.	-	-	-	No. 2.
	White sugar.	-	-	-	℥i.
	Powd. Germ. Tragacanth.	-	-	-	gr. xv.
	Orange flower water	-	-	-	℥ij
	Water.	-	-	-	℥iv.

Mix.—TRANS.

venience, besides, is very slight, if it be a luxation; the patient indeed, wears the apparatus much longer than if there were no fracture, but this is not to be compared with the consequences of a contrary treatment.

Having established the diagnosis, what apparatus shall we apply? It has been already spoken of, but we will now give it more in detail. Extension, counter-extension, and coaptation having been properly effected, and the reduction completed, the limb is placed on a pillow, previously covered with the bandage of Scultetus; position proper for the arm is one intermediate to flexion and extension; graduated compresses, three fingers' in width, and three or four inches long, are then applied on the anterior and posterior surfaces of the humerus. These compresses are to be kept in place by two long compresses. The many-tailed bandage is then applied, afterwards a cushion, of which one end is folded, in order to double it at the point, where it bears on the lower part of the humerus. The same thing as regards the olecranon. By these means, the humerus is thrust backward, and the olecranon forward. A short splint is placed on each cushion, and the tapes are tied somewhat tightly, in order to keep the apparatus *in situ*. In twelve or fifteen days, there is no danger of displacing the fragments. The swelling which takes place in the surrounding parts is an obstacle to consecutive displacement. Thus the swelling, which in case of fracture, is mistaken for luxation, at the end of a few days, permits no longer any reduction, becomes, if we are correct in our diagnosis, a very important auxiliary in the cure.

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## CHAPTER XXXV.

### ON EXOSTOSIS OF THE UPPER SURFACE OF THE LAST PHALANX OF THE GREAT TOE.

When treating of inverted toe nail, I designedly omitted, saying any thing touching exostosis of the upper surface of the last phalanx of the great toe, as it seemed then out of place. I now purpose detailing to you some cases, and also offering some remarks on this subject. A physician of the city lately consulted me in the case of his child, who, he thought, labored under inverted nail. I examined the little patient carefully, and found it to be an exostosis of the upper surface of the phalanx, and that the matrix of the nail was unaffected. The three following cases will tend to give you a more correct idea of the disease.

CASE I.—Emery Louise, 22 years of age, in good health, born of healthy parents, and declaring that she never had been affected with venereal, consulted me on the 28th of December, 1821.

For the last two years, she has had, at the extremity of the last phalanx of the great toe and near its outer edge, a very hard bony tumor, indolent, except on pressure; its large base has thrust aside the nail, which it has worn away.

The girl can assign no cause for the disease; it began, more than two years ago, with pain in the end of the toe, not augmenting during the night, but much increased by walking and pressure. It gradually reached its present size. I advised its extirpation, to which she consented.

**CASE II.**—**Loury Catherine**, a seamstress, 20 years of age, has had for 18 months on the external inferior part of the left great toe, a hard, bony tumor, which has increased but slowly, when we consider the period of its first appearance and its present size, which is not more than that of a small walnut; the disease can be referred to no known cause. It gave no pain, but interfered with her walking.

It was removed on the 8th of January, 1822, in the following manner: The patient being laid in bed, and her foot held by an assistant, I encircled the tumor by two semilunar incisions, and removed nearly all of it at the first attempt; other portions were removed successively. I found the tumor, according to my diagnosis, to consist of bone, composed externally of a hard layer, and spongy within. A simple dressing was applied. On the 12th the wound was suppurating and in a fair way of recovery.

**CASE III.**—A young woman, 25 years of age, had been affected, for two years, with a tumor under the great toe nail; at first small, it gradually increased, elevated, and deformed the nail, rendering it exceedingly painful to walk. The patient then consulted an expert farrier, who thought it was a wart and cauterised it. This, far from relieving the disease, exasperated it; the tumor increased considerably, the nail became more bent, so that its anterior extremity turned backwards, nearly touched its root; it was, moreover, rough, unequal, and of a deep yellow color. The sufferings of the patient induced her to enter the Hotel-Dieu, to receive advice. On the 3d of June, it was extirpated in the manner before described.

This disease has not, to my knowledge, been described by any writer. It consists in a pyramidal exostosis; arising from the upper face of the last phalanx of the great toe, which raises up the nail, deforms it, and renders locomotion painful and sometimes impossible.

Although not dangerous in itself, it is very inconvenient, and has frequently given rise to mistakes which have led to painful and useless operations.

In the commencement, the disease is free from pain, but this gradually appears as the nail is elevated by the tumor. It is sometimes very severe, and becomes excruciating if the patient strikes the toe against any hard body.

The causes of the disease are unknown; it most frequently occurs in persons who have received no blow on the part, nor worn tight shoes or boots. It sometimes takes place in the contrary case, syphilis and scrofula do not appear to excite it more readily than other causes.

Generally the patient takes it for a wart, and the physician is frequently led into the same error. Under this idea, the tumor is cauterised, and always with an unpleasant result. Sometimes it is thought to be a disease of the nail, and the latter is removed. As the disease increases, the nail becomes more deformed, is bent backwards, so much so sometimes that its anterior extremity is in contact with the root.

The dissection of the tumor, when it has reached this point, shows it to be formed by the skin, a fibrous tissue, and a pyramidal bony tumor, arising from the upper surface of the last phalanx. This exostosis is formed by a spongy tissue, covered by a layer of compact substance; it is generally not very firm, and may be easily divided, and removed with a strong bistoury. However, it sometimes becomes very hard, requiring the gouge and mallet for its removal.

If the disease be allowed to progress, unhealthy ulcerations may appear,

and tend to make it still more painful to walk. I once saw, a surgeon remove the last phalanx of the great toe, for a tumor of this nature, which had terminated in an ulcer.

The only remedy for this exostosis, is its complete extirpation. The removal of the nail is sometimes necessary ; but in a majority of cases, useless. A semi-lunar incision is made on each side of the tumor. These incisions surround and expose the bony tumor, which is then removed by the bistoury, or the gouge and mallet. The whole of the tumor must be extirpated, to prevent a recurrence of the affection. I have performed this operation, at least in thirty cases, and have always by these means, effected a perfect cure.

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## CHAPTER XXXVI.

### ON FIBRO CELLULAR TUMORS OF THE UTERUS,

#### *Commonly Known by the Name of Polypus of the Uterus.*

During the month of January last, (1833,) two women, laboring under those anormal productions, commonly known by the name of *polypus of the uterus*, were admitted into the surgical wards of the Hotel-Dieu. One, 46 years of age, stated, that for a month she had had a discharge of blood from the vagina, to which since the last eight days, had succeeded a whitish discharge, sanious and slightly foetid ; she declared that until that time she never had experienced any symptoms indicating lesion of the uterus. Much credence cannot be given to this assertion, for there is a class of women, who, habituated, as it were, to a host of inconveniences, do not observe themselves, and cannot relate their sensations, except when a general reaction or some accident prevents their following their ordinary occupation. This woman was examined in the city, and the disease stated to be a cancer of the uterus. She has suffered, for some time, from obstinate constipation, which may be easily explained by the pressure of the tumor upon the rectum. We prescribed some laxative enemata, and the patient was so much relieved as to suppose herself cured. But the polypus is larger than one half of one's fist ; some superficial ulcerations exist on its surface, but the discharge has not that repulsive foetor so frequent at a certain stage of the disease.

The other patient is 48 years of age. Remark the coincidence of the ages of these women ; and indeed, it has been observed that a majority of cases of organic diseases of the uterus occur about this period of life, or between 38 and 50 years. This latter patient has had for a year a red discharge, continual and copious, which she calls her menses, and explains, without being at all alarmed, by saying, that it is very common amongst women about the critical time of life. Since the last month this bloody discharge has changed into one of sanies, horribly foetid. She has frequently felt pain in the loins, a dragging sensation in the groins and thighs, a painful sensation of weight about the anus, and of this last symptom she complains most at the present time. On examination we have discovered a polypus as least as large as the first. By

circumscribing it with the finger, it was found slightly conoidal at its lower extremity, then increasing about the centre, then narrowing and inserted into the uterus, by a pedicle nearly as thick as two fingers which takes root in the interior of the organ, and is surrounded and compressed by the neck of the uterus as if by a ring.

Let us now compare the two cases. The two women are nearly of the same age; in both the tumor is nearly of the same size, occupies the same region of the uterus, and has given rise to the same external phenomena, a discharge of blood, followed by a sanious and foetid discharge. But in one, the surface of the tumor is smooth, in the other it is unequal; in the former it is hard and resisting, in the latter softened; in the first, the bloody discharge has only existed for a month, and is not very foetid; in the second, it has existed for more than a year, and the foetor is horrible. Hence, we may conclude, that the tumor has not yet degenerated in the first case, and that the operation may be delayed for a few days; whilst an incipient degeneration in the second, warns us to perform the operation as soon as possible, and even then our chances of success are very problematical.

The second patient, however, suffers greatly; she has acute pain in the loins, vagina, and rectum. On the other hand, whether the pains be real or feigned, she will not consent to any operation. The former, on the contrary, is free from suffering; is perfectly resigned; there is no complication; no contra-indication has been observed; the glands of the groin and abdomen are not enlarged; her general condition is good; every thing promises success, and we do not hesitate to perform the operation immediately.

On the 21st of January, the patient was carried to the amphitheatre, and placed on the lithotomy table, her legs and thighs flexed, widely separated, and held by assistants. The parts were again examined, the forceps of Museux introduced and fastened in the substance of the tumor; a moderate and continued traction was commenced; desiring the patient, at the same time, to bear down, as if in labor. The tumor being brought near the external orifice, it was seized by a second pair of forceps, the gentle tractions still continuing, the neck of the uterus soon appeared at the orifice of the vulva. The pedicle was then separated at its root, by two or three strokes of strong curved scissors, without leaving any trace of diseased tissue.

The section was accompanied by no pain, nor loss of blood, although the orifices of several blood-vessels were observed on the divided surface of the pedicle.

The next morning, she had lost, perhaps, one or two ounces of blood, during the preceding twenty-four hours. I must confess, that far from rejoicing at this circumstance, which, indeed, refutes triumphantly one of the principal objections to the operations, I should have preferred the loss of a small quantity of blood, which, I believe, is always useful after such an operation, as it tends greatly to diminish the danger of consecutive inflammation. After my remarks of yesterday, upon the harmlessness of the separation, I was anxious to see the patient to day; she has gone on well; there has been no chill, nor fever; the general state is most satisfactory, and as yet nothing indicates an inflammatory reaction on the uterus; she must be carefully watched, and on the first symptoms, the whole apparatus of antiphlogistic remedies immediately applied, general and local bleeding, topical emollients, revulsives, &c. Strict

diet has been ordered, and should no serious accident occur, she will probably be well in a fortnight.

On the 3rd day of the operation, one would have said, the woman was in perfect health; she was entirely free from fever, cheerful, contented, and desiring something to eat; prudence alone, prevented a compliance with her desires. Having been without a passage for several days, an enema was prescribed, and the emollient fomentations over the abdomen continued. She was discharged cured, in the early part of February.

The second patient, in a much less favorable situation, encouraged by the preceding case, consented to the operation, which was performed the next day, on the 22d January.

I remarked to you, that in this latter case, a sanious discharge has, for a month past, succeeded that of blood, and soon acquired an extreme fœtor; that the polypus mass was soft and fungous, indicating an incipient degeneration. Indeed, after seizing the tumor with the forceps, it yielded and tore on the slightest effort. When brought to the external orifice, we saw a grayish, gangrenous, mass. After its large diameter had passed the orifice of the vulva, I introduced my fingers, and had scarcely reached the pedicle, when I found it so soft, that it would have been impossible to draw it out without a rupture. In order to avoid this, I made the section as near as possible to its insertion, but am persuaded some part was left, which may lead to serious consequences, as will be hereafter explained.

This operation, like the first, was followed by no loss of blood, but a few spoonfuls had been lost by the next morning; there was no sanious discharge nor fœtor; the patient had had no chill, presented no symptoms of metritis, peritonitis, or phlebitis. She had still some pain in the hypogastrium, and fifteen leeches were applied to the thighs. On the fourth day she was attacked with a chill, and complained of great pain about the umbilicus, loins, and back. Leeches were again applied. On the 5th day, she was in an indescribable state of uneasiness, pain in the throat, high fever, repeated chills, general prostration. This increased, and she died on the night of the 27th and 28th, that is on the 7th day of the operation.

The operation was performed quickly, and without pain; there has been since no discharge of any kind, but the previous existing symptoms still remained, and even were increased. The pain and fever became more acute, the yellow color of the face more decided; still no symptom was observed which might have been a consequence of the operation; there appeared no indication of consecutive inflammation of the uterus, or other organs; she has therefore perished from the continuance and increase of the primary symptoms, and the consequence of an absorption of pus, arising from the remains of the pedicle, which the instrument could not remove.

On an examination after death, the epiploon was found perfectly healthy. A considerable quantity of purulent matter was found between the bladder and uterus, which latter was very voluminous. All the organs of the pelvis adhered together by organized productions, of a cellular nature, and consequently the effect of former inflammation, much anterior to the operation. They must have existed for several weeks, and the period of their supposed formation, exactly coincides with the time when the patient first experienced pain in the pelvis.

We have said that the uterus was three or four times as large as natural. Was this owing to hypertrophy, or a second polypus inclosed in its cavity? This last opinion is not without foundation, for fibro-cellular polypi of the uterus are seldom solitary. It frequently happens that one of them projects from the neck of the uterus, and is accompanied by another contained in the cavity of the organ, of which the existence could not be ascertained, and which was not even suspected. The first is removed, the patient recovers for a time; but the second remains, degenerates, and kills the individual.

The peritoneum being removed the surface of the uterus was of a deep red color, highly inflamed. On making an incision into the parietes of the organ, they were found considerably thickened. This thickening was evidently the cause of its unnatural size, for its cavity contained no polypus, nor fluid. The internal surface was of the same red color as the external. On its posterior face, near the neck, a circumscribed spot was observed, of the size of a piece of thirty sous, projections, putrescent, fungous inequalities, extending into the substance of the organ. These were supposed to be the remains of the pedicle and its point of insertion, as in the bodies of women, recently delivered, we find the traces of the attachment of the placenta.

I remarked to you, after having drawn to the orifice of the vulva the tumors in the cases just related, their grayish, violet, and evidently gangrenous appearance. But, in one, this gangrenous condition was confined to a small spot on the lower surface of the polypus, whilst it had attacked the greater part of the second.

In this case, the substance as well as the pedicle of the polypus was soft and fungous; both cases were in a state of degeneration, the former much less advanced than the latter.

What we have observed in these two cases, I have seen in all cases of polypi, which left to themselves had reached a greater or less advanced degree of degeneration. So long as the patient has a white or red discharge, there is no foetor; examine her; the tumor presents an equal hardness; introduce the speculum, and you find a white or roseate body, smooth, with a polished, equal surface, &c. Should a sanious discharge occur, a horrible foetor is exhaled, and insupportable gangrenous smell; examine the parts, you will find softness, fungus to an extent proportionate to the time elapsed since the appearance of the last symptoms.

Now the constitution of the patient begins to suffer; the face becomes of a straw color; a general reaction is developed, with continual fever; the patient rapidly emaciates, loses her appetite and sleep, and is in imminent danger.

Thus, a very foetid, sanious discharge, is a certain sign of the development of gangrene in the uterine tumor; consequently it is possible to ascertain precisely the period when this gangrene has commenced. Of the truth of this remark, the two cases we have been considering are a striking proof; and it, hence, appears that there is a coincidence between the appearance of the gangrene and the commencement of the cancerous process. Let us now inquire into the cause of this gangrene and the error into which many have fallen as regards it.

Much has been said of the spontaneous fall of polypi in consequence of gangrene, and the cure resulting therefrom. In the cases under consideration, could it have been a means of cure? What is the cause of this phenomenon?

Is it the constriction exerted by the neck of the uterus upon the pedicle of the tumor when the latter has passed beyond the orifice? But, generally, the gangrene does not attack at once the whole of the polypus; it begins at first near its apex, and then extends gradually over the whole surface and the pedicle, which, mostly, does not occur until after some time.

The softening, therefore, commences on the lower surface, or that exposed directly to the contact of the air. The body of the polypus is first attacked, the pedicle last. Consequently these phenomena can not be attributed to a constriction of the os uteri as has been pretended.

But can you suppose that the general reaction, the phenomena of infection manifested at this period of the disease, the rapid emaciation, the pain, sleeplessness, &c. are not without danger to the patient? That the latter, worn out by the continual discharge and fever, can reach with impunity the remote and uncertain period, at which the pedicle of the polypus shall become gangrenous and detached from the uterus? Gangrene, hence, becomes useful and a probable means of cure, only when it is general, that is, when it attacks the whole of the tumor; when partial, it is hurtful and endangers the life of the sufferer.

Again, the pedicle is rarely completely detached from its insertion in consequence of gangrene, some portions generally remain, and these furnish the elements for a reproduction of the disease, or keep up the existing general symptoms, and consequently the afflicted situation of the patient. And here let me observe, that the latter is in the same situation, as after having undergone the operation by ligature; for the ligature acts by causing the gangrene of the tumor.

On the other hand, the cases of spontaneous separation of the polypus from gangrene are extremely rare; I have never seen but one, whose history I will now detail to you.

CASE I.—Péligrini, F..., 32 years of age, of a dry constitution, menstruated at the age of eighteen, mother of four children; was delivered of the first, at the age of twenty-two, and of the last, at that of twenty-eight. From that period her menstruation has been pretty regular, but each time was followed by a white discharge for several days. In the month of August, 1816, without any known cause, she experienced copious losses (*pertes*); but felt no inconvenience about the genital organs, and continued her usual occupation, without observing that fatigue increased the discharge. This flow lasted for five months, sometimes red, sometimes white, with scarcely a day's intermission. About the month of February, 1817, she felt pain in the loins and a dragging sensation in the groins; she made use internally of astringents, imagining herself to labor under an ordinary uterine hemorrhage, for she had not as yet been examined.

She came to the Hotel-Dieu on the 18th of March, 1817. She complained of continued and copious discharges, alternately red and white, slight pain in the loins, with intermitting dragging feelings in the groins; the patient did not present that alteration of countenance, and pallor following abundant and long continued losses of blood. No difficulty in the excretion of urine or fæcal matter; no sensation of weight in the perineum. An examination, per vaginam, soon discovered a cylindroid, soft, and slightly irregular body, of the size of the end of the index-finger, extending nearly an inch and a half

beyond the os uteri, in which it was engaged; the open orifice of the latter received easily the end of the finger, which could completely circumscribe the body indicated; but the point of its insertion could not be felt; this body was therefore a polypus. As it was not large, and not so firm as uterine polypi generally are, I proposed removing it with the forceps; the operation was put off until the fourth day. The patient was laid on the edge of a high bed; on introducing the finger the tumor could not be felt; the patient then said, that during the previous evening, she had passed a black elongated body, which she took for a coagulum, and not having preserved it, she could give no idea of its shape or size. As to its consistence, it was firmer than a coagulum she had previously passed; on the second day, the red discharge had diminished; on the third, it had entirely disappeared, and a white discharge succeeded; it was not very copious and ceased on the sixth day. She then had slight pain in the loins and hypogastrium. On the 30th of March, the eighth day of the fall of the polypus, the os uteri had closed, the uterus itself was not larger than ordinary. On the 2d of April, she went out nearly cured; the previous evening she had still some red discharge. Six days after her departure, she passed another body similar to the preceding ones; the discharge then ceased entirely.

What opinion can be given on the disappearance of a polypus, whose existence had been well ascertained by several persons? Did it reascend into the uterus? The thing may be conceived by those who know how these bodies arising from the fundus of the uterus, descend into the vagina; for we know that they bring with them the fundus of that organ, and even cause more or less inversion; we know also, that after the section of the pedicle of the tumor, the uterus ascends, so that the point of insertion can no longer be felt. Moreover, we have lately seen in this hospital, a case of uterine polypus, pretty large, which alternately ascended into the uterus, and descended into the vagina.

This polypus may have been spontaneously detached, not, as is supposed by M. Levrel, the author of an essay on the subject, because the pedicle of the tumor was strongly compressed by the neck of the uterus, as by a ligature, but rather, in my opinion, because the frequent examinations to which the woman had been subjected, served in some degree to lacerate that pedicle.

There are uterine polypi, which are spontaneously detached, without any gangrene of their pedicle; they are those developed almost immediately under the internal membrane of the uterus; they have scarcely passed the os uteri; their exterior coat, being very thin, breaks easily and they fall of themselves, after having occasioned some discharge. Cases may be found in divers authors, amongst others Mme. Boivin, and in a memoir on polypus of the uterus, in the *Journal Général de Médecine*.

The opinions of medical men are divided, in favor of two operations; the *ligature* and *excision*.

Firstly. The ligature is not so easily applied as has been pretended, as is proved by the great number of instruments successively devised for its performance. In consequence of this difficulty it does not always include the whole of the pedicle, from which circumstance results, as we have said, either the recurrence of the disease, or the continuation of the general symptoms

Secondly. I have been led to prefer excision, from the fear of consecutive accidents. The patient does well for two or three days, but at the end of this period, a most foetid discharge takes place, resulting from the mortification of the tumor; symptoms of infection from absorption of pus appear; an ataxic condition comes on, which is in vain combated by tonics and antiseptics, and the patient perishes. After death, evidences of violent inflammation of the uterus, its appendages, and even of the peritoneum, are found; sometimes no proof of the existence of this inflammation is found, but we are convinced that the patient has died from poisoning by absorption of pus. I have seen eight or ten cases of this kind, and have never seen excision give rise to these consequences; indeed it cannot, as it leaves no cause of suppuration.

Thirdly. The ligature is very painful, which may be explained by the existence of a fleshy membrane around the polypi; moreover, when the ligature is applied, the patient experiences acute pains in the loins, pelvis, and groin, until it falls off, and the tumor is detached. Excision is followed by no pain, and the patient is instantaneously relieved of his previous sufferings.

Fourthly. We often see the pain occasioned by the ligature, which generally ceases when it is very firmly applied, continue; extend into the iliac fossæ, to the connections of the uterus; give rise to vomiting, and an inflammation which slowly progresses, attacks both sides and is fatal, after having led to hopes of cure from the apparent trifling nature of the accompanying symptoms. The following is a remarkable case in point.

CASE II.—A washerwoman, 43 years of age, had had for five years, a discharge which prolonged her menstrual flow as long as twelve days, and was succeeded by a very copious discharge of whitish matter. She suffered no pain, nor inconvenience even in the uterus itself, but daily grew thinner and weaker. A middle sized polypus was found to exist. A ligature was applied, and tied pretty tightly. She was immediately seized with acute pain, which lasted all day and night, entirely depriving her of sleep. On the second day, the pain was less violent behind the pubes, but the left side of the belly was very sensible to pressure; she had fever and vomiting, which were relieved by antispasmodics; the ligature was tightened. Third day, the vomiting and fever returned, belly painful, a reddish matter passed from the vagina. Fourth, the patient thinks she suffers less, her pulse is, nevertheless, very frequent, the ligature drawn still tighter. Fifth, the patient is tranquil, but the left iliac region is still very painful, and the pulse very frequent; ordered whey and an anodyne potion. The eighth day was reached without any other symptom than the pain in the iliac region; the rest of the belly was indolent. During the evening, the ligature which had not been tightened since the fourth day, fell off. On the ninth, the polypus was extracted, but with difficulty, for instead of forceps, which were not at hand, hooks and small forceps were used. A little sleep followed the relief afforded by the extraction of the foreign body. The patient wanted to rise, but pain appeared in the right iliac fossa, and that in the left continued unabated. Three days passed in this state of moderate pain, limited to the iliac fossa, but on the fourth, the 14th of the operation, and sixth of the fall of the polypus, a great exacerbation of the symptoms took place; the whole abdomen became hard, tense, very painful, pulse hard and very frequent, and the patient in imminent danger of syncope at every moment. However,

she had no hiccough, nor anorexia; a bath and sixty leeches were prescribed. The pain continued, the debility increased, syncope came on, and she died on the next morning. (Journ. Gener. de Med.)

No case, I think, can better illustrate the dangers of the ligature in general, and particularly, of the ligature when successively tightened, without any reference to the existing symptoms.

Fifthly. One of the frequent consequences of the ligature, is secondary inflammation of the veins of the pelvis, and especially of those of the uterus. I have never seen this occur after excision, in persons whose organs were free from chronic inflammation.

Sixthly. The fall of the ligature is ordinarily followed by the cicatrization of the wound, and the discharges cease immediately, if not kept up by some other cause. Sometimes, however, the consequences of the ligature continue after its separation, and although less alarming, are sufficient to cause death. Many cases are related by writers. M. Dubois has several times seen (*Dict. des Sc. Méd., art. Polypi*) the blood gush out on the separation of the ligature, and from this cause has lost several patients.

Seventhly. The ligature, even in the opinion of its most decided partizans, should be abandoned when the polypus is formed of nearly pure uterine substance; it is impossible when the polypus is adherent and very large.

Nothing, in these cases, contra-indicates excision; indeed it is the only remedy applicable.

Eighthly. These dangers, and these positive and real objections to the ligature, being avoided by the instantaneous division of the pedicle, and removal of the foreign body, there remains only, as an argument against the latter proceeding, the fear of hemorrhage, which has been over exaggerated. A long experience and very numerous facts prove, that hemorrhage is exceedingly rare. During the last 20 years, I have performed this operation upwards of two hundred times, and never have seen hemorrhagy but *twice*; once in this hospital, and once in the city. In both cases it was speedily and easily arrested by the tampon. M. Velpeau, in eight cases, has never observed it. Such are the dreaded dangers of hemorrhagy. I have always preferred the scissors to the bistoury; the former cutting with some *contusion*, is less liable to bleeding than the smooth clean cut of the latter.

We will recapitulate the comparative merits of the two plans, by presenting to you the remarks of M. Malgaigne, in an essay published by him, which is decidedly the best that has hitherto appeared on the subject.

A comparison of the consequences, says he, of excision and ligature, shows us that to the latter belong pain, convulsions, fœtid discharges, secondary symptoms, inflammation from purulent absorption, slowness and difficulty of applying the apparatus, the necessity of keeping the *serre-nœud* in the vagina, &c.; whilst the former is distinguished by its simplicity, rapidity, and facility of performance, the almost constant absence of the symptoms above enumerated; the question, therefore, appears answered in a very satisfactory manner. Excision should, henceforward, be looked upon as a general method, and the other operations as exceptions. Indeed, is there not a flagrant contradiction to use the bistoury in excision of the neck of the uterus, in which the ligature is proscribed, and reject it in polipi whose pedicle is formed of the same tissue as the neck of the uterus, with merely less thickness and fewer vessels.

Fibrous bodies are tumors of various forms, generally more or less round, composed of an accidental tissue, very analogous to that of the tendons of the muscles or ligaments of the joints. They are developed in all regions of the body in which the fibrous organic element abounds, where it presents a firm texture, and especially where it is found united to the cellular tissue. They are most frequently met with in the uterus, and they occupy different situations, which it is highly important to distinguish, for this distinction is, as it were, the foundation of the curability or incurability of these affections.

First. Some arise from the external surface of the uterus, between this organ and its peritoneal covering, by a pedicle sometimes very narrow; this pedicle and some cellular laminæ appear the only means of junction of this body with the fibrous part of the uterus. They project into the abdomen, raise up the peritoneum, and from the smallest size may reach that of a child's head, and sometimes attain a weight of 10, 15, and 20 pounds.

Second. Others are formed in the very substance of the uterus, at an equal distance from its external and internal surface. The tissue proper of the organ enters not into their composition: they are developed by separating the fibres of the latter, and never united to it by continuity of substance; they are sometimes so isolated, as to appear to be encysted; they have no pedicle; their growth is slow; and although generally smaller than the preceding species, they sometimes become as large as the head of an adult. Occasionally they grow uniformly in all directions; sometimes they increase more in one direction than in another. These tumors are very common, and admit of no operation, for the only possible means of reaching them, would be through the parietes of the uterus.

Third. Some of these tumors are developed, in the substance of the organ, but at a point near its external or internal surface.

They are then sometimes furnished with a pedicle, sometimes not. In the latter case, they belong to the preceding class; in the former, they approach that class of which we are next to speak.

Fourth. These tumors are often situated on the internal surface of the uterus, and either simply project into the uterine cavity, or, which is most common, have a pedicle. These last constitute the proper fibro-cellular polypus, and are composed of a root, a neck or pedicle, and a body, resembling much in shape, a mushroom. In both cases they are covered by a very fine membrane formed from the substance called by Bichat, the mucous membrane of the uterus.

When the body of the polypus is perfectly round, the pedicle cannot be discovered, unless it be much elongated, and the polypus, having passed beyond the neck of the uterus, projects more or less into the vagina. I call root of the polypus, the part by which it is inserted into the tissue of the uterus, and through which the fibrous body receives its principal nourishment by means of the vessels composing it.

It is formed by nutritive vessels, veins, lymphatics, cellular and fibrous tissue. This it is important to know; for if the polypi frequently reappear, even when they have been divided as near as possible to the surface of the uterus, this recurrence must be attributed to some portion of the diseased tissue having been left. This often occurs in the extirpation of erectile fungous tumors.

You have seen that fibrous tumors have occasionally a pedicle, and occasionally none; and that this difference is owing, at least in general, to their location. Thus, there is none in polypi developed in the interior of the substance of the uterus, and those, which projecting externally or internally, are still covered by a layer of this tissue. A general division may be therefore established between polypi with pedicles, and those without. The former constitute *fibrous polypi*, the latter *fibrous tumors of the uterus*.

The length of the pedicles is very various; some are scarcely distinct from the body of the tumor, others are two or three inches in length; moreover, the latter is always in relation to the extent and prolongation of the tumor itself. The more extensive the polypus, the longer the pedicle. Thus we find the longest in those cases, in which the polypus having passed out of the os uteri, has descended more or less into the vagina; but they diminish in the same proportion, and then if the fibrous body be at all large, they break, and the latter is spontaneously detached.—(See Case I.)

Their thickness and firmness are consequently in the inverse ratio of their length. Nevertheless they are sufficiently strong to resist a considerable effort. They are generally formed of very dense fibrous tissue; but when less consistent and thinned or softened from any other cause, they may be easily detached by mere torsion. I have always preferred, even under these circumstances, division, because the torsion always leaves some remains of the pedicle, and the disease is liable to recur.

These pedicles are formed of arteries, veins, lymphatics, cellular tissue, and probably of nerves. Now, if there are arteries, why does not their division cause hemorrhagy? This reason has been alledged as giving the preference to the ligature. True it is, that these arteries are sometimes very large, yet hemorrhage is extremely rare.

The existence of lymphatics cannot be denied; they can even sometimes be seen. As to the nerves, if any exist, they must be extremely small, possessing but little sensibility, and purely organic; for the excision of the tumor never gives the least pain, and should the patient complain, it is because, by mischance, some part of the sound tissue has been included in the forceps, or because the uterus has been too suddenly drawn down.

The age and strength of the patient have certainly some influence over the development of polypi, and the degree of their increase; but this increase is owing much more to the degree of compression, exerted by the body or neck of the uterus; and indeed experience has shown, that those which attain the greatest size, are seated on the external surface of the uterus, where no obstacle opposes their growth. But this size varies most singularly. I have known them, from the size of a millet-seed, reach that of a man's head; and from the weight of a few grains, that of 12 or 15 pounds. The largest I have ever met with in the dead subject, weighed nearly 25 pounds. M. Gauthier de Clanbry has given an account of an enormous mass 36 1-4 inches in its vertical, 29 1-4 in its horizontal circumference, and weighing 39 pounds.

So long as the polypus has not degenerated, it has a whitish aspect, a smooth surface, nearly resembling that of the uterus in a healthy state; it is more or less red when inflamed: and lastly assumes a brown, grayish, or black color, when it degenerates spontaneously, or becomes gangrenous from the effect of a ligature or any other cause.

They present various degrees of consistence, but are mostly very firm, dense, and cannot be crushed like cellular, vesicular, or mucous polypi. They are as dense as the intervertebral fibro-cartilages, and remarkably elastic, so as to rebound several feet from the floor when thrown upon it.

Their form is exceedingly various; generally globular or ovoid, they are often angular, irregular, when they dip into the vagina, and approach a large size; they are almost always divided by external fissures. I have seen them resembling an inverted mushroom, others conoidal, with the apex downwards, &c. These peculiarities are not unimportant, as it is often very useful, in forming our diagnosis, to understand the arrangement of the whole of the tumor. The following case is a proof.

CASE III.—The wife of a gentleman in the vicinity of Paris, consulted one of the most skillful surgeons of that capital. He examined her, found a tumor, observed the foetid smell, declared the disease to be cancer, and that she had not three months to live. I was desired to see her, I examined her and found a large tumor, which I could circumscribe with my finger. Carrying the finger higher I found the pedicle, and lastly discovered its insertion into the neck of the uterus. I told the gentleman that his wife had polypus, which could be easily removed, and she would be well in a short time.

He was perfectly astonished, and after a few minutes of silence, asked me if I was very sure of what I asserted, and begged me to examine again. This examination confirmed my previous opinion. He then communicated to me the opinion of the celebrated surgeon of whom I have spoken. Such imposing authority made me, I confess, fear some mistake on my part, and I made a third examination still more carefully; but was convinced of the correctness of my diagnosis, and proposed the operation as a prompt and easy cure. It was eagerly consented to, and in 12 or 15 days the patient was perfectly restored to health.

Let us examine still further the anatomical structure of these polypi: they are composed of a body, a pedicle, a root, the whole covered by a membrane, and formed internally of fibro-cellular tissue; the enveloping membrane is lost in that, called mucous membrane of the uterus. It is this membrane which gives to the polypi their smooth surface and roseate white hue.

What apparently proves its mucous nature, and consequently the mucous, nature of the internal lining of the uterus, of which it is only a prolongation, is its susceptibility of contracting all the changes peculiar to this species of membranes. Such as inflammatory, catarrhal, ulcerative affections, mucous serous, sanguineous, sanious discharge; it is capable of a turgescence similar to that giving rise to the menstrual discharge, and thence arises a distillation or a true flow of blood; it may take on *exulceration* similar to that observed in the pituitary membrane in ozæna, and these *exulcerations* become the sources of puriform, sanguinolent and sanious discharges.

These *exulcerations* are frequently found on the neck of the uterus, and especially on the os tincæ, and it is highly important not to confound them with cancerous *ulcerations*. They may be distinguished from cancerous ulcerations, by their redness, their irregularly round form, being white at the bottom of the cavity, formed of a layer of fibro-cellular tissue which is not easily distinguished from the tissue proper of the polypus.

On using the word *root*, as applied to the polypus. I do not wish to be understood that these are prolongations, or ramifications into the substance of the

uterus, similar to the root of a tree, but have merely given this name to the *ensemble* of tissue by which it is connected to the uterus. These are, arteries, veins lymphatics, probably nerves, a fibrous and cellular element, all covered by a mucous or serous membrane, accordingly as the polypus is situated internally or externally. The following is their mode of development, and of the formation of the pedicle: the polypi arises at some point in the surface of the uterus, by a process as yet unknown to us; they constantly increase; are gradually enveloped by the serous or mucous membrane of the uterus, which they carry before, as they depart from their origin; but as they increase and depart, they leave between their strongest portion and the uterus, a thinner part which constitutes the pedicle, and which diminishes in size and firmness in the direct ratio of its length. Lastly the enveloping membrane of polypi of the uterine cavity, is, as we have said, the same which lines this cavity. Its anatomical characters, its physical and physiological properties are evidently proved, and it is a most absurd idea to suppose that it is formed at the expense of the tissue proper of the uterus; in fact, it is continuous, and only forms a whole with the internal membrane of the uterus; it merely adheres to the fibrous body by a cellular tissue, easily destroyed when it has not become inflamed nor degenerated, subject to the same lesions, and often presenting physiological phenomena similar to those of mucous membranes. Let us, moreover, judge by comparison. Have the fibrous bodies of the external surface any other covering than the peritoneal coat of the uterus, and are not those growing in its substance merely covered by a cellular layer which separates them from the tissue itself of the uterus? This opinion is, therefore, as untenable as the former. Let us now examine the substance proper of fibrous bodies.

More deeply we find that tissue, which I have called fibro-cellular, and of which the whole tumor, with the exception of its envelop, is composed. The nature, therefore, of these tumors is entirely different from that of polypi, called cellular, vascular, vesicular or mucous. Whilst the former are very common in the uterus, the latter are very rarely found there; but frequently, as is well known, in the nasal fossæ, on the margin of the anus, and on the mucous membrane of other parts. I have sometimes seen them on the uterus, but only on the neck.

If divided immediately after their removal, fibrous polypi are of a pearly white color. We have said that they were similar to the inter-vertebral substance. If the latter be boiled for a long time, it is reduced to a gelatinous matter; the same is true with fibrous polypi. They are composed of still another element—I mean the cellular tissue, but generally more dense and firm than is met with in other regions. These two elements are sometimes united in equal proportions; but generally one predominates, and to this excess is owing the majority of the changes which they undergo.

If the fibrous element predominate, the polypus does not degenerate, or if at last it should degenerate, it passes, not into the cancerous, but into the osseous state.

If the cellular tissue, on the contrary, be more abundant, the polypus passes into the carcinomatous state. This tendency to carcinoma is certain and inevitable after a certain length of time. Its substance becomes inflamed and softened; the surface unequal, irregular, and frequently ulcerated. Then

commence those horribly foetid, sanious discharges, certain symptoms of disorganization. The patient's constitution suffers, her face takes on a yellow hue, she rapidly emaciates. The tissue of the polypus is transformed into a cerebriform substance, in which are found fungi, depositions of pus, effusions of blood, in short, all the products of carcinomatous disorganization.

Experience has shown that polypi rarely pass into the cartilaginous or osseous states, but generally into carcinoma.

Between the two elementary tissues of the polypi, of which we have spoken there exists a greater or less quantity of serosity, either free or in combination. If free, carcinoma is less to be feared, but much more to be dreaded if the fluid be combined with the fibro-cellular elements.

Such are the different terminations to which fibrous polypi tend, from their peculiar organization. But their disorganization is often the effect of another cause, namely, inflammation of their serous or mucous envelop. The serous inflammation sometimes spreads over the peritoneum, giving rise to peritonitis and all its consequences; sometimes it is confined to one spot in the tumor and causes adhesions between it and the adjacent parts, or else it penetrates more deeply and is the origin of one of the degrees of the disorganization I have just spoken of. If inflammation attack the mucous membrane, it pursues a similar course; then follow catarrhs, metritis, ulcerations, mucous, serous, purulent and sanious discharges and invariably carcinoma. But the distinction between the effects of these two orders of causes, is, that the disorganization, which I shall call spontaneous, and which is the necessary consequence of the organization of polypi, proceeds from the centre to the circumference; whilst that which is the product of inflammation, commences at the periphery.

Cavities are sometimes found in the interior of fibro-cellular polypi of the uterus. These cavities are original and organized, or consecutive and resulting from the softening and disorganization of the polypus. The internal surface of these cavities is sometimes smooth and polished, and sometimes presents bundles of fibres, like the columnæ carneæ of the ventricles of the heart.

The cavities of the second species, arising from the ramollissement, and disorganization of the polypus, are filled with a sanious, sanguinolent, puriform fluid. A surgeon having applied the forceps to a similar tumor in order to effect its depression, the cavity burst, and a quantity of black, ropy, foetid matter escaped. A cat having licked up a small portion which fell on the floor, died the same day with symptoms of cholera morbus. (*Journ. Gener. de Med.*)

It follows from the preceding facts that all those fibrous, cancerous, fungous, fibro-cartilaginous osseous, and stony tumors, &c., which had been considered as productive of different natures and arising from different causes, are merely different degrees of the successive transformations of the same disease.

The disease under consideration was formerly considered very rare. When Levret first turned his attention to it, in seven years he only found three cases to which his method could be applied. Herbiniaux is said to be the second who saw it at Brussels; and a dutch professor, who had never seen it, pretended that his country-women were exempted from it. But, since, it has been ascertained that fibro-cellular polypi of the uterus is one of the most

common diseases peculiar to females. Bayle reckoned at one fifth, the number of women over 35 years of age, in whom he found one or several fibrous bodies. Portal, in 1770, found, out of 20 cases which he examined, 13 containing polypi. In my opinion, there is scarcely an uterus of an old woman, which does not contain some tumor of this nature.

I think it useless to waste time in considering the various hypothesis which have been advanced, concerning the remote and proximate causes of polypus of the uterus; they can be of no benefit to you, and are not less unknown to us than to our predecessors. There are, however, two facts relative to the predisposing causes on which experience seems decided. It appears from a considerable number of cases collected from different authors, that the period between 40 and 50 years of age, is most fertile in uterine polypi; and on the other hand, that the assertion of Bayle, so often repeated without examination, upon the influence of celibacy and sterility in the production of the disease is entirely erroneous.

The number of cases I have collected is sixty-two, taken principally from the works of M. Velpeau, Mme. Boivin, M. Recamier, M. Bayle, the *Journal General de Medicine*, volume 101, and the Thesis of Dr. Marx.

First. As regards *age*. Little is generally known of the history of the patient previous to her coming under the notice of the physician. I have endeavored, however, to establish two periods in the life of the patient; by the former, which I consider by far the most important, I mean the date of the first appearance of the disease. By these means alone, can we correctly ascertain at what period of life polypi are most common.

Age of the patients when the first symptoms of the disease appeared.

From the 62 cases, five must be deducted, whose history does not give the commencement of the disease; 57 remain.

Of these 57, the first symptoms of the disease appeared

In	1 patient of	15	to	20 years inclusive,
10	"	20	"	29
19	"	30	"	39
23	"	40	"	49
3	"	50	"	59
1	"	60 and upwards,		

Total, 57

Thus the period furnishing most cases, is that from 40 to 50 years; next, from 30 to 40. But by consulting the real age of each patient, we find that it is from 35 to 45 or 48, that the disease most frequently appears.

Age of the patients at the date of observation and treatment.

From	20	to	29 years inclusively	8 patients.
	30	"	39	18
	40	"	49	24
	50	"	59	6
	60 and upwards		"	5
	Age unknown			1

Total, 62

Second. As regards marriage or celibacy. We have of course considered

as married, all those women who have cohabited with men. It would be truly ridiculous to consider as in a state of celibacy, girls who have abused coition, and then pretend that celibacy has great influence over the development of polypus: that question belongs alone to the municipal authorities.

Of the 62 cases, the character of four is unknown. There remain, therefore, but 58.

Of these 58 patients 54 were married, or being unmarried had cohabited,  
4 only were virgins, and supposed never to have cohabited.

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Total, 58

Third. Let us now inquire if the opinion of Bayle, as regards sterility, is better founded than the preceding; we must first deduct from our list the four virgins, and seven women and girls, whose fecundity or sterility has not been ascertained, there then remain 51.

Married women having had from 1 to 10 children,	39	}	42
Girls having had children,	3		
Married women having had no children,	8	}	9
Girls having cohabited without children,	1		

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Total, 51

Fourth. State of the menstrual function.

41 were regular until the commencement of the disease.

5 were irregular for some years previous to the appearance of the first symptoms.

6 had been always irregular.

1 48 years of age, although regular, had suffered from violent leucorrhœa, from the age of 18, and had, nevertheless, had six children.

9 The state of this function was unknown.

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Total, 62

The reductions which may be drawn from the preceding facts relative to age, celibacy or marriage, fecundity or sterility, are positive, and too evident to be passed over in silence, and I am persuaded, that whatever number of cases may be selected, the result will be found very nearly the same.

The lymphatic temperament, has also been classed among the predisposing causes, but as yet we have not had sufficient experience to decide. As to the occupation, &c., and immediate causes, I can find nothing satisfactory in writers.

Let us now proceed to another not less important part of our subject, the symptomatology, diagnosis and treatment, concerning which, however, the limits of our present work do not admit of much detail. No precursory symptom foretells the existence of a polypus; and even in many cases, this anormal organic production can only be ascertained when it has acquired a pretty considerable size; and in others, it is impossible to be positively certain of its existence.

If the polypus be very small and at the same time situated on the peritoneal surface of the uterus, giving rise to no inconvenience, it cannot be known

during life, and in this case belongs exclusively to the domain of pathological anatomy.

This does not obtain when they are large or project into the cavity of the uterus; they then occasion well marked symptoms by which their existence is revealed. But these symptoms are far from being uniform, and differ widely according to the situation they occupy. We must, therefore, study their symptoms and signs, according as they are located in the internal surface of the uterus, the thickness of its parietes, or its peritoneal surface.

First. In the cavity of the uterus. When the polypus arises and grows in the cavity of this organ, the first symptoms are a sensation of weight in the abdominal region, a painful dragging in the groins, the region of the loins and inner part of the thighs, more or less severe colic, which is accompanied by a painful tension in the hypogastric region, and if the tumor has acquired a certain volume, a sensation of weight and pressure at the fundament.

Women, who still menstruate, at first become irregular; the period of the discharge occurs more frequently, is of longer duration, or returns several times during the month at unequal intervals. They are also subject to copious leucorrhœa and as we before said to menorrhagia. But all these symptoms, merely indicating some disturbance of the functions of the uterus, may depend upon a cause totally distinct from a polypus projecting into the cavity of the uterus. She is, therefore, generally reduced to mere conjecture in this *first period* of the disease.

But the *second period* arrives, much less obscure, and furnishing already some rational signs of high importance; it is when the polypus having acquired more or less size and gradually distended the uterus, appears at the internal orifice of the neck, presses against it, dilates and opens it, and passing through projects into the vagina. It is highly important to remember, that, generally several months, and frequently more than a year elapse between the first and second period; and that consequently, when we have reason to suspect the existence of a polypus, we should not lose sight of the patient, but examine her at least once monthly, in order to be prepared against any serious symptoms which may arise. Women have frequently perished, for want of these precautions.

The disease having reached this point, a series of complete and constant symptoms becomes manifest; the pain in the lumbar region and groins take on a dragging character, and to it is added a sensation of weight at the anus, and a tendency to constipation. Walking is sometimes difficult; and lastly the patient complains of pressure, and an unusual feeling of distress about the inferior portion of the vagina. Then appear those uterine contractions, similar to pains of childbirth, repeated at various intervals, and sometimes presenting the inexplicable character of very regular periodicity. The following case will demonstrate at the same time the difficulty of the diagnosis of the disease at this period, and how it was discovered by means of a manual examination.

CASE VI.—A young woman of 22 years of age, of an opulent family, residing on the frontiers of the kingdom, came to Paris for advice concerning a disease of the uterus. She was placed under the care of two celebrated physicians. Both considered the disease as an engorgement of the organ and treated her according to this erroneous opinion, for more than two months. She was daily getting worse, and at the end of that time, a celebrated surgeon was called in consultation. The attending physician pointed out to him a

remarkable phenomena, namely, that every day, at the same hour, the patient experienced pains like those of labor. This first awakened his attention, and made him cautious in his diagnosis.

The surgeon examined her in a recumbent posture. Placing her then in an erect position, the orifice of the uterus presented a dilatation about as large as a one franc piece; the index finger carried to the opening and circumscribing its margin, recognized a considerable hardness which appeared to belong to the parietes of the organ and to be lost in them. There was a sensation of swelling and thickening of the neck, and if the examination had been carried no further, one might have easily believed in the existence of engorgement. Such had been the cause of the error of the first physicians, as was proved by a new examination, and afterwards by the autopsy; in fact the polypus developed on the internal surface of the organ, was exactly applied to its orifice and did not extend beyond its edges. On introducing the finger still further, a pretty large tumor was felt, which could be easily circumscribed with the finger, and the surgeon announced the existence of a polypus. Its extirpation was decided upon, but as the patient was on the eve of menstruating, it was deferred until after that period. The menstrual discharge came on; but immediately a violent peritonitis took place, and the patient soon fell a victim to it. The autopsy verified the diagnosis; the disease was a fibrous polypus. (Journ. Comp. des Sc. Med.)

This progress of polypi of the uterus, belongs exclusively, as you well know, to those which are furnished with pedicles. But when they are not pediculated, and merely projecting into the cavity of the uterus, the symptoms are those of the first period, that is to say, very uncertain.

Sometimes, however, the os uteri is so rigid, the polypus so much increased in the interior of the uterus, that although without a pedicle, it cannot open a passage through the orifice, and the disease remains at the second period. The symptoms in that case, are much more serious and dangerous; the uterus dilates, as the polypus increases; the efforts of expulsion are more violent, and may give rise to inflammation of the organ; there is a copious and almost constant discharge. Hence, general debility, inability to walk or move, increasing paleness, bloated appearance, partial or general dropsy, pulse small, weak, and rapid, frequent syncope, and if relief be not obtained, death takes place in complete anemia and prostration.

When the polypus has descended into the vagina, or reached its third period of development, the pains in the hypogastrium, generally cease; but the tumor presses more on the bladder, and according to its position, occasions a frequent desire to make water, or prevents its flow entirely; its pressure on the rectum, opposes defecation; on the perineum, prevents the patient from sitting; on the parietes of the vagina, causes a chronic irritation, accompanied by leucorrhœa, or a sanious discharge of horrible odor. There are at the same time, frequent and continued discharges of blood; lastly supervene, all the general and local symptoms, which we have elsewhere described, indicating the cancerous disorganization of the polypus.

The disease in the *fourth period*, or, when the tumor had passed out of the vagina, and is fixed between the thighs, seldom gives rise to any new symptom worthy of attention; but the situation of the patient is most painful and disgusting. One circumstance deserves notice, namely, that as the whole mass

is exposed to the action of the air and constant friction, rapidly becomes disorganized. It may sometimes be returned into the vagina, but it is liable to a new protrusion on the least muscular contraction of the abdomen, a slight cough, a false step, &c.

From the nature of the facts just related, it is evident that each stage of the disease, presents different means of *diagnosis*, and greater or less difficulties. When fibrous polypi are completely enclosed in the uterus, of which the orifice is undilated, we can only form conjectures from the rational symptoms; feeling and sight are inadequate.

But when they appear at the uterine orifice, and the neck is more or less dilated, the means of diagnosis are more numerous and certain; in the first rank stand an *examination per vaginam*, and inspection by means of the *speculum*.

By an examination we feel the tumor, which appears between the lips of the orifice, round, smooth, of variable consistency, but generally very firm.

The question then arises, if it be polypus or an engorgement of the neck? if the polypus arise from the edge of the neck, or from its internal surface? or if it proceed from the cavity of the uterus? The first question is not always easily answered, especially when the tumor is scarcely engaged in the orifice, or when the latter is not sufficiently dilated to allow the introduction of the finger, as may be seen by case VI.

We should then repeat the examination as often as may be necessary; endeavor to introduce the finger into the os uteri, if possible. Should a polypus exist, we may circumscribe its surface, discover its pedicle by the circular depression which is formed, and even sometimes ascertain its point of insertion, and portion of the uterus from which it arises. In engorgement of the neck, these symptoms do not exist; no depression or pedicle is to be found; the finger cannot circumscribe the tumor; and we cannot decide whether there be a simple engorgement, or a polypus of the second species. The same difficulties obtain, when the polypus adheres, in consequence of inflammation of its envelop, to the surface, or to the neck of the uterus. Much skill and experience in examining are here required. If the polypus is implanted in the edge of the neck, the orifice is free, and alongside of it is felt one of the lips occupied by a tumor, with or without a pedicle.

Fibrous polypi arising from the neck of the uterus, occasion considerable increase of the size of the part of the neck from which they arise. This part seems to extend and mingle with the polypus. It is sometimes difficult to distinguish where one begins and the other ends. In these cases the neck of the uterus always loses its natural position.

When the polypus has extended into the vagina, if it be of moderate size, it may be easily recognized by the finger. This method of exploration is more difficult and delicate if it be large, and fill the whole vaginal cavity. We must circumscribe with the finger, the pedicle of the tumor; if a circular groove be felt around, in which the finger or an instrument can penetrate, and if around this groove, the neck of the uterus be dilated, and its edges free, we may affirm that the tumor comes from the uterus. If, on the contrary, the orifice be free, but one of its lips continuous with the pedicle, we have to do with a polypus of the neck.

Sometimes the polypus so completely fills the vagina, that the finger cannot

turn freely around the pedicle; we must then introduce, alternately, the index finger of each hand on each side of the tumor, in order to ascertain its origin, by penetrating as far as the neck of the uterus.

This is sometimes impossible; and we then are obliged to follow the advice of Levret, to seize the tumor with the forceps, bring it down to the vulva, and execute at the same time the diagnosis and operation.

CASE VII. Jeanne Monconteau, 50 years of age, widow, of a bilioso-nervous temperament, delicate constitution, having ceased to menstruate at 46 years of age, was attacked with a very copious white discharge, with acute colicky, lumbar and inguinal pains. She was slightly relieved by the use of the warm bath. A year afterwards bloody discharges came on, twice and thrice monthly, sometimes more seldom; they were accompanied by weakness, and general langor. She came to the Hotel-Dieu on the 18th of April, 1818; on examination, a large, smooth tumor, completely filling the cavity of the vagina and distending its parietes, was discovered; the neck of the uterus could not be felt without great difficulty, and pain to the patient; it was impossible to feel around the tumor with the same finger. Standing on the left side of the woman, the index finger of the hand of the same side could be insinuated between the tumor and vagina. Having reached the neck of the uterus, the whole right side of the circumference could be explored, and the tumor was found not to be inserted at this point; the same was true of the left side.

She was transferred to the surgical wards on the 21st of April, 1818, in the following condition: face pale, yellow, anxious; eyes dull; skin dry and clayey; articulation feeble; pulse small and slow; little appetite; digestion impaired; weariness and weight in the loins and thighs; frequent colic; white discharge from the vagina; a smooth and hard tumor was felt in this cavity, completely filling it, and distending its parietes. I found great difficulty in ascertaining the point of its insertion, and only succeeded by following the process of my colleagues.

I then proceeded to perform the operation in the usual manner; but having brought the tumor to the vulva, and endeavoring to extract it by that orifice, I was unable to succeed on account of its narrowness, as the woman had never had children. The posterior commissure was then divided for about half an inch. The tumor was brought out, and its pedicle divided with the scissors. There was no hemorrhage.

In a few days she was sent to the medical ward, whence she came, and was soon after discharged perfectly cured.

In the fourth period of the disease, when the polypus appears at the vulva, or has passed beyond it, the manual examination is easy. Difficult cases, however, occasionally occur.

The foundation of the diagnosis is always the exploration of the neck, its central orifice, and the circular cul de sac separating it from the vagina. Therefore, even when the polypus has passed out of the vagina, if the uterus has not been brought down with it, if the pedicle is very long and very large, we can ascertain the nature of the tumor, but it is often impossible to know whence it arises, where the pedicle finishes, or where it is inserted.

CASE VIII.—M. L. Tellier, 51 years of age, mother of two children, of which the younger is ten years old, regular, and enjoying good health, until

the appearance of her present disease ; began about nine and a half years ago, to experience some derangement in the menstrual function. This discharge occurred at intervals of two weeks, a month, and even two months, and was each time followed by a flow of mucus which lasted several days.

Six years after, she felt at the bottom of the vagina, a tumor, which, on her making any exertion, descended to the margin of the vulva. A continual discharge of reddish, fœtid fluid, took place ; the general health of the patient grew worse, and she became pale and emaciated.

The tumor at last reached the level of the lower orifice of the vagina, and by its pressure on the rectum, interfered considerably with defecation.

On the 14th of May, 1826, in an attempt to evacuate her bowels, the tumor suddenly protruded, accompanied by the discharge of a quantity of blood, and acute pain in the lumbar region. On the 18th of May, she came into the Hotel-Dieu. Face pale, skin of a straw color, eyes dull, pulse feeble and moderately frequent, debility great. The upper part of the space between the thighs was occupied by a round polypous mass in the shape of an inverted mushroom, six inches in diameter, and three in thickness, with a rugged surface. Its upper surface presented a kind of umbilicus, from which arose a pedicle an inch in diameter appearing externally about two inches, and occupying the whole length of the vagina. The examination was exceedingly difficult, on account of the size of the pedicle ; the finger could penetrate to the depth of two or three inches, and then met with a circular cul de sac, embracing the most remote part of the pedicle, without being able to distinguish the lips of the os uteri.

The nature of the tumor was evident, and on the next morning it was removed in the usual manner ; but on account of the state of the parts, I thought it most prudent to pass a ligature around the pedicle, as high up as possible, but without exerting the least constriction upon it. The pedicle was then divided at the inferior orifice of the vagina. A little blood was lost from two small arteries, but the discharge soon ceased. The patient was put to bed, and carefully watched, in case of a recurrence of the hemorrhage.

None occurred during the day, but the patient was constantly in a state approaching to syncope.

(Infusion of linden and orange flowers.)

A fibrous and scirrhus tissue was discovered in the centre of the polypus, presenting a central band continuous with the pedicle ; on the circumference, for the extent of about an inch, a red and very vascular tissue, furnished with veins, some of them as large as a crow quill. The firmness of this tissue diminished from the centre towards the circumference. Parts of the exterior were very soft, and on the point of ulcerating.

The external surface of the tumor, was covered by a thin, flocculent membrane, composed of mucous membrane. The pedicle was similarly organized, except that the scirrhus tissue predominated. Its centre was traversed by an artery, which, in its passage, gave off several branches, and was finally lost in the body of the polypus.

During the two weeks following the operation, the patient was always pale, weak, with a small and frequent pulse, without sleep, and having some diarrhœa, the pedicle of the polypus became inflamed, and doubled in size ; its surface was covered with a slight suppuration, but which annoyed the patient

from its continuance, and excoriated the upper part of the thighs and perineum, notwithstanding all our care to prevent it.

On the 21st day, the tumor beginning to diminish, a bandage was applied with the intention of assisting its ascent into the vagina. Two days after, the patient having pushed the pedicle rather roughly, it suddenly ascended beyond the reach of the index finger. The suppuration gradually decreased, her appetite and strength returned, and she asked for her discharge on the 26th day after her admission, or 25th of the operation. Since that time I have not heard of her, and cannot say whether the pedicle may or may not have given rise to inflammation of the uterus, a relapse of the disease, or disorganization.

Notwithstanding all the means of diagnosis which we possess, difficulties are innumerable and mistakes frequently occur. The following case is a remarkable instance of the liability of men to error; we see in it, at every moment, the opinions of the highest standing in the profession, the most contradictory and erroneous.

CASE IX.—Mad. L. . . . , 37 years of age, of a lymphatic constitution, worn out by many years of suffering, first menstruated at the age of 14.

At the end of this time, after any exertion, a white discharge, at first slight and irregular, but afterwards copious and continuous, appeared; later, there supervened dragging sensations in the epigastric region, and a feeling of weight about the perineum. Several years of her life were passed in this state, the menses became less abundant, and somewhat irregular. Married at the age of 22, Mad. L. became a mother a year after; the mucous flow decreased during pregnancy, but reappeared very copiously after delivery. Her health was pretty good during the first 10 or 12 years of her married life.

In December, 1816, she consulted M. Cavalan; he examined her, and supposing her to be affected with prolapsus uteri, prescribed a pessary, which could not however be borne, and it was removed in three days.

In February, 1817, M. Forestier was called in. The patient still experienced the dragging about the genital organs; the white discharge was very copious, the menstrual flux pretty regular, but preceded by horrible pains in the loins. The menses were so abundant, that Mad. L., called them *losses* (*perles*). The treatment consisted of baths, injections, rest in bed, without any relief.

M. Dubois having been consulted, and examined the patient, said that there was nothing the matter, that it was useless for her to remain in bed, and that she could walk.

M. Ganthier de Sancy followed M. Forestier; he prescribed pills of assa-fœtida and cicuta, without effecting any change. After a year's treatment M. Ganthier recognized the existence of a polypus, proposed the ligature, and requested M. Boyer to consult with. In September, 1818, the latter examined her, said that M. Ganthier was mistaken; that Mad. L., was affected with ulcerated scirrhus of the body of the uterus, and that an operation was impossible; he advised a tonic regimen to support as long as possible the existence of the patient, whose end, in his opinion, was near at hand. She was placed under the care of his nephew, M. Vareilliand. He at first was of his uncle's opinion, but in February, 1820, he ascertained the disease to be merely an enormous polypus, and proposed to call me in consultation.

I saw Mad. L. for the first time, in the month of March. On examination

I discovered an enormous polypus, pointed out its nature, and gave it as my opinion, that the small size of its pedicle, offered many chances of success, if it were removed, but that the operation ought to be performed immediately. M. Boyer made a new examination, and recognized the existence of the tumor, but was disinclined to any operation. However, the patient consented to the operation, and it was performed on the 3d of April, 1820.

Placed as in the operation for lithotomy, two assistants held the knees firmly against their breast with one hand, and with the other, separated the genital organs. I first introduced one hand in order to distend the vagina; a branch of the forceps of Museux was implanted into the tumor; then I drew on it in order to fasten a second branch, and endeavored to extract, but the tumor was arrested at the inferior strait, at the moment of passing the ischiatic strait; applying then a second pair of forceps, and assisted by two fingers passed between the tumor and the superior commissure, it was brought out of the vulva. Depressing it with one hand, I divided its pedicle by means of strong curved scissors. The operation was completed without pain or loss of blood. The tumor was unequal, fibrous, smooth, not ulcerated, about as large as the head of a child a year old, and weighing one pound. In two weeks she was very nearly entirely well.

Secondly. In the substance of the parietes of the uterus. We have said that fibrous bodies, situate on the surface of the os tincae, are easily recognized provided they be as large as a pea or a filbert, because they form a hard tumor, indolent, and projecting more or less into the vagina. But when these same tumors are seated more deeply in the neck of the uterus of the tissue proper of the body of this organ, nothing indicates their existence if they are not large; they may increase insensibly and acquire the size of an egg, or even of the fist, without any sensible inconvenience, provided they be situated so as not to increase too much the cavity of the uterus. Bayle, indeed, thinks that this latter circumstance is of little importance after the critical age. He says, he has seen women in whom fibrous tumors larger than both fists together, developed after the 50th year, have given rise to no serious symptom, although they had enlarged considerably the cavity of the uterus.

When we examine a woman who has a fibrous body, not yet very large, in the tissue of the parietes of the uterus, we generally find a more or less projecting tumor in the centre of the hypogastrium. Place one hand on that spot, and introduce the index finger of the other into the vagina; by pushing upwards the neck of the uterus, the motion is felt in the hypogastrium, and reciprocally. In these cases, the neck is sometimes in its usual state, sometimes almost obliterated or slightly deformed; and if the tumor be very large, it is generally very elevated, as in the sixth month of pregnancy.

How, therefore, are we to distinguish, under these circumstances, whether we have to deal with a fibrous tumor, with pregnancy, a mole, or a spontaneous increase of the uterus? Time and an attentive examination of the progress of the disease may answer the questions as regards the mole or pregnancy, but nothing can distinguish between the first and last, unless the tumor project more or less into the cavity or the peritoneal surface of the uterus. Fortunately, uncertainty is productive of no evil consequences, for the disease, whatever it may be, is entirely beyond our control.

Thirdly. On the peritoneal surface of the uterus. If the polypi developed in this region have no pedicles, we meet with the greater part of the difficulties experienced in the preceding cases. If they have pedicles, but which are very small, nothing reveals their existence; if the pedicle be of some size, they are easily discovered. By feeling the lower part of the abdomen and introducing a finger into the vagina, we find a tumor more or less round, moveable, not painful on pressure, sometimes deeply seated in the pelvis, sometimes projecting in the middle of the hypogastric region, or situated in one or other of the iliac regions, according to its point of origin in the uterus. This diversity of situation is very important, as regards the treatment, as will be hereafter seen.

Fourthly. Polypi developed without and around the neck of the uterus. Particular attention should be given to polypi developed in these parts, because, on account of their different situations, the nature and anatomical structure of the parts, they occasion remarkable phenomena, and become the subjects of very interesting considerations. Some time ago, being consulted by a lady who complained of general uneasiness, pain in the interior of the vagina, and above all of having had no children, I examined her and found around the neck of the uterus a kind of tumefied band, composed of projecting tubercles very close to each other, and also soon perceived the fibrous nature of these bodies. But, taught by experience, the almost constant multiplicity of polypi growing in these parts, I endeavored to discover another, and indeed found one situated higher up on the very body of the uterus. What was remarkable, was the annular disposition of the fibrous bodies around the neck, and their co-existence with other fibrous bodies in the uterus. Some years ago, I was consulted by the wife of a professional gentleman. She had been examined by a number of physicians. Some inclined to the opinion that there was a hysterical nervous affection, others an organic lesion. After several examinations I discovered a tumor on the right side of the neck of the uterus. Yesterday (21st of March, 1833) I saw a similar case; the woman had a fibrous tumor on the body of the uterus, but in addition, a second situated in the dense cellular tissue uniting the rectum to the parietes of the vagina. I opposed an attempt at any operation, for which I will afterwards give you my reasons.

Many analogous cases might be quoted. Two important facts follow from them; the frequency and almost constant multiplicity of fibrous polypi of this region, and their incurability in the greater number of cases. How can the first fact be explained? Is it owing to the greater abundance and firmness of the fibro-cellular element around the neck of the uterus than in the body itself of the organ? Let us examine their effects.

Generally, in this species of polypus, the symptoms are more pronounced than in those of the first three categories already described. They present characters peculiar to their situation. They cause a sensation of weight at the fundament, pain in the abdomen, at first at distant intervals, then returning more frequently in proportion as they threaten disorganization, or as the woman has frequent connection with other sex; the pain is greater in walking and the erect position, when the rectum is filled with fæcal matter.

I have also seen a very remarkable case, namely, a fibrous tumor developed between the urethra, and the anterior wall of the vagina; and what was singular

lar, it gave rise to a red and white discharge, and caused most acute pain. I made an incision between the urethra and vagina, I dissected very carefully the parts, and aware of the great number of blood-vessels in this highly erectile tissue, and the profuse hemorrhage which takes place, I tied every important vessel as it was divided; I reached the tumor, and succeeded in removing it. Two years ago, I extirpated a similar tumor; situated in the thickness of the genital organs, surrounding the uterus, there was a slight hæmorrhagy, which was soon arrested. Let us recapitulate these facts; fibrous tumors developed around the neck, and in the tissue surrounding the uterus, are rarely solitary, but most generally multiple, they are very common, and the reason of their frequency is in the nature of the tissues from which they arise; they are found in all parts of the vagina, in front, behind, on the sides of the neck, between the vagina and rectum, or the vagina and urethra. They give rise to peculiar symptoms which facilitate the diagnosis, by the different situations which they occupy. In a very few cases, can they be extracted; and if this be possible, it should not be delayed, for we possess no other remedy. In a majority of cases, extirpation is impossible. Indeed, how could we remove tumors deeply seated in the vagina, which project either in the rectum, the bladder, or above the pubes? The hemorrhagy is frightful and difficult to arrest; the consecutive inflammation certain, and the inflammation of the peritoneum fatal.

*Prognosis.* As long as fibrous polypi give rise to none of the general symptoms, interesting seriously the constitution of the patient, their existence is free from danger.

The general disorder resulting from the disorganization of polypi or copious discharges, are always serious; the danger is imminent, and the operation urgently demanded.

A polypus, which, having sprung from the cavity of the uterus, has considerably increased it by its growth, and which cannot afterwards pass beyond the neck of the uterus, will cause serious symptoms, which it is important to arrest as soon as possible, by efficacious treatment.

If the polypus be complicated with a tuberculous or scirrhus affection of the uterus, or any other organ, an acute or chronic inflammation of the latter, or its connections, or of the peritoneum, or lastly some lesion of the viscera of the principal cavities, the case is dangerous, and the operation affords but a slight chance of success.

In all diseases which are liable to recur, the success of the operation depends essentially on the complete removal of the affected tissues, all circumstances therefore, preventing our reaching the pedicle of the polypus as far as its root, are so many circumstances unfavorable to the operation.

Although, in similar diseases, we can never guarantee a non-recurrence, the latter is much more rare, and less to be dreaded, all things being equal, when we operate before any cancerous disorganization, than when it exists, and that when the patient labors under the fever of absorption, for a longer or shorter period.

Polypi of the cavity or neck of the uterus, especially when they have descended into the vagina, generally degenerate into carcimona. The fibro-cartilaginous or bony disorganization attacks those which appear in the substance of the organ, or on its surface.

Voluminous polypi of the body of the uterus, admit of no operation or accident of their position, as also those of its peritoneal surface, from the fatal consequences which would result.

We can predict nothing positive as to the progress and consequences of polypi, developed in the substance of the uterus, or on its peritoneal surface. Some, although small, are very troublesome, others attain an enormous size without any inconvenience to the patient, during many years.

We have seen that polypi developed in the substance of the uterus, may present all the phenomena of pregnancy, a mole, or a spontaneous increase of this organ; that those appearing on the peritoneal surface, may be confounded with chronic tumors of the ovaries, or other organic lesions, and that the existence of either, can seldom be positively ascertained during life. They have frequently been mistaken for cancer, and the neck of the uterus amputated, when the patient required quite a different treatment.

Polypi of the uterus have some analogy with a host of affections, amongst which the principal are prolapsus and inversion of the uterus or vagina, and vaginal hernia.

The development of a polypus in the interior of the uterus, often occasions symptoms analogous to those of incipient pregnancy, such as slight tumefaction or tension of the hypogastrium, weight in the abdomen, general uneasiness, sensibility, and increase of size of the mammæ, &c.

I have seen several women laboring under polypi, who believed themselves in the fifth, sixth or eighth month of pregnancy, and physicians have attributed their symptoms to extra uterine pregnancy. When they have reached a certain development they can rarely be mistaken.

Generally, the menstrual discharge ceases during pregnancy; in polypus, it not only continues but is more abundant and occurs several times during the month. The uterus is globular, very hard, sometimes equal, sometimes not; no *ballotement* can be detected.

Some polypi, which attain, in the cavity of the uterus itself, a very large size, on the approach of the menses and during their continuance give rise to pain and efforts at expulsion similar to those of parturition. An amollisement of the neck is the result, and also, during the duration of the expulsive pains, the projection of the tumor which appears through the os uteri. Under these circumstances, examine the patient when she is not menstruating; you find merely an increase of the size of the uterus, of which the neck is closed. But examine her at the period of the discharge, or during a pain, and you will perceive the polypus engaged in the neck of the uterus. You may suppose this is a polypus which has reached the second stage. That is erroneous. It is because the polypus has ascended into the uterine cavity. I have never but once seen the efforts of the uterus alone expel a large polypus, of which the patient was soon relieved by appropriate means.

In inversion of the uterus, the latter appears under the form of a pyriform, reddish tumor, complicated with sero-purulent and even bloody discharges, like polypus; the patient complains of the same feeling of heaviness and dragging sensation in the loins; experiences the same difficulty in walking, standing erect, and evacuating the rectum and bladder. But polypus is indolent, unless its surrounding membrane be inflamed, whilst the uterus enjoys

some sensibility. Inverted uterus is soft, compressible; polypus is firm and resisting. Polypus is developed slowly and with the symptoms we have described; inversion, on the contrary, takes place suddenly, and from causes far remote from those producing polypus.

Inversion is complete or incomplete. In incomplete inversion, the uterus represents a convex elastic tumor, and always preserves this shape and character; not so with uterine polypus; its pedicle, which may be followed as far as the neck of the uterus, passing this orifice or implanted into it, leaves no doubt as to the nature of the tumor; in incomplete inversion the finger can penetrate but little between the tumor and neck of the uterus; the contrary obtains in polypus, if indeed the os uteri be sufficiently dilated to admit the finger. Different writers have laid down innumerable distinguishing signs, which, taken separately are all insufficient. M. Malgaigne, in his excellent essay on this subject, has proposed the following means of diagnosis:

In incomplete inversion, says he, the uterus forms a sac with the opening upwards, in which sometimes the intestines, sometimes the bladder, and occasionally all these viscera are found. Therefore, introduce a curved male catheter into the bladder, turn its point backwards, the concavity being below, and thus apply this point upon the fundus of the uterine sac; the finger in the vagina should feel the projection of the instrument as easily as it can be felt in the hypogastrium in ordinary catheterism. Experience must decide on the value of this new method.

If the inversion be complete, the uterus is turned like an inverted finger of a glove; the tumor is pyriform, and projects entirely from the vulva: the vaginal part of the uterine neck, alone free from the inversion, encircles the pedicle; above the vagina, inverted on itself, makes a second pedicle, but hollow and inserted in the internal surface of the great lips, the vaginal cavity no longer exists; the diagnosis is consequently easy. Besides, we have said that the polypus is insensible, and the uterus is sensible. Polypus is of slow growth, and complete inversion of the uterus is always sudden, generally following parturition.

Incomplete prolapsus of the uterus without inversion, in the majority of cases, is easily distinguished from a polypus in the vagina; the circular cul-de-sac formed by the latter, the orifice in the centre of the tumor, which represents a cone of which the vertex is below and the base above, an orifice, through which a sound or stylet may be introduced, are sufficient to prove this merely the displaced uterus. We should not be deceived by cracks, inequalities or ulcerations on the inferior part of the polypus, as frequently happens: let it be remembered that the tumor formed by the fall of the viscus, is narrower above than below, so that it draws the vagina after it, in such a manner that the parietes of this canal, turned upon themselves as incomplete inversion, leave no cavity in which the fingers can be carried around the tumor. Sometimes if the neck of the uterus is affected with cancerous disorganization, we may experience some difficulty, which is, however, removed by means of the speculum.

Fibrous polypi resemble so closely the uterus in color, and external appearance, that some surgeons have supposed that they had extirpated a cancerous uterus, which was merely a disorganized polypus arising from its cavity. A

fibrous polypus not yet disorganized, occasionally resembles so much a healthy uterus, as to give rise to doubt, which has happened to myself.

In complete prolapsus uteri, that is to say, when it is entirely beyond the vulva, the vagina being also completely inverted, and serving as an external tunic to the tumor, there is no longer any vaginal cavity; this tumor, as in complete inversion of the uterus, seems to arise from the internal surface of the labia majora. We cannot err, if we remember that it should present in its centre an orifice which is not found in a polypus.

Polypi of the uterus are often confounded with cancer of the neck of this organ. I have seen several cases cured, in a few days, by excision, which several surgeons had pronounced incurable. We have related several interesting cases. The error is not always so easily avoided as has been pretended. There are, in fact, cancers which have pedicles, and polypi which have none, or cancers of large size and composed of several lobes. How under these circumstances can we distinguish the nature of the tumor? In the first place, the tumor formed by cancer of the os tincæ, is continuous with the neck of the uterus; the latter, on the contrary, forms a projection round the tumor when it is a true polypus. A scirrhus tumor is irregular, uneven, very hard; a fibrous polypus not degenerated is also very hard but exceedingly elastic, it presents a smooth surface, a regular ovoidal shape. In scirrhus we have lancinating, deep seated pain, which is not the case in polypus. In scirrhus pressure gives great pain; in polypus it causes not the least uneasiness.

The bladder, intestines, and epiploon when displaced, form sometimes in the vagina a tumor, which might be taken for polypus. An accurate examination will guard against this error. When the bladder projects unnaturally into the vagina, it is invariably at the anterior portion of this canal. The projection has a large base; it diminishes, even disappears when empty, and increases in volume if its function be suspended for some time. It cannot be compressed without exciting the irritability of the bladder and the expulsion of urine; polypus of the vagina presents none of these characters. A tumor formed in this canal by the displaced intestine or omentum, occupies constantly its superior or lateral portion; increases when the patient stands erect, coughs, cries, or holds her breath: none of these symptoms belong to polypus of the uterus or vagina.

Inversion of the vagina can be mistaken for polypus, only by persons who have no knowledge of the disposition of the parts. In fact, inversion of the vagina forms a circular tumor which appears between the labia pudendi and sometimes without it. The finger placed in the centre of the tumor can penetrate into the remainder of the canal at the bottom of which will be found the neck of the uterus. This viscus drawn down by the vagina, is lower than its natural position. In polypus, on the contrary, it preserves its normal situation, the tumor is isolated from the parietes of the vaginal canal, circumscribed, encircled by the neck if it proceeds from the interior of the uterus, or implanted on the side of the uterine orifice if it has arisen externally.

*Treatment.*—We have observed, in the course of our remarks, that polypi of the body and peritoneal surface of the uterus may acquire a large size without causing, during a number of years, any very sensible inconvenience to the economy. Intra-uterine polypi in many women reach the second and even

the third stages, without revealing their presence by any well marked symptoms. But frequently polypi of the uterine cavity, inaccessible to our senses and instruments, give rise to distressing symptoms, whose true cause we cannot discover, such as copious loss of blood, leucorrhœa, violent pain in the belly, loins, &c.; here medical treatment is required, which although merely palliative is not the less imperiously demanded, for the life of the patient is frequently in great danger. The indications under these circumstances are to keep the bowels free; venesection repeated according to circumstances; the application of leeches; baths; emollient, narcotic, or astringent injections either by the vagina or rectum; topical applications of the same kind to the abdomen, anodynes and tonics internally, and revulsives.

Such is also the treatment demanded, before the removal of a polypus whose pressure has been ascertained, if the patient labor under serious general re-action. The state of the patient's mind should also be attended to. Rest, diet, anodynes internally and by injections, slight tonics if the constitution has been much shaken, &c. will prepare them to bear, not the pain of the operation, which is always trifling, but its effects and impressions on the mind.

But is there no remedy for these diseases than by an operation? I believe none, and experience has too well proved it. What has not been tried for the resolution of these tumors when developed in external parts of the body? Every thing has hitherto been unsuccessful, and we must not expect it in the diseases of the uterus. Cases of polypi, however, occur in which an operation is impossible, and here a medical treatment alone can be used in order to support the patient through the progress of an incurable disease. Still there is a rock to avoid, namely, to avoid hastening the termination of the malady by stimuli or narcotics. Hence, whenever polypus is incurable, we should limit ourselves to the treatment of the symptoms.

Frequently, when they have attained a certain size, they remain stationary and indolent and merely produce *mechanical* effects. I use this term, because it conveys precisely the idea of the action of these bodies on the organs.

These effects have been described; the polypus from its weight, rests upon the rectum, the vagina thrusts aside the bladder, urethra, or falling over the pubes, pushes forward the parietes of the abdomen. From this follow pains in the fundament and difficulty of defecation; which may be relieved by emollient and narcotic enemata; a great inconvenience from weight in the vagina, may be remedied by a pessary; retention of urine, requires the catheter; and in the last mentioned case, the belly is to be supported by a bandage.

When the removal or destruction of the polypus is determined upon, the operation must depend on many different circumstances. 1st, relative to the situation of the tumor; 2dly, its species; 3rd, the stage which it has reached. We will first treat of the operation in these three points of view, and then, in a few words, speak of the different methods now in use. There are, the cautery, torsion, breaking up (*broiement*), avulsion (*arrachement*), ligature and excision.

First. The cautery, which has been attributed to Celsus, and is performed either with caustics, or the iron, is appropriate neither to fibrous polypi developed in the substance of the uterus, nor to those which arising from its cavity or peritoneal surface, have acquired a certain size, whether they have or not a pedicle. How, in fact, can this remedy be used, without the consequence of

serious danger? If we use but slight caustics, they must be, for a long time, frequently repeated; now, experience has proved that the repeated action of such an agent excites and determines the carcinomatous disorganization of the tumor. If the cautery be deeply applied, an intense inflammation extending to the surrounding parts may follow, or a metritis or metro-peritonitis frequently fatal. If after having destroyed the tumor, some particles of its pedicle should remain a recurrence of the disease is almost certain; if the cautery be carried deeply enough to remove all vestige of the diseased tissues the same danger of inflammation, as before mentioned, is to be feared.

Nevertheless, however serious be the above objections, it does not thence follow, that the cautery is to be prohibited in all cases. It has been successfully applied to *vesicular* polypi of the nostrils, and probably might be equally so to those of the uterus. Sometimes it is very useful after the excision of *cellulo vascular* or *fungous* polypi, either to destroy the diseased tissues which the instrument was unable to remove, or to prevent hemorrhagy.

Second. *Torsion*. The rupture of the polypus by torsion has been celebrated by several writers; it was successfully employed in a case by Bondon, in which he would not apply a ligature, and in which the pedicle, of the length of an inch, was only five or six lines in diameter. This method can succeed, however, only when the pedicle is small, and not very firm in substance. But the fear of twisting some part of the tissues of the uterus, and producing a laceration, has caused it to be thrown aside, notwithstanding the advice given to twist the tumor very gently, after having seized its pedicle with strong forceps.

Third. *Breaking down* (broiement). This operation originated with M. Recamier; if, by this name, we can call the manner in which he once destroyed a soft and vascular polypus, inserted into the neck of the uterus and extending beyond it about six lines. M. Recamier pressed it against the paries of the uterus, with the index finger reduced it to a pulp, and thus extracted it in two minutes; it was of the size of the great toe.

This method cannot be applied to fibro-cellular polypi, unless they be very much softened; and then the only advantage we can expect is to diminish the size of the fibrous body, and render another operation more easy.

Fourth. *Forcible extraction* (arrachement) should only be practised under peculiar circumstances; when, for instance, any other operation is impracticable, and the woman is in imminent danger from the consequences of the polypus. In order to perform it, the body of the polypus is to be seized with the forceps of Museux, an ordinary forceps, or even with the fingers, if it is large and can be reached; we then practice methodical traction, either simple, or combined with slight rotary movements, until the polypus be extracted.

Fifth. *Ligature*. We have given our reasons for having abandoned this operation as a general plan; but in some cases, it is to be preferred; and sometimes should even precede excision.

Many instruments have been devised, but that of Desault is the only one now in use. It consists of two porte-nœuds and a serra-nœud. The two porte-nœuds have not the same shape, one which M. Boyer calls canula-porte-nœud, is a straight silver canula, seven inches in length, in which is

contained a silver or steel stem, of about nine inches in length. This latter is divided at one end, in the direction of its length, into two parts, each containing a semi-circle.

The serra-nœud is a silver stem, terminating in a ring fixed at right angles to it; the other end is flattened having a deep slit extending in the sense of the length of the instrument.



The annexed is an accurate representation of the application of the instrument, from Velpeau's *Médecine Opératoire*, pl. 20, fig. 3. It conveys a clearer idea than can be expressed by any words, of this instrument itself, as well as the manner of applying it.

*Description of the figure.* Uterus opened on its anterior surface, and containing a pedunculated polypus, to which Desault's ligature is applied. The two instruments brought from behind forwards, cross each other on the anterior region of the polypus a, so that the ligatures ee, may strangulate its peduncle. After having turned them once or twice on their axis, we must let go one of the ligatures, thrusting the stem h, into the canula i, to open the forceps f. The tube-porte ligature g, being removed, the serre-nœud is applied, and the operation finished. Although inserted high in the uterus, as is shown by the division of the neck, ee, the polypus projects considerably into the vagina dd.

After the ligature is fixed in its place, it should be drawn as tight as possible in order to completely arrest the circulation in the tumor. Experience has shown, that by these means, the consecutive accidents are less to be feared, and the separation of the polypus is more rapid. But frequently the pedicle is so large that the circulation cannot be interrupted at once; the

ligature should then be gradually tightened, unless it is effected. We should tighten the ligature as long as the patient does not complain and never longer; for a too great constriction has been known to cause excessive pain, convulsions, and even death from this last cause. Should any of these occur, the ligature should be relaxed. When the ligature is properly applied, the circulation of the fibrous mass being interrupted, it is decomposed, becomes gangrenous

from the periphery towards the centre, the thread gradually cuts the pedicle, and after a longer or shorter time it falls, according to the degree of stricture exerted, the size of the pedicle, &c. This frequently occurs on the fifth or sixth day. In a case related by Leblanc, it did not occur until at the end of three months.

The most difficult part of this operation, is to carry the ligature high enough to tie the pedicle near its insertion into the uterus. In order to effect this end, first was devised the depression and demi-inversion of the uterus, and then the invention of several instruments. The depression and demi-inversion of the uterus, apparently pointed out by nature, proposed and performed by Herbiniaux, and afterwards rejected by other surgeons, has been in later days taken up and performed by M. Dupuytren, and constitutes the basis of his operation of excision.

The instruments of M. Mayor appear the most simple, ingenious, and easy of application. They consist of elastic stems of whalebone or steel, terminating by claws like those of the crab. The ligature is placed as in the forceps of Desault, and carried in the same manner around the polypus. In order to disengage it, it suffices to draw on the conducting instrument as soon as the *serre nœud* has reached the pedicle ready to arrest its circulation.

We have said that in order to avoid the difficulty presented by the application of the ligature, the necessity of placing it as near as possible to the root of the pedicle has been questioned. Levret and Segard, and recently M. Gensoul supposed, that like the umbilical cord, the polypus would separate at its point of origin, without regard to the place of ligature. I do not think so; the pedicle is sometimes only wholly detached, when tied very near its root; in other cases, when tied at some distance from its insertion, the part below the ligature falls, but that above it continues to live, increase, and reproduce the tumor; hence the frequent relapses, and one of our principal objections to the operation.

The after treatment consists, in removing by antiseptic injections, the uncleanness and dangers resulting from the fœtid discharges, proceeding from the mortification of the tumor, and which are always in proportion to its size. The discharge, in fact, irritates the parts on which it falls, and being decomposed by the heat of the body, it may give rise to symptoms of poisoning from absorption of pus.

Sixth. Let us now examine the operation of *Excision* and its application to the various circumstances of the disease. I think it proper, in order to facilitate the description, and render it more easily understood, to establish four general divisions, purely arbitrary, but deduced from the particular indications presented by each one; intra-uterine, extra-uterine polypi; intra or extra-uterine pedunculated polypi; intra or extra-uterine non-pedunculated polypi, small or large. Those arising in the cavity of the body or neck of the uterus, and called by me intra-uterine, present again different indications, according as they are enclosed in the interior of the organ engaged in the canal of the neck, projecting in the vagina, or beyond the vulva.

There is also a distinction to be made between extra-uterine polypi, situated on the neck of the uterus, and those of the same species inserted into the different regions of the body of this organ; and it may indeed be easily

conceived, that the former, whether large or small, pedunculated or not, other things being equal, are much more accessible to the resources of art, than the latter.

Extra-uterine polypi are analogous in their nature to those in the cavity; but their treatment is widely different. It would appear, at first sight, that both might be removed with equal facility. Such, however, is not the case; for the removal of the former a very large opening is required, into the largest serous membrane of the economy, and that most susceptible of inflammation. Their extirpation is very dangerous, and most generally followed by a rapidly fatal peritonitis.

As regards those developed in the substance of the uterus, and which sometimes project inwards or outwards, unless they be very superficial and small, admit, for a still stronger reason, of no operation; for the uterus must be divided, in order to extract them. When they appear in the substance of the neck, we have a better chance; the operation sometimes however, cannot be performed. In short, in all cases of external polypi of the uterus in which excision is possible, the manual part of the operation is the same as in those of the cavity.

Polypi of the peritoneal surface of the uterus, are, as we have said, very common; but one unfavorable circumstance is, that they are rarely solitary, but generally several exist at the same time. You will frequently meet with women whose abdomens are filled with tumors of greater or less volume. At first, indolent for a long time, they become painful, and very sensible to pressure. The patient, whose health until that period was unaltered, feels lancinating, deep and acute pain; her constitution is impaired, she loses her strength, rapidly emaciates, her skin becomes yellow, ascites and infiltration of the extremities follow.

Guard against tapping in such cases; it is useless.

These women perish at last, and you find tumors of different sizes on the different regions of the uterine surface and peritoneum, and the belly filled with serous or sero-purulent fluid. Open these tumors, and you find all the grades of carcinomatous disorganization. In their centre, remain some traces of fibrous elements, proving their original nature. In the substance of the uterus you will find here a tubercle yet in the fibrous state; there, another beginning to soften; in another place a disorganization, which, after having attacked the tumor, has invaded its peculiar envelop and extended to the surrounding tissues, and lastly the uterus itself, the subject of general inflammation or disorganization to a greater or less extent and depth.

These considerations lead us to examine a very important question in surgical therapeutics; a new case, just presented, furnishes us the opportunity of answering it.

A woman of small stature, well formed, thin, from 40 to 45 years of age, came to the consultation, on the 26th of this month (March, 1833), complaining of very copious white, and at times, red discharges, dragging pain in the loins and thighs, pain in the belly, a very great sensation of weight on the rectum and vagina, &c. I examined her, and found, at about a third of the length of the vagina, an enormous tumor, filling the whole cavity of the upper strait of this canal. However, I could pass my finger around it, and found its

surface smooth, its form conoidal ; the finger, carried higher up, met with the circular depression, peculiar to pedunculated tumors. There was no doubt as to its nature. On examining the belly, I felt several tumors implanted in the body itself of the uterus, and projecting into the abdominal cavity. Thus, the woman presented a case of a multiplicity of fibrous tumors in the same person, and a large polypus of the cavity of the uterus, co-existent with several other tumors of the body of the organ itself. But this is not the most remarkable part of the case ; let us examine the effects of this multiplicity as regards the treatment.

It is very evident, that it would be absurd to attempt a cure by pharmaceutical means ; on the other hand, we believe that the extirpation of the polypus of the cavity, although very large, is possible ; but is not this operation contra-indicated, and ought it to be attempted ? That is a highly important question.

In the first place, the removal of the principal tumor, which is accompanied by one or several others, does not prevent the latter from following their course, and reaching their ordinary termination. Again, a single fibrous tumor which has been extirpated, may be followed by the development of another or of several fibrous tumors, I have frequently seen this occur. But what is much more remarkable, and hitherto, as far as my knowledge extends, unnoticed by writers, is, that a great number of women who have been affected with uterine polypi, are attacked, after some time, with cancerous disorganization of the uterus, even when only a single tumor existed, which was properly removed, without any other having appeared afterwards. Those women possess some general disposition, undoubtedly organic, which renders them highly liable to cancerous disorganization.

Our patient therefore, under whatever point of view she may be considered, is exposed to a relapse ; moreover, on account of the multiplicity of the tumors, she cannot be radically cured by the removal of the principal polypus occupying the vagina. Are these sufficient reasons to preclude the operation ? I think not. This tumor is of serious inconvenience ; the white discharge is assuming a red color, the latter may become very copious, continual, and change in a true hemorrhage ; the abdominal pains are very great ; an extremely painful sensation of weight in the fundament and vagina ; the course of the fecal matter is interrupted mechanically by the pressure of the polypus upon the rectum, and the discharge of urine constantly excited by the displacement of the bladder ; lastly, cancerous disorganization may be near at hand, and then appears that train of fatal symptoms described in another part of this chapter, which soon destroy the life of the patient. By the operation, we not only suddenly arrest the present symptoms, but likewise anticipate those dependent on the progress of the disease. What will be the result ? that this woman, although bearing other fibrous tumors in her abdomen, will enjoy for many years repose and comfort, until the appearance of their inevitable consequences. And who can tell how distant the period may be ? We have said that fibrous tumors may acquire a considerable size without any sensible derangement of the functions of the economy, that they degenerate much more slowly than those of the uterine cavity, and that lastly, passing into the osseous or cartilaginous state, the patient may live for many years.

I knew a case of a lady, first affected at 35 years of age, with symptoms of polypus, who reached that of 84 years without much inconvenience, although the tumor had acquired an enormous size.

Polypi of the cavity of the uterus, can only be recognized when they are accessible to the fingers, that is, when the os uteri is sufficiently dilated to permit a sufficient examination. The first question which is here presented, is, at what period should they be extirpated? The propriety of the operation depends entirely on the symptoms of the patient. If a copious discharge exhausts her, acute pains cause general reaction, or the disorganization of the tumor be commencing, in a word, if any important indication exist, no time should be lost in extirpating the tumor, whatever may be its situation. In contrary cases we may wait without impropriety for a more favorable opportunity.

If the tumor be still contained in the uterus, and the operation urgently demanded, how is it to be performed? One of the two following circumstances necessarily exists; the neck is either sufficiently dilated to admit the passage of the polypus, or is but little or not at all dilated. In the former case, I am of the opinion of Griffith, that the ergot may be advantageously used to expel it, provided always the polypus have a peduncle; for if the base of the tumor be large and implanted in the substance of the uterus, the contractions of this organ would be entirely useless. It is superfluous to add, that the administration of the medicine might be dangerous if there were not a dilatation proportioned to the size of the tumor.

The above remarks have been fully confirmed, by a recent case. On the 19th of March, 1833, M. Guessent, junr., was called to a woman, suffering from general uneasiness, colic, pains in the loins and fundament, in the uterus, accompanied by discharges. He examined her, found the os uteri freely dilated, and in the cavity of the organ a round smooth body which he immediately recognized as a fibrous tumor. He prescribed the ergot, whose effects were soon manifest. The contraction of the uterus drove the polypus into the vagina, where it now is requiring excision.

In the second case, that is when the neck is but little or not at all dilated, some practitioners have advised and attempted to effect *mechanical dilatation*. One trial proved the danger of the experiment. Some years ago, I was called in great haste to see Mad. C . . . ., wife of a banker in Paris. She was indeed in a very distressing situation. I learned that she had been affected with polypus of the uterus, which appeared at the neck of the womb; but that the orifice not being sufficiently large, its dilatation had been attempted by the introduction of sponges and prepared root of gentian. The attempt resulted in an intense metro-peritonitis, which had progressed very far when I was called.

Again, the ergot, which I think may be useful when there is sufficient dilatation, is totally useless under many circumstances; for the same symptoms do not here occur as in parturition.

In the latter case, the neck becomes softer and thinner, and gradually distended by a continuous effort; in polypi it preserves all its thickness; which thickness is often increased by a morbid process, and it presents an extreme rigidity which becomes almost an insurmountable obstacle. Incision of the neck which I have frequently done, is here the safest and least dangerous method.

After this operation, nothing contra-indicates the exhibition of the ergot in order to attempt the descent of the polypus.

This incision may be performed in two ways; by *debridement* from within outwards, with a probe pointed bistoury or the lithotome caché, and by puncture from without inwards. I have by these means succeeded in curing cases which were considered beyond the resources of art.

After the incision of the neck has been performed, as also when a greater or less dilatation of the os uteri exists, the forceps of Museux are to be introduced, the tumor grasped and drawn downwards in order to effect the excision. But in many cases, whether from the adhesion of the tumor, or its want of peduncle or extreme shortness of the latter, this depression cannot be effected, notwithstanding the best directed efforts. Nothing then remains but to bring the tumor to the lower strait, and perform the demi-inversion we have spoken of; if this demi-inversion cannot be effected, the neck must be incised, and the tumor removed from the interior of the organ. The same indications exist when the peduncle of a polypus which has descended into the vagina is tightly embraced by the neck, and that its section cannot be made above the os tinæ.

CASE.—Tarcois, 49 years of age, by trade a seamstress, never having borne children, and always menstruated regularly, came to the Hotel-Dieu, on the 10th of December, 1823. During the month of the preceding August, she had had a copious discharge, which lasted several days. She soon perceived in the vagina a tumor, which in a few days appeared at the vulva, and projected from the labia. She was then attacked with pain in the belly, dragging sensations in the loins, whitish discharges, weight at the fundament, difficulty and pain on going to stool.

At the date of her admission, the tumor was rugose, reddish, hard, and ulcerated at several points. The finger, introduced into the vagina, easily distinguished the peduncle which was strongly embraced by the neck of the uterus. Her general health being good, the operation was performed on the 13th of December.

In the progress of the operation, I found it impossible to divide the peduncle above the orifice of the uterus, and was obliged to divide the neck of the womb with a probe pointed bistoury, by which means I was enabled to remove by the curved scissors, the polypus from the cavity of the uterus. There was no loss of blood, and the uterus immediately reascended.

On examining the tumor, it appeared hard, dense, elastic, grayish, creaking under the scalpel. In its centre was a pretty large cavity, furnished with fibrous columns, similar in arrangement to those of the heart. At some points disorganization had commenced.

The patient did not experience a single bad symptom, after the operation. On the 9th day, not having had an evacuation for some days and impelled by necessity, she made too violent an exertion; a slight discharge of blood took place, and lasted several days. On the 24th day of the operation, she left the hospital, perfectly cured.

When the polypus had descended into the vagina the manual part of the operation is, in most cases, very simple. We have already sufficiently described it. It may, however, sometimes be more complicated. Occasionally the uterus is not very movable, depressed with difficulty, or the polypus

resists, and its peduncle cannot be brought to the vulva. The surgeon must then with the point of a straight bistoury whose blade has been covered previously with linen, or with curved scissors, which I prefer, without permitting the polypus to reascend, divide its stalk at its narrowest part, following the instrument with the finger of the left hand in the vagina. This is also the plan to be pursued if the peduncle be so much softened, as to lead to the fear of rupturing it in the effort to bring it to the vulva. Before proceeding to bring down the polypus, the surgeon should ascertain whether or not it has contracted adhesions with the surrounding parts; if it have, these adhesions are to be destroyed successively by very long and strong scissors, curved on their flat surface and of which the edges are not very sharp, which divide the parts by contusing and bruising the vessels which might pour out blood. Much prudence and management are required in this dissection which is very delicate.

There is another circumstance to be observed, and which occurs frequently at the moment in which the tumor escapes from the external orifice of the vagina. As in parturition a jet of blood escapes with it, which, as in extraction of nasal polypi, undoubtedly proceeds from some contusion or laceration of the vessels of the vagina. It is but momentary and of no importance.

Uterine polypi are sometimes so large as to be unable to pass beyond the vulva. If the obstacle depends on the narrowness of the orifice. I do not hesitate to divide the posterior commissure. But if it arises from considerable disparity between the size of the tumor and the diameter of the inferior strait, we must have recourse to compression by the forceps, laceration by hooks, or lastly, its division by the bistoury.

It has been shown, how little foundation there is for the dread of hemorrhage. Some rare cases occur in which I think it advisable to apply a ligature previously; namely, when the polypus contains large vessels which may be distinguished by their pulsation.

In all cases of tumors without peduncles, seated in the substance itself of the uterus, in which the operation may be attempted, I proceed in the following manner; first, around the anterior half of the base, a semi-elliptical incision of greater or less depth. The retraction of the edges of the wound causes the tumor to project, a similar incision is then made on the posterior half of the base, so as to meet the first. The tumor may then be easily dissected and detached with the handle of the scalpel or the finger, or if it should arise from the inter-lamellar cellular tissue of the uterus.

Let us now say a few words concerning the after-treatment and consequences of the operation. As soon as the peduncle is divided, the uterus quickly ascends to its natural position, the hemorrhage is very slight, and ceases spontaneously in a few hours. The morbid discharges cease immediately. The patient, if not previously much exhausted by long suffering, is generally well in twelve or fifteen days. It is most prudent to confine the patient to a very strict diet for the few first days, even when she is apparently doing very well. It should not be forgotten, that even in the absence of all complications, she is in danger of inflammation, must be closely watched, and the earliest symptoms combatted by general or local bleeding, emollient cataplasms, baths, &c. Emollient injections are useful in all cases. If the patient has been considerably weakened by previous indisposition, diet should

be observed only for the time absolutely necessary, and then prescribe a light but nutritious regimen, increased gradually, added to tonic and strengthening remedies.

I have sometimes seen polypi having a swelling in the cavity of the uterus to the internal surface of which it is attached by a peduncle. These are to be treated in the same manner as those which cannot escape beyond the os uteri. I have also seen a singular phenomenon observed after the suppression of any habitual discharge, namely, a very unpleasant buzzing noise in the ears. This may be relieved by sinapised pediluvia, the application of mustard to the extremities, and generally by revulsives.

## CHAPTER XXXVII.

### OBSERVATIONS ON TRACHEOTOMY.

The introduction of a foreign body into the respiratory passage is always a serious accident. Indeed, if the patient be not relieved he may rapidly perish. Even the operation is not always successful. Under the most favorable circumstances, the foreign body appears at the opening and is expelled by a violent expiration; sometimes it is extracted, and sometimes appears at a latter period between the lips of the wound. But in every case, the importance of an indispensable operation is evident: for the opening in the glottis which easily gives passage to the introduction of a French-bean, for instance, in the majority of cases does not allow its egress, and affections of the lungs supervene, which always carry off the patient.

CASE I.—One of my friends, observed M. Dupuytren, playing with some children, tossed into the air a piece of ten sous, and caught it in his mouth; the piece fell into the pharynx at the moment of inspiration, and lodged in the trachea. The cough and peculiar sound accompanying it, pointed out clearly, the nature of the affair; the piece was sometimes immovable for several hours and then respiration was regular; sometimes it was thrown towards the larynx, and then acute pain following the bruising of these delicate parts. The patient hoping that the body would be thrown out, refused to submit to any operation. For five years, the piece was movable and gave him a good deal of inconvenience; after that time, it became firmly fixed in a bronchial tube and caused but little uneasiness. Symptoms of phthisis afterwards manifested themselves in Trieste, whether the patient had gone on account of his business. He died ten years after the introduction of the foreign body, which was found in the centre of a tubercle.

The patient was then 36 years of age, and gifted with a robust constitution.

The above case proves, that a small and very hard body, may not find an exit through the glottis (and this even most ordinarily the case), although presenting a shape favorable to this exit. Sometimes, however, it is ejected with some violence. This case shows, moreover, that when a body of this nature remains unextracted, it gives rise to consecutive affections so serious as to demand all our skill to prevent them. The following case strongly corroborates this precept.

**CASE II.—*A Bean in the Air Passages of a Child; Tracheotomy; Expulsion of the Foreign Body; Analogous Facts; Result.***—A little girl eight years of age, having stolen a red French bean from a grocer, swallowed it quickly. The form and lightness of this body seemed more apt than perhaps any other to overleap the opening of the glottis, especially when impelled by the column of inspired air. Such was the case of this child, and immediately she experienced a violent cough with threatened suffocation. The accident happened on Thursday at 3 o'clock in the afternoon. M. Deluas and several other physicians who saw the patient, prescribed an emetic which vomited her, but the bean remained fixed. The night and part of the following day were passed alternately in tranquility and paroxysms of suffocation. On the evening of the next day the child was brought to the Hotel-Dieu.

During the night the paroxysms were renewed with a frightful intensity. At his visit in the morning, the professor ascertained their nature; he heard the noise of the foreign body in the trachea (a species of rattling, *grelottement*, very easily distinguished on applying the ear above the sternum). The cough was violent; with nausea and glairy vomiting. The indication of treatment was very evident; the child was carried to the operating room on Saturday, at 10 o'clock in the morning (February 13th, 1830).

Before the operation, we again endeavored to ascertain the rattling noise, as a pathognomic sign of the presence of the body in the trachea; but it no longer existed, without doubt because at that moment the bean had lodged in one of the bronchial tubes. As it certainly had not been spontaneously ejected, the operation was commenced. An incision of an inch in length was made exactly on the median line of the neck, a little above the edge of the sternum. The skin and cellular tissue were cautiously divided; the muscles covering the trachea separated; and the cartilaginous tube reached without the necessity of securing any vessel. With a straight bistoury several rings as well as their uniting membrane were divided; the incision enlarged above and below, the edges of the wound kept apart by a pair of dressing forceps; and after some violent efforts at expiration, the bean surrounded by bloody mucus, fell out upon the breast of the patient.

The wound was cleansed of the blood surrounding it, dressed with a piece of fine linen covered with cerate, and kept together by compresses and a bandage. The child cried violently, and preserved her voice even when some air issued from the opening in the trachea. Otherwise there happened no accident dependant on the operation. Nevertheless we must mention a difficulty which may arise. Between the sterno-thyroid, sterno-hyoid muscles and the front of the trachea, is found a space filled with cellular, in which the instruments become entangled as in the trachea itself. After making an incision into the elastic rings, it was impossible to introduce the end of the forceps, and the operation was not completed. A little attention shows this false passage. The bean was five lines long, and three wide. It was a little enlarged on account of the swelling of its cotyledons. Sometimes they have been found in the commencement of germination. The short space of time that this one remained in the trachea accounts for its having preserved its size.

In the evening manifesting symptoms of bronchitis she was bled; passed a restless night. The next day alternation of calmness and dyspnoea; she breathes almost entirely by the wound, the mucus adhering to it causing a

rattling sound. On the evening of the same day, 15 leeches were applied to the neck, with considerable relief. The cough less frequent; has passed a good night, free from fever.

15th. Respiration easy, a slight hissing heard from the wound the skin retaining its natural heat.

16th and 17th. Apparently well, sleeps tranquilly. Speaks with facility, voice natural. The issues but slightly from the wound, which may be greatly attributed to the swelling of the edges.

20th. The edges of the wound were brought together; emphysema being no longer to be feared, as the mucous tissue covers the edges of the incision, and renders the cellular tissue impermeable. From this time nothing remarkable took place; some days after the parents of the child took her home, the wound was then two thirds closed. She was brought back to the hospital on the 12th of March, a month after the operation. At that time, there was only a small opening by which a very small stream of air escaped. The patient returned no more.

This case presents several important points to which I would draw your attention. And first, as to the position of the patient during the operation, for the incision of the external soft parts and the trachea, and that proper after the opening of this tube in order to favor the expulsion of the foreign body.

It is evident that if the head is thrown backwards the incision of the soft parts and trachea is rendered easy. But this position is unfavorable for the issue of air from the trachea and much more for that of the foreign body. Indeed we have seen in the case just related, that the incision did not give exit to the air, much less to the bean. It was probably partly due to its small size, but also to the position of the head, which stretched the edges of the wound, and prevented them from separating. In the flexion of the head, on the contrary, these edges will easily separate and give exit to air and a foreign body. It is also during the flexion of the head that any foreign body will spontaneously fall out. Thus, after the phenomena observed in this patient and others in the same state, it may be laid down as a useful precept in the operation of tracheotomy, that we should throw the head backward for the incision of the soft parts and trachea, and in order to facilitate the issue of air and any foreign body lying loose in the trachea, we should flex the head that the edges of the wound may separate.

As regards the diagnosis of foreign bodies in the trachea, there is another sign, which I deem it necessary to add to those already given, as characteristic of the presence of those bodies; it is the sensation of their striking against the sides of the canal, which may be readily perceived both by the hand and the ear. It does not always exist very distinctly, in all subjects, nor at all times in the same subject. Indeed, it may adhere and then not being displaced by the air, it does not strike against the parietes of the tube; or else, being thickly coated with mucus, the sound produced is less clear than under other circumstances. The mode of treatment also deserves some attention. The sides of the wound were kept apart, in order to avoid the danger of emphysema. During the few first days, the cellular tissue is easily permeable by air; but after some time, being hardened by inflammation and rendered compact, this accident is no longer to be feared, and we may hasten the cure, by bringing together the edges of the solution of continuity.

CASE III. A child six years of age, living at Larigny, near Paris, on the 18th of May, 1822, was amusing himself by throwing beans into the air, and catching them in his mouth. One of the beans passed suddenly over the epiglottis, into the respiratory passage; immediately he was attacked with cough, suffocation, and remained in this distressing state for nearly an hour. Becoming then tranquil, he took some food; the same phenomena recurred. A physician was called to the child, and imagining, for what reason I know not, that the foreign body had lodged in the œsophagus; he sounded this canal several times, and exhibited some emetic, but as may be easily foreseen without any avail. The patient was still in the same state, having a violent cough, and complaining of acute pain in the trachea, which probably induced the physician to apply some leeches to the neck.

On the fifth day, the situation of the patient was so distressing on account of the progress of the disease, that the parents deemed it proper to have additional advice. He was therefore brought to the hospital, on the 23rd of May, laboring under the following symptoms: considerable anxiety, produced partly by the disease and the fatigue of the journey; voice entirely lost; face bloated; eyes projecting and injected; nose and lips bluish; respiration hurried, and accompanied by a loud rattle in the trachea, and in the bronchial ramifications. During the movements of inspiration, there could be heard, at the bottom of the larynx, a noise similar to that of a valve, alternately opened and shut; this peculiar sound could proceed only from the contact of a foreign body applied suddenly to the edges of the glottis, and agitated by the column of air. During respiration a convulsive cough, returning at intervals, threatened the little patient with immediate suffocation. He was in a state of asphyxia, and energetic measures were absolutely necessary. The operation of tracheotomy, affording him the only chance for safety; notwithstanding his dangerous situation, M. Dupuytren did not hesitate, but proceeded to perform it in the following manner: the child being laid on his back, the head slightly inclined backwards, he made an incision extending from the inferior edge of the cricoid cartilage, to the superior edge of the sternum, dividing the skin and sub-cutaneous cellular tissue; a second incision exposed the trachea; then holding this canal firm by means of the thumb and middle finger of the left hand, and introducing the fore-finger into the incision as far as the trachea, he made an opening with the bistoury into the trachea, which being enlarged slightly upwards and downwards, the air rushed out along with some blood and mucus. After a few minutes rest, the opening was again enlarged with a probe-pointed bistoury; it was now an inch or an inch and a quarter in length.

The lips of the wound were then kept open, in order to favor the expulsion of the foreign body, which twice appeared at the opening; the operator endeavored to seize it with the forceps; he succeeded in extracting a portion of it, and the remainder was suddenly ejected by a violent expiration. It was a bean, as the child had said, and had acquired a considerable size. The patient experienced immediate relief. A large quantity of thick mucus flowed out, mixed with blood effused into the air passages during the operation. The patient was carried to bed; but although no blood came from the wound, it was not thought proper to bring the edges together immediately, for fear of emphysema of the cellular tissue. The wound was dressed with a piece of

linen perforated with holes, *linge fenetre*, covered with simple cerate, and over that some charpie, and a compress. Drink barley water, diet strict.

24th. To the livid hue of the nose, lips, and cheeks, succeeded a considerable blush of red. There was some fever during the day; a good deal of mucus discharged through the aperture; cough frequent; the patient slept during the night; mucus rattle in the anterior superior part of the lung; the pulse feeble and miserable before the operation had acquired strength, and even some hardness and frequency; skin warm, respiration accelerated. Leeches to the lower part of the neck; same dressing as on the preceding day. The edges of the wound still left open.

25th. This day and the preceding night passed pretty well; the leeches have somewhat calmed the irritation of the bronchi and trachea; the face less infected; respiration less frequent and embarrassed.

Pus mixed with a quantity of mucus escaped from the wound; mucous rattle; belly indolent, somewhat hard, constipation for three days, fever high.

The edges of the wound were brought together by adhesive straps. A spoonful of mercurialized honey, barley water, diet.

26th. There has been considerable cough; fever much increased during the day. The patient greatly agitated, the bandage has been deranged by the efforts of coughing, still he has had some sleep during the night. Respiration still hurried and accelerated, pulse frequent, skin hot and slightly moist. An unhealthy inflammation is feared in the air passages, or of the cellular tissue of the neck surrounding the wound. Some spoonfuls of syrup of ipecacuanha; enema of mercurialized honey; application of a bandage with adhesive straps and graduated compresses to keep the edges of the wound united, six leeches in front of the trachea, same drink.

27th. Much better; the leeches have been of service; the syrup was not administered; cough less frequent; respiration still hurried, but less embarrassed; less fever; a quantity of pus discharged from the edges of the wound; the mucous rattle much diminished.

28th. Continues to improve; cough considerably diminished in frequency; apyrexia almost complete; respiration almost natural, as also the voice; the edges of the wound nearly united; no mucus passed; good appetite. Whey with barley water, bonillon.

29th. No fever; the edges of the wound covered with granulations, a little air still escapes, cough seldom, a little mucous rattle, appetite good. Until the 4th of June, nothing peculiar occurred. At that time the child was convalescent, the wound nearly healed, discharged some pus, but no air or mucus escaped; cough has nearly disappeared, voice natural, digestive functions in good order; the pain, loss of blood, and prolonged diet, have weakened the little patient who earnestly desires to return home. The country air will complete his cure, and he is about to be restored to his parents.

It frequently happens that the foreign body will not escape at the moment of the operation, the edges of the wound are then to be kept open by a silver canula or simply a silver or leaden wire. The application of a cloth spread with cerate is indispensable, but no charpie or other light body should be used in the dressing, lest it penetrate into the trachea and give rise to very distressing symptoms.

An old man was admitted into the Hotel-Dieu, for disease of the urinary

organs; he soon had attacks of suffocation which were attributed to asthma, or spasm of the glottis. The healthiness of the respiratory functions between the attacks, banished all idea of any disease of these parts, and he was subjected to no treatment for it. He perished in one of the attacks.

On opening the body, the glottis was found completely closed, by a prolongation formed of the vascular and cellular tissue, and covered by the mucous membrane. It was a true polypus arising from one of the ligaments extending from the lateral part of the epiglottis to the arytenoid cartilages. It was more than 18 lines in length, and bifurcated at its free extremity. The polypus was then floating in the lower extremity of the cavity of the pharynx and was of no inconvenience. As soon as by a change of position it was placed above the opening of the glottis, it produced more or less occlusion, giving rise to the symptoms above mentioned.

The operation of tracheotomy is not only performed in order to assist the extraction of foreign bodies, but has also been successfully practised in cases of occlusion of the glottis, by the production of false membrane, or tumefaction of its mucous membrane. The following is a case of œdematous angina, in which it completely succeeded.

CASE.—On the 24th of October, 1832, Mad. B . . . , 54 years of age, was brought to this hospital in a state of suffocation threatening her life at every moment. Five months previous she had been attacked with a guttural angina and intense bronchitis. For a long time she has felt pain and heat along the anterior part of the neck, her voice was hoarse, and since several days has entirely lost her voice. Rest, bleeding, leeches, emollient and anodyne drinks, allayed the majority of these symptoms. Scarcely had this been effected, when she returned to former habits, such as singing in church with her pupils, &c., and fatigued herself greatly. The symptoms soon reappeared, less intense but more tenacious. The patient coughed frequently, had constant pain and heat in the larynx, her voice was changed, respiration difficult, sometimes whistling and convulsive during the night. There were some intervals of improvement, but at last the patient was obliged to enter the hospital. She was then in the following situation: the posterior part of the pharynx was red, slightly painful and swollen, much uneasiness in the larynx and surrounding parts, her respiration was labored, inspiration accompanied by hissing, voice hoarse and weak, she complained of great pain behind the lower part of the sternum. During sleep, respiration was more difficult, and the laryngo-tracheal whistling more pronounced.

On the 25th, 26th and 27th, this affection was treated by simple means, such as balm tea, pediluvia, sinapisms, poultices around the neck, gargling; the disease increased; Mad. B . . . thought there was a foreign body in her throat preventing her from breathing; the duration of the cough was longer; her voice very hoarse, feeble and interrupted; depression and stupor during the day; insomnia and great uneasiness during the night; countenance very anxious; pulse quick without being frequent, and irregular during the attacks of coughing.

On the 29th, 30th and 31st of October, 20 grains of ipecacuanha were administered daily, seven grains every three hours; there were several evacuations upwards and downwards, vomiting accompanied by severe symptoms, such as convulsions, afflux of blood to the head, frequent cough, and threatened suffocation.

These remedies were not more successful than the former ; the disease continued to advance.

On the 2d of November, the suffocation increased ; she was bled largely from the arm ; sinapisms to the thighs ; a purgative enema.

November 4th. Same state, 50 leeches to the base and lateral parts of the neck ; in the evening the patient was a little better. The night of the 4th was wretched ; in the morning, her respiration was very irregular, hard and interrupted, the air can hardly be heard entering the chest ; inspiration is so difficult that it produces a sound similar to the bellowing of cows ; the patient is obliged to sit up. (Venesection, sinapisms to the thighs.)

5th. Same state. I examined the patient, felt the superior opening of the larynx, recognized considerable engorgement, thought there was œdematous angina. (She was again bled, sinapisms to the legs and arms.)

6th and 7th. The repeated attacks of suffocation threaten instant death, unless relief be promptly procured. Hæmatisis no longer takes place, the face is of a leaden hue, considerable orthopnœa. During the cough the face is pale or becomes red. The patient was in a state of indescribable anguish, her countenance is excessively anxious, and she feels her end approaching. She was again bled in the arm, without any relief, and at 3 o'clock, tracheotomy was deemed indispensable.

I performed the operation in the usual manner ; a quantity of mucus was discharged from the trachea and bronchi ; the patient felt immediate relief. Her respiration and pulse gradually became more regular, the paleness of the face and stupor diminished, she slept several hours during the night. On the morning visit, she said she felt better ; the wound is kept open by a metallic canula.

On the 9th, the opening was perceived to have a tendency to contract, and was partly obliterated by the drying of the mucus and pus collected around its edges. A gum-elastic canula was introduced, and occasionally removed and cleansed.

12th. A gentle purgative was administered.

14th. I put a seton in the back of her neck.

16th. On closing temporarily the wound, the voice was observed to be less hoarse, respiration easier, and the hissing less intense.

20th of November. I enlarged the opening, by dividing another fibro-cartilaginous ring.

Calomel was given in the dose of eight or ten grains, until the discharge of the patient on the 5th of December. Mad. B... was doing very well although not entirely cured. The wound was nearly cicatrized, and the affection of the larynx almost disappeared.

On the 20th of January, the patient wrote from Pont-Thierry, announcing that the opening had entirely closed, the cough but rarely occurred, and that the hoarseness had wonderfully disappeared.

On the 31st of March, she came to the public consultation at the Hotel-Dieu. She was radically well, and enjoying the most robust health.

## CHAPTER XXXVIII.

## OF ERECTILE TUMORS AND FUNGUS HÆMATODES.

I was the first who made known, and described in my course on *Pathological Anatomy*, said M. Dupuytren, a remarkable tissue, whose existence under circumstances of diseased action had never before been verified; and which I have named the *erectile tissue*.

In a normal condition this tissue is recognized in the genital organs of most animals of both sexes, and particularly in the urethra, corpora cavernosa, and glans penis, upon the head and neck of a large number of the gallinaceous tribe, and upon the buttocks of many monkeys, &c., it is of a more or less vivid red color, and of variable firmness, according to the state in which it is observed; its temperature is more elevated than that of other tissues; it is provided with an elastic fibrous exterior envelop, whose office is to surround and isolate it, to permit, or to control its development; interiorly it is composed of fibrous columns interlacing each other in all directions, forming a species of net-work, which serves to support and sustain an infinite number of arterial capillary vessels extremely attenuated and very difficult to inject without rupture, as also venous capillaries less easy still to fill than the preceding. In it there are also to be found nerves, bestowing sensibility, the primary source of its properties and uses. This tissue is distended with arterial blood, the immediate and material agent of the divers functions which it performs. Finally, scarcely developed in infancy, at which time its functions are null, this tissue acquires, in all parts of the body where it is found, its highest state of perfection at the proper age for procreation, and becomes one of the principal agents of reproduction. Its redness, warmth, and other properties are lost in consequence of debility and disease, and in old age it becomes altered, is absorbed, and removed. Such is the structure, the model and type of a host of accidental tissues, which derangements of organization, original or acquired, developed in all parts of the body, giving rise to voluminous and extensive tumors, to which belong more or less strikingly, the organization and properties of erectile tissues.

These accidental structures present the same vascular and organic arrangement, the same envelop and fibrous net-work, only the envelop is more delicate and the supply of nerves less considerable. The cutis, and sub-cutaneous cellular substance are especially the seat of these morbid tissues, which however are to be met with in all parts of the body. They are located at times upon the face and covering of the cranium. They form the bases of the greater number of spots, and marks upon children (cuvies). Sometimes they engross the entire substance of an organ. Thus I have seen, continued M. Dupuytren, the concha anus and adjacent parts converted into a true erectile-organ. In other instances they constitute larger or smaller tumors lodged in the interstices of organs. Under some circumstances they appear the result of degeneration of the natural tissue, and of dilatation of its capillary structure; whilst in others they appear to form in fact new organs, located between the other parts. In the former case, they are lost on all sides in the healthy tissues—in the latter they separate and compress them, and are isolated from them by a circumscribing cellular envelop.

The accidental erectile tissues are reddish or yellowish, ordinarily granulated upon the surface and implanted in the skin, sub-cutaneous cellular structure, or between the muscles. They are manifested under the form of tumors depressed or prominent. The skin covering them is sometimes scarcely altered. They undergo movements isochronal with the arterial pulsations, and diminish in volume by pressure. Habitually soft, the slightest irritation brings about in them a remarkable swelling and tension. If increased blood issues so abundantly from the incision that it is difficult to arrest it, these accidental productions do not disappear spontaneously, but on the contrary tend to increase. In a similar manner as the natural erectile tissue, these tumors undergo at the same periods, and by the operation of the same causes, a development well marked, and an alternation of augmentation and diminution, which are in accordance with the state of health or disease, in strength or debility of the individuals.

A great number of remedies have been employed for the cure of erectile tumors. We will speak in this place only of compression, cauterization, the ligature and extirpation.

CASE I.—*Erectile Tissue; Aneurismal Dilatation of the Arteries of the Ear, of the Temple and Occiput.*—D . . . entered the Hotel-Dieu the 9th of April, 1818. This patient, aged 20 years, born at Villemanoche, department of Yonne, possessed a moderate robust constitution, a tall, rather slender person, and was of the bilious temperament; he followed the trade of a cartwright. At birth two small spots existed upon the exterior fold of the right ear, called commonly wine blotches. The ear was not deformed, it appeared only larger and thicker at the place occupied by these blemishes; a slight itching was the only inconvenience they occasioned, but the youthful patient, rendered uneasy by this itching, constantly was scratching them, and whenever he did so the skin was removed, and blood of a vermilion red color flowed from the wound.

He remained in this condition until his 12th year; at this period when development of the genital organs commenced, the ear increased in size, changed its color and became violet.

Three years after, the patient perceived that it was affected by slight movement; it had acquired double its ordinary volume, and the spots had enlarged proportionally. Eight months after the appearance of the pulsation, the first hemorrhage came on, and was produced by an effort to remove his hat from his head. This loss of blood could not be arrested but by the application of very exact compression; it had weakened the patient, but the size of the tumor had been reduced by it and the pulsations were less forcible. This amelioration was but momentary; the ear soon regained its primitive volume, distension and throbbings. Although but 15 or 16 years old the sufferer withdrew from the amusements peculiar to his age, for he had experienced an aggravation of his malady, whenever he used violent exertion as well as when he took stimulating nutriment or used wine, &c.

At this period compression made upon the ear by means of a tight cap, diminished the volume of the tumor, but this diminution did not continue longer than the operation of the compressing agent, and the ear regained its size as soon as it was removed. Sometime afterwards, a second hemorrhage occurred spontaneously; it was considerable, and stopped of itself. A surgeon

was then consulted, who applied compresses soaked in an astringent solution, these had no effect, except that a pricking sensation which the patient experienced in the ear was diminished. A third loss of blood took place sometime after the second, while he was confined to his bed.

Suffering from the affection, and not being able to pursue an occupation in which the violent exertions he was forced to make determined the blood to the head. D. again, two years ago, consulted a surgeon who ordered an emplas-tic application, which produced no change. Another surgeon better informed with regard to the nature and dangers of the disease, advised him to go to Paris to obtain the advice of the most eminent practitioners. This advice was neglected. A fourth hemorrhage came on, which was arrested by the applica-tion of agaric sustained by a bandage.

It is remarkable that in all these hemorrhagies the blood although vermilion red, and evidently arterial, did not come out by jets, but oozed out as is usual from the surface of a fungus hæmatodes which has been cut into. The patient at length consented to enter the Hotel-Dieu de Sens, the 5th of August, 1817, he was then in the following condition: the right ear was three times as large as the left, an inch thick, and hung down from its own weight. It was the seat of pulsations synchronous with those of the heart, the hairy scalp of the temple was corrugated, and the small wound from which issued the blood first lost had not yet cicatrized. MM. Populus and Retif who had charge of this hospital, confined themselves at first to methodical compression upon the track of the arteries of the ear and also upon the temporal and occipital by means of tents of lint kept in position by a narrow bandage; but the sufferer not being able to support it, they determined to attack the disease by ligature, and to perform the operation of tying successfully the temporal, anterior auricular, occipital arteries. This operation based upon an attempt of the same kind made five years before at the Hotel-Dieu of Paris was instituted for the purpose of intercepting in detail from all sources the blood which supplied the tumor. The ligature placed upon the first of these branches diminished slightly the volume of the ear, but the pulsation although rendered less forcible still persisted, the edges of the wound were brought together and maintained in contact. The ligature came away between the twelfth and fourteenth day.

Twenty-one days afterwards, there came on from a small wound of the helix a fifth hemorrhage which did not yield but to powerful compression; the blood was bright red as in the former instances. A few days after this a sixth hemor-rhage occurred from the same wound; upon the twenty-eighth day a small slough, as large as a five franc piece was formed between the helix and anti-helix; the separation of this eschar took place upon the thirty-fifth day; upon the forty-third day after the first operation which had only effected some slight amendment, the tying of the occipital artery was carried into execution, but without happier results than the preceding.

Finally, still attacking the disease, the two practitioners named, endeavored to take up the external carotid, the common origin of all the arteries of the ear, temple, and occiput. It appears certain from the account they have given me that they did nothing more than tie the trunk of the superficial temporal artery which was much dilated. Be this as it may, the last ligature was not more efficacious or less inconvenient than the others, and the patient left the institution after having remained in it three months.

Having returned home the size of the ear commenced to augment anew, as also the pulsation. He then decided to come to Paris and enter the Hotel-Dieu.

The diseased ear was twice as large as the other, an inch in thickness, and the helix and anti-helix were effaced. The contour of the superior extremity presented posteriorly a shallow fossa, resulting from the fall of the eschar we have mentioned. The whole organ was of a deep violet color; it was soft and compressible. The fingers could distinctly feel pulsation at some points, and at others movements of expansion and contraction synchronous with the pulsation of the heart. These movements communicated to the ear a general impulse which alternately increased and diminished the distance between it and the side of the head.

Nearly the whole of the surrounding hairy scalp was of a bluish color, and covered with inequalities. Compression made upon the primitive carotid artery, so as to intercept the flow of blood, was sufficient to remove the throbbing in the tumor, which then contracted, grew palid and remained so, until the compression was removed, then tumefaction and redness re-appeared, and the pulsations being stronger for some moments, impressed the part with more marked movement. The ear appeared warmer to the patient than the other parts; and he perceived each time that the heart threw a column of blood towards it, a roaring noise, which was very inconvenient and painful.

In other respects the general health was good, the patient complained of nothing, he did not suffer even pain in the head, he heard well, and vision on the same side was perfect; he only was subjected to the inconvenience of being upon his guard against chafing of the part, for fear of hemorrhage.

Such was the condition of our young patient; his affection was simple in character. The eye and finger distinguished in the mass, two very different elements, which are found sometimes united, but which ordinarily are distinct in the diseases they produce. The first of these two elements is presented under the form of large canals; sinous, unequal, knotted, full and incompressible, ramifying upon the temple and ear, to which they give an embossed appearance. These canals are connected together like the arteries; the size of their trunks being equal to that of the little finger, gradually decreases, becoming in the smaller branches as contracted as a crow's quill, which latter could be traced into the skin.

The origin, situation, direction and division of these canals, but above all their pulsatile movement synchronous with that of the heart, the force of which appears at each moment to threaten rupture and produce fatal hemorrhage, are proofs sufficient to convince us, that they are formed by the unnatural dilatation of the arteries distributed upon the ear, and upon the temporal and occipital regions. This enlargement exists in the trunks, branches, and even in the cutaneous ramifications.

Whatever else in this singular disease, did not appertain immediately to the dilatation of the arterial trunks, was attributable to the formation of the accidental erectile tissues, the description of which has been given at the commencement of this lecture.

The second element of the disease of D. filled up the interstices of the net work formed by the occipital, auricular and temporal arteries; it conferred upon the part its violet color, its elevated temperature, its double movement

of expansion and contraction, it subsided and was rendered palid by the effect of slight compression, but soon after regained its habitual color, volume and tension. Upon the slightest puncture, or least abrasion, there oozed from it red, vermilion, arterial blood, without projectile force, and which had given rise, upon more than one occasion to alarming hemorrhagies.

The little success of the operations already practised, the persistency of the pulsations, the increase of the volume of the ear, in despite of the ligatures applied, did not permit us to pursue the same plan of treatment. Being certain that by tying the branches coming from a large trunk, separately, and at greater or lesser distances from each other, little advantage could be expected, because the numerous connections and free anastomosis between the vessels would constantly tend to reproduce the pulsation, and perpetuate the disease. I therefore concluded that benefit could only be looked for by taking up the main trunk, from which all these arteries are derived, and that by attacking and cutting off all the sources from which blood upon one side of the head is derived, the vessels of the ear would become obliterated, and that organ return to its natural state.

After having announced by a sort of presentiment which was verified by the result, that the application of the ligature was less to be relied on in the treatment of the accidental erectile tissue, than in cases of simple aneurismal dilatation of arterial trunks; the primitive carotid was tied upon the 8th of April in the following way: the patient being placed upon a bed, an oblique incision was made along the internal margin of the sterno-cleido mastoideus muscle, three inches in extent, beginning above and extended downwards and inwards; the cellular tissue was carefully divided by means of a bistoury guided by a director; the muscle on one side and larynx on the other were kept asunder by assistants. The artery was laid bare, and isolated from the jugular vein and nerve which accompany it. Then a directory was placed under it, a ligature passed round by means of an eyed stylet, and both instruments were immediately withdrawn. The necessity of a careful separation of the artery from the nerve and other parts cannot be too much insisted on. It is undeniable that by including in the ligature, the nerves and veins which accompany the artery, the dangers of the operation are augmented in proportion to the importance of these parts. It will not be sufficient in order to appreciate these dangers, to add together the effects of each part separately tied, but we must take into the account the combined operations of the interruption to the flow of blood, and the suspension of nervous influence simultaneously induced, before the effects upon the organs can be appreciated, to which are distributed the vessels and nerves included in the ligature. This careful separation is no where so important as in performing the operation upon the carotid artery. Its importance is consequent to that of the organs to which are distributed the nerves surrounding the vessel, to wit: the heart, lungs and stomach, the functions of which may be suspended, or at least undergo an alteration serious and irremediable, by the effect of a ligature upon the nerves. All these parts were avoided, and the artery was successfully included. In fact, each time that the artery was compressed by the thread, the pulsations ceased, the ear diminished, without the heart, brain, lungs or stomach being disturbed in any of their operations.

This experiment was tried several times successively before the ligature was finally secured; at this moment the patient experienced an attack of severe pain in one of the bicusped teeth of the right side; this pain did not exist previous to the operation, and it was doubtless caused by it, without our being able to explain the manner. Moreover it was the only uneasiness caused by the ligature. The bulk of the ear although diminished, did not, however, appear as much reduced as we had been induced to hope, a circumstance which was to be attributed to the retention of blood in the cells of the erectile tissue. In other respects, no pulsation or alternate movement in the tumor of expansion and contraction were perceived. The dressing was applied; compresses were used over the ear, soaked in Goulard's solution, and lint placed between them and the side of the head.

To divide the skin, reach the location of the artery, lay it bare, isolate it, raise it, place the ligature around and tie it, only occupied a few seconds; but the patient fatigued during the day by indiscreet questions and reiterated conversation, experienced in the evening violent pain in the head. He vomited, a bleeding was practised, but the affection of head persisted; a species of numbness was felt in the superior extremity opposite to the disease; his feet were put into a mustard bath.

Second day. Pain in the head less vivid, but it had extended to the ear; the patient compared it to the pricking of a needle; still vomits; in other respects no disturbance of the functions of the brain, heart, or lungs; sinapisms were applied to the feet, and gummed Sedleitz's water, as well as strict diet were prescribed.

Third day. Pain in the head almost removed; no vomiting; the eye retains its sight; the ear, the tongue, and the nostrils, preserve their sensibility, and have not undergone any alteration in their functions. No pulsation in the tumor, nor in the temporal arteries &c.; the volume of the ear is diminished, the part is warm and red.

Fourth day. The patient eat with appetite and without inconvenience some light broth; no more vomiting; upon the fifth day the first dressing was removed; suppuration was established; it was of a healthy nature; the wound was re-dressed in the simplest manner.

Sixth day. Patient continues to do well; some pricking sensations in the ear; no pulsation; it has somewhat diminished.

Seventh and eighth day, same state.

Tenth day. Still no throbbing in the ear; erectile tissue has lost one third of its volume. The excoriated surface which had poured forth blood before the operation, now secretes laudable pus. In the evening the patient had fever; the skin was warm; pulse elevated and frequent, much pain in the head, and embarrassed respiration. Blood was again detracted under the apprehension that this state of excitement, would renew the hemorrhage, or produce internal inflammation.

Eleventh day. Patient is better, the night has been comfortable, the pain in the head removed. The ligature about to come away, all force avoided in removing it.

Twelfth day. The ligature has separated without hemorrhage, having cut through the coats of the artery.

Eighteenth day. The erectile tissue which up to this date had gone on diminishing, appeared to have re-assumed slight movements of expansion and retraction, although, no pulsation in the contiguous arteries could be perceived. Compression was made upon the ear.

Thirtieth day. Expansive and contractile motion was perceptible to the eye; upon the forty-third day the ear was undressed; it had been compressed between two pledgets of lint; in some parts only, there existed slight movements; in the temporal artery no pulsation was evident.

Pus was retained at the bottom of the wound, it came out by pressure. Evening, pain in the chest, and labored breathing, pulse frequent and hard. (Twenty leeches applied to the side of the chest.)

Forty-fourth day. Patient was better, pain in the chest has been removed; the wound from the operation has completely cicatrized.

Forty-sixth day. After reflecting much upon the obstinate continuance of the erectile tissue, and the recurrence of its movements, I imagined that uniform and continued pressure would be more effectual than that which had been made by the lint sustained by compresses and bandages. Consequently having diminished the size of the ear, by compressing it with the hand carefully and exactly for some time, I covered the organ and the parts contiguous with soft plaster of Paris. I hoped that the plaster in hardening would enclose the ear in a mould, capable of resisting every effort to expand, which the disease might exert, but my expectations were deceived. The expedient was not successful inasmuch as the compressing force, was not equal to the power exercised by the tumor, and large masses of the substance employed were raised, and separated. The plaster laid on the side of the head, to keep the ear in contact with it, soon gave way, and that which surrounded the ear itself, cracking and separating, suffered the erectile tissue to protrude through the crevices, which served to remove to greater distances the broken fragments of the mould. It was in vain that we endeavored to sustain these fragments by means of compression, and as little success attended the application of the plaster case a second and third time around the ear, or an increase of its thickness.

The force of expansion in the tumor broke at each time in a few hours, and although the magnitude of the part appeared a little diminished, I ceased to employ an application unequal to the end designed.

I next was encouraged to hope that better results would be obtained, from the application of an apparatus consisting of two valve like plates united by a hinge; these receiving the ear, and drawn together by fastenings, at the ends opposite to the hinge, could compress it at pleasure. To fix it securely against the temple, a bandage was carried around the head. This apparatus was kept on during some time; it had more power to retain the ear and compress it than the preceding method, but it did not succeed better in effacing the erectile tissue. To cure this part of the disease, it would have been necessary to remove the tissue which composed it, or to have changed its organization. The removal, the only method of cure, and which we have frequently employed in isolated, and less extensive cases, would have brought about dangerous consequences. To change the nature of the organization, was not within our means; we could therefore, only confine our efforts and care, to the removal of the aneurismal dilatation of the arteries, and abandon to itself a

tissue, which when existing without the serious complications of which we had freed it, could engender but trifling inconvenience, at the same time waiting until the diminution of the general forces, should overcome its expansive tendency, lead by degrees to its obliteration, and reduce it to a state of organization, the properties of which, would not create alarm, or expose the patient to any danger.

This observation is worthy of attention in various points of view. The first consideration presented, is the facility and safety of tying the primitive carotid artery, while at the same time, it proves its efficacy in aneurismal affections of this vessel. It shows also, that if the ligature is not a resource in the treatment of the erectile tissue, as effectual as in aneurism, it at least restrains the progress, and diminishes the dangers of it. Such is the experience derived from the case of D., noted during five years after the operation.

After the carotid artery had been tied, the tumor was stationary in volume and color, and no hemorrhage occurred. The patient informed us in February 1833, that he experienced no inconvenience, but that he had remarked that fatiguing exercises, exerted an influence over the ear, and rendered it larger. He had pursued a less active profession, and the symptoms had moderated. We can believe that with the progression of age this tumor will lose its tension, and diminish in size, and that the individual will escape a fatal termination of a disease, whose nature and seat will always be productive of apprehension.

Tying the main artery exerted in this case a favorable influence, but it is not to be concealed that in the greater number of instances, this operation has totally failed. Such a result seems naturally to result from the free communication between vessels springing from different trunks. The influence of the ligature then is limited to diminishing the tumor and for some time arresting its progress, but the circulation becoming re-established by the numerous vascular connections, the disease inevitably returns to the condition in which it was prior to the application of the ligature.

But however small may be the certainty of cure, by tying the artery, we believe that this measure should be adopted in cases where the erectile tumor has its location in a part, which renders it improper to employ either compression, cauterization or excision. I should likewise add, that when the erectile tissue exists without complication with carcinoma, the disease progresses more slowly after the operation.

Compression has been recommended for the cure of this disease. The greater number of practitioners reject it, because it causes great pain, because it cannot be exactly made to operate, and even produces local inflammation; leading to a more rapid increase of the affection. We cannot adopt so sweeping a conclusion, for several cases have fallen under our notice in which these tumors have been cured by compression. We have practised it with success in infants, and among others in the case of a daughter of a lawyer. This child was laboring under an erectile tumor situated below the inner angle of the eye; methodical pressure was kept up, and at the end of six weeks, the cure was accomplished. The same effect has been witnessed by you (Feb. 1833).

The subject aged, 40 years, had enjoyed good health; nine months ago he

received upon the lower jaw a kick from a horse, which strictly speaking, is to be considered as the origin of the disease. In a short time there appeared upon the lower lip a small tumor which rapidly progressed. The patient being desirous of getting rid of the inconvenience caused by it consulted a skillful surgeon, who aware of the nature of the tumor tied the two coronary arteries and a branch of the labial. It diminished at first, but soon re-assumed its size and pulsations. Seeing the failure of this experiment, the patient came to consult me. From the position of the tumor I thought that compression gradually augmented in force would be employed advantageously. It was brought to operate by means of two valves, similar to castanets which embraced both sides of the lip, and by means of a screw the pressure was made upon it. If this had not succeeded, extirpation would have been carried into effect.

Caustic is sometimes advantageous. The following observation will present some proof of its utility. M. Wardrop recommended this mode of treatment which he believed to operate by producing ulcerative inflammation in the erectile tissue and then causing its destruction.

*CASE II.—Ulcerated Erectile Tumors upon the Thigh and Left Foot; Cauterization with Nitrate of Mercury.*—D....., eight months old, born in the country, well formed, was sent to see M. Dupuytren by M. Marjolin, upon the 5d of March, 1828. This infant had been born with two red blotches upon the body; they were elevated above the skin, and produced by an anormal development of the capillaries; one of them occupied the dorsal face of the three first metatarsal bones of the left foot and extended between the first and second toe round to the sole of the foot, where it covered about an inch of the surface; the other was located upon the external part of the left thigh and was as large as a franc piece.

For some time these tumors remained stationary, except that when the infant cried, the sanguine turgescence became deeper colored and more prominent. When three months old, the little patient made known its sufferings by its plaintive sobbings. Then it was perceived that the tumor of the foot had augmented in volume, and shortly after superficial ulcerations appeared between the toes. At first, no hemorrhage occurred from these ulcers, although they daily extended in depth and breadth. The general health became by degrees impaired, the ulceration extended to the dorsum of the foot, and after having progressed for five months, this child was sent to Paris in the following condition: a deep fissure existed between the toes, extending each way, superiorly upon the foot; inferiorly to the sole it was two lines wide, ulcerated, of a grayish leaden hue, and fungoid in appearance; its borders were elevated, turgescient, hard, violet colored, and formed by the destruction of the erectile tissue. The ulceration which had taken place in this tissue appeared to be owing to a similar destructive process as that which produces hospital gangrene. M. Dupuytren, after having examined with care the affection, considered it as a degeneration composed of erectile tissue and a production cancerous in appearance. The purulent sanies mixed with shreds of the ulcerated tissues, exhaled an unusually fetid odor.

The surrounding parts were tumefied, and the toes much swollen; there was even cause to suppose that the disease extended to the bones beneath. The tumor of the thigh had increased, but not ulcerated; it was unequal, violet

red, and subsided immediately by pressure; it was twice as large as at birth. M. Dupuytren regarded the condition in which it was, as very serious; he thought of practising amputation of the limb, but was diverted from this idea by the fear of relapse, and also by the presence of the tumor on the thigh evidently similar to the one on the foot. These weighty considerations induced him to apply the cauterizing preparations of nitrate of mercury, in order to change the nature of the ulcer and promote cicatrization.

The first application was made upon the 7th of March, by covering the entire surface of the ulcer with a dossil of lint soaked in the solution. It was accompanied with pain which lasted during the application; a few drops of black blood oozed out. On the next day the wound was examined, but the effect of the cauterization did not appear to be favorable; the eschar was soft, fetid, grayish, and the general aspect of the sore was analogous to hospital gangrene. The measure however was not abandoned, and seven days after (the 14th), a new application was carried into effect, in the same manner as the first which was as fortunate. After this second application of the caustic, the ulceration seemed improved; an abscess formed upon the 20th of March in the superior posterior part of the right thigh, which rendered it necessary for us to suspend the treatment. This abscess was opened the 1st of April, and soon healed. A third cauterization was made the 9th of April, its effects were very advantageous. The ulcer lost its grayish aspect, its borders were removed, and the extent of the disease was diminished. Other applications were made, nine in number, with intervals of five days between them. The success exceeded our expectations, and towards the end of May, cicatrization of the ulcer upon the foot was accomplished.

The tumor upon the thigh however pursued a different course; this, which up to the period of the fifth application had remained stationary, now commenced to take on a new aspect; ulcers were formed upon its surface and in its thickness, and there was established in this place a kind of emunctory resisting cauterization, and which on the contrary appeared to progress in proportion to the healing of the sore on the foot. M. Dupuytren anticipated the advantage to be derived from a counter-issue, and in order to form one, caustic was applied upon the left arm. The suppuration induced was of the greatest utility. Five applications produced cicatrization of this last ulcer, while the general health of the infant remained unimpaired. The cure was complete on the 25th of June. The infant remained in the hospital awaiting the arrival of its parents until the 10th of July, when it went out. (Communicated by Dr. Fournier d'Anas. The first case was noted by Dr. Marx.)

The removal of erectile tumors by caustic can then be successfully accomplished, but it is less sure than the actual cautery, which is one of the most powerful methods employed to get rid of these tumors. Recourse, however, is rarely had to it, on account of the fear that it causes to the patient, and above all, since a cutting instrument acts with as much efficacy without being accompanied with the same inconveniences. It can be used, nevertheless, when the tumor is too extensive, too thin, or too much blended with healthy tissues to allow us to extirpate it.

The bistoury, then, from the latest experiments, is the surest instrument which can be used to remove erectile tissues. The scissors are sufficient for some cases. It should not be forgotten that the greater the distance from the

morbid structure, the fewer are the vessels to be taken up, and if it is at all implicated in the excision, the patient is exposed to a considerable loss of blood. If the tumor is situated upon an isolated part as the finger, lip, &c. it is practicable, after milder measures have been unsuccessfully practised, to remove the base alone with it, as in a cancerous ulcer, and to re-unite the bodies of the division.

Erectile tumors, said M. Dupuytren, have a remarkable tendency to be re-produced, and the greatest possible care ought consequently to be taken not to leave the smallest portion of them. There is almost no part of the body from which I have not taken similar tumors, and in all cases I have obtained a radical cure confirming me in my principles.

Extirpation being the measure most frequently successful in my hands, and the one to which we give the preference. We will now report several examples of this mode of treatment.

CASE III.—*Erectile Tumor on the Lower Lip; Removal; Cure.*—L....., eight years old, well formed, stout constitution, entered the Hotel-Dieu January 4, 1828. This patient had on his lower lip a small tumor, of the nature of those called erectile. At the time of birth it was very small, but had gone on increasing with the growth of the infant. Its progress had been slow and little evident. When the little patient was presented for advice, the tumor was as large as a filbert; it occupied the middle of the lip, and projected slightly; the surface being irregular, its projection was influenced by the movements of the mouth. The base of the tumor appeared to penetrate somewhat into the muscular tissue of the lip; its appearance was paler than is usually the case in tumors of this character. The complexion of the child was rather palid, the tumor was soft yielding to the impression of the finger, and when the finger was removed, the point upon which it had been applied was of a dull white, soon becoming re-injected. It could by compression over its whole surface be entirely removed for the time being. There was no arterial throbbing, nor any movement of expansion or retraction.

Many measures might have been adopted to cure this deformity, which, it is true, created no uneasiness to the patient, but the increase of which was to be apprehended. It appears as if compression should first have been adopted, but this was difficult in application, more especially in consequence of the age of the subject, as its restlessness rendered its use almost impracticable. The extirpation of the tumor, the only possible measure, could be accomplished in two ways; one with the curved scissors, by which the part could be removed entire with one cut, the other by means of two incisions meeting below; after this latter method had been practised, the lips of the wound could be brought in contact with little deformity. The desire to remove the whole of the erectile tissue without leaving any remains of the operation except the linear cicatrix, induced us to give the preference to this latter method. Upon the 8th of January, the operation was performed in the following manner: With the straight scissors, two incisions were made resembling the letter V, meeting towards the base of the lip; the tumor was thus separated and removed. Two needles were passed from side to side, and the lips brought together by ligature as in the operation for hare lip.

The first few days after the operation, the little patient had a little fever; the needles were withdrawn on the fifth day; reunion was complete on the side towards the mucous membrane, with the exception of about half a line upon the

summit, the incision externally was open, and suppuration had commenced; this portion appeared to be more extensively implicated than the internal side. A uniting bandage was applied to keep the parts together. The cicatrix, linear in shape, was nearly completed when the patient went out, the 11th of January, thirteen days after the operation.

The small tumor examined after its excision was of a pale yellow color, soft, yielding, composed of a cellular structure. The resemblance of this tissue to a portion of the corpus spongiosum urethræ was very close.

CASE IV.—A man, 43 years old, of small stature but well formed, had a tumor upon the right side of his head, which covered portions of the parietal, frontal, and occipital regions, together with the whole superficies of the temporal and mastoidal, as also the superior part of the side of the neck. This tumor projecting at its superior part from two to three inches, insensibly diminished towards the inferior edge, and was entirely covered with hair. The head being shaved, it was evident that the skin was healthy, and divided into three surfaces, one superior and anterior, separated from the others by a transverse line, appearing to be formed by organized substance of tolerable consistence; a second intermediate presenting equivocal fluctuation, and a third, inferior, soft, impressed by movements of expansion and contraction synchronous with the systole and diastole of the heart. A most attentive examination could not detect any thing similar in the two other portions of the tumor. There was perceived behind, upon the mastoidal portion of the temporal bone, an irregular opening, roughened by osseous projections. It was also thought that the zygomatic arch was implicated. This patient interrogated with regard to the history of this tumor, answered that it had existed at the time of his birth, that it had increased slowly, and without pain, and that four years before his entrance into the hospital he had received many blows upon it. A surgeon being consulted made an incision into it, which produced a flow of pure blood. Since which occurrence, no inconvenience has been experienced, and he should not have applied for the assistance of art, had it not been for the fall of a mass of earth upon his head. This disease is evidently incurable, and ought not to be touched; nevertheless, at the reiterated instigations of the patient, a tentative puncture was made with the bistoury; arterial blood immediately gushed out which appeared to come from vessels, and not from a cavity where it had been confined. The discharge was easily arrested. In a few days the patient was seized with fever, accompanied with nausea, vomiting and great pain in the tumor; the wound afforded exit to a large quantity of blood. Next day sensation of weight in the head; tumor softened, painful. Third day, same symptoms. Fourth day, erysipelas of the scalp came on, extending to the face and side of the neck. The least touch is painful, pulse small, contracted. Sixth day, tumefaction has augmented. Seventh, discharge of bloody serosity. Eighth, erysipelas, has extended to the chest (emetised whey). Ninth, abundant discharge (emet. whey and sulphat of soda). Upon the succeeding days subsidence of tumefaction, desquamation, flow of a reddish pus, return of appetite. On the twentieth and twenty-first day, frequent hemorrhage, entire loss of appetite; fever continued, infiltration of the legs, delirium; death the thirtieth day.

The autopsy was made by M. Dupuytren, who himself took down the peculiarities presented.

An injection thrown into the right carotid artery in an instant filled the

cavities of the tumor and returned through the jugular vein. That which was introduced into the veins, distended a great number of very large veins upon the surface and in the vicinity of the tumor. Dissection clearly demonstrated that it was composed of two entirely distinct parts, the one formed a very considerable mass consisting of three tissues. First, a reddish tissue like muscle, very friable, and without linear arrangement; this structure was generally located beneath the skin. Second, a fibro-cellular tissue forming the greater bulk of the tumor, infiltrated with a considerable quantity of serosity, traversed by veins of large caliber, and by arteries proportionally smaller. Thirdly and lastly, in certain portions, a fibro-cellular tissue, redder, and more vascular. It was in this heterogeneous mass that the abscesses were formed of which we have spoken, and in their places were discovered very extensive pouches, the walls of which were red and studded with villi; from these had issued the hemorrhages occurring during life.

The second part of the tumor, much less voluminous than the preceding, occupying the mastoid process, was but the appendage to the larger situated on the cranium, and projected through the opening observed during life; this consisted of a serous cyst, developed in the thickness of the right lobe of the cerebellum, which had entirely disappeared. It was united to the inferior occipital fossa by cellular and fibrous attachments. Its cavity was traversed by vertical and horizontal partitions which gave it a cellular aspect. The cells were filled by serosity and membriform remains, which it was suspected were the remains of some disorganized hydatids. But this conjecture could not be verified in consequence of the pulpy nature of the fragments.

In addition to these two principal affections, it was likewise observed: First, that the superior angle of the malar bone was disconnected from its union with the external angular process of the frontal bone; second, that this cheek bone had undergone a fracture from its superior angle downwards, but which had reunited; third, that the veins connected with the parts were varicose, and formed an independent tumefaction existing in this position.

It is impossible to deny that the cyst and disease of the brain were preceded by other lesions, and that the projection externally of the cyst, was not the cause of the pulsatile movements observed in this portion of the tumor. But it is impossible to conceive how this extraordinary disease could form, and destroy an entire lobe of the cerebellum, without any alteration in the cerebral functions, or in those connected with them. It is difficult to determine the period at which the erectile tumor commenced. Did the consolidated fracture originate from the blows which the patient received four years before? The disarticulation of the malar bone appears to have occurred at the date of the accident.

CASE V.—A young man, aged between 16 and 17, of good constitution, was the subject, six or seven years since, of a tumor, situated upon the right side of the face, in the furrow which separates the cheek from the upper lip. This tumor at first small, increased gradually and became as large as a filbert. It created no pain; the skin was healthy and unchanged in color; when compressed it diminished in size, without entirely disappearing; there existed no dilated vessel around it. This tumor presented neither throbbing nor motion. The patient by compressing it, perceived in its centre a small hard kernel, and upon these occasions only he suffered uneasiness.

The diagnosis presented great difficulty. At first sight and before questioning the patient, M. Dupuytren thought it an abscess, but convinced of the incorrectness of this opinion, from the details furnished by his account he was inclined to believe that it was either a fatty, or erectile tumor. A lipoma placed in this situation might diminish and even entirely disappear in the canine fossa. An erectile tumor likewise would possess characteristics such as belonged to the affection in question; but ordinarily compression can be carried to a greater extent, reducing the bulk of the tissue much more than could be done in the present instance. The central kernal, which the patient said he plainly felt when squeezing the part, likewise increased the difficulty. Removal alone could remove all doubt; it was practised December 19th, 1828. An incision made into the body of the tumor, gave rise to the flow of a considerable quantity of vermilion colored blood. The nature of the disease being thus recognized by this tentative division, its extirpation was carried into effect with every possible care. All the parts concerned were likewise removed, and upon examination, a small osseous concretion was formed in its centre, constituting the kernal mentioned.

The wound bled freely, dressings, and forcible pressure were applied, and no hemorrhage afterwards occurred. The cure went on well, only cicatrization required some time to be accomplished, in consequence of the application of caustic, least some remains of disease still existed. This man went out, a complete cure, on the 14th of January, 1829.

This case is remarkable for the difficulty of establishing the diagnosis. It should render us more circumspect in the judgment exercised with regard to these tumors, and convince us that their true character cannot always be ascertained before extirpation. (Communicated by M. Paillard.)

CASE VI.—An infant, aged nine months, well formed, was brought in 1818, to M. Dupuytren, in consequence of a tumor, situated on the superior lip, occupying its left half. This tumor rounded in form, of a mottled color, as voluminous as a large filbert, soft in consistence, and indolent in character, extended through the entire thickness of the lip. From this augmentation in the volume of the superior lip, it resulted that the left half overlapped the lower lip, so that the infant was precluded from sucking on this side. The difficulty in the infant had caused a greater development of the left breast of its mother, which was one third larger than the right. Beyond this there was no inconvenience resulting to the infant from the tumor. It augmented considerably when the child cried, or took the breast; no pain appeared to be suffered in consequence; pressure pretty forcibly made had no effect of the kind.

The tumor at first presented itself under the form of a very small black spot, which the mother mistook during a whole month for a bruise, which the accoucheur had produced with his finger nail. At the end of this period, this patch became raised, and assumed the appearance of a small vesicle, as large as the head of a pin. For some time it did not increase, but at length it rapidly became as big as a mulberry in consequence of repeated spells of crying. Since then, that is to say, during the last three months, it has continued to make marked progress.

This child had two other tumors of the same nature, one situated upon the left buttock, the other upon the thigh. These are sufficiently circumscribed; some what more consistent, but less highly colored, than that upon the lip, and

traversed by fissures of little depth, which gives the idea of a collection of lobules, such as form the fruit of the raspberry. The mother asserted that it was in consequence of her desire to obtain this fruit, that her child was thus marked. These last are no more painful than the one upon the face, but they have not pursued the same progressive course in their development. The parents of the infant affirm that these three tumors were of the same size at the time of birth. M. Dupuytren recommended waiting until the period of weaning had arrived, before the operation should be performed.

CASE VII.—Aubertin, two years old, well formed, was born with a small tumor towards the external commissure of the eyelids of the left side. It was upon a footstalk, red, vascular, and underwent swelling during crying spells, and when in great agitation. It continued to progress without causing any pain, not even when pressed. Its volume being equal to a large filbert, the parents brought the child in 1818, to consult M. Dupuytren. The external angle of the eye was drawn down, and the lower eyelid slightly concealed by being overlapped. These derangements in the integuments would have become greater by the increase of the erectile body, and the functions of vision ultimately impaired.

M. Dupuytren practised excision of this tumor with the curved scissors. But a small quantity of blood was lost, and it was not necessary to apply cautery; the wound was simply dressed. Eight days afterwards the patient was perfectly cured. Dissection demonstrated very satisfactorily the vascular nature of this erectile production.

CASE VIII.—A man had an erectile tumor upon the head, within the circle compressed by his hat. He constantly therefore carried his hat under his arm. One day in fit of anger, he suddenly placed it on his head. The tumor was torn and bled; after this mishap frequent hemorrhages occurred. M. Dupuytren was obliged to remove the erectile production, which up to the moment of the violence had remained stationary.

CASE IX.—A young man, aged fifteen years, came towards the last of March, 1833, to consult M. Dupuytren. He labored under a tumor on the inside of the lower lip; it was violet colored, wrinkled, and the size of a filbert. Movements of expansion and contraction were evident. It diminished under pressure, but was not long in regaining its volume. This tumor had existed the whole lifetime of the patient. At first very small, it had taken on during the two last years greater development. Excision was practised in the beginning of April. Dissection demonstrated that it was formed by an exterior thin fibrous membrane, and by numerous small arterial and venous vessels. The cure was complete at the end of eight days.

If extirpation in the majority of cases, is the best means of curing these tumors, it ought nevertheless, not to be practised when they have not attained considerable size, and when they occasion neither pain nor embarrassment. Observation has evinced that they will continue stationary a long time, and even finally contract and be removed.

The erectile tissue, often congenital, sometimes accidental, is found to exist without appreciable cause, or is induced by external violence, as for instance, continued attrition. It arises as we have said, in all parts of the body, but shows itself more generally upon the lips, without doubt, in consequence of their spongy and vascular structure. It is met with upon the arms, legs,

scalp, ear, cheeks, labia, pudendi, in the thickness of the skin, muscles, periosteum and bones, in the kidneys, liver, &c. In short, erectile tumors can invade successively an entire limb. Such is the experience of Samortier; the skin, the muscles, the bones themselves, were affected from the fingers to the shoulder.

#### FUNGUS HÆMATODES.

The erectile tissue is not always presented in the state of simplicity which we have just noticed, the second case excepted. It is often commingled with cancerous substance, and to the joint production of these two elements, it is, that I have given the name of fungus hæmatodes. Sometimes the cancerous substance predominates, while at times, on the contrary, the erectile tissues is in greater abundance. This difference in the proportion of these two elements is not a refinement in description, or of minor importance in the treatment. According to the predominance of one or the other of them, the disease will have a different termination; thus, for example, if the scirrhus tissue is more developed, degeneracy will be prompt in proportion, a return of the disease more easy, and extirpation will be far from presenting favorable results. If the erectile tissue is in excess, removal in nearly all cases will terminate successfully.

Fungus hæmatodes in some cases is enveloped by a cyst, more or less extensive, and containing sometimes a quantity of serosity, which at first sight, frequently is deceptive as regards the nature of the disease.

CASE I.—*Tumor in the Substance of the Left Breast; Fungus Hæmatodes; Extirpation.*—A young woman, aged 20, laboring under a tumor in the left breast entered the Hotel Dieu about the 1st of August, 1829. She attributed her disease to strong pressure made upon the part two years previous. The tumor was as large as the fist; the skin which covered it was healthy; sharp pain was experienced in it; and marked fluctuation existed. M. Breschet, who at the time had charge of the wards, plunged a bistoury into it; some quantity of blood was discharged; dressings were lightly applied. During the next 24 hours, two hemorrhagies profuse in character occurred; they were arrested by means of agaric and forcible compression.

M. Dupuytren conjectured that the case was fungus hæmatodes. He allowed the agaric to remain some days upon the wound. Upon the 7th of August it came off, and between the lips of the wound which were widely separated, there was perceived to arise a spongy fungus body of some size, and easily allowing the escape of blood. This appearance of things no longer permitted the nature of the disease to remain doubtful; removal was the only measure which could be employed. It was performed the 8th of August. A crucial incision was made over the tumor, which being laid bare, the finger was introduced between it and the surrounding parts. M. Dupuytren perceived that it was contained in a cyst, intimately adhering to the surrounding parts. The removal of the tumor from the cyst was easy and prompt, and consisted in fact of a sort of enucleation. The interior of the sac was examined with care, and did not appear to contain any remnant of the disease, the part of the cyst from which the disease seemed to spring was extirpated entirely. The sac was filled with lint, and lightly compressing bandages placed over the breast.

The intention of M. Dupuytren, was to cause suppuration in the cyst, and thus obtain the cohesion of its parietes. The tumor which had been removed was nearly the size of the fist, and composed of matter resembling the substance of the brain, but much more consistent and traversed in its different portions, by an innumerable quantity of vessels crossing each other in all directions. A cellular tissue very abundant, dense, and even fibrous in certain points, contained the varied elements of the tumor. This was nearly pale as to color, and the recent coloring contrasted strongly with that which existed prior to removal. (Communicated by M. Paillard.)

Fungus hæmatodes, developed in the breast, is a very rare affection, and M. Dupuytren has met with it but seldom in his practice. The following fact, in this respect merits consideration.

CASE II.—A woman living in Paris (rue St. Denis), was affected with a tumor of some volume in the substance of the breast. M. Dupuytren being consulted in the case, thought that it was scirrhus, and recommended an operation. He performed it himself; upon the first cut made by the bistoury, there issued an enormous quantity of transparent serum. M. Dupuytren perceived the error in the diagnosis, and thought that it was an hydatid. The serosity having flowed off, simple dressings were applied, but shortly afterwards a very abundant hemorrhage manifested itself. The bandages were removed, the wound enlarged, and at the bottom of the serous sac there was discovered a bloody tumor; it was formed of erectile tissue, and cancerous matter. In other words it was a fungus hæmatodes. Extirpation was practised. The whole of it was not removed at once, for another hemorrhage occurred some days after, from the wound occasioned by the operation. The opening was therefore enlarged anew, and all the diseased points carefully removed. After this, no more loss of blood ensued, and the wound healed without accident. The patient being perfectly restored to health, has since suckled several children, and continued to enjoy good health.

The cysts surrounding fungus hæmatodes are fibrous and cellular on the exterior, and adherent to the contiguous parts; interiorly they present the organization of serous membranes, and from the surface is exhaled serosity. Sometimes it is from a single point within the sac that the fungus arises, and to which it is adherent; in other cases it attaches itself to the whole internal surface of the cyst which contains it; in this case the cyst is completely fibro-cellular.

Placed beneath the skin, at a greater or less depth, and without involving this tissue, or altering it in any manner whatever, fungus hæmatodes sometimes deceives the surgeon, and leads him to mistake it for other distinct diseases. It may present the insidious characters of manifest fluctuation, and persons well skilled in their profession have so considered it. But instead of pus which had been expected to issue from a puncture, there flows out blood, then a fluid tinged with a reddish color, and finally a bloody fungus excrescence grows out, and rapidly advances.

Fungus hæmatodes is confined to young subjects, and those who have reached adult life. It follows blows, falls, or any external violence, and may result from rheumatic or gouty swellings.

In the locality where the disease is about to manifest itself, there is

developed a painful tumor, over which the skin is at times uncolored, at others red or violet. Pulsations are soon perceived, deep seated at first, but augmenting in violence until they give sensible motion to the part; these pulsations are synchronous with those of the arteries, but without sound. Sometimes they are accompanied with expansion in every sense of the term, when the disease has made some progress. These movements cease completely, when the artery between the heart and tumor is compressed. Pressure upon the tumor with the finger at some points, gives rise to a sound resembling that produced by folding parchment on a dry membrane. Upon other points the finger penetrates to some depth without meeting with any resistance. The pulsation observed in all these tumors, which is sufficiently forcible to be compared with that of true aneurismal tumors, results from the synchronous movements of dilatation and contraction, in all the small arteries which supply the diseased part. From all such partial, but simultaneous movements, results an universal pulsation.

Fungus hæmatodes is a very serious malady which cannot be cured but by extirpation, when practicable, or by amputation. One of the elements which enters into its composition can, under certain circumstances, be modified by tying the main trunks of the arteries, whose terminating branches carry on the circulation of the tumor, but the other element (the scirrhous, cancerous, or encephaloid substance) which is found in more or less abundance, and which unfortunately in the generality of cases preponderates, is a powerful obstacle to the cure by ligature. Nevertheless, this measure can diminish to a considerable extent the malady, retard its progress to disorganization, and consequently prolong and render supportable the life of the patient. I have had recourse to it with advantage in the two following cases.

CASE III.—R..., 39 years old, slender, lean, tall, complexion pale, had not suffered from disease, except tinea capitis, which continued from his childhood until he was twenty years of age; when thirty-two, a tumor commenced to make its appearance upon the internal superior part of the right tibia just below the articulation of the knee. When the hand was placed upon this tumor, there were perceived pulsations in it synchronous with the pulse. It had augmented considerably in volume, and on the 9th of February, 1819, the patient entered the Hotel-Dieu. During the last year only he perceived that the right leg had lost its power, and that it often bent under him, that a small tumefaction existed below the knee, and in this point he experienced shooting pain. He consulted a physician who directed him to apply emollient cataplasms. To this was added the application of leeches, and finally a blister. This treatment was not productive of any relief; the tumor went on increasing, and the skin which covered it became red; upon his admission into the hospital he was in the following condition: The tumor occupied the superior external part of the leg; situated upon the superior portion of the external face of the tibia, extending internally; its length is somewhat less than that of the palm of the hand. This tumor was not circumscribed; the skin which covers it is red and thin; it presents at all points pulsations synchronous with those of the heart, which cease when the crural artery is compressed, but re-appeared as soon as compression is removed; the pulsations of the anterior tibial artery are also distinct. After having questioned the patient and examined him with

great care. M. Dupuytren thought that this tumor was occasioned by dilated capillary vessels, and perhaps also by the alteration of the soft parts and of the bone.

The treatment was commenced by applying compresses, soaked in Goulard's lotion, upon the track of the femoral artery, and confining them by a circular compress, but the vessel slipped from under the pledget, so that the desired effect could not be obtained. This mode of treatment continued until the 10th of March, but not being productive of any amelioration, or diminution in the volume of the tumor, M. Dupuytren determined to tie the crural artery. Upon the 15th of March, the skin being divided in the inside of the thigh, to the extent of three inches along the external edge of the sartorius muscle, the parts being then dissected, the artery was reached, covered by the fascia of the adductor minus, which was divided by means of the director and bistoury; the vein and nerves being separated, the director was thrust beneath it and a waxed thread passed round. To be certain that it was correctly placed, he drew the two ends of the ligature together, and completely obliterated the pulsatile movements in the tumor. The ligature was then tied, and was productive of no pain. The wound was brought together by means of adhesive strips, a simple dressing applied, and the leg demiflexed, placed upon a cushion and surrounded with bags, filled with hot sand.

In the evening a bleeding to the extent of two bowls-full was practised to prevent any sanguine congestion in some one of the principal organs. Next day, the tumor did not present any pulsatile movement; it was diminished in volume, and the limb enjoyed all its sensibility and mobility. Upon the sixth day, the dressing was removed; the wound had united throughout its length, except where the ligature issued from it; pulsation was no longer perceptible in the tumor, and the patient generally was as well as could be. During the night of the fourteenth day, there issued a slight bloody discharge. On the fifteenth day, the ligature came away without pain, and without hemorrhage. The next day, some pulsation was evident in the tumor, and during the ensuing night an hemorrhage to the extent of two bowls-full occurred, which was arrested by means of the circular compress, placed by the patient himself above the wound, upon the track of the crural artery. He, however, removed it in opposition to the most express and reiterated warnings, and upon the twenty-second day another hemorrhage took place; the patient with coolness and courage, again suppressed it without assistance.

From this time until his discharge upon the 30th of April, the compress was kept on. Diet, blood-letting, constant continuance of the same position on the left side, with the two hemorrhages, had so diminished the strength of R., that the limb became infiltrated, but the pulsations had completely disappeared. The place where the tumor had existed still was a little swelled, but no indication of motion in it existing, the aneurismal character had disappeared; engorgement alone remained.

Seven years after this operation, the tumor commenced to augment anew. Upon the 1st of August, 1826, the man determined to enter a second time the Hotel-Dieu. There then existed upon the superior part of the right leg near the knee joint, a tumor which extended some distance downwards. This tumor projected more in front than behind, the veins which coursed along the skin were much enlarged, the cutis was so thin as to threaten rupture in

several places. No pulsation was evident, the tumor was thirty-two inches in circumference. Flexion of the knee was impossible; the general health was good, although the patient was emaciated, pale, and somewhat of a yellowish tint.

Aug. 5th. M. Dupuytren who recognized the nature of the tumor, performed the operation of amputation, this being the only chance of cure. The operation was performed in the usual way. A great number of vessels were taken up, and the patient put to bed. No accident ensued; the bandages were only soiled with a little blood.

6th. Slept, no pain, no fever during the day. In the evening a little frequency in the pulse.

7th and 8th. Some heat of skin, and frequency of pulse in the evening only.

9th. Sharp pain in the stump; no fever; (tenth since the operation,) the patient has not had a stool; continues the same. (Injection.)

11th. Sixth day after the operation, the apparatus was removed for the first time; there flowed from the inferior angle of the wound a large quantity of bloody pus; union had commenced in several places.

12th. Stump looks well; general condition well.

18th. Up to this time the patient has gone on well; some nourishment being permitted, he was seized with slight diarrhœa; there is a little warmth of skin and frequency of pulse. (Diet rice gummed.)

21st. Diarrhœa continues, still a little warmth of skin and frequency of pulse; the stump still secretes pus; it is of good quality; the wound is uniting finely. (Rice gummed, thirty grains of diascordium.)

22nd. Same condition; refuses to take the diascordium.

26th. Diarrhœa continues; tenderness of the belly; tongue red at the edges; skin warm, and pulse frequent in the evening; complexion very palid; stump improves; during the dressing several ligatures came away.

28th. Twenty-fourth day of the operation; all the ligatures have been removed; the wound had a good appearance; it had almost entirely cicatrized; the diarrhœa had been removed; the tenderness of the abdomen was less; the redness of the tongue had diminished; nevertheless, there was some warmth of skin and frequency of pulse. The man desired to be removed from the hospital; M. Dupuytren agreed that he should return to his home (a Francouville).

The thigh was nearly well and there remained but slight marks of irritation in his digestive organs.

*Anatomical Examination of the Limb after the Amputation.*—The diseased member had been examined with care by MM. Dupuytren and Breschet. This last named practitioner after having procured a model in wax by M. Dupont, placed it in the Anatomical Museum of the Faculty of Medicine; the dissection and the preparation were made by M. Laillard, assistant at the Hotel-Dieu.

The tumor was thirty-two inches in its greatest circumference. Viewed exteriorly, the amputated limb presented an enormous tumefaction formed by the extraordinary development of the superior extremity of the tibia. The patella concealed in the thickness of the engorged and indurated tissues, was of natural size, and just below it commenced the tumor proper, which presented anteriorly in its most prominent part, one or two softened points where

the bony tissue which appeared to form a casing, allowed the pulsations produced by enlarged vessels to be plainly distinguished. The limb in its two lower thirds was healthy. Although the adipose tissue was more abundant than ordinary, the part above the knee is in the same condition; the prominent and softened points, of which we have spoken, had become flabby and presented manifest fluctuation after the diseased limb was removed.

The skin very much stretched, attenuated and shining, presented here and there bluish streaks. It appeared about to give way anteriorly; it was separated posteriorly from the subjacent parts of fatty tissue very abundant and somewhat infiltrated. There was sudden transition from the diseased to the sound condition at the line where the tumor terminated inferiorly.

The cellular tissue was in small quantity anteriorly, where the tumor was composed principally of bone. No fat was found in this place, but behind, between the skin, and the gemini and ham string muscles, a layer of fat white, semi-fluid, and of some thickness was observed.

The muscles of the thigh, to the extent of one fourth their length having been removed, were natural, not having undergone any alteration, either in color or firmness; they were surrounded by a large quantity of cellular fatty tissue of a yellow color; the gemini muscles were palid, soft and attenuated; those of the other portions of the leg presented the same change.

The popliteal artery possessed its ordinary volume, but it was ossified in several places, immediately behind the articulation of the femur and tibia; it was flattened by pressure upon it. The articular arteries were not augmented beyond the usual size, they rather appeared diminished. Although the injection was thrown into these vessels carefully, it was observed that the branches which penetrated the joint from behind, were peculiarly small; among these were noticed the superior and middle articular. The anterior tibial artery, on the contrary, was very large, as also all those vessels supplying the superior part of the tibia; further down they re-assumed their natural state, and did not present any remarkable features.

The venous circulation of the limb was much increased, the deep-seated veins were double their usual size; the lesser saphena was equal to the little finger, and very tortuous; it did not, however, possess those nodosities which are peculiar to varicose veins; the veins seemed only augmented in bulk, without being in a morbid condition. Large branches which in the healthy state are minute ramifications, penetrated into the tumor, enveloped it by their connections, and finally were collected into one common trunk, on the inside of the knee.

The great sciatic nerve was healthy as far as the joint, and enclosed in its middle a tolerable sized branch of the ischiatic artery. This nerve was larger than common. At the point of its bifurcation, the neurilema was separated by infiltration into the surrounding cellular membrane, which appeared to constitute a portion of it, and which was separated with difficulty from the nervous substance already commencing to undergo the lardaceous degeneration.

The lateral ligaments, exceedingly reduced in thickness, were converted into membranes. They projected unequally at different points, and a commencing state of carcinomatous degeneration was remarked within the joint, upon the inner surface of the tibia. The capsular ligament containing the fluid effused into the joint, projected posteriorly so as to form a small tumor;

its fibres were separated from each other to admit the numerous arterial branches, and from its tension and shining appearance resembled a serous sack. The ligaments throughout the rest of their extent, intimately blended with the diseased cellular tissue formed the irregular nipple-like projections which ordinarily distinguish white tumors.

The lower extremity of the femur retained its natural volume, but its substance was exceedingly softened and readily yielded to the scalpel. A perpendicular section in the direction of the axis of this bone, exhibited a very advanced stage of softening both in it and also in the patella, but there existed no augmentation in bulk.

The tibia was enormously enlarged, and distended at the part which forms the articulating surfaces. Cut perpendicularly through, the whole interior of the tumor was displayed. It was found to consist of cells separated by partitions, resembling the pomegranate; the anterior cell was the largest and contained a substance resembling gelatine; its sides were lined with a vascular net-work highly organized. Some of the cells contained the same substance, others a yellowish matter, dark colored at certain points, and appeared to be the result of putrefactive agency, or of carcinomatous degeneration carried to its extreme limit.

Upon the membrane which lined some of these cells, there were seen vascular web-like expansions, which had been distended by the injection thrown into the arteries. This injection was also diffused through some of the lacunæ or larger cavities. Lastly, others were filled with albuminous layers formed by coagulated blood, as is witnessed in old aneurismal tumors. The cartilages almost unaffected, were simply loosened from the bony surfaces, and rendered movable.

This case is worthy of close examination, on account of the application of a ligature upon the femoral artery, of the consecutive hemorrhagies which up to the twenty second day after the operation, of the disappearance of the tumor, and of the long interval which elapsed before its re-appearance.

CASE IV. T...., twenty two years of age, of delicate constitution, but not having suffered from any disease, except a scrofulous tendency during his infancy, experienced in the month of December, 1834, a crackling sensation in the right knee, when making an effort to save himself from falling. Since that period he has suffered at remote intervals more or less pain, but to which little attention was paid.

In the month of September, 1835, he met with the same mishap, and the knee immediately became exceedingly swollen. Forty leeches were applied, the swelling increased, and the pain was exceedingly severe. The patient now made use of various remedies, and successively employed unguents, electricity, and a seton; but all ineffectually. The affection continued to advance, and locomotion was completely impeded. The patient entered the Hotel-Dieu during the month of March 1820, and was in the following state. A tumor existed upon the external side of the right knee, nearly as large as the fist, the skin over it being unchanged; pulsations were perceptible in it synchronous with those of the arteries. These pulsations ceased when the popliteal artery was compressed. The leg was half flexed upon the thigh, and motion produced great uneasiness. M. Dupuytren having examined the patient, gave it as his opinion that he was laboring under an erectile tumor at the head

of the tibia, with degeneration of the tissues (*fungus hæmatodes*), which induced him to reject all idea of tying the femoral artery, and to prefer amputating above the knee. The man refused to submit to the operation, and returned home, where he remained a month. During this period, the seton was continued, but the disease continued on the increase. A surgeon made an incision into the tumor, from which a flow of blood occurred. The patient again entered the hospital upon the 3rd of May; he had then determined to permit the operation, but as the cutting instruments were a cause of apprehension, he had screwed himself up to a degree of courage which he did not in reality possess. The tumor still presented the same characters as upon his first entrance into the hospital, except that its volume was greater, and its pulsations less evident. As to his general condition, the patient was emaciated and pale; the chest sounded well upon percussion; there was no pain in the abdomen, no diarrhœa or constipation, but his mental condition was that of a timid man who affects determination.

On the 5th of May, M. Dupuytren practised amputation upon the thigh, in the ordinary way. Fifteen ligatures were applied, and the edges of the wound were immediately brought together. During the day, no occurrence took place, the pulse of the patient was only slightly augmented in frequency and his skin became somewhat hotter towards evening. (Infusion of the flowers of tilia and orange leaves and anodyne.)

May 6th. The patient has slept little, but makes no complaint, his mouth is dry, teeth a little fuliginous, skin warm, pulse feeble and frequent.

May 7th. Same as last evening; profuse perspiration; he affects that he is well; the dressings are a little bloody. (Emollients, water of mallows.)

May 8th. Little sleep; has had chills during the night; profuse perspiration; face somewhat excited, pulse frequent and weak; tongue and teeth darkly coated; no pain; continued all day in the same state, but at four, P. M. was seized with nausea, vomiting and prostration; the dressings are saturated with blood; the face is pale, and the nose cold. The man was encouraged to bear up, and the dressings were removed; the blood was found to issue in a stream, and its loss estimated at about two bowls-full. The attendant not being able to seize the vessels which poured forth the blood, applied pledgets of lint, covered with rosin.

The patient continued weak. M. Sanson saw him in the evening and prescribed six grains of the sulphate of quinine in two doses, which the patient could not retain, but threw up from his stomach. At nine o'clock, the hemorrhage had not reappeared, the exhaustion was the same (broth, a draught with syrup of quinine and sulphuric ether). No change for the better ensued and at three o'clock in the morning of the 9th of May the man died.

*Autopsy*—twenty-eight hours after death. *Examination of the Stump*.—The bone had been divided four inches and a half above the condyles, the skin and muscles are of a blackish gray color; the bone is denuded to the extent of four lines, all the ligatures are still on the vessels, the femoral vessels are of a dark appearance; the clot of blood in the femoral artery commences beyond the blackened portion, which seems to be in a state of putrefaction; the clot itself is several lines in extent, and appears to be but slightly adherent; it is red and appears of more recent formation than those in the other vessels

of the stump. The nervous and circulatory system, gave no indications of diseased action; nor was any disorder of the digestive and genito-urinary apparatus evident upon inspection. In general all the organs were pallid and devoid of blood. The tumor was placed in the possession of the faculty of medicine to be injected and examined by M. Breschet.

*Examination of the Joint.*—The tumor was less bulky than before the operation; it had collapsed at the point which had been the most prominent during life; compression by the fingers, met with some resistance, more in some places than in others, and by increasing the pressure, the part yielded with a crackling sensation. As the tumor had been laid open lengthwise to exhibit its nature to the clinical pupils, it was plain that interiorly it was formed of envelopes, strictly fibrous at some points, fibro-cartilaginous at others, and lastly, cartilaginous throughout a large extent of its circumference. Its superior portion was solely cartilaginous; the fibro-cartilaginous tissue tumefied and softened, indicated the part in which the articulation commenced to assume disease; the lateral ligaments were swollen, soft, and at points, especially on their internal surfaces, were in a state of scirrhus or of carcinomatous degeneration. The popliteal artery and its divisions were natural, except that their caliber was enlarged. The division of the tumor did not permit the operation of a regular injection, that is to say, with a colored substance which would become solid, it is therefore not attempted, but water was thrown into the artery, and penetrated into the tissue of the tumor, where it appeared by a multitude of orifices; none came out exteriorly. This demonstrated that the arterial system of the leg was healthy beyond the affected osseous tissue. An attentive examination of the immediate tissue of the tumor demonstrated, that it was filled with blood in the portions which had been composed of cellular substance, that this blood was collected in concentric layers, which formed the parietes not of a single cell, but of an infinitude comparable to those of a honey comb, but of larger size. The exterior layers were less colored, and firmer than the central ones, which had the color and consistence of a simple coagulum. The pure water thrown in penetrated into these cells, and clearly evinced that they were connected with as many distinct arteries. The alteration of the arteries consequently existed less in the exterior branches, than in the ramifications which penetrated the bones and were distributed throughout their substance.

The subject of which we treat, is not one of those which can be thoroughly understood by one or two observations; the difficulty of diagnosis, the responsibility of the prognosis, make us sensible of the necessity of facts; we are therefore contributing our quota in citing the following observation.

CASE V.—L..., aged 33 years, linen weaver, entered the Hotel-Dieu, on the 5th of July, 1825, to be treated for an affection upon the dorsum pedis. This woman, of sanguine temperament and robust constitution, had made a false step a few months previous to her entrance, in consequence of which the foot was thrown forcibly backwards, and the whole weight of the body brought to bear upon the toes; she then perceived a crackling sensation in this part, and experienced excessive pain. The foot became rapidly swollen, red and painful; leeches were applied and the resolvents, but perfect rest of the part was not adhered to.

Three days after the accident, a tumor appeared, corresponding to the second toe; it was according to the report of the patient, both movable and pulsatile, and continued progressively to augment during five months. Before coming to the Hotel-Dieu, this woman had consulted several surgeons, and all of them were of opinion that the disease was an aneurism. A large number of leeches were applied, thirty or forty, to the tumor itself, and at each application, the pulsations and the pain were diminished, re-appearing however in two or three days. Emollients as well as resolvents were as unsatisfactorily employed. When the patient was examined, the tumor was found upon the back of the foot over the second and third metatarsal bones; it extended laterally from the first to the fourth metatarsal bones, and longitudinally from within an inch of the ankle joint to the toes, it projected forwards an inch in height, and was adherent by its base, without increased warmth, redness or alteration of the skin. Upon the first inspection, it was supposed that the tumor was of a strumous character, and the patient was questioned, to ascertain if she had suffered from the venereal disease, but she stated that she had experienced nothing of the kind. Upon making still further investigation, the tumor evinced pulsatile movement, which were deep seated and obscure, but still perceptible. M. Dupuytren at first thought that the movement was only in the course of the anterior tibial artery, and that the tumor was an abscess to which this vessel imparted the sensation of pulsation. Some of those present thought that it was more likely to be aneurismal or fungoid in its nature. In short, evident pulsation was discoverable, as is the case of aneurism, and throughout its whole extent, the artery displaced and thrust towards the internal side of the tumor, permitted its pulsation to be felt, distinct from those of the tumor, itself. Upon laying the hand over the whole surface, it was raised up by the expansile motion which was synchronous with that of the pulse, and ceased totally when the artery was compressed. The patient complained of very acute pain, which disturbed her rest, but her general health did not appear to have been impaired in consequence.

Examined again by M. Dupuytren; the diagnosis was less clear and easy to establish; he wavered between an abscess and an aneurism. A change in the relative situation of the artery and tumor, had no influence upon the pulsations of the latter, thereby augmenting the uncertainty and leading him to suppose that it was an aneurism. M. Dupuytren brought the man into the amphitheatre, and stated that he would make an explorative puncture, which would not interfere with the tying of the vessel if it was the seat of an aneurismal disease. With this design the preparatory arrangements were made, as well as those necessary for amputation if it should be deemed advisable; the affection having its location in the bony structure, and being one designated by the term fungus hæmatodes.

Compression upon the crural artery being made, a bistoury was thrust into the centre of the tumor, and a small quantity of dark colored blood oozed out, without any jet; the pressure upon the artery was then relaxed, but the flow of blood became neither more rapid nor more abundant. The incision was next increased by means of the blunt bistoury, and a soft fleshy reticulated bleeding tissue was recognized, the partial removal of which was attempted both by the fingers and by the forceps, but portions only could be extracted, and it

was found to be analagous in structure to the corpus cavernosum of the penis, or perhaps more like the substance of the placenta. At this stage, M. Dupuytren recognized the character of the disease, and decided to remove the portion of the foot affected, which was done according to the method of Chopart.

Half an hour after the operation, the dressings were applied; the flaps were brought together and maintained in contact by three strips of adhesive plaster; and the ligatures were placed at the superior angle of the wound; no untoward circumstance occurred; cicatrization commenced upon the sixth day, but was not completed until the sixth week, at which time the patient left the Hotel-Dieu, after being provided with a boot which concealed the deformity and facilitated her walking.

The portion which had been removed was examined with care, and it was ascertained that in the place of the second metatarsal bone there existed a carcinomatous substance, whilst in places here and there, the remains of bony substance were plainly felt by the fingers. These fragments of osseous matter were more numerous towards the inferior extremity of the bone, and the articulating surface and the cartilage were in a sound condition. Posteriorly the disease had attacked the first, second, and third metatarsal bones simultaneously; besides, having invaded their surfaces articulating with the cuneiform bones, and at this point, the affection consisted of a softening of the spongy or cellular tissue, causing a diminution of it. This diminution was carried so far as regarded the first metatarsal bone, that a true anfractuous cavity existed large enough to contain a walnut, closed behind by a simple osseous lamella, to all appearance healthy, and supporting the arthroidal cartilage unchanged. The posterior extremity of the third was likewise hollow, presenting a cavity of a similar character; the internal surface being covered with grumous blood. The first cuneiform bone was partially destroyed, it was softened and rarefied (if this word can be employed), and its spongy substance resembled the vascular tissue of the spleen, which by washing the fibrous reticulated structure is all that remains. The second cuneiform bone was less diseased, and the third still less so; their change of structure, however, resembled that of the first.

Fungus hæmatodes, to which has been given a host of names, as spongioid inflammation, medullary sarcoma, bloody sarcoma, and vascular sarcoma, is a disease of a very serious character, on account of the elements which enter into its composition. Tying the principal trunk of its arterial supply may be efficacious, when the cancerous matter does not predominate and prevent the rapid progress of the disease towards complete degeneration; it is not, however, to be compared with extirpation. Entire removal is then the only definite chance of success in the treatment of fungus hæmatodes. Sometimes the affection will be reproduced, although every trace of diseased structure has been cut away, leaving nothing of suspicious character connected with the wound. From this tendency to reproduction, it must be admitted that there exists an internal cause. It should not be forgotten in practising the operation, that the smallest portion still left remaining may renew the disease. An English surgeon having performed amputation for a similar disease, perceived a slight extension of the affection into the parts from which the stump was

formed this he supposed would be removed by inflammation and suppuration. His error was fatal to his patient, for the tumor reappearing, his endeavors to eradicate it were fruitless. The thigh was removed, but it was in vain; the patient died of exhaustion some time afterwards. Let us not omit, in bringing this lecture to a close, to remark that carcinoma of the eye or elsewhere, in which the neighboring veins have been much dilated, and also a great number of bloody collections have been mistaken for fungus hæmatodes, but these tumors have not the most remote analogy to it, except by the flow of blood when they spontaneously discharge or are cut into. There exists among them not only difference of species, but also difference as regards their nature.

## CHAPTER XXXIX.

### ON HARE-LIP.

There are two important points as yet undecided in the operation for hare-lip, generally so simple; namely the proper time for its performance, and the treatment applicable to a complication hitherto but little noticed.

Various opinions exist as regards the first question. Many have thought it most advisable to wait until the child was able to appreciate the deformity. They relied on the greater thickness of the lips and the strength of tissue necessary to support the suture. Some surgeons have preferred waiting until the end of the third year, except in cases in which the child was prevented from sucking. The tissues, say they, having become more solid, without losing any of their extensibility, can better resist the needles; and at that period, the child having more reason submits with more docility to the precautions necessary to the success of the operation.

Others have thought it proper to operate on children immediately after birth, because the lips being furnished with blood-vessels, of which a great part soon disappear, heal, at that period of life, more promptly. Besides children then are more passive, and have not as yet acquired the habit of sucking. But the operation is not certain so soon after birth, because the flesh is too soft and easily divisible by the needles, and because the general mortality, independently of any particular reason, is greater at that period of life than at any other, and it would be imprudent to increase the chances of death. Such are the objections, are they counterbalanced by the advantages? It would undoubtedly be important to operate so early, in order to give the child the faculty of sucking; but this very inclination to suck, is one of the most powerful opponents of the success of the operation. Could this be avoided, the operation at birth would have a powerful argument in its favor; but the child sucks instinctively, even before having taken the breast: the obstacle is therefore as powerful then as at a later period.

That, however, is by no means the least favorable period for the operation; and I cannot understand why so many writers have preferred the age of four or five years, alleging that the child being reasonable enough to feel the necessity, and foresee the success, will submit to the operation with more

courage. Experience must have undeceived them. At that age, children have just sense sufficient to feel and remember the pain, without reason to support it; they, therefore, endeavor to avoid it as much as possible, and do all they can to frustrate the operation.

At a later period, reason and courage are indeed more developed; but if the bones be implicated, their increased solidity gives less hope of success. In all cases, it is preferable to operate early; the deformity is less, and even that proceeding from the separation of the bones disappears. Therefore, I think the most suitable time is at the age of three months, life is then more firmly established, and the chances of death less than at birth; the infant feels the pain, but forgets it immediately, and does not oppose the success of the operation.

There is another point in the operation for hare-lip, to which I would call your attention. When there is a middle tubercle projecting, with two well defined lateral divisions, either the bony portion supporting is removed, or we endeavor to restore it to its place.

If the median tubercle project in front, we must observe where it is inserted into the septum nasi, as on this frequently depend the degree of projection and the treatment. When this insertion is near the point of the nose, and the lateral portions of the lip are attached to the tubercle, the latter is drawn backward; the point of the nose follows the movement; the alæ are separated, and the nose becomes flattened, resembling more the snout of an animal than any thing else. What is the consequence of its insertion precisely into the end of the nose? Now this occurrence overlooked by writers is not uncommon. In such a case, struck by the deformity which would ensue, I adopted the following plan: The fleshy tubercle was separated from its bony attachment, the latter removed by the forceps; the edges of the fleshy portion having been pared, it was raised horizontally backwards, and used to form the septum, or a portion of the inferior septum of the nostrils. Then whether we wait for reunion, or complete the operation, the hare-lip is reduced to its greatest simplicity, and the operation performed in the ordinary manner; a bandage is sufficient to keep the tubercle in place.

It is only when the labial tubercle is inserted near the bony nasal spine, that it ought to be preserved as an integral part of the lip. In this case I remove a portion of the subjacent osseous tubercle. M. Malgaigne in an article published by him in the Medical Gazette, thinks that this plan is liable to objections. The most serious, according to him, is the removal of the germ of two, three, or even the four incisors. We shall see what foundation this remark has. The operation, indeed, is not always free from danger, as may be judged by the following case:

*CASE I.—Double Hare-Lip. Excision of the Bony Tubercle. Hæmorrhage. Death.*—In the early part of August, a child was admitted into the Hotel-Dieu with a double hare-lip. On the right side the separation involved the whole lip, the palatine vault and velum palati; on the left side, it did not extend so far. The middle tubercle was inserted pretty near the nasal spine, so that it was thought possible to make use of it in perfecting the lip. It was, therefore, separated from the bony tubercle, and the latter excised by means of scissors; it contained the germ of two incisors; the rest of the operation was put off to another day. A little blood was lost at first, the hæmorrhage

then appeared to cease, but the attempt to suck brought on a recurrence, and it was cauterized. The blood which had been swallowed was partly discharged by stool, and on the day fixed for the operation, the child being too weak, it was deferred. The debility increased: the median tubercle became gangrenous, and the child perished; an examination was not permitted. Many circumstances, amongst which may be noticed the great loss of blood, and its stay in the alimentary canal, tended to destroy the life of the patient; but this event is very rare. Blood is never digested. If not discharged by vomiting, it becomes disorganized, is an irritant, and gives rise to pain and diarrhœa. Hence its expulsion should be assisted by purgative enemata. The flow of blood into the mouth causes also a movement of suction, which becomes habitual to children, and which may destroy the cicatrix should any exist.

CASE II.—*Double Hare-Lip. Labial Tubercle inserted into the End of the Nose: Operation perfectly successful.*—L. R..., 14 years of age, was admitted into the Hotel-Dieu in October. She had a very complicated congenital double hare-lip. Indeed the middle bony tubercle formed by the incisors projected more than six lines beyond the place of the upper maxilla; of the four incisors which it supported, the two middle ones, very large, and directed downwards, inclined forward on their outer edges, so that the junction of the inner edges formed an angle above; in front of the bony tubercle was a fleshy tubercle, nearly circular, arising immediately from the end of the nose, from which it was separated by a groove scarcely perceptible. Without this median portion, the nostrils communicated with each other, and by means of two large divisions with the opening in the lip. Behind these two divisions terminated in a single one, separating throughout its whole length the velum palati and the uvula; so that externally there was a horrible deformity, and internally a complete communication between the nasal fossæ and the buccal cavity. On the 5th of October the operation was performed in the following manner: the patient being seated, her head thrown back and firmly supported on the breast of an assistant, I divided the mucous fold uniting the cutaneous to the bony tubercle, and then with very sharp bone forceps removed as much of the latter as projected beyond the anterior plane of the upper maxilla. This stage of the operation being finished, I pared the lateral and lower edges of the internal tubercle, as also the vertical edges of each lateral portion of the lip. A needle was then introduced at about the distance of a line from the pared edge of the left side of the lip, very near its free edge, directed from below upwards and from without inwards, comprising one half of the thickness of the soft parts, and then made to traverse obliquely the other side in a contrary direction. This proceeding was intended to assist in the formation of a median projection of the lip. The second needle was placed about a line and a half above the first. The third, longer than the others, was destined for a more complicated business. I began by folding the cutaneous tubercle, bleeding every where except at its root and external surface, and applied it to the bony septum of the nostrils, so that its outer surface became inferior, in order thus to form on all sides a sub-septum to the nostrils. This needle, therefore, comprised at once the upper extremity of each portion of the lip, and the free extremity of this folded tubercle; lastly, two stitches of the interrupted suture united each angle of this flap to the labial portions. The

ligatures were applied to the needles in the ordinary manner, over them adhesive straps, the whole being covered by a bandage, which, at the same time that it compressed the cheeks and tended to bring them forward, bore somewhat upon the nose, in order to avoid the dragging of the flap.

The patient was carried to bed, ordered a very strict diet, and diluent drinks. The first days were free from pain. On the 8th of October pain came on, slight at first, but soon almost insupportable. On the night of the 9th some bleeding took place, for which nothing was done, owing to my detention at home from sickness.

The bleeding ceased spontaneously, the pain seemed a little abated, it returned with hæmorrhage on the following night. The next morning I removed the external bandage. There was no indication of derangement of the two halves of the lip, the needles were not disturbed. The flap of the sub-septum was of a blackish grey color, exhaling a fetid sanies, and giving rise to the fear of gangrene. It was washed with wine. A semicircular piece removed from the upper adhesive strap, of which the edge pressed too much on the base of the flap, and the bandage reapplied. Four days afterwards the dressing was again removed, the flap had assumed a red color, and cicatrization was going on.

On the 26th it was nearly complete; but the nasal sub-septum appearing too large, it was diminished a few days after, by means of a bistoury and forceps. A tent was introduced into each nostril in order to keep them dilated, and the last incisions being healed, the operation was perfectly successful, and her face, formerly horribly deformed, was now quite passable.

The first part of the operation was intended to remedy the external division. We will now endeavor to overcome the separation of the maxillary bones by a bandage similar to that used in hernia, and terminating in two pads. But, it will be asked, is this approximation possible? Yes, for the separation in young subjects is caused by muscular action alone, and this bandage tends to overcome that action.

On the 19th of December the girl was doing very well, the re-entering angle of the upper lip had considerably diminished, and presented only a slight irregularity. She stated that she could perceive with her tongue some approximation of the bones, especially in front. From this improvement there is good reason for hoping that perseverance in the pressure will, in a few months, effect, if not a complete cure, at least a very remarkable improvement. The pads should be applied below the cheek bones upon the deep seated part of the maxilla. There is here an adipose cellular tissue which prevents pain, and if the bandage does not press so immediately, it is more easily kept in place. It bears partly on the alveo-dental arch, and partly on some joints of the maxillary bone.

Three months after the operation, the girl was again brought to the hospital. The approximation had increased during that time, by a line and a half, her voice had still a nasal sound, but she performed perfectly the motions of suction and prehension. The halves of the palatine vaults had begun to touch each other, and it was expected that the reunion would be complete. In six months she will again return.

How can we conceive the production of such a state of things? It has been explained recently by supposing a cessation of development. According

to this idea the upper lip was originally formed of three distinct portions which should have united at a more advanced stage of intra-uterine life. What adds weight to this opinion is, that the middle portion of the upper maxillary bones, which ordinarily supports the middle labial tubercle, presents, even in adult age, marks of separation from the bone to which it adheres, and on this account has received from some anatomists the name of inter-maxillary bone. Such indeed was my opinion, but distinguished men who have made osteogeny their peculiar study assure me that they have never found this inter-maxillary bone, and much less the middle part of the lip, separated from the lateral portions, bony or fleshy; and I must confess that I now have strong doubts as to what I once believed, and thought I had seen myself.

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## CHAPTER XL.

### ON ANTHRAX.

Carbuncle is merely the inflammation of several clusters of cellular tissue contained in the areolæ of the chorion. In order to understand the mechanism of its formation, it will be proper to say a few words concerning the structure of this portion of the skin; it is thick, white, elastic, more dense on its external than on its internal surface, composed of fibres which, by their interweaving, form areolæ placed irregularly side by side. Each areola is filled by a portion of cellular tissue, which sometimes being impregnated by a quantity of adipose fluid distends the cell containing it. The numerous areolæ of the dermis have all a nearly conical form. The apex is directed towards the rete mucosum, and the base towards the internal surface of the skin, which rests entirely on a layer of cellular tissue. These areolæ do not terminate in a cul-de-sac at the external surface of the fibrous part of the skin, but by an infinity of small foramina, having an oblique direction, and very apparent after maceration for some time.

The definition just given of anthrax, shows that it differs from furunculas merely in extent, and the multiplicity of clusters of cellular tissue which become inflamed at the same time.

Like furunculus, it occurs in those parts of the body in which the skin is thickest, and the cellular membrane most abundant and developed. It most frequently attacks the nape of the neck, shoulders, dorsal region, parietes of the thorax, and the thighs.

Anthrax cannot be mistaken for furunculus, as it is always larger than the latter. Furunculus, seldom solitary, opens only at its apex; the skin covering it is of a light red color. Anthrax, on the contrary, is of a livid hue, almost always solitary, and presents several small openings over its surface.

Anthrax has been confounded with bubo and malignant pustule, varieties of a disease essentially gangrenous; in anthrax on the contrary, gangrene is a consequence of strangulation. The latter is never contagious, the former are. Incision cures the latter, the former generally requires the actual cautery or caustics. One is seated in the cellular tissue of the chorion,

the other in the rete mucosum, or the subcutaneous cellular tissue. Anthrax is not necessarily attended by an adynamic or ataxic state of the system. Malignant pustule and bubo are always preceded or accompanied in some of their stages, by one or other of these conditions.

*Prognosis.*—This depends on its situation, size, date, existence, degree of inflammation, and the general state of the patient. When on the nape of the neck or back it is more serious, *cætaris paribus*, than when under the clavicle or on the chest. It is still more serious if very large, and if it have existed for twelve or fifteen days, if gangrene have supervened, or there be acute inflammation, and if the patient be debilitated by previous disease, or from any other cause.

From a knowledge of the nature of anthrax, its treatment can easily be deduced. Like that of all inflammations with strangulation, it consists in the use of incisions, which should extend the whole depth of the carbuncle and somewhat beyond the limits of the disease.

If the tumor is very large, an incision must be made in the length of each flap. This plan puts an immediate end to the strangulation and pain. By pressure a viscous pus is discharged. A good deal of blood is lost, which acts as a topical remedy and contributes greatly to reduce the inflammation. The whole tumor should be covered with an emollient poultice. The patient is put on the use of bitter infusions and laxatives. Should it be on the back, the patient must not lie supine, for gangrene will then occur in spite of the incision.

CASE I.—A man was admitted into this hospital in 1812, having on his back a carbuncle of the size of a hen's egg. I made an incision into it, dividing it into two parts. On the upper portion another was made, perpendicular to the former. An emollient poultice was applied. The next day the inflammation had disappeared from the upper portion, but the lower was hard and much larger than on the preceding evening, and the man complained of pain in that part alone. An incision was made into it, and all the bad symptoms vanished.

Every carbuncle, left to itself, terminates in gangrene, from which necessarily results an ulcer, which has an extent proportionate to the parts deprived of life. If the edges are hard and elevated, emollients should be used; and when they are depressed, they should be brought together by means of adhesive plaisters, and dressed with simple cerate or dry charpie, or with different remedial agents according to the degree of excitement; the skin is generally separated. If it be thick and adherent to a certain quantity of cellular tissue, the reunion is almost always effected. If, on the contrary, it be thin, deprived of adipose tissue on its internal surface, we generally are obliged to remove it, after having uselessly attempted its reunion: a simple dressing is then applied, and the patient ordered to use bitters and mild laxatives; the aponeuroses and muscles are sometimes destroyed, but these circumstances do not alter the mode of treatment. When the ulcer is very large and suppuration copious, tonics frequently become requisite.

CASE II.—T. B., Cœur de Roy, 49 years of age, of good constitution, had for two or three months pain between the shoulders, when on the 24th of January 1813 a small pimple appeared; his health had however suffered no change. The pimple increased rapidly, and in less than twenty-four hours

an enormous inflammatory carbuncle made its appearance. It is worthy of remark that the patient saw but little with the right eye, and that immediately after the appearance of the carbuncle his sight was restored. For four days he suffered acute pain, the tumor then opened at several points, portions of cellular tissue were discharged, and on the 7th of February the skin was entirely destroyed. On the 15th of the same month he entered the Hotel-Dieu, with an ulcer four or five inches in diameter, and complete separation of the skin around its whole circumference. The edges of the wound were brought together by adhesive strips, a simple dressing applied, taking care to exercise a slight compression on the edges of the ulcer, which soon united. The patient left on the 5th of April, not entirely cured, although he had reached the 70th day of the disease.

We will terminate this article by the observation that we must continue at each dressing, and until the perfect discharge of all the slough, the pressure intended to assist the expulsion of the fragments of the gangrenous cellular tissue.

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## CHAPTER XLI.

### ON BLENNORRHAGIC OPHTHALMIA.

#### *On Corneal Specks, and Inflammation of the Retina.*

Scarcely a week passes without the admission into our wards, of individuals affected with venereal ophthalmia. This serious disease generally results from direct inoculation by means of the finger carried to the eye, after being soiled by the mucus of the urethra. In some cases, however, it follows a sudden suppression of an urethral discharge, especially when the cause of this suppression is of a nature to irritate the conjuction, as a sudden cold for example. M. Boyer thinks this disease is very rare among females. This I believe to be erroneous; in hospitals devoted to the treatment of syphilis, this ophthalmia is found to be more frequent among women than men; the wards of the Hotel-Dieu furnish a similar result.

This disease, always alarming, demands on the part of the practitioner a constant attention and vigorous treatment. I have seen the inflammation destroy and empty the ball of the eye in seven or eight days. A child at this moment (April 1833) in the ward, has lost its sight on account of this disease. The mother was infected with venereal, the ophthalmio remained without treatment for a long time, and her sight was nearly destroyed when she came to the hospital. It has been generally said that when this ophthalmia results from the suppression of an urethral blennorrhagia, both eyes are equally liable to it, whilst direct inoculation affects only one. My observation has not confirmed this idea, as in the majority of the cases under my notice, and nearly all of which depended on the latter cause, both eyes were diseased. But be the cause whatever it may, the malady demands the most energetic treatment in order to prevent its fatal termination.

Antiphlogistics, such as general and local bleeding, emollient lotions, and revulsives are generally insufficient. Without neglecting these means, which are undoubtedly useful, we should have recourse to a specific and local treatment, for the others are merely accessory. This treatment consists in blowing calomel upon the conjunctiva of the eye and eyelids by means of a small tube.

This is done once or twice per day: and in addition to this, but only at night, one or two drops of laudanum are dropped between the lids.

CASE I.—L . . . . , 30 years of age, a tradeswoman, small, very fat, enjoying good health, having menstruated at the age of 14 years, had in early life six children, none of whom she nursed herself; has had leucorrhœa, as also gonorrhœa several times. She states that on the 18th or 20th of January, the cold air caused her much uneasiness in her eyes, which soon became inflamed. On the evening of the 20th the right eye became very painful, as if filled with sand; she could not sleep, and the next morning the eyelids were so swollen that she was unable to open them. Cataplasms, bath, pediluvium lotion with infusion of melilotus; no improvement. On the 22d, a large blister to the arm: on the 24th the left eye became similarly affected: the same remedies were used until the 2d of February, when she was brought to the Hotel-Dieu.

The eyelids were greatly swollen; the conjunctiva presented a violet-red projection very painful, and copiously discharging a green puriform and very fetid pus: impossible to discern the cornea. The patient sees nothing; both eyes affected with deep lancinating pain: constant cephalagia, anorexia, fever, tongue foul. The patient had an abundant urethro-vaginal discharge; she would say nothing as to the origin of her disease, but sometimes facts exist which are stronger than the answers of the diseased.

That evening the insufflation of calomel was commenced, a drop of laudanum dropped into each eye, the parts well washed with pure water, and the eyes covered with a bandage fastened to the cap. She passed a better night.

By the influence of these remedies, her improvement was rapid, the purulent discharge lessened, and the pain much less acute. However, the red projection formed by the swelling of the conjunctiva still hides the cornea, so that it is impossible to say what will be the result. The woman had the disease for ten days before her admission, and I should not be surprised if there were ulcerations on the cornea, which might give rise to perforations causing the loss of sight. Two weeks afterwards the left eye recovered its functions.

CASE II.—A woman came to the Hotel-Dieu about a month ago, with gonorrhœal ophthalmia of the right eye; both eye-lids were bathed in a greenish pus, the eye was opened with great difficulty, the conjunctiva red and swollen, and the pain acute.

The insufflation of calomel and instillation of laudanum were commenced five days after the first appearance of the disease. A marked improvement soon took place, and in three weeks she was perfectly cured.

Blennorrhagic ophthalmia is frequent among children, in them called generally puriform without relation to the cause. In newly born infants, it depends on direct inoculation during parturition; it is always serious and frequently followed by the loss of the eye. The treatment is the same as in adults, much care and perseverance are however required, for the pain gives rise to a spas-

modic contraction of the orbicularis palpebrarum muscles, and it becomes very difficult to make the remedies reach the affected parts.

In modern days, the new ideas concerning syphilis may have thrown some doubt upon the etiology of venereal ophthalmia. I believe it contrary to facts to reject proofs given by authors worthy of credence. Astruc relates that the urine of a person laboring under an urethral discharge, used as a lotion for the eyes, gave rise to a very serious purulent ophthalmia. Merteus gives the history of an experiment tried by a physician who had some doubts, but who was soon convinced of his error. Chaussier has seen the puriform mucus of an ophthalmic blennorrhagia produce, by contact with the sound eye, a precisely similar disease. Lastly, we have the cases of those unfortunate medical students who perished the victims of their zeal for science.

You have all seen a number of cases of this disease cured in the Hotel-Dieu, and that without any attempt to restore the urethral discharge. It must be however confessed that too sudden a cessation of the discharge may produce the ophthalmia, and the best means to prevent it is not to arrest the former too suddenly. In a majority of cases the two diseases progress simultaneously, and do not appear to act by mutual revulsion. These ideas of antagonizing forces, so beautiful in theory, rarely accord with facts. Inflammation of the skin produces a similar effect on the mucous membranes. A serous phlegmasia gives rise to the successive development of one or several phlegmasiæ of the same nature in other serous membranes; and we are forced to believe that analogous tissues are rather sympathetic than antagonist.

*On Corneal Specks.*—For a considerable number of years, I have been in the habit of seeing many cases of specks of the cornea, which I have treated as follows: if there be much irritation, I bleed; if not so much, apply leeches to the temple; at the same time giving a mild purgative every two or three days. A seton is placed in the nape of the neck, and I generally use one made of several strands of cotton thread, preferring it to a riband, inasmuch as its size and the consequent irritation can be increased at pleasure. To the above remedies is added the insufflation, repeated morning and evening, of a pinch of the following powder:

Prepared Tutty (Oxyd. Zinci, impur. præparet.)

Sugar Candy.

Calomel. Of each equal parts.

The patient should neither wash nor wipe the eye after the introduction of the powder.

When there is no disease of the eyelids, no inflammation, nor irritation of the conjunctiva, the insufflation will generally remove the corneal speck. Those which are recent and slight generally disappear in a few weeks. Those of older date, thicker and larger, are usually removed in a month or six weeks; and I have seen specks occupying nearly the whole surface of the cornea, and covering the pupil entirely, so as completely to intercept the passage of light, removed in a few months.

#### *On Inflammation of the Retina.*

Whilst describing the operation for cataract by depression, I pointed out as one of the most frequent and serious consequences of this method the inflam-

mation of the retina, called *iritis* by those who are more struck with the apparent symptoms than the cause and true seat of the disease. From this affection result long and obstinate pain in the head, contraction of the pupil, dimness of the aqueous and vitreous humors, redness of the conjunctiva, continual discharge of scalding tears, intolerance of the least degree of light, strong contraction of the orbicular muscles, the formation behind the pupil of an accidental fibrous pellicle, to which the iris generally adheres, lastly blindness, which, however, may be remedied after some months, by destroying or displacing the pellicle above mentioned, by means of a cataract needle.

This inflammation, which frequently attacks scrofulous children, and is characterised by a horror of light, may undoubtedly be treated by venesection and leeches, diluents and revulsives, such as setons and purgatives; but too frequently convinced of their inefficacy, I have sought for other remedies. I have derived for the last ten years most advantage from the internal use of the powder, and extract of the *atropa bella donna*. I give the powder in the dose of three, four, eight, twelve, or more grains; the extract in the dose of one, two, three, or more grains; both divided into six doses, to be taken every two hours.

In order to prevent the narcotism, whether local or general, which this remedy may produce, I generally accompany its use by that of artificial Seltzer water.

It is needless to remark that the use of bitter, anti-scorbutic, and anti-scrofulous remedies, so much praised for the last twenty-five years, but with so little reason, can only serve to maintain and increase this inflammation when children are the subjects of it.

## CHAPTER XLII.

### ON THE FORMATION OF CALLUS.

There is perhaps no subject of pathological anatomy which has more engrossed the wisdom of observers, and the imagination of those who frame hypotheses without regard to observation nor experience, than the theory of the formation of callus. Two opinions have, in modern times, divided scientific men, namely those of Duhamel and Bordenave. The former attributed the consolidation of fractures to swelling of the periosteum and medullary membrane, to the elongation of each fragment towards the other, to their reunion and ossification. He found that this union is effected, sometimes by means of a simple external ferrule of bone (*virole*), sometimes by means of a double ferrule, one of which envelops the fragment, whilst the other is in the medullary canal, where it forms a kind of peg or pin more or less elongated. Bordenave establishes other principles. He supposes that the reunion of fractures is effected by the same mechanism as the reunion and cicatrization of the soft parts. He thought he detected cellular and vascular granulations between the fragments of the fractured bones. According to him, these granulations being opposed to each other, united and became solid by means of the accumulation of calcareous phosphate internally, thus effecting the cica-

trization of the parts. These ideas, more or less modified, had been adopted until our time.

When I undertook, in 1808, to verify the doctrines of Bordenave and Bichat, I was astonished to find nothing to justify them. I multiplied my researches and was led from numerous experiments to establish a theory partly founded on that of Duhamel, which I have taught in my lectures on pathological anatomy. Let us now point out the most remarkable phenomena observed between the occurrence of the fracture and its perfect union.

On examination of the injured parts, from the first to the tenth day of the accident, we find an effusion of blood around the fragments, between them, even in the medullary canal. This ecchymosis may extend to distant parts. Considerable inflammation is developed in the irritated parts. The fleshy fibres are mingled with the inflamed cellular membrane and cannot be distinguished from the other parts. The periosteum becomes red, pale, swells, softens, and pours out between and the surface of the bone beneath it a reddish and apparently serous fluid. The fibrous structure of the walls themselves disappears. The medullary tissue becomes tumefied and inflamed, and gradually obliterates the central canal of the bones. The marrow becomes as it were fleshy and is united to that of the opposite side. Examine now the fragments, the clot separating them is, in a few days, absorbed and replaced by a gelatiniform fluid. From the fourth to the sixth day the surfaces of the fracture are covered by a reddish tomentose substance, but which does not always exist.

From the tenth to the twenty-fifth day, the engorgement of the soft parts becomes more solid; its adhesion to the substance between the fragments appears every day more intimate; the muscles recover their appearance and functions. The tumor which I have, the *tumor of the callus*, diminishes in extent and separates from the surrounding parts. The tissue composing it is homogeneous, pretty similar to fibro-cartilages and difficult of division. On separating it, it is seen to be formed of fibres parallel to the axis of the fractured bone. The medullary membrane swollen and transformed into a fibro-cartilaginous tissue, diminishes successively the central cavity of the bone and finally obliterates it. The internal pin resulting from these organic operations is lost, on a level with the fracture, with the substance intermediate to the fragments.

As we advance in the examination of the formation of callus, we will discover other peculiarities. These may continue from the 25th until the 40th and even 60th days. In weak persons, the process occupies three months. The lardaceous and fibrous mass constituting the tumor of the callus, and which entirely envelops the fragments, gradually becomes cartilaginous and slightly osseous. Towards the end of the time, the fragments are sunk in the centre of a solid ferrule of bone adhering to them throughout its whole surface. Externally this ferrule is covered by a thick periosteum united to that which envelops the sound portions of the bones, and no external evidence is left of the fracture. The surrounding cellular tissue is still hard and dense, the soft substance existing between the fragments has become more dense and adherent to the ends of the bones, but is yet far from uniting them in a perfect manner. The centre extends towards the extremities, rapidly increases in consistence, and soon forms a very solid bony cylinder. The dressings are generally

removed at this period : but this callus does not remain ; and I have called it *provisory callus* (cal provisoire), in order to indicate that nature removes it, to effect by other means the union of the fragments.

From the third to the fifth and even the sixth month, the tumor of the callus gradually becomes more compact: the central portion undergoes the same change. The substance intermediate to the fragments acquires all the organic characters and consistence of the compact substance of bone, from which it is distinguished only by its peculiar color. It is this transformation of the intermediate substance into bony tissue which I have called *definitive callus*. In the last stage of the formation of callus, the central part becomes thinner, cells appear in it, and it is changed into a reticulated tissue which finally disappears and leaves the central canal of the bone perfectly free. A medullary membrane at first lines the cells, after the completion of the canal of the bone, it is continuous with the membrane which lines it and secretes a medulla. The exterior part of the provisory callus at last disappears. It can be understood that different varieties of fractures may cause slight changes in the callus uniting their fragments.

In short, the union of bones in ordinary fractures present the following phenomena: 1st, effusion of blood and of a viscous and adhesive fluid between the fragments: 2d, formation of ecchymosis in the tissues surrounding the extremities of the fractured bones: 3d, the formation of a cartilaginous ferule, bony externally, and the development, in the centre of the bone, of a peg or pin formed by the tumefied medullary membrane which undergoes the same transformations: 4th, ossification of the substance intermediate to the fragments: 5th, diminution of the tumor of the callus, restoration of the medullary canal, and of all the parts surrounding the bone to their natural state. It will be seen from what has been said, that the period of forty days, fixed by many surgeons as the limit of consolidation, is by far too short, and that it should be much longer in oblique fractures, and in those in which the fractured extremities overlap each other.

This being granted, let us establish the facts which prove, that to a certain period, we can, without danger, make a deformed callus yield to our efforts. One of the first questions which arise is, Can this be done at all? This question we will answer by cases from the Hotel-Dieu, which have been witnessed by many individuals.

CASE I.—*Fracture of the Leg consolidated, with deviation of the Inferior Fragment backward, straightened, commencing on the 59th day.*—A . . . . ., 44 years of age, having fallen from his horse in the street, was brought immediately to the Hotel-Dieu, on the 3d of August, 1820, in a state of complete intoxication. He had fractured both bones of the leg. The least motion of the limb drove the fragments in every direction, and the crepitation was most distinct. The patient, from his state, feeling no pain, moved his leg, endeavored to stand upon it, and without the high and strong boot which supported it, the fragments would most probably have pierced the integuments. On account of his continued agitation, the reduction was but imperfectly effected on the first day. The next morning on more accurate examination, the leg was found to be fractured near its lower third, obliquely, from below upwards and before backwards; that the fragment of the tibia formed an acute point, which raised the integuments of the leg and seemed on the point of piercing

them. The lower fragment had ascended behind the upper one, from which resulted a shortening and curvature of the limb, by reason of the contraction of the muscles inserted into the lower fragment. The limb was laid on its external face in a demi-flexed position, the reduction effected, graduated compresses and a splint placed on the projection of the superior fragment, and the limb dressed in the ordinary manner of fractures of the leg.

Inflammatory symptoms being feared, he was twice bled, put on strict diet and diluents. On the following days pain and great tumefaction took place; vesicles appeared on the skin, an abscess formed on a level with the fracture at the anterior internal part of the limb; this was opened and the wound suitably dressed. The wound and inflammation permitted us to give but little tightness to the apparatus. The patient was very uneasy, would not be quiet, and several times the house surgeon was obliged to yield to his desires and loosen the dressings. On the 27th day the wound had healed and the apparatus was only applied at intervals. On the 45th day there was still some swelling. On examining the limb, consolidation was found to have taken place, but it was also seen that the displacement backwards of the inferior fragment had not been successfully opposed. The deformity was, however, too trifling to attract much notice. A simple roller was applied. The patient was allowed to move about in bed and to sit up. On the fifty-ninth day, on a second examination of the limb, whether the nearly total disappearance of the swelling permitted a better view of the parts, or from the effect of motion, the deformity was much more apparent than on the removal of the apparatus; still it was solid and firm. The limb appeared bent; the projection was on its anterior surface at the seat of the fracture; the lower portion of the leg and foot were turned outwards. This malconformation must have impeded his walking, which might also have tended to increase the deformity. We therefore endeavored to correct it; and in order to effect this end, I made use of the bandage I usually apply in fracture of the fibula with deviation of the foot backwards. First making moderate attempts at reduction, a large pad folded like a wedge was placed over the whole posterior part of the leg, so that the edge corresponded to the hollow of the ham and the base rested on the heel; above that a stiff splint of the same length was applied. The whole was fastened below the knee by several turns of a roller. A little pad was placed on the projection formed by the lower extremity of the upper fragment, and several turns of a roller passed around this last pad, the limb, the large pad and splint. This last part of the apparatus, the only one which acted in reality, tended by the same action to push the upper fragment backward and the lower forward. The limb was laid on its exterior surface, in a demi-flexed position, in order to relax the extensor muscles of the foot, which were the principal agents in the displacement. The apparatus was carefully watched, and in the beginning tightened every three or four days, then less frequently; the patient wore it twenty-eight days, at the end of which time the limb had recovered its natural shape. Ten days afterwards, the patient began to walk with crutches, afterwards without any support. The stiffness which existed around the joint gradually disappeared, and the patient left the hospital on the 25th of November, perfectly cured. Four months had elapsed since the accident.

The case just detailed leaves no doubt as to the possibility of making the

callus yield, without danger, even after some time. Now comes the question, until what period will the callus yield? Here, only a mean term can be given as an answer; for many general and individual circumstances must be remembered, such as the age, state of health or disease, the particular bone, and kind of fracture. The displacement may occur in the length of the bone, in its direction, circumference or thickness. Displacement according to its direction requires most attention, because it occurs most frequently, and its callus can be made to yield more easily, and at a more advanced period. This displacement takes place when the patient leans on his limb, or wishes to use it when the callus has not acquired sufficient firmness, when during the treatment the limb has not been equally supported throughout, and has partly yielded to the forces acting upon it.

Applying these principles to facts resulting from our experiments on living animals, and examinations of persons who have died at different periods of fractures, we may infer that it is generally possible to make the callus yield until the sixtieth day.

Many plans have been adopted to effect this purpose; the following five are the principal; 1st, *The rupture of the Callus*. It has been proposed to reduce the angular canal, by breaking it like a stick, or striking upon the point of union a sudden and sufficiently powerful blow. Pathological anatomy has proved the absurdity of this method, and the knowledge of the provisory callus proves that there is less question of rupturing a hard and compact substance than of making a very elastic body give way. 2d, *Permanent extension*. This is effected by the usual apparatus; and when there is overlapping and the callus is still provisory, it is the most rational plan. 3d, *Compression*. This is principally used in angular displacements; it is effected by ordinary splints or divers mechanical means. Its employment is also limited to the first stages of callus. It is the method used in Germany, but mercurial frictions are there added to it. 4th, *Section of the Callus*. This consists in exposing the callus and dividing it with a saw or chisel. It is the only plan to remedy the promiscuous consolidation of the bones of the fore-arm. Lastly, the *Seton*, known by the name of Weinhold's operation. Here it is indispensable before attempting any thing, to understand perfectly the displacement experienced by the fragments, as well as the causes which have produced and kept it up. When this point is ascertained, it is much easier to determine the direction in which the fragments should be carried, and calculate the degree of force necessary to overcome the resistance of the callus, as well as the natural resistance of the agents of the displacement.

The surgeon should always make the first attempt, conformable to the general rules for extension, counter extension and coaptation. The limb should be placed in a demi-flexed position, and the muscles relaxed as much as possible. The extension should be increased until too great resistance or pain indicate its cessation. We can thus generally succeed, on the first attempt, in making the callus yield and the deformity partly disappear without much additional pain to the patient. After these attempts have been made, we must keep the effects produced, and even augment them by means of suitable apparatus.

Let us suppose a projection formed by the end of one or two fragments; the limb is placed between two inflexible plans, compressing it in opposite

directions; the projecting points therefore have a tendency to be restored to a level with the rest of the bone. If the projection be increased by some pads, graduated compresses, leaving an empty space opposite, much more marked effects might be obtained, and even a deformity in the contrary direction. We may attain the end, without acting on the seat of fractures by using the lower fragment as a lever. By traction exercised on its lower extremity, it is made to execute a see-saw movement by which its fractured extremity, carried in an opposite direction, may be restored and kept in its natural relation with the upper fragment.

CASE II.—*Fracture of both Bones of the Leg, with lateral deviation, straightened on the 29th day.*—L . . . . , 27 years of age, threw himself from a third story window into the street, and was unable to rise or walk. Acute pain, swelling and ecchymosis took place in the leg. Cataplasms and resolvent applications were the only remedies used for 28 days, when his parents brought him to the Hotel-Dieu, on the 14th of February, 1820.

The patient was then in the following condition; the left foot much turned outwards; the leg appeared to be formed of two parts, joined a little below its middle, at an angle of about  $45^{\circ}$ , the apex of the angle turned inwards. It was evident that both bones of the leg were fractured; but union had already begun to take place. The next morning without any previous attempt at reduction, I applied the internal lateral apparatus for fracture of the fibula, acting in a direction exactly opposite to the displacement. As the bandage was tightened, the leg insensibly became more straight, but we were obliged to desist on account of the great pain he suffered. The leg was laid on its outer surface, the pain ceased, and the apparatus was left. On the 40th day the limb was firm, and of a natural shape; a little swelling still existed around the ankle joint. On the 56th day the patient left the hospital: could walk well, and it would have been difficult to say which was the injured limb.

CASE III.—*Fracture of the Radius with deviation towards the Radial Side, reduced on the 25th day.*—Madame L . . . . , 69 years of age, fell on the 15th of November 1821, upon the pavement. The palm of the left hand received all the force of the fall. She felt acute pain in the wrist of that side, and swelling soon came on; but the patient supposing it to be merely a sprain, consulted no one, and merely used emollient applications to the seat of pain. Notwithstanding the assiduous use of these remedies, she perceived that her wrist was daily becoming more deformed, and that its motions, far from improving, were more embarrassed. She therefore entered the Hotel-Dieu on the 11th of December 1821. The following deformity was then observed: the hand was strongly abducted, with a depression at the inferior extremity of the radius; the movements of pronation and supination were very painful and almost impossible. The next morning (25th day of the accident) I discovered a fracture of the lower extremity of the radius, and was of opinion that, notwithstanding the length of time elapsed since the fall, the limb might be restored to its natural shape. In order to effect this, an assistant held the fore-arm at its upper part to make counter-extension. Taking hold of the hand of the same side, I endeavored to give it a direction contrary to that caused by the fracture, that is, to bring it to adduction. The fragments of the fracture were thus carried outwards, the interosseous space increased, and the depression entirely disappeared. The remaining indications were easily

fulfilled. The limb was merely to be maintained in its proper direction during the time necessary for consolidation. The usual apparatus for fracture of the fore-arm was applied with the addition of the ulnar splint. The parts were by these means kept in a proper position. The apparatus was not removed until the 10th day, and re-applied on the 20th, the limb retaining its natural conformation. On the 32d day the callus was thought to be sufficiently solid to admit of its final removal. The patient left the house on the 17th of January. All deformity had disappeared, the consolidation was perfect.

It may be easily understood, that it is always necessary to give to the first dressing a degree of constriction greater than in cases of recent fracture; the state of the limb should be carefully attended to. If great pain and swelling take place, if the heat and sensibility diminish in the parts not comprised in the apparatus it is a proof that it is too tight, and should be immediately loosened. Even when no bad symptom arises, the apparatus is to be removed on the third or fourth day to examine the limb, and make new attempts at reduction. As long as the deformity is not completely corrected, this should be done every three or four days. The bandage maintaining what has been gained each time, we can gradually restore to the limb its natural conformation. In cases of shortening we can only use a simple retentive bandage, when the patient cannot bear extension. This extension, however, must not be too long continued for the consolidation would be prevented from taking place.

When the parts are brought to their natural shape, we have only to follow the ordinary rules for the treatment of fractures. Many authors have supposed that the duration of the treatment should be short, because an old fracture is sooner cured than a recent one. Admitting the possibility of this fact in a great number of cases, I think it much more prudent, especially when the deformity is considerable, to prolong the treatment, at least as long as for a recent fracture.\*

## CHAPTER XLIII.

### ON FRACTURES OF THE LOWER EXTREMITY OF THE RADIUS SIMULATING LUXATIONS OF THE WRIST.

All writers on the subject of luxations of the wrist have described four species. The only difference to be observed between them, is in point of number. We must go back as far as T. L. Petit, to find rational ideas on the melancholy consequences of pretended luxations of the wrist negligently treated, and on the proper treatment in these cases. Ponteau, in a chapter on fractures of the fore-arm, in consequence of falls, has this remarkable passage. "These fractures are generally mistaken for sprains, for incomplete luxations, or a separation of the ulna or radius at their junction at the wrist." Desault also published some cases of fracture of the lower extremity

\* See the excellent works of M. M. Breschet, Sauson, Couveilhier, and Villermé on Callus.

of the radius; and observed that they were *sometimes* mistaken by inattentive surgeons for luxations of the bone. The observations of these surgeons should have thrown some light on this obscure point; but M. M. Richeraud, Boyer, Delpech, Leveille, Monteggin, Sam. Cooper, and all our dictionaries of medicine, have adopted the same error, unanimously recognised the four luxations of the wrist, given their symptoms and treatment. For a long time, however, I have publicly announced in my lectures, that these fractures are very common, that I had always seen these pretended luxations of the wrist changed into solutions of continuity, and that our records, despite of so many descriptions, do not afford a well marked case of this injury. I have also dissected wrists, and never found a luxation in consequence of a fall upon the palm of the hand: the only ones I have ever met with were consecutive to disease of the joint or symptomatic of other lesions.

I now propose to give a history of the injury, but in a question which has been the subject of so many contradictions, and in which so much erudition has been displayed, let us see if the facts collected be favorable to our doctrine, and commence with the anatomy of the parts.

Three principal articulations demand our attention: the inferior radio-ulnar; the radio-carpal, and medio-carpo-metacarpal.

The articulation of the radius and ulna present a movement of rotation effected by the radius, in which is a cavity of a quarter of a circle, occupied by the head of the ulna presenting a wounded surface about equal to half a circle. The pronation and supination of the hand are therefore limited to a quarter of a circle, but the looseness of the ligaments and synovial membrane which extends somewhat farther than the articular cartilages, makes this motion about equal to two-thirds of a semi-circle. If at first sight it appear more extensive, we must remember the rotation of the humerus in the glenoid cavity, and even a slight movement of the scapula; all these united make the complete rotation of the hand nearly equal to three quarters of a circle.

The skeleton of the radio-carpal articulation demands an attentive examination. The inferior extremity of the radius, thickened and enlarged, constitutes nearly three fourths of it. With the exception of some partial cristæ which limit the excavations of the tendons, the epiphysis of the radius rests behind, nearly on the same plane as the body of the bone, and does not project remarkably: outside, the projection is two or three lines in length, in the form of a pyramid, with four faces: this is the styloid process which is always found at the extremity of the great diameter of the wrist.

The anterior surface is more remarkable. The epiphysis enlarging, is carried so much forward, that it there forms a transverse crest, or spine, projecting more than four lines above the plane of the body of the bone. Below this crest is a rough surface inclining backwards, at most a line in height on the inside: extended on the outside nearly half an inch to the apex of the styloid process. To all this surface is attached the anterior capsular ligament, from which insertion may be imagined its thickness and strength.

On the lower surface of the epiphysis is the glenoid cavity of the radius, narrowed in front and behind by the insertion of the ligaments presenting an irregularly triangular shape, of which the apex directed outwards terminates at the point of the styloid apophysis. It therefore presents a great obliquity from without inwards, its outer extremity descending four lines lower than

the inner one. From all this it follows that if we let fall the axis of the body of the radius upon this cavity, that it will be divided into two very unequal parts; the posterior forming scarcely one fourth, and the anterior three fourths, and which in a full perpendicular to the radius would have as a support merely the portion of the epiphysis projecting in front of the body of the bone. This disposition will explain the frequency of fractures in the vicinity of the joint.

The ulna has no immediate share in the radio-carpal articulation: it is separated from it by a triangular ligament whose apex inserted into the centre of the semi-circle presented by the articular surface of the ulna, is always, whatever may be the relations of the two bones, at an equal distance from the radius, and consequently never in a state of tension, nor relaxation. By this very simple mechanism, the articular surface which receives the bones of the carpus is never altered, neither in smoothness nor extent.

The extremity of the ulna presents different aspects according to the movements of the radius. What is called the small head or articular portion of the ulna, forms a thick rounded projection, extending three or four lines beyond the plane of the body of the bone, and situated on the side opposite to the styloid apophysis. When the fore-arm is in forced pronation, this projection looks backwards, and elevates the skin covering it; the styloid apophysis looks somewhat forward; the anterior surface of the bone is nearly plane. When there is complete supination, the head of the bone projects forward, the styloid process is turned completely backwards; lastly in the medium position the styloid process is turned outwards at the extremity of the great diameter of the articulation, exactly opposite to the styloid process of the radius.

Two important circumstances result from this; that which is called the ulnar malleolus is not always represented by the same osseous projection, like the radial malleolus; secondly, that the great diameter of the joint is subject to remarkable variations.

We can hence infer the degree of confidence to be reposed in the symptom given by Ponteau, as characteristic of fracture of the radius or ulna; the increase of the articular diameter. In order to judge if it be really increased the joint must be placed in the medium position; we then find that a fracture, at a half inch or inch above the joint, may by the approximation of the inferior fragment, separate sufficiently the styloid processes to add to the great diameter two lines; but to effect this the inter-articular ligament must be divided. In proportion as the fracture is seated higher up, the separation is less; at the inferior third of the bone it is not more than half a line.

There is another important feature which I never have seen published; that when the diameter of the fore-arm at the wrist is larger than ordinary, without any morbid affection, the understanding is almost invariably weak and obtuse.

Three bones of the carpus, the semi-lunar, pyramidal and scaphoid, united firmly together, articulate with the radius and inter-articular ligament. There is here a disposition which has been overlooked. The articular surface of the scaphoid and pyramidal occupies nearly two faces, the posterior and superior. Compared with that of the radius it presents one third more in extent. The articular surface of the pyramidal is much narrower, in proportion to the contraction of the surface of the inter-articular ligament. We

may, therefore, a priori, infer that this articulation only serves inflexion backwards. And that this flexion is greater towards the side of the radius than that of the ulna. Now this is in fact the case. Dissect this articulation with its ligaments; the anterior surface of the radius and the first row of the carpus form a smooth plane, and the flexion of the bones of the carpus in this direction is nearly null. Behind, on the contrary, the motion is so extensive that the radius covers nearly the whole of the first row, and almost touches the bones of the second. In fact, and it may be examined on one's own hand, flexion backwards is much more extended on the side of the thumb than on that of the little finger. This is caused by the disposition of the muscles: the extensors of the carpus, thumb, and index finger, have an oblique direction which precisely corresponds to the obliquity of the flexion; they draw the radial side of the hand backwards and slightly inwards. The number and strength of these muscles diminish as we proceed towards the ulnar side of the hand; the thumb has three; the index, two proper to it; the middle finger, one; the ring finger only its share of the extensor communis; the little finger has indeed an extensor peculiar to it, but very delicate; and its metacarpal muscle, the flexor carpi ulnaris, tends as much to adduction as to extension.

By means of a remarkable mechanism, the movements of the second row of the carpus, which may be called *medio-carpal*, are totally opposite to those of the former. The three first bones of the carpus present on their internal surface a deep cavity, representing the external three fourths of their articular surface. The internal fourth is an oblong, slightly convex surface. The second row presents outwardly, an articulating head formed by the os magnum and the unciform, inwardly a surface hardly concave. When the hand is extended in a right line with the fore-arm, the second row bears such a relation to the first, that they cannot be flexed backwards on each other. On the contrary, they are readily flexed forwards. But the flexion is not every where equal; it is evident that the plane arthrosis of the internal side cannot have an extent of motion equal to the external enarthrosis. Thus the flexion forwards is most complete on the side of the little finger; there is there also a very strong muscle the flexor carpi ulnaris, which is attached to the unciform bone, through the medium of the pisiform, in the same manner as the triceps suræ acts upon the tibia through the intervention of the patella.

It may thus be seen how inexact are the terms flexion and extension as applied to the hand. Compare the two angles: flexion backwards is equal to flexion forwards. In order to give more precision to the expression, we must admit the first row of the carpus as forming a particular portion of the *wrist* properly so called. The second row, united to the metacarpus, notwithstanding a very limited motion, may be considered as an isolated portion, a simple lever called the *hand*. The wrist is flexed backwards and extended in a right line upon the fore-arm; the hand is flexed forward on the wrist and extended in the same direction as this last. It certainly will not be denied that the hand is flexed backward on account of the flexion of the wrist, and that this circumstance may cause some confusion; the same effect is found in other joints; and without leaving our subject, the rotation of the humerus doubles the extent of the pronation or supination at the fore-arm, without the action of either being confounded with the other.

Thus, the precise movements of each articulation are, flexion of the wrist

backwards and a little inwards ; flexion of the hand forwards and a little outwards. To these must be added the movements of adduction and abduction. The former seems to take place more particularly in the wrist ; the second in the hand ; unless by a premeditated effort, before flexing the hand, the palm looks somewhat towards the radius and the little finger towards the ulna ; the contrary takes place in flexion of the wrist, so that the motion peculiar to each of these articulations is triple, made up of flexion, inclination or rotation of the hand, and lastly of adduction or abduction. We must not consider as nothing the movements of the partial articulations of the bones of the carpus with each other, and even with the metacarpus ; they may increase the effect, but are nevertheless of secondary importance.

These different articulations are revealed externally by different folds which it is useful to be acquainted with, both in amputations and the diagnosis of fractures and luxations. On the anterior surface, a transverse line which is never wanting, indicates the enarthrosis of the medio-carpal articulation. Below this line the hand is divided into the thenar and hypo-thenar eminences ; above is the wrist. It must be observed that when the wrist is flexed these eminences are on the same plane as the fore-arm ; when the hand is extended in a right line, they project several lines. The other folds of this surface, generally two in number, are less constant ; sometimes the middle one answers to the radio-carpal articulation, and the upper to the transverse crest or spine of the radius. On the posterior surface they are less marked, we can only distinctly perceive that making the inter-articular radio-carpal line.

These preliminary notions on the articulations of the wrist, indispensable to the proper understanding of the displacement of the articular surfaces, require for their perfection, a review of the numerous points of resemblance presented by a parallel of the superior and inferior extremities. One of the first is the analogy of fractures of the inferior extremity of the radius, with those of the tibio-tarsal articulation. This analogy of relation in a pathological view becomes equally striking on a comparison of the upper and lower extremities. The counterpart of the scapula is the os innominatum. The arm and elbow correspond to the thigh and knee, with this slight difference ; the olecranon is continuous with the ulna, whilst the patella, analogous to it, is held in its place by ligaments. The fore-arm and leg resemble each other strongly, but here the difference is more forcibly marked. In the fore-arm the bones have less strength, length, and size, than in the leg, because the former are organs of motion, the latter of resistance. Thus the bones of the fore-arm require more flexibility ; they are separated by very moveable articular intervals, intended to favor the movements of pronation and supination. In the leg these articulations are solid, because the different movements do not exist. Lastly, the bones of the fore-arm have their small extremities placed in contrary directions ; it is not so in the leg, the tibia is the principal support of the thigh and foot, and is merely aided by the fibula at its lower portion. Thus when a patient falls on his foot, the shock is borne by the tibia, which may be crushed without injury to the fibula. If the external violence bear on the upper part of the tibia, the fibula suffers no change. But, it will be said, the fibula is often fractured ; this is true, but it occurs only when the foreign body infringes directly on the bone, or when the foot is forcibly twisted outwards or inwards.

Having established these differences and analogies, let us examine the consequences of the disposition of the bones of the fore-arm. Let us suppose that a man in walking meets a large stone or some obstacle (as generally happens) the point of the foot rests on the ground, the impetus is arrested below and continued above; equilibrium is lost and the individual falls. What then happens? the hands are instinctively thrown forward to preserve the face from the effects of the blow. If the articulations are demi-flexed the force of the fall is somewhat lost; but if they are in a state of tension, the force of the fall multiplied by the rapidity of it, bears upon the bones. Two things may then happen; the individual may have fallen upon the ends of the fingers and injured them more or less; but as the fingers are weak, they yield easily and transmit to the carpus and metacarpus the force of the blow, which is lost in the numerous movable articulations composing these parts. Sometimes however the phalanges and bones of the metacarpus are fractured. But if, instead of falling on the fingers, the fall is spent on the wrist, a different accident occurs; sometimes the upper part of the arm is luxated; sometimes the elbow is carried backwards; but generally there is fracture of the lower end of the radius: why? because of the two bones of the fore-arm, one, the radius, is large and contiguous to the bones of the carpus, and the other, the ulna, is feeble and not immediately articulated with the carpus. It follows that in a fall the force is spent on the body offering most resistance; now the radius, or as it has been called, the *manubrium manus* presents this disposition; it is the principal support of the hand: with it nearly solely is articulated the posterior face of the first row of the carpus; its inferior extremity supports the blow; upon it is spent by contre-coup the violence resulting from a fall on the anterior part of the wrist; it is therefore not astonishing that fracture should occur in this part. But it will be asked why does that large bone offer no resistance? because there is no part of the body which is not fractured in a fall where the velocity is multiplied by the weight of the body; add to this the spongy and soft structure of the lower part of the radius, and that it is the point of concentration of all the violence of the blow.

To the reasons just given explaining the frequency of fracture of the lower part of the radius, we may add others drawn from the surgical disposition of the organ. In examining the structure of the soft parts, it will be seen that it is not the ligaments which oppose the displacement forward of the articular surfaces, but the tendons of the flexors, deprived of fleshy parts, and reduced to the fibrous tissue which composes them. These tendons pass under the anterior carpal ligament. They then create so much resistance, that falls multiplied by the velocity and weight of the body cannot rupture them; the hand, in this movement, is forcibly extended, and the tendons applied to the anterior part of the joint uniting the carpus to the fore-arm. If the extension is more considerable the parts are applied more firmly to the articulation and their resistance is incalculable. I do not think a force of two thousand pounds could overcome it; this is not exaggerated, for it will suffice to remember the power of the tendon Achillis.

Luxation backward from falls on the dorsal surface of the hand is not less prevented by the tendons of the extensors. These are in the same situation as the flexors; they have, indeed, less resistance, but still present considerable, kept as they are in their sheaths by the posterior carpal ligament

In short the impossibility or extreme rarity of luxations forward and backward is owing to the resistance of the flexor and extensor tendons.

I have said that I had never seen a luxation of the wrist, and that fractures of the radius were very common; the following facts, from the records of the Hotel-Dieu will place this beyond doubt. In 1829, of one hundred and nine fractures treated in the hospital, twenty-three were of the fore-arm, viz, sixteen of the radius, two of the ulna, five of both bones. In 1830, of ninety-seven, twenty-two were of the fore-arm, sixteen of the radius alone, two of the ulna, four of both bones. Fractures of the lower extremity of the radius occur at all ages; the fourteen fractures in 1830 were between the ages of eight and eighty-eight years; both sexes are equally liable. An interesting question is, which side is most frequently affected? In the preceding cases there were nine fractures of the right radius for seven of the left; out of ninety-seven cases fifty-nine belonged to the right side. It may be observed that fractures, in general, occur more frequently on the right than on the left side.

As regards the causes, three were produced by falls on the back of the hand: the remaining eleven by falls on the palm. This result destroys the inference drawn by M. Cruveilhier, that fractures appear impossible in falls on the back of the hand. The opinion of Ponteau, that the fracture resulted from the convulsive contraction of the pronator muscles, does not merit serious refutation.

We have now seen why these fractures are so common. Let us now examine the seat of the lesion. The observations which we have been enabled to make have proved to us that they may affect different points of the inferior extremity of the radius; most frequently they happen very near the wrist joint. In young subjects, the separation of the epiphysis is more common than the fracture.

The fracture may occur transversely or obliquely, at three, six lines or an inch from the articular surface. The consecutive displacement will the more resemble a luxation as it approaches nearer to this surface: in some cases I have seen a comminuted fracture, or kind of crushing of the articular portion of the radius.

Many fractures, by radiating, may then be observed on this part of the bone. The injury requires a long time to cure; there is often considerable swelling of the lower extremity of the fore-arm, difficulty of motion, deformity. Generally, fractures of the inferior extremity of the radius have an oblique direction from above downwards, and from the dorsal to the palmar surface. They may, however, occur in the opposite direction. We shall hereafter see how the displacement of the fragments is effected.

Hitherto, we have merely spoken of fractures occurring from contre-coup by falls on the palm of the hand; they may take place from falls on the back of the hand, as has been seen above; this is very rare; there are, nevertheless, some cases of it, and it will be seen that the blow falls upon the first row of the carpus, and through it in a direct line on the radius.

Before we had made known the frequency of these fractures, and changed the opinions established on this point, some one must naturally have asked himself, What is the nature of this injury? By some it was considered as a sprain, by others a diastasis or separation. M. Boyer classed it among

luxations. We have shown how much this view is opposed to facts, and will merely add that we cannot understand how the swelling of the soft parts in consequence of contusion or sprain, could make the head of the ulna project, and throw the hand towards the dorsal face and one of the edges of the forearm, whilst fracture, by giving a vicious direction to the inferior extremity of the radius, explains this deviation of the hand. A fall on the anterior surface of the wrist may produce a simple contusion of the articulation, and great distension of the anterior ligaments, uniting the carpus to the radius and ulna; but there is a vast difference between that and our present subject.

Let us consider for a few moments the two first opinions; I mean diastasis and sprain. A single word will suffice for the first: no external power can separate the radius and ulna, so as to produce diastasis. As to sprain, it demands a closer investigation because it is intimately connected with fractures of the lower extremity of the radius. It is in reality the first effect of the causes producing these fractures; and by admitting what does not appear to me to be true, the luxation of this bone, the sprain would still be the first effect.

When an individual falls upon the thenar or hypothenar eminences, and fracture of the radius does not take place, it may produce tension of the ligaments of the anterior part of the carpus; these ligaments are numerous, but as we have seen, without much strength, being supplied with fibres from the flexor tendons. The tension of the ligaments frequently causes acute pain, which forces the patient to seek the aid of a surgeon. At a later period there appears a swelling in front when the wrist has been forced backward. If the fall has taken place on the dorsal surface, the tension of the ligaments, pain, tumefaction, redness and difficulty of motion occur on the posterior part of the wrist. Here, as in sprains of the ankle, the symptoms appear on the side opposite to that to which the limb was carried. The sprain may take place in another direction, as, for example, in a fall on the ulnar edge, the tension is outside and the sprain external: in a fall on the radial edge, it is internal.

Sprains forward and backward are the most common and serious. The pain is generally transient; but it is often followed by tension and inflammation which may cause suppuration in the sheaths of the tendons between the vessels. The danger of inflammation may be conceived, as it is almost always complicated with strangulation; but suppuration is much more serious on account of its depth and situation.

This affection does not appear under merely an acute form; it may give rise to phenomena of a chronic nature; and to this last class belong especially white swellings (*tumeurs blanches*). Examine, in fact, the diseases of the joints called by this name, and you will find that the majority of them have as a primary cause the tension of the ligaments. A scrofulous constitution tends especially to their production. Since sprains whether acute or chronic have such serious consequences, they should be attended to as soon as possible. Should much pain exist, bleed, apply leeches, surround the part with resolvents of a sedative nature; the solution of sugar of lead is excellent. This pain yields easily to time and remedies, and the patient deceived by this circumstance hastens to use his limb. This error is productive of serious consequences, for it is the almost infallible cause of those chronic inflammations and white swellings for which we have so often to amputate the limb. When

the pain has ceased, it is prudent to place the articulation beyond the power of motion, by exercising proper compression around it, in short, by treating it like a fracture of the extremity of the radius. Should the inflammatory symptoms re-appear we must have recourse to antiphlogistics.

If the inflammation has passed into the chronic state, we must have recourse to flying blisters, cauteries, moxas, and the means of determining the inflammation to the skin. Absolute rest is indispensable.

Generally fractures of the lower extremity of the radius are simple, they are, however, sometimes compound. In some rare cases, the radius has been fractured, the ulna luxated and driven through the integuments.

*CASE.—Double Fracture of the Radius ; Luxation of the Ulna inwards with rupture of the Integuments ; Resection at the end of eighth months ; Incomplete Cure.*—B . . . . , 62 years of age, came into the hospital, on the 27th of February, 1832. On the previous evening, she made a false step, and fell down a flight of 60 steps ; she could not tell how the fore-arm had met the floor. The ulna projected outside. The left fore-arm was deformed near the wrist, and presented a re-entering angle on the radial side ; the radius was fractured in two places, at an inch above the joint, and at an inch and a half above the first fracture. On the inside there was a longitudinal wound along the edge of the ulna, about four inches in length with regular edges, as if it had been made by a cutting instrument. The ulna luxated inwards, projected considerably ; more than an inch of the bone was beyond the integuments. The internal lateral ligament had been broken, the muscles and other soft parts were more or less lacerated and contused : the hand and part of the fore-arm were very much swollen.

On seeing the case, M. Breschet proposed amputation, but the patient positively refusing, he resolved upon the resection of the ulna, which was done immediately and in the following manner ; the hand and wrist being carried outwards, the ulna was drawn inwards. The surgeon separated it with the bistoury from the soft parts which still adhered to it, and having passed a piece of pasteboard beneath, with a saw held obliquely he removed about one inch and a half of the end of the bone. No vessel was wounded, the fore-arm was restored to its natural position, simple dressings applied, and it was fixed on a splint. (Strict diet ; diluent drinks.)

The first dressing was left untouched for four days ; at this period, suppuration of a healthy aspect was found to have taken place. A sero-sanguinolent discharge which had saturated the dressing, had tended to diminish the swelling.

Three days afterwards, it was again dressed. The wound was of a fine red color, but the suppuration not abundant, and some portions of gangrenous soft parts were about separating. It was therefore decided to dress it every day. In order to prevent the displacement of the radius, some graduated compresses were applied on the radial side. Its fragments were movable upon each other.

All went on well for a few days, the pain was bearable and only returned at intervals, when on the 9th of March a swelling of the back of the hand was perceived ; and on examination manifest fluctuation was felt. An incision caused the discharge of about two spoonsful of healthy pus ; a poultice was applied. We had then two wounds discharging pus. The first appearing to

communicate with an abscess surrounding the fragments of the radius, the arm was placed in a position to make the ulna wound the most depending portion. Thus passed several days, without any bad symptom except an obstinate diarrhœa, which diet, enemata, and rice water, could not entirely arrest. On the 24th of March the whole fore-arm as far as the elbow was red, tense, swollen, and presenting some points of fluctuation. Several small incisions were made on its dorsal surface, and in a few days it was restored to its natural size.

With time, the diarrhœa ceased, the ulnar wound diminished and discharged less purulent matter; the incision on the back of the hand was reduced to a small opening which scarcely suppurated. On the 10th of April, new tumefaction and abscess on the dorsal face of the fore-arm. Incisions, simple dressings, and poultices. In three days the swelling disappeared, the general health improved, light nourishment was allowed. 25th. Another general swelling of the fore-arm with increased suppuration of all the openings of the parts. This new attack yielded to cataplasms, without creating abscesses, and from that time the patient began to improve: on the 10th of May the wound of the back of the hand and that of the ulna were reduced to fistulous points. The suppuration of the other abscesses began to diminish, the fragments of the radius were rapidly uniting, the patient could move the fore-arm without pain, the fingers were capable of some motion, the appetite was restored, she sat up for several hours during the day. With these alternations of better and worse, less serious as they were remote from the time of the accident, the patient spent the months of May, June, July, and August, in the hospital. She left on the 25th of August. The wounds of the inferior and inner parts of the wrist were not yet closed.

In a short time the wounds healed, and then re-opened: and on the 17th of November 1832, there were two fistulous openings near the wrist and on the inside of the fore-arm, giving exit to a small quantity of pus. The ulna was found exposed, and exfoliation threatened. The fore-arm deformed, covered with cicatrices, had lost an inch of its length. Supination and pronation were entirely destroyed. The fingers extended by the treatment were stiff and could not be bent; flexion of the hand was also lost. A slight mobility of the radio-carpal articulation, gave a faint hope of some slight restoration of flexion. The skin of the fingers was so tender, that they were obliged to be separated by compresses to prevent their adhesion, and the fore-arm supported by a scarf.

CASE II.—The subject of this case was an adult woman, of whose previous history no information could be obtained. The fore-arm appeared much shorter than natural; the inferior extremities of the radius and ulna caused a considerable projection of the skin; that of the radius was less prominent and did not descend as low as that of the ulna. The upper extremity of the carpus was on a plane superior and anterior to that of the lower extremity of the bones of the fore-arm. The hand formed a right angle with the fore-arm, and also inclined towards the radius, so much so that they could be brought into contact on their external side. Extension was impossible; flexion could be carried much further than a right angle.

On dissection, M. Cruveilhier found, 1st, all the muscles of the arm atrophied, but principally the radial and ulnar muscles peculiar to the articulation of the wrist, and the pronators and supinators, muscles peculiar to the

radio-ulna articulations. The tendons of the posterior radial, and the common and proper extensions were received in a deep groove wrought on the posterior face of the inferior extremity of the radius, interrupted at this bony groove to which they intimately adhered. The posterior ulna was reflected at a right angle over the ulna and inserted into the fifth metacarpal bone. The anterior ulna atrophied was inserted into the pisiform bone.

2d. The carpus presented a remarkable malformation. The bones of the anti-brachial row were reduced to the state of rudiments, and lost their shape and size. The pisiform alone had undergone no change. The corresponding surfaces of the bones of the 2d row were changed; there existed mere rudiments of the os magnum and os unisforme; the upper half of the trapezium and trapezoides corresponding to the scaphoid was much diminished. The ulnar but little changed, extended five or six lines below the extremity of the radius. Above its inferior extremity, at a height corresponding to the extremity of the radius, a deep excavation existed to receive an articular process of this last bone. It was united to the pyramidal bone by means of an extremely long ligament which allowed the hand to be strongly inclined towards the radial side of the fore-arm. 3d. The radius was shortened and deformed. The deformity was principally at its lower extremity which was large, as it were crushed; deeply grooved posteriorly in order to accommodate the combined tendons of the extensor muscles. There was a sort of transposition of the articular face of the radius, which occupied the outer side of this extremity; a projecting apophysis on the internal side, articulating with the ulna. Lastly, the body of the radius was larger than natural, its lines of insertion and processes more projecting; its upper extremity, instead of being hollowed to receive the small head of the humerus, was convex. The possibility of fracture of the lower extremity of the radius, being now beyond a doubt, let us examine by what signs it may be recognised. On the instant that an individual falls on the anterior surface of the hand, he ordinarily perceives the sensation of a crackling about the wrist; acute pain follows; the wrist, lower part of the fore-arm and hand soon become swollen. An attentive examination of the part shows more or less pronounced projection of the ulna. If the fracture is seated at a quarter of an inch, a half inch or more from the radio-carpal articulation, the superior fragment or fragments lean towards the palmar face of the fore-arm; the carpus and inferior fragment are directed backwards: these are the projections which give rise to the idea of luxations. A second displacement soon follows this primary one; the wrist leans towards the inside of the fore-arm, the interosseous space is diminished and even destroyed, and consequently, when the injury has been mistaken the movements of pronation and supination; whenever there is fracture of the lower extremity of the radius, a greater or less depression is observed on the radial side, at the supposed point of fracture. On examining the extent of the transverse diameter of the anterior face of the fore-arm of the sound side, it is found greater than that of the injured side, whilst the dorso-palmar diameter of this same side is somewhat increased. Crepitation is distinct.

By extension and counter extension the deformity easily and instantly disappears, but recurs on a cessation of the efforts. To these different signs must be added the displacement of the styloid process of the radius, the

remarkable swelling of the anterior part of the fore-arm, the flexion of the fingers, the difficulty of moving the hand, a pain which has its precise seat, not in the wrist joint, but at the inferior extremity of the radius, and which increases on pressure at this spot: whilst the movements of the radio-carpal articulation do not influence it in the least. Below the head of the ulna is another painful spot owing to the tension of the internal ligament of the wrist joint.

These symptoms of fracture are not always found combined; in a majority of cases, they are not well marked. Sometimes, on the contrary, there are some more pronounced; thus the fracture may be transverse and the displacement, in the direction of the thickness of the bone, may be considerable; the hand and inferior fragment are then carried backwards. The same thing occurs if there be separation of the epiphysis instead of a fracture.

The displacement of the fragments demands our attention; it may take place in the direction of the thickness or the length of the bone. In the latter direction it affects especially the two fragments which are drawn towards the interosseous space, which explains the diminution of the transverse diameter. External violence assists in effecting this displacement but the pronator muscles contribute powerfully thereunto.

Displacement in the direction of the length is considerable in proportion to the obliquity of the fracture. The violence of the fall, and all the muscles going from the fore-arm to the hand tend to produce it.

Lastly, displacement in the direction of the thickness of the bone, which, as in the preceding case, affects only the lower fragment, takes place from behind forwards in oblique fractures, from above downwards and from before backwards; whilst it occurs in the opposite direction when the fracture is opposite. The muscular action, overlapping, and especially the exertion causing the fracture tend to produce it.

The radius articulating with the hand alone, the latter should accompany the inferior fragment. This is indeed what is seen in consequence of displacement of this fragment; the inferior articular surface of the radius slightly ascends: it leans towards the radial edge of the fore-arm, and most commonly towards the dorsal surface, from which result the abnormal projection of the head of the ulna and the depression of the hand backwards. The hand, however, does not invariably lean towards the radial edge of the fore-arm, on account of the opposition of the internal lateral ligament of the radio carpal articulation, which obliges it to take an oblique direction, and in some cases, incline towards the ulnar edge of the fore-arm. It may sometimes happen that the inferior fragment is thrust from below upwards with so much violence, that the inter-articular fibro-cartilage and the internal ligamentous fibres of the lower radio-ulnar articulation are ruptured.

The *diagnosis* of fractures of the lower extremity of the radius demands our most serious attention; because they have been and are yet often mistaken for a luxation of the carpus backward. It is however highly important not to commit this blunder. The treatment of luxation is very different from that of fracture, and on the proper treatment depends the restoration or loss of certain movements of the fore-arm. The following is a case of this error:

Many years ago, a mason having fallen from a high scaffold, was carried

to the Hotel Dieu. He had several severe injuries, among others, a fracture of the cranium, with an extensive wound of the scalp; there was at the same time a deformity of the wrist joint. Many surgeons thought that there was a luxation backwards of the carpus. I was of the opposite opinion, and declared that there was a fracture of the most inferior part of the fore-arm. The man died from the effects of the fracture of the skull. On examination after death, my opinion was found to be correct. There was a fracture, and the joint was uninjured.

The same thing lately occurred in a Parisian hospital. The surgeon in chief thought there was a luxation of the carpus backwards. The patient died, and a fracture was discovered. The surgeon in chief was M. Majolin, whose skill and integrity are well known.

Among the affections which may be mistaken for luxations, we shall describe the following, of which an account has been given in the Dictionary of Medical Sciences, and which has frequently fallen under our notice.

There is a variety of the radio-carpal articulation which has not been hitherto sufficiently studied by practitioners, and of which workmen in particular trades offer striking examples. It is especially observed in men whose hands are subject to sudden, violent and repeated efforts; such as printers and packers of cloth or any goods in which a press is used. Influenced by these continued efforts, the ligaments of the wrist frequently relax and extend so as to allow the bones more motion than in the natural state. The carpus then ceasing to be solidly fixed to the fore-arm, it yields to the action of the flexor muscles, and is found in front of the lower extremity of the radius and ulna. All the symptoms of luxation are present, but free from pain or inflammation. The only inconvenience is a greater or less deformity and weakness of the part.

When fracture of the lower extremity of the radius has been mistaken for a luxation, or even left to itself, very serious changes take place in the limb; the interosseous space is obliterated; the fore-arm instead of presenting at this point a surface flattened anteriorly and posteriorly, has a cylindrical form; pronation and supination are lost.

When the existence of a fracture is not known, the swelling of the soft parts remains for a long time; the joints remain nearly immovable for a considerable period; in old persons especially this embarrassment of motion is with great difficulty removed. If the fracture be complicated with rupture of the ligaments of the inferior radio-ulnar articulation, the unnatural mobility of the bones upon each other will remain during life.

In order to effect the reduction of the fracture, I remove the arm from the body; the dorsal face of the hand is turned upwards, and the fore-arm demi-flexed on the arm. The assistant who makes counter extension takes hold of the arm at its lower part. Another extends the hand gradually, combining the extension with an inclination of this part towards the ulnar edge of the fore-arm. The surgeon standing on the inside of the limb, compresses with his hand the muscles on both sides of the fore-arm, in the interosseous space; then, acting on the two fragments, he pushes them towards each other in order to remedy the displacement in the direction of the length. The fracture is easily reduced, but it is not always so easy to keep the fragments in proper relation to each other. Having terminated this first stage of the operation, I

apply the ordinary apparatus for fracture of the fore-arm; that is, a graduated compress on each side of the arm, and above that a splint extending on the hand, the whole covered by a roller. This plan combines all advantages, and is infinitely preferable to placing a roller first, or graduated compresses, then the bandage and splint. The bandage in this case by compressing the fragments laterally, destroys the interosseous space which has been restored by the reduction.

A circumstance of which no notice has been taken by writers, and which nevertheless is very important, is presented in fractures of the lower extremity of the radius; it is the tendency of the hand and inferior fragments to incline from the radial edge of the fore-arm. It is remarkable, I observed in my lecture on fracture of the fibula, that in fracture of the inferior extremity of the radius, the same re-entering angle is observed on the side of the fractured bone, and the same salient angle on that of the ulna, and that these angles are, in that case, as in fractures of the fibula, one of the most certain signs of fracture of the radius. If this be not remedied, and union takes place in this position, there is deformity and greater or less embarrassment in the movements of pronation and supination.

This displacement is sometimes so marked, that a considerable projection of the ulna inwards results from it, the bone appears curved, and practitioners have frequently supposed there was luxation of its lower extremity.

At least twenty years since, I remarked the great tendency of the hand to turn inwards in fractures of the radius; but until recently had found no other means of preventing this displacement, than the more accurate application of the ordinary apparatus; but this was insufficient and the displacement was always reproduced.

I then added to this apparatus a splint which I called *ulnar*, formed of an iron blade, about an inch in width, of the length of the fore-arm, and which at its lower extremity was bent in a semi-circular shape. In the concavity of the circle, were several knobs at equal distances. The usual apparatus of fractures of the fore-arm being applied, the upper extremity of the metallic splint was applied against the internal edge of the edge, and between the inner side of the wrist and the point of the convexity of the ulnar splint, compresses frequently doubled were placed in order to separate them from each other. Between the thumb and index finger, another compress was placed having at one end two tapes. These tapes were carried before and behind the hand, over the concavity of the splint, and fastened to one of the knobs. The hand which inclined towards the radial side and was forcibly separated from the splint, tended to approach it; it experienced at the same time an oscillatory movement, by which it leaned more or less towards the ulnar side, according to the height at which the tapes had been tied. The ulna turned inwards, thrust the two fragments of the radius outwards. By this modification of the ordinary apparatus of fractures of the fore-arm, based on the same principles as those which led me to devise an apparatus for fractures of the inferior extremity of the fibula, all possible indications to effect a cure without deformity are fulfilled.

*CASE.—Fracture of the left Radius from a fall on the Palm of the Hand, untreated for Twenty days. Deformed consolidation; Rupture of the Provisory Callus; Cure; Discharged on the twenty-fifth day.—L.... 69 years*

of age, of a good constitution, came into the Hotel-Dieu, on the 11th of December 1820, with fracture of the left radius, near its inferior extremity, produced by a fall on the palm of the hand.

No surgeon had seen the case, the patient supposing it was merely a sprain, had used emollients for twenty days, without much relief.

The pain continued; the deformity instead of disappearing increased daily; motion, instead of being restored, became more and more limited, and if bony union had taken place in this position the movements of pronation and supination would have been lost forever; lastly, the swelling of the limb continued in the most obstinate manner.

On her admission into the Hospital, twenty days after the accident, the limb presented a remarkable deformity; the hand was strongly abducted; there was a deep depression at the lower extremity of the radius at the seat of fracture, the movements of pronation and supination were almost impracticable and very painful.

Notwithstanding the lapse of time since the fall, I thought it would not be impossible by proper means to restore to the limb its natural shape. But, to effect this, the provisory callus must yield to the attempts at reduction.

On the next morning this reduction was tried; an assistant, holding the upper part of the fore-arm, made counter extension. Taking hold of the hand of the same side, I moved it in a direction contrary to that given it by the fracture; that is, brought it gradually into adduction. The callus yielded, the fragments of the fracture were carried outwards, and the interosseous space increased.

Nothing more was now necessary than to preserve the limb in its present natural shape during the time requisite for its consolidation; and in order to effect this, the ordinary apparatus for fracture of the fore-arm was applied; to keep the hand in the direction of adduction, the ulnar splint already spoken of was also applied.

On the 15th of January, she left the Hospital; all deformity having disappeared, the union perfect, and the interosseous space restored, the limb was commencing to be able to execute the different movements of which it is susceptible. (M. Hatin, clinical report of the Hotel-Dieu.)

*CASE.—Fracture of the Inferior Extremity of the Radius, not recognised for twenty-nine days; Union with Deformity, and entire restoration.*—Julius Bechet, 10 years of age, fell, on the 29th of September, 1820, from the branch of a tree, on which he was swinging, a height of about 15 feet. Both hands, knees, and the chin struck the ground, but the palm of the right hand experienced the greater part of the shock; he heard at the same time a cracking noise, but did not know in what part of his body it was produced. A surgeon was immediately called, who having examined the right wrist where the pain was principally situated, said it was merely a sprain, applied some leeches, and surrounded the part with discutient applications. The swelling, pain, and difficulty of motion continuing, and the parents observing, with much uneasiness, that the hand and wrist of their child had not their natural shape, consulted me, on the 28th day. I supposed it to be a fracture of the inferior extremity of the radius. In fact, the hand was no longer in the direction of the fore-arm, but inclined towards the radial side; on the same side, at the distance of half an inch from the styloid process, was felt an angular

depression; and at this point the transverse diameter of the arm was considerably diminished. The fracture appeared united, for neither mobility nor crepitation were present. Relying upon what I had seen, I thought that I could by proper means correct the deformity; this opinion was opposed by another surgeon who declared, that all attempts at reduction would be accompanied with danger. The parents, however, decided in favor of the attempt, and on the next morning (29th day of the accident), I proceeded to the reduction in the following manner: standing on the outside of the patient, who was seated on a chair, whilst assistants made extension and counter extension, I seized and held, with my left hand, the upper part of the fore-arm, carried in pronation, whilst, with the right, I operated on the wrist and drew the hand towards me, so as to straighten it and even carry it towards the ulna; by this plan, a direction contrary to that communicated by the fracture was given to the inferior fragment of the radius. By means of these efforts, continued and without violence, the reduction was effective, the ordinary apparatus for fractures of the fore-arm applied whilst extension and counter extension were kept up, and in addition along the ulnar edge of the fore-arm the iron splint was fastened, by means of which the hand was kept in the direction of the fore-arm and prevented from leaning towards the radius.

The apparatus was removed on the third day, when deformity was found to have nearly entirely disappeared. It was again removed on the 8th day; the conformation of the wrist and fore-arm was perfectly similar to that of the opposite side: the dressing was then reapplied on the 15th, 23d, 30th, and 38th days. At this period every thing being in excellent condition, it was not again used, and in a few weeks the child could use his arm as well as previously to the accident.

Latterly M. Goyraud does not bring the end of the graduated compresses lower than at an inch above the articulation of the wrist, and supplies their place below this point by compresses folded several times so as to form two pads of which the anterior stops above the projection of the palmar region of the hand, whilst the posterior descends as far as is desired on the dorsal face of the metacarpus.

From the foregoing considerations, and the details into which we have gone concerning fractures of the inferior extremity of the radius, we may draw the following conclusions:

1st. Without absolutely denying the possibility of luxation backward of the radio-carpal articulation, although I never have seen it, it may be admitted as excessively rare, and that perhaps it has never existed as a consequence of a fall on the anterior part of the wrist.

2d. That luxations backwards of the carpus on the fore-arm, described as such by authors, were probably only fractures of the radius, situated at a quarter, a half, or even an inch from its inferior extremity, or simultaneous fractures at this same point of the radius and ulna.

3d. That the apparatus for fractures of the fore-arm still used by many surgeons, and consisting of, first, a roller, before or after the compresses, and then in the application of splints, as recommended by many highly esteemed modern surgeons; that this apparatus, I say, is highly improper and in no-wise fulfils the first and most important indication presented by the accident.

4th. That the tendency to displacement inwards so commonly seen in fractures of the radius, and from which result the inclination of the hand, inwards, requires the use of appropriate means to push the fragments outwards and maintain them in a proper relation and situation, and that the best plan is to use, under these circumstances, the ulnar splint.

5th. Lastly, when the fracture has no tendency to displacement, the simple apparatus for fractures of the fore-arm is sufficient, without having recourse to the ulnar splint.

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## CHAPTER XLIV.

### ON AMPUTATIONS.

The diseases requiring amputation of the limbs are numerous; some of them belonging to the bones themselves or to their articulations, and others more especially to the soft parts. As a general principle whenever the injury of the parts is such, that the loss of the limb, at some period, however remote, must follow, or that the symptoms threaten the life of the patient, the surgeon should amputate immediately. But is it proper to apply this principle to each particular case which is met with in practice? Assuredly not; especially when the case is so serious as to remove all doubts as to the propriety of the operation, or when there is still a hope of finding, in the resources of art and nature, some means of snatching the unfortunate patient from the dangers of the injury, without exposing him to those of the mutilation. You have more than once seen cases of organic lesions whose extent and severity appeared to demand instant amputation, and which nevertheless, have been cured without it. But you have also seen others, which, although perhaps less severe, have made us regret not having performed the operation, on account of their fatal termination. Notwithstanding the temerity of the surgeon is frequently justified by success in organic lesions produced by ordinary causes, this is seldom the case in gun-shot wounds (see chapter on gun-shot wounds). I have before said, and let me here repeat it, let us not be deceived by ill founded hopes. Military surgeons were formerly accused of performing too many amputations; but the experience I have acquired principally in 1814-15 and 1830 has convinced me how unjust is this reproach; and I fear not to establish as a principle in compound fractures produced by gun-shot wounds, that by delaying the amputation, more individuals are lost than limbs are saved.

A man was admitted, in 1832, into the Hotel-Dieu, in whom a ball had traversed the elbow joint, broken the olecranon, the inferior portion of the humerus and the superior part of the ulna. Notwithstanding this extensive injury, we endeavored to save the limb. Every thing went on well for the first few days, but on the 9th the patient became much emaciated; the wound, grayish, wan color, presenting a degeneration analogous to hospital gangrene; the pus was unhealthy and the limb was so much agitated as to displace the fractured bones. Three days afterwards diarrhœa came on, then symptoms

of an ataxic fever. Amputation was performed on the 20th, but with little hopes of success; indeed the patient died on the same day. On examination we found a phlebitis of the brachial vein and purulent abscesses in both lungs.

On the 7th of July, 1832, a young man 16 years of age, was admitted into the hospital, who had fallen from a great height upon the floor through the trap-door of a granary.

The bones surrounding the ankle-joint seemed to have been crushed by the force of the fall: the tibio fibular articulation was evidently enlarged: there was a compound fracture of the leg of the same side, with projection of the fragments; the lacerated muscles and cellular tissue came out of the wound which discharged a black blood; so great an injury appeared to demand immediate amputation. Notwithstanding this, relying on the youth and strength, we preferred to trust to the efforts of nature. The different reductions were effected; proper dressings applied; he was bled several times, and leeches applied; a strict diet was ordered, in order to prevent too much inflammation; he had no fever, chill nor swelling of any part, and after a tedious period of uninterrupted progressive amelioration, he was discharged perfectly well.

After numerous examples of similar accidents which had occurred during the preceding month, and which, simplified or not by amputation, terminated fatally, this case suddenly contradicted the fatal prognosis which we might have laid down as a general principle. I have seen fractures less complicated than this require amputation or end in death. I have seen others of the same nature get well; so that the prognosis of this kind of injury is subjected to great uncertainty. How can we explain these opposite results? By difference of organization, undoubtedly, whose cause are unknown, whose symptoms cannot be foreseen, which can be ascertained only by the result. In doubtful cases, the age must undoubtedly be regarded as one of the most important reasons for delaying or hastening the amputation. This case enables me to point out another contra-indication, founded on the prevailing constitution of the atmosphere. Should we decide on an amputation, otherwise rationally indicated, when numerous preceding cases assure us, to almost a certainty, of a fatal result? The maxim of the ancients is here applicable, that it is better to let the patient die than to kill him, and it is prudent to delay the operation, however necessary it may appear.

The fatal influence of the constitution of the atmosphere is not unfrequently felt in large hospitals. In the Val-de-Grace, phlebitis has been known to follow, for a period of two weeks, the most expert venesection; and in the most simple affections, even in the Hotel-Dieu, consecutive phlebitis has, at certain periods, been so frequent, that for a long time we were obliged to lay aside the use of the lancet.

If in general the necessity of the primitive amputation result from the extent of the organic lesions, especially when produced by gun-shot wounds, it may be said that the excess of this extent is itself a contra-indication. The following is a pertinent case; a boy, 17 years of age, carrying a bucket in each hand, after having passed from the roof of one house to that of another, endeavored to enter a narrow dormer window: unfortunately he had only calculated on the breadth of his body, so that on his attempting to pass in, the buckets struck with so much violence against the sides of the window that

he was thrown over backwards. He therefore fell from the 6th story, without any thing to impede his velocity, and struck the ground with his feet, from which arose a most complicated injury. The left heel was dreadfully contused, the calcaneum and bones of the tarsus crushed, the fibular and tibia separated at their articulation, the extremity of the tibia crushed, and the leg fractured at its superior third. The contusion of the right foot was not so great; the leg was fractured at its middle, and the upper fragment of the tibia, stripped of its periosteum, oblique and cutting, projected outwardly. The extreme weakness of the patient did not allow us to bleed him on the first; it was done on the next, but that day he died.

This is certainly one of the most severe cases on record. Still there are examples of individuals having survived in similar circumstances. If the injury here, had been confined to one side, amputation was the only resource. Why was it not performed in this case? Because the situation of the patient was so dangerous and complicated, that it could not have been simplified by an operation, which would therefore have been useless, and consequently contra-indicated. It may be said that military surgeons have amputated both legs when fractured by a cannon ball, and thus saved more than one life. The cases are not parallel; in our patient we must take into account, besides the vast injury of the lower extremities, the general disturbance resulting from a fall from so elevated a place, and communicated to the organs of the great cavity, and above all to the brain.

Such are very nearly the same reasons, for which I would refrain from amputating in the following supposed case; a man of middle age, falls from any great height upon the pavement; he meets with extensive injury; 1st, a large lacerated wound of the forehead, exposing the os frontis, and complicated with fracture of the base of the orbit; 2d, a compound fracture of the right thigh, with contusion in front of the patella; 3rd, the left tibia and fibula carried behind the condyles of the os femoris, and the patella broken into fragments, three or four openings into the joint already full of blood and air. Lastly, without speaking of the probable disorder of the viscera, the patient is delirious when brought to the hospital. This case afforded but little hope, and indeed he soon perished. Under such circumstances should amputation be performed? The nature of the injury of the extremities certainly required amputation of both thighs; but after this double operation, we have remaining the wound of the forehead; with fracture of the orbit, nervous delirium and probable lesions of the internal organs. The situation of the patient could not be improved, and the operation ought not to be performed. Much more serious accidents sometimes follow a fall upon the feet, from an elevated position. I have seen a case, where the head of the femur, piercing the cotyloid cavity, had passed entirely into the pelvis; and another, where the whole force of the blow having been sustained by the spine, the bodies of four vertebræ have been crushed, and the spinal column diminished by this enormous space.

*Luxations* with extensive laceration of the soft parts and especially of the vessels, are sometimes followed by such severe symptoms, as to have been early classed among those cases imperiously requiring amputation. The agonising pain produced by inflammation, the gangrene which frequently follows and which nothing can arrest, death itself preceded by most intense suffering, must appear to be reasons proper to justify some general rules as

regards this subject. This rule is, however, liable to numerous exceptions. If the laceration is not very extensive; if the luxated bones are not at the same time fractured; if the nerves and principal vessels are not torn, and gangrene does not appear inevitable, the parts should be restored to their proper situation, incisions should be made if necessary, to prevent extreme tension, and we should use antiphlogistics and anodynes of all kinds; prevent bad symptoms, or attack them rigorously should they arise. But if the integuments, tendons, ligaments and articular capsules are much lacerated; if the bones are fractured and at the same time the soft parts torn or violently contused, lastly, if the joint is of too little importance to expose the patient to secondary symptoms by preserving it, we should not hesitate to practice immediate amputation. Such cases are frequently met with in the wrist and ankle joints.

The uncertainties obscuring the indications of primary amputation are generally neither so great nor so numerous as those attending secondary or *consecutive* amputations; that is those required by the progress of the pre-existing disease.

Exceedingly embarrassing cases, however, sometimes occur. Among the pre-existing maladies which demand amputation, some affect the joints, others the limbs; some are seated in the bones and others in the soft parts. It is proper to determine what are the characteristics of both, which leave only this last resource.

1st. I have frequently performed amputation for *white swellings* of the joints; let us now inquire for what reasons, for we cannot here establish, *a priori*, general rules; it is only from the investigation of individual cases, that the motives of treatment in analogous cases can be deduced.

A child of 7 or 8 years of age was attacked with an inflammatory engorgement of the elbow, in consequence of a fall on the part. This affection, perhaps, was badly treated in the city; perhaps also the feeble and scrofulous constitution of the patient, contributed to the ill success of the means employed. From some cause, however, the swelling and engorgement continued and increased; the cartilages and bones themselves were attacked; abscesses formed in several places, and left fistulous openings. Moxas and the cautery were used in vain at the hospital; the disease progressed, and a considerable transverse motion took place as if the articular ligaments being destroyed, could no longer oppose the displacement of the bones. Crepitation was very manifest.

In such a case I thought the amputation of the arm indispensable; it was performed and the child got well.

Let us relate another case of the same nature in which amputation was not performed, and yet a cure was effected by ankylosis. It will be easy to infer from the comparison of the two cases, the difference of indication and the reasons for the treatment in each. A young man was admitted into the Hotel Dieu in October, 1831, for a white swelling of the right elbow joint. The latter was very large, the ligaments so much softened that the fore-arm was capable of very extensive transverse movements on the arm, movements, which in the ginglymoidal articulations, are, as is well known, a certain index of great alteration of the surrounding soft parts, and consequently of an advanced stage of white swelling. The least motion of the fore-arm gave exces-

sive pain. Notwithstanding this disease, I preferred before amputating the trial of other therapeutic remedies. Moxas were several times applied around the joint with advantage. Several large abscesses formed, which opened at several points and discharged at first a great quantity of pus. The proper treatment was followed. A remarkable and progressive improvement took place; the joint became gradually stronger and less movable; and in process of time a cure was performed by ankylosis.

In these two cases the reasons for my conduct were, in the first, the inefficiency of the remedies, and the unceasing progress of the disease; in the second, the advantage resulting from the use of those same remedies. It must not be forgotten, indeed, and this remark applies to all organic lesions, that the removal of the limb should always be our last resource. Another consideration had great weight with me in the above cases; the second patient had a good constitution, his general health and strength were not impaired; there were no symptoms of any disease of the internal organs; neither fever, nor diarrhoea; much was to be hoped from the efforts of nature. The former, on the contrary, was of a scrofulous constitution, a prey to a continued fever, a progressing emaciation, and his strength was daily diminishing.

2d. A *violent inflammation* of the articulations or *abscesses*, following *chronic inflammation*, sometimes demand amputation of the limb. The following is a remarkable case, which has given rise to the double question of the propriety of amputations or whether it was preferable to simple resection of the diseased bony structure.

A young man, 20 years of age, having contracted a very well marked syphilitic disease, was attacked, after three months of active treatment, with dull and deep seated pain in the right shoulder joint. We will observe here that this young man occupied a very damp chamber. Enormous swelling followed, without redness of the skin, and there was soon total loss of the movements of the fore-arm. At a later period, the skin became of a violet color, thinned, ulcerated, and a fistulous opening established a communication between the cavity of the joint and the atmosphere. In this state he entered the Hotel-Dieu on the 9th of September, 1829. A sanious, fetid pus was discharged from the fistula; the patient was pale, weak, and complained of continual pain. After having tried, for a few days, without advantage the antiphlogistic plan, we were inclined to prescribe another anti-syphilitic course; the affection of the elbow increased in malignity; the pain was intolerable. On examining the state of the joint the bones were found denuded, the articular extremities movable in every direction, and an operation was determined upon as the only means of arresting the progress of the disease. But was it proper to perform amputation or resection of the articular surface? The chance of both operations having been explained to the patient, he soon decided the question, by preferring amputation, which was performed by M. Breschet on the 15th of October. On the 7th November the cicatrization of the stump was complete.

Now were we correct in yielding to the patient's wishes? The anatomico-pathological examination of the limb shall answer the question. We have seen the external appearance of the part and particularly of the skin: let us inquire further. The cavity of the joint contained about eight ounces of sanious pus. The cartilages were destroyed and the bony surfaces exposed,

were red and porous, the medullary canal of the bones was injected. The scalpel penetrated easily the inflamed bony tissue. The ligaments were partly destroyed and the remaining portions of them softened and, as it were, putrified. No vestiges of a synovial membrane were found. The external cellular tissue was changed into pus. Purulent abscesses were found in the surrounding muscles, which were pale and softened. None of the vessels were changed.

Can an abscess of a joint, resulting from chronic inflammation, be cured without amputation?

It is necessary to know how long the abscess has existed, its extent, effects upon the different parts of the joint, the consequences of its spontaneous or artificial opening. A child of 10 or 12 years of age had met with a violent sprain of the ankle joint, three years since. From that time a chronic inflammation had constantly existed around the tibio-tarsal articulation; and when the child was admitted into the Hotel-Dieu, in March 1828, there was considerable tumefaction with obscure fluctuation on the inner side of the inferior extremity of the leg. Externally the swelling was less marked. The movements of the articulation were still free. I thought of opening the abscess; but the fluctuation was obscure; the disease had existed for three years; an unequal resistance and feeling of fungus was communicated to the fingers; and I concluded that amputation was the only chance. The leg was therefore removed and the boy soon recovered. The limb was dissected. On opening the internal abscess a serous and flocculent pus escaped; the abscess was multilocular; several of the tendons which had been primitively denuded were covered with a fungous matter easily removed by the back of the bistoury. The articular cartilages were destroyed, the extremities of the fibula, tibia, and astragalus carious. The external abscess contained a small quantity of the same kind of pus.

3d. We include among the indications of amputation, *caries of long standing*, giving rise to copious suppuration, whether situated at the articular extremities of the bones, or their centre, and *necrosis* of the same date, deep and accompanied by too copious suppuration. Caries of the articular surfaces often merely demand their resection; we shall see under what circumstances. As to necrosis, it is only in particular cases that it becomes an indication of amputation, as for example when it affects the whole thickness of a long bone; the following is a case in point.

A tailor, 49 years of age, of a strongly marked lymphatic constitution, had had in early life a large scrofulous abscess in the middle of the leg, and of which evident traces were left. Since then he had always enjoyed good health. Towards the end of 1829, this same limb became inflamed, and notwithstanding an active antiphlogistic treatment an abscess formed, and was opened by a surgeon. The wound did not heal, and the patient entered the Hotel-Dieu, in the early part of November of the same year. There was great loss of substance of the anterior and external part of the leg; a fetid suppuration and exploration by the probe soon evinced the nature of the disease. It was evident that the abscess, instead of constituting the original disease, was only a symptom of caries or necrosis. After having ascertained as well as possible the extent of the disease, amputation was proposed to the patient as his only chance of life. In the meantime having made some

slight exertion during the night, the tibia was fractured at the seat of the disease. The general symptoms being then too severe, our attention was directed to soothing them. The operation was performed on the 12th of December. The dissection of the limb discovered a necrosis mingled with caries of the tibia, which was diseased throughout nearly its whole thickness.

4th. *Gangrene* or *sphacelus* forms also one of the most positive indications of amputation. But before deciding, it is of the greatest importance to determine the cause and nature of this gangrene; and from a knowledge of the etiology of the disease will result the solution of the question so much agitated by our predecessors, namely, whether we should in such cases, wait until the progress of the mortification be arrested, and its limits defined. Thus, when a wound is the cause of this accident, or when it depends on attrition of the parts, the extent of local disorders, the rupture of an artery, or the division of the principal vein and nerves of a limb; when, in short, the mortification does not seem to depend on a general lesion, or some internal or hidden cause, the amputation should be performed without delay. When, on the contrary, its causes, as frequently happens, is the complete or incomplete obliteration of the artery or principal vein of the limb, from ossification of the first, or mechanical obstructions of the cavity of either, amputation cannot prevent it from extending, nor limit its ravages. Such are cases of *senile gangrene*, more properly, in my opinion, called *symptomatic gangrene*.

A man, 56 years of age, in a drunken fit, fell under the wheel of a cart laden with building stone; the wheel passed over his thigh. There was a comminuted fracture of the femur, but without alteration of the integuments. Enormous swelling and violent inflammation immediately followed. He was instantly carried to the hospital. The limb was cold, amputation was proposed, but he obstinately refused to submit to it; the fracture was therefore reduced and dressed. Delirium supervened; and the dressing was constantly deranged in consequence of his agitation. Vesicles appeared on the foot, gangrene took place, extending to the leg and thigh, and did not seem about to cease there. The patient was extremely weak; pulse small and frequent; delirium continued; the straight waistcoat was applied; the belly was tense, painful; the liver appeared engorged and extended beyond the ribs; the skin had a decided icterose hue; there was diarrhœa. What was to be done in such circumstances? Shall we amputate, and does amputation give the unfortunate man any hope of life? The gangrene, indeed, is not arrested, and authors have laid down as a general rule not to amputate until this is effected. Here this rule is inapplicable; the cause of the gangrene is the fracture and accompanying injury. Therefore, far from being a contra-indication to the operation, it is a proof of its necessity; but the desperate situation of the patient, the tension of the belly, the swelling and engorgement of the soft parts of the thigh, into which blood is largely infiltrated; the fear lest the contact of the air increase still more the inflammation, justify our hesitation.

However, a slight improvement took place; the belly became less tense, the icterose hue less pronounced, the gangrene was arrested. The patient earnestly demanded the amputation of the limb, now become insupportably offensive to him. It was performed on the 25th of April, but it is useless to add that he soon sunk. This case demonstrates clearly how necessary was the immediate removal of the limb, and apart from the chances always uncer-

tain of so serious an operation as amputation of the thigh, it may be said that the obstinate refusal of the patient cost him his life.

Gangrene sometimes appears on a fractured limb in consequence of the compression of too tight a bandage which has not been removed for several days.

In these cases the cause is entirely local, well ascertained, as amputation is required only when all other means to arrest the mortification have failed.

5th. *Osteo-Sarcoma, Spina-Ventosa, Tumors called Fungus Lymphatic*, which are situated in the periosteum, *Cancer, Fungus Hæmatodes, Hydatid Cysts* developed in the bones and articulations frequently require amputation. Cancer, when it is large, immovable, extending beyond the integuments, comprising the aponeurosis, vessels, nerves and muscles, and *a fortiori* when it penetrates as far as the bones. Fungus hæmatodes, when it cannot be completely extirpated, or when it has attacked a very large portion of the limb; osteo-sarcoma, if it embraces the whole thickness or more or less extent of the thickness of a long bone, or if being seated in the articular extremities, it has attacked at the same time both surfaces of the joint, and produced serious disorganization of the soft parts and copious suppuration. As to hydatid cysts, it is imminently dangerous to open them; death has sometimes followed the operation, and even when the patient is cured, it is only after very severe inflammation, and hence sometimes follows the necessity of amputation. But this necessity becomes much more imperious, in consequence of the degeneration of the tumor, or its transformation into a lardaceous substance.

6th. *Aneurism* is sometimes complicated with so much general derangement, as to leave no hope of cure by the ordinary means, amputation must then be performed. These cases are now rare, thanks to the progress of science. This last resource is indicated when the surrounding parts are so deeply disorganized that the ligature presents no chance of success, when there exist ossifications of the artery beyond which the ligature cannot be applied; or when from this cause or from gangrene secondary hæmorrhage, &c. takes place.

7th. Is amputation an efficient remedy in *traumatic tetanus*? I have expressed my opinion on this subject, when treating of gun-shot wounds. I then pointed out to you how erroneous were the ideas of several celebrated teachers, and how vain were the hopes founded on this remedy. The *bite of a rabid animal* is in the opinion of some a good reason for amputation. A surgeon in London recently amputated the arm of a man bitten in the hand by a mad dog; the individual nevertheless died of hydrophobia. It might be allowed if the bite was in a part of little importance, a finger or toe for instance, and even then it should be performed before the absorption of the virus had taken place.

8th. It has often been my lot, during a long practice, to be requested to perform bloody operations, and amongst others amputations on individuals affected with deformity, either congenital or resulting from previous disease, such as false articulations, ankylosis, adhesions, contractions of the fingers or toes, &c.; sometimes I have yielded to the entreaties, but more frequently have refused; and the following reasons have guided my conduct in both cases. One very powerful motive which should teach surgeons the greatest prudence is, that it is proved by experience that these operations, called

*operations of convenience*, are, all other things being equal, more frequently followed by fatal consequences than those required by actual disease or accident. We have often seen in this hospital, and elsewhere, the simple removal of a finger or toe for a deformity followed by tetanus, delirium tremens, gangrene, and general symptoms which carry off the patient in a few days. Therefore, as a general rule, the surgeon should not operate in these cases, unless there be an absolute necessity. This necessity exists when the deformity incapacitates the patient from providing for himself or his family, or whenever, from the disposition of the parts there must result a secondary affection which will render amputation indispensable. In the former case it is an act of humanity, which it is the surgeon's duty to perform, if not evidently contra-indicated; if the latter, it is only an operation anticipated by which the patient may be spared the chances of a secondary disease.

Such are the majority of diseases in which amputation of the limb may become necessary. But the task of the surgeon is not fulfilled when he has ascertained that this operation is indicated by the nature of the injury, its incurable character, or the immediate danger of the patient. He must examine if there be not other lesions which *contra-indicate* it, render it useless, or even hasten the fatal termination. He should ascertain if the disease be local; if its ramifications do not extend as far as the regions of the trunk, or at least to a part of the limb beyond which the knife cannot be applied; if it have not produced sympathetically changes in the viscera; or if it do not co-exist with some other organic affection. In cancerous affections, particularly, it is known that the lymphatic system undergoes with great facility a degeneration analogous to that of the part primarily affected; that the ganglia soon become the seat of engorgements, appearing first in the vicinity, and afterwards in the thoracic and abdominal cavities. Thus we must first ascertain the existence or absence of these ganglionic tumors. Some patients are so much exhausted by a long continued and copious suppuration, by hectic fever or absorption of pus, by colliquative diarrhœa, that amputation is impracticable, and in all cases it cannot be performed without raising the strength, diminishing the suppuration and diarrhœa, calming the fever, in a word, without having by appropriate means improved the general health. The organs of the thoracic cavity demand a most scrupulous examination. We frequently find bronchial catarrhs or chronic pneumonias in persons laboring under diseases requiring amputation. The cure should if possible be first effected, and if not the operation must not be performed. The same thing is to be observed if one of these diseases or a pleurisy should occur during the treatment of the external injury, as is often seen in hospital practice. Nothing is more common than the co-existence of a tuberculous affection of the lungs with an external injury, which has no resource but amputation, especially in scrofulous subjects. This affection, sometimes latent and difficult to recognise, is generally manifested after the operation by formidable symptoms which soon destroy the patient. Lastly, amputation is sometimes contra-indicated by the extent and magnitude of the injury itself.

Among the palliative means calculated to soothe the agonizing pains of cancerous and osteo-sarcomatous affections, I have for a long time observed that narcotics, and amongst them the *extract of aconitum* enjoy a peculiar efficacy. Indeed having prescribed it to two patients in the dose of a grain to a grain

and a half, they have felt so much relief as to express loudly the next day their joy at having tasted a sleep unknown to them for so long a time; I have continued its use, combining it with the extract of opium, and the pain has nearly entirely disappeared.

The necessity of the amputation being granted; writers have debated this question, namely, *what is the period of the disease most suitable for the operation?* I must confess I cannot understand the interminable discussions on this subject. The solution of the question is necessarily based on the nature of the indications. The symptoms on which these are founded carry with them the urgency of operating or the power of temporizing. If we have lost all hope of preserving the life of the patient, by preserving his limb, no reason can justify the delay; should any hope remain, it is because the necessity of the amputation is not well proved. Too often, indeed, is the foresight of the practitioner deceived, but that merely proves that science is as yet far from affording us elements of diagnosis capable of preventing similar mistakes. Thus, 1st. If we have a serious accident, such as the crushing of a limb or any other part by a heavy body or a gun-shot wound, which demands immediate amputation, the danger of fatal symptoms which may arise at every moment, by indicating its necessity, indicate equally the urgency of its immediate performance. Experience, especially of late years, has too well convinced me how erroneous is the opinion of those who think it better to wait in these cases for the development of the first symptoms of reaction, than to amputate under the influence of the disorder and commotion of the organism produced by the external violence. The great difficulty lies in distinguishing with certainty, in the multiplicity of analogous cases, those in which amputation is or is not of absolute necessity. 2d. In case of copious suppuration, as long as it does not influence materially the general health of the patient, no indication exists; but as soon as his strength diminishes, his constitution becomes impaired, &c., notwithstanding all our exertions to moderate the suppuration and maintain the organic vitality, amputation is indispensable, and the surgeon should not wait for a more unfavorable state of things. 3d. As regards sphacelus, I must refer you to what has been said on this kind of indication. 4th. In case of cancerous, osteo-sarcomatous affections, fungus hæmatodes, necrosis, caries, presenting the conditions we have enumerated, the proper time for removing the limb will be when the disease has been perfectly understood and declared incurable by any other means; for as we wait it will increase, and reach on the economy, and the chances of success be less. 5th. Lastly, whenever any complication exists, either internal or external, we must postpone the amputation until it shall have disappeared. It is useless to add that if a patient come under your care, exhausted by pain, by the extreme abundance or long duration of suppuration, by repeated hæmorrhage, &c., the operation should not be attempted until by appropriate treatment he has gained sufficient strength to support it.

Let us now say a word respecting the *preparatory treatment*. Some require strict diet, others a mild or slightly tonic regimen. If constipation exist we must use mild laxatives, enemata; if at the moment of operating the bladder be full of fluid and the patient cannot make water, the catheter must be introduced; should he be agitated, by insomnia, sleep must be invited for some days previously by appropriate remedies, &c.

When the patient is of a bad constitution, scrofulous, scorbutic, &c., or when the amputation is demanded in consequence of long standing disease, which has given rise to copious and continued suppuration, I create, some time beforehand, an issue, either by a blister or cautery, on some part of the sound limb, in order to prevent the accidents which might follow the sudden suppression of the suppuration.

A woman, 60 years of age, was admitted into the Hotel-Dieu in January 1830, for a carcinoma occupying almost the whole circumference of the lower part of the fore-arm. The date of its first appearance was very remote, it appeared to have been determined by mechanical irritation, and an old burn was its original cause. Twenty years ago, she said she had been thrown down by a carriage of which the wheel fractured the right humerus; the fore-arm was grazed and the cicatrix of the burn broken, but she was cured, and only two years since the disorganization had commenced, and she first felt lancinating pains. Neither rest, nor different topical applications could arrest the disease. After having attacked the whole cicatrix, it reacted upon her general health and disturbed the function of digestion. The fetor exhaled from the fungus, and from which nothing could protect the patient, might have had this effect, independently of absorption. The copious suppuration and hæmorrhage occurring several times daily, could not add to her natural sparseness. At the time of her admission into the hospital, the fungous mass, surrounding the arm like a bracelet, was uneven, reddish; black in some places, bleeding at the slightest touch, and was the seat of lancinating pains. About two inches in width, it stood at least one inch above the level of the limb. The digestion was very much disordered, but as yet no diarrhœa existed.

I saw no chance of safety but in amputation. In order to avoid the accidents which might follow the sudden suppression of an old and copious suppuration, I applied previously a blister to the sound limb. The amputation was then performed at a distance of three inches from the elbow.

The fungus arose from the tissue of the cicatrix; the sub-cutaneous cellular tissue, aponeuroses and bones were sound, the carpus was in a state of forced flexion. The fungous mass soon lost its color, it became soft, friable, resembling cerebral substance. The patient did very well for a few days; but intense thoracic and abdominal symptoms supervened, and she died at the end of eight days.

It is the duty of the surgeon to show every kind attention to the miserable beings who are reduced to the necessity of undergoing these cruel mutilations. Let him, by every means in his power, gain their confidence, and animate their sinking courage.

He will succeed by sympathizing with their misfortune, deploring the impotency of the remedies of art hitherto used to preserve them from this last alternative, by pointing out the chances of a speedy and certain cure, in exchange for inevitable death: by fortifying their alarmed imaginations against the pain inseparable from an operation; and by pointing out all the means which still remain to provide for themselves or their families. And here observe the vast difference in the *morale* of hospital patients, and of men wounded on the field of battle! The soldier, accustomed to entire self-denial, accustomed to fatigue, familiar with danger and death, is happy to preserve

his life at the cost of a limb; and certain of his pension, he submits courageously, and even sometimes cheerfully to the knife of the surgeon. But see that unfortunate workman, farmer, or artisan, whose numerous family depend on his industry and labor, haunted by the fear of the misery that awaits him; his countenance expresses deep sorrow, profound melancholy, and even despair: he yields reluctantly to the supplications of his surgeon, and often obstinately resists at a time when the operation presents but little hope of success. Wonder not, therefore, at the difference of the results obtained in the two theatres, whose conditions are so widely different.

Some patients are struck with stupor and horror, at the mere idea of the operation. Many, ashamed of their weakness, make a violent effort to overcome it; but they submit then, rather like victims than brave and determined men, and remain impressed with the idea that the operation must necessarily be fatal. No state of mind can be more unfavorable than this. As long as it exists, the operation must be deferred. The patient should regard the operation as the only chance left to him. Hope should animate and sustain him: if he despair, and dream only of death, it is rare that a consecutive encephalitis does not occur, and cause a fatal termination.

The imagination undoubtedly exerts great influence over the success of operations, and much of their danger must be attributed to the *foresight* of man; that faculty he possesses of looking into futurity, of calculating its chances, and his proneness to be agitated and disturbed at the aspect of impending evil.

Thus, operations generally succeed better in children, who, unprovided with this too often fatal power, bear them without any moral agitation, regardless of the result.

We should generally mistrust the power of resistance of those individuals who, after having consented with great reluctance to an operation, suddenly decide, at the same time exhibiting marks of extraordinary courage. Subsequent delirium and fatal exhaustion are to be feared. Mistrust also those who hitherto feeble and pusillanimous, affect a sang-froid almost amounting to indifference. Nearly always overwhelmed by the blow, they disguise their terror by an affectation of tranquillity of mind which they are far from possessing. During the operation, they make every effort to repress any expression of pain. But this struggle having exhausted their strength, they fall into a state of stupor and collapse, from which nothing can arouse them. The sensibility resembles the blood: the fountain of the former may be exhausted by pain and the moral affections, as well as that of the latter, by too great a loss; and this reflection should always be a powerful motive in deciding on an operation.

The instruments required are, 1st, a tourniquet; 2d, straight knives, single or double-edged; 3d, two bistouries, one straight, the other convex-edged; 4th, a retractor; 5th, amputating saws.

The apparatus for securing the vessels and the dressing are numerous: 1st, dissecting forceps, a tenaculum, and armed needles; 2d, ligatures of different materials and sizes; 3d, adhesive straps, six or eight lines in width, and of different lengths; 4th, charpie or scraped lint; 5th, some long compresses; 6th, rollers, five or six yards in length, and three fingers' breadth wide; 7th, small pieces of muslin spread with cerate to place under the ends of the liga-

tures; 8th, fine sponges, warm water, vinegar, and a brazier full of hot coals to warm the adhesive strips. The different portions of both series should be disposed in the order they will be required, which is as enumerated above.

For a long time amputation, properly so called, was performed by dividing the flesh and bone by means of the knife and saw, or when the limb was small, by sharp pincers which removed it at one blow; or lastly, by laying the limb on a block, and separating with a large chisel and mallet. The hæmorrhage was then arrested by the actual cautery. Since the time of A. Paré ligatures have been in use. About the middle of the last century the pincers and chisel were laid aside, but still the soft parts were divided by a single blow down to the bone, and the latter divided on the same plane as the external incision.

From these different modes of amputating, muscles with long and those with short fibres were divided at the same point, from which followed a conical stump, inappropriate to the formation of a good cicatrix, as well as numerous and serious inconveniences. All the soft parts retired towards the origin of the limb, as much by the effect of their contractibility as by the irritation caused by the instruments, and the necessary consecutive inflammation. The bones, deep seated muscles, and the whole surface of the wound was exposed; hence resulted high and extensive inflammation, acute pain, copious suppuration, secondary sympathetic symptoms, a long and tedious process of cicatrization, frequently necrosis and exfoliation of the bone, requiring a new operation. Struck with these objections, the most celebrated surgeons have endeavored to avoid them, and from their labors have arisen the three principal methods now in use, known by the names of *circular*, *flap* and *oval* or *oblique* operations.

T. L. Petit, following somewhat the steps of Chiselden, performed the circular amputation by first making an incision, interesting only the skin and subcutaneous cellular tissue; he then turned this back for the space of two fingers' breadth, then divided the flesh and lastly the bone on a level with the incision of the skin, thus turned back like the sleeve of a garment.

Louis, thinking that the conical shape of the stump was owing more to the contraction of the muscles than to that of the skin, divided at one cut the integuments and superficial muscles, drew them up as far as possible, and at a second cut divided the deep seated muscles and finally the bone. Alau-son began by dividing the skin circularly, dissected it from the sub-jacent parts, turned it up when he supposed he had detached enough to cover the whole of the stump, and then at one cut divided all the muscles, holding the edge of the knife obliquely upwards, so as to form a hollow cone. This plan was again modified by B. Bell, and that adopted by modern surgeons presents three stages: the first consists in dividing the integuments and subcutaneous cellular tissue by a perpendicular incision, dissecting and turning back the flap like Alau-son: in the second stage the muscles which do not adhere to the bone are divided on a level with the fold of skin, and lastly the deep-seated muscles are divided on a level with the retracted surface of the superficial muscles. This retraction of the skin and soft parts is aided by an assistant who, grasping with both hands the limb above the point of incision, draws them forcibly upwards as they are divided.

Of all these different plans, some fulfil but imperfectly the end designed.

others are difficult of execution: and by the modifications adopted in modern times, pain is uselessly increased. By first dividing the skin, then dissecting it, by cutting successively the skin, superficial and deep-seated muscles, and lastly the muscular fibres adhering to the bone, the knife is evidently applied three or four different times to the parts. The operation is therefore long and painful.

These considerations have induced me to perform an operation, which I have since practised in the Hotel-Dieu, with complete success. At one cut, I divide the skin and muscles as far as the bone, generally perpendicularly, some times obliquely, after the method of Alauson. The retraction effected by the assistant, who grasps the limb above the wound, and the contraction of the muscles give immediately to the wound the shape of a projecting cone. At the base of the cone, I then apply the knife and separate all that projects. By thus drawing up the flesh as it is divided and cutting successively all that remains, the bone may be denuded for the space of more than six inches. By this method, the operation is performed in an inconceivably short space of time, enough flesh is preserved to cover the bone, enough skin to cover the stump, and the painful dissection of the skin and integuments is avoided.

The flesh being divided it is drawn up as far as possible in order to facilitate the section of the bone. To effect this the retractor with two or in the case of the leg or fore-arm with three tails is all sufficient. A bistoury carried circularly around the periosteum serves to divide this membrane, and detach it above and below. That being done, the operator seizes the limb with his left hand, placing the thumb immediately above or below the point which is to bear the action of the instrument. The saw, held in the right hand, is applied perpendicularly. It is then carried from heel to point, at first slowly, afterwards more rapidly as it penetrates deeper and is less liable to slip out. When the bone is nearly divided it should be carried very gently. The assistant holding the limb must be particularly cautious not to depress the part too much, lest the bone break before it is completely divided, nor to elevate it too much, for fear of arresting the progress of the saw.

The *flap operation* consists in making at the expense of the soft parts one or several flaps with which the wound may be completely covered. It is performed in two ways, either from without inwards or the reverse. In the former we cut from the skin towards the bone, in the latter we plunge the knife through the limb and then carry it out. If the former plan be more regular and certain the latter is liable to several objections. One or several flaps may be made. The principal advantages supposed to be presented by this plan are, a greater quantity of soft parts to cover the bone, and a greater certainty of having a conical stump. But the circular operation attains the same end, and causes a much more simple and less extensive wound.

The essential character of the *oval* or *oblique* operation consists in a section of the soft parts, in an oblique plane or like the mouthpiece of a clarionet. The line described is represented by a V or a triangle of which the apex is above and the base below. The point of this V-like section should pass some lines beyond the spot at which the bone is to be divided. It must also correspond to the part of the limb least abundantly furnished with flesh, or large

blood vessels and nerves. Circumstances do not always permit us to follow this principle.

As to *disarticulations*, they were well known to the ancients, and by them preferred to amputations, as being more rapidly performed; less blood was lost during the operation, the means of arresting which were less understood by them than in later days. They had, however, nearly fallen into oblivion, when Heister, J. L. Petit, Hoin de Dijon and Brasdor revived them. Have they any advantages over amputations? We should not generalise an affirmative answer to this question; but their advantages are undoubted in some parts, doubtful in others, and in others null if not decidedly liable to great objections. Thus experience has demonstrated the advantages of disarticulation of the fingers over amputation of the phalanges; amputation at the articulation of the wrist gets well more rapidly than those performed above it. It is certain that the disarticulation of the shoulder joint is more easily cured and less frequently accompanied by serious symptoms than the amputation of the same limb in its continuity. Such, however, is far from the case in other amputations. As to the coxo-femoral amputation compared to that of the thigh, experience has proved that the cure of the former is infinitely more rare than that of the latter; in consequence, undoubtedly, of the enormous wound which is unavoidably made.

The flap operation is particularly applicable to amputations at the joint; many surgeons however prefer the oval and circular operations. In order to disarticulate *promptly* and *certainly* we must, 1st. Remember distinctly the height and direction of the articular line. 2d. Make the ligaments as tense as possible by drawing towards us the portion of the limb to be removed and giving it alternately movements to the right, left, backwards and forwards, that the knife may act upon all parts of the joint. 3d. Traverse the articulation by directing the knife according to the line of the union of the surfaces.

This short *expose* of amputations in general appeared necessary to the study of particular operations. We shall proceed to treat of each in detail, confining our remarks to those which appear most important.

*Amputations and disarticulations of the upper extremities.*—1st. Of the fingers at the articulations of the two last phalanges. This amputation, easily performed, and always the same, may be executed by a single flap taken from the palmar face of the finger large enough to cover the whole surface of the wound; or two flaps, one long from the palmar face and another shorter from the dorsal. The intention of this disposition of the flaps is to prevent the cicatrix from being inside near the palmar surface or in the middle of the articular surface, but that it may be above near the dorsal surface. The operator taking hold of the portion of the finger to be removed demi-flexes it, and carrying transversely the blade of a narrow bistoury over the projection which forms the joint, as if he would split the head of the remaining phalanx, divides the skin, and at the same time the posterior part of the capsule. The lateral ligaments are then cut, and passing through the joint, the operation is ended by making from the palmar face of the finger the long flap intended to cover the greater part of the wound.

As no flexor tendon is inserted into the first phalanx of the fingers, some

surgeons have thought that after the removal of the second, these bones would remain extended, immovable, and useless. It has been proposed to make, on the palmar face of the first phalanx, a deep longitudinal incision, which should penetrate to the flexor tendons of the finger, in order to make them adhere to the bone in front of which they are placed, and then perform the amputation when the cicatrization is completed. This plan consists in performing two operations, and exposes the patient to inflammation of the fibrous sheath of the flexor tendons; and again, why should not the tendons of the flexor muscles, divided during the operation, contract adhesions with the first phalanx, and communicate to it motion, as well as after the previous incision under consideration?

2d. Of the fingers at their metacarpo-phalangeal articulations. This is generally done in the following manner: the hand being pronated, the adjoining fingers separated by an assistant, the operator applies the heel of the bistoury upon the dorsal face of the finger, and successively to the palmar face of the joint, and thus forms a first flap which should be immediately raised up. The corresponding side of the joint being exposed, the bistoury is introduced, and passing round the articular part of the phalanx, the operation is ended by making the opposite flap.

Here the integuments are cut obliquely to form the flaps. Hence an inconvenience which it is important to avoid, and which has induced me to commence by dividing the soft parts *perpendicularly to their thickness*, by means of a semicircular incision, directed from the dorsal towards the palmar surface of the finger. Again I have observed that when the ring or middle finger is removed and the head of the corresponding bone of the metacarpus preserved, the adjacent fingers remain separated at their base, whilst they approximate at their extremities, from which result great deformity and embarrassment in their functions. In order to avoid this difficulty, after having made the incision just spoken of, instead of stopping at the phalanx, I carry the flap beyond the joint, and remove the head of the bone with the saw. After the operation the flaps are brought together and the wound dressed. There is no necessity of tying the collateral arteries which are divided. In this manner, the heads of the adjoining bones approach exactly, and no deformity nor embarrassment follows.

3d. Of the fore-arm. The law which requires amputation to be performed as far from the trunk as possible, applicable to all amputations of the upper extremity, is particularly so to those of the fore-arm. The limb, in fact, diminishes gradually towards the wrist, and consequently the nearer this point, the smaller is the surface of the stump, and the more simple the operation. Yet some of the most distinguished modern surgeons recommend its removal at its most fleshy portion, in order to avoid the tendons and aponeuroses which they do not think capable of furnishing healthy suppuration. This advantage does not compensate for the loss of a very useful member; and, besides, since the section at the wrist is successful, why should not the same thing take place in adjoining parts? Hence the majority of surgeons amputate as near to the wrist as possible.

In order to perform this operation by the circular method, which I prefer, the patient is placed on the edge of the bed or seated on a chair; the fore-arm is held by two assistants, one supporting the wrist, the other the elbow; the

brachial artery is compressed on the inside of the middle part of the humerus; the fore-arm is flexed and pronated. The surgeon stands on the inside, makes a circular incision in the skin, detaches it from the cellular tissue which binds it down and turns it back to an extent proportioned to the thickness of the limb; he next divides the soft parts, then detaches those which adhere to the bones, and proceeds to the section of the interosseous tissues, as in the leg. But as the tendons roll from the edge of the instrument its division is less easy. The best plan is to slide the knife in a flat position along the anterior face of the ulna, and then of the radius, so as to comprise before it all the deep seated muscles of the anterior surface of the fore-arm, which are divided by turning the cutting edge of the instrument.

The periosteum being divided, and the parts protected from the saw by the retractor, the saw is applied first to the radius, as being the thicker except at its upper part, and as offering less resistance. It is then made to bear at the same time on the radius and ulna, which is done by carefully raising the wrist. In order to be able to saw them both at once, the fore-arm must be pronated as much as possible. In another position the ulna comes almost immediately below the radius. Besides these bones vacillate on each other, thus impeding the action of the saw, and endangering the upper articulation. Lastly the easy closure of the wound terminates the operation.

Let me here remark that flap operations in the continuity of a limb are banished from surgery. A well executed circular operation is far preferable. It is more easily and rapidly performed, does not require the preservation of so much of the soft parts below the point of division of the bone, and lastly permits the not less complete and exact union of the flesh on the surface of the stump, than if ample flaps had been preserved.

4th. Of the fore-arm at the elbow joint. This operation formerly performed, has been for a long time neglected by surgeons, and many of them prefer amputation of the arm above. In order to execute it, Brasdor had invented a difficult operation, which consisted in opening the joint at its posterior part and terminating by a flap made from the flesh of the upper anterior part of the fore-arm. I think this plan may be advantageously replaced by the disarticulation of the elbow whenever the condition of the joint and the flesh will allow it. It is done in the following manner:

The fore-arm being one third flexed, a straight double-edged knife is introduced transversely in front of the joint from one tuberosity of the humerus to the other, and serves to make a flap of the flesh of the upper anterior parts of the fore-arm. This flap being turned back, the articular capsule and lateral ligaments are divided at the second cut, and the operation is terminated by sawing the olecranon from in front backwards.

The brachial artery is not divided in this amputation but only its radial and ulnar divisions. These are soon tied as well as some muscular and recurrent branches which pour out blood. The flap should then be folded from before backwards over the lower extremity of the humerus, and kept in this situation by long adhesive strips.

I have performed this operation ten or twelve times and always successfully. It has the advantage of preserving more of the limb, and we gain much by dividing the olecranon with the saw, because, fixed to the cicatrix, this process continues to furnish a solid insertion for the triceps brachialis

muscle. I always perform this operation except when too little of the soft parts are left to form an anterior flap to cover the condyles of the humerus. In this case, it is performed as follows :

The fore-arm should be demi-flexed and the surgeon place himself on the outside of the limb. The first incision is made at three fingers' breadth below the condyles of the humerus, and comprises the integuments as well as the aponeuroses. The parts are then held up by an assistant, and at a second cut the surgeon divides level with their edges the muscular fibres down to the bones. Ascending slightly along the latter by detaching the soft parts from their surface we reach the joint which should be opened by the section of the lateral ligaments and anterior part of the capsule. The knife then penetrates easily between the bones, and the operation is finished, as in the preceding case, by the section of the olecranon.

5th. Of the arm and thigh. We shall treat under the same head both of these subjects, in order to subsequently avoid repetition, inasmuch as 1st. Their structure is very analogous ; and 2d. Because the operation, whether circular or flap, is the same in both cases.

The amputation may be performed at any point of the arm or thigh, there is no choice, the disease alone requiring the operation must determine. But as a general rule, we should amputate as low down as possible, in order to preserve a long fragment, which may be useful. Even when the disease requires amputation of the arm at the upper part, it is very easily performed with making two longitudinal incisions to form a trapezium shaped flap, as has been recommended, but by simply following the rules we have laid down for the circular operation.

The amputation is well performed when the wound representing a hollow cone of at least two inches in depth, at the apex of which is seen the bone, there remains enough skin to cover the stump easily and meet on both sides, forming a longitudinal wound directed from before backwards. It is badly done when the bone projects, or the skin is too short to cover the whole stump, or when, too large, it folds on itself, forming a kind of *pouch* behind which a vacuum exists which may serve as a receptacle for any discharge from the wounded surface. When about to dress it, after the operation, it is most advisable to let the ends of the ligatures hang from the posterior angle of the junction ; this is more easily done in the arm than in the thigh, and with more certainty.

Thus, in the arm and thigh, as also wherever the circular operation can be performed, there are two stages in the division of the soft parts, one comprising the integuments and superficial muscles, the other the deep seated muscles adhering to the bone, a stage in which these adhesions are broken up, and by the successive retractions of the flesh, the bone is denuded to a considerable distance, even five or six inches.

6th. Of the arm at the shoulder joint. Four general methods are now in use for the disarticulation of the shoulder. In the first, an external and internal flap is made ; in the second, an anterior and posterior flap. These two plans are generally adopted. Still some distinguished men have proposed and performed two others ; the circular (of Sauson), and the oval (of Scontetten). It must be here remarked, that it is scarcely possible, in the ablation of the arm, to lay down any invariable and determinate plan for all cases, because

the majority of injuries requiring the operations have altered, or even destroyed, more or less, the soft parts surrounding the articulation, so that the surgeon is frequently obliged to suit his operation to existing circumstances. Therefore I have devised two principal methods, giving to either the preference, according to the indications of the disease. The first is as follows:

The limb being raised from the trunk, the operator lifts with one hand the deltoid muscle and the parts covering the shoulder externally, and passing with the other an amputating knife under these parts, grazing the bone immediately below the acromion, I make at one cut the external flap, which is done by Lafaye by three incisions and a painful dissection. This flap being held up by an assistant, and the joint exposed, I divide the tendons and articular capsule. The edge of the knife is then carried in front of the head of the humerus, between it and the flesh which it separates from above downwards as far as the insertion of the latissimus dorsi, teres major and pectoralis major muscles. At this stage Lafaye tied the artery; I prefer, however, to compress it by the hand of an assistant grasping the whole flap, and without stopping terminate the operation by dividing near their insertions the tendons of the muscles forming the folds of the axilla and the skin.

The operation thus performed lasts but a few seconds, makes a much cleaner wound and more exact union, and is more rapidly cured than by any other plan with which I am acquainted. Nevertheless, it must be observed, that in this manner one of the flaps is outside and the other on the inside. This possesses some inconveniences, and therefore I only employ it in cases in which the alteration of the tissues does not permit that which we will now describe.

In the second place, I make a flap from the soft parts of the anterior and posterior regions of the shoulder. The arm is elevated to a right angle with the body, a catling is introduced below and slightly in front of the summit of the acromion. The operator then divides at a single cut all the flesh forming the posterior part of the shoulder, as far as the posterior edge of the axilla. This first section forms a flap, which being raised up, exposes the posterior part of the joint. The elbow is then inclined forwards against the thorax, the head of the humerus thus rendered more salient, the tendons and articular capsule are divided; the bone is luxated; the instrument after having passed around the head from behind forwards, is carried from above downwards, along its anterior side, to form the second flap, which the operator detaches after the assistant, having grasped it at its base, has arrested the flow of blood by compressing the artery which it contains. In order to perform this operation, the surgeon, standing behind the patient, should hold the knife in his right hand to operate on the left shoulder, and *vice-versa*. If he be not ambidexter, he stands before the patient, to operate on the right side, and commences with the anterior flap.

This plan is undoubtedly the most simple and easily performed of any in use, and as such considered by all surgeons who are not led away by the interests of self-love. The two flaps in fact extend in the direction of the longest diameter of the wound, and their mutual apposition is as exact as simple and easy. Collected in one bundle below, the ligatures form a kind of conductor or gutter, which assists the escape of the pus. The cicatrix resulting from the operation is linear, of small extent, and always soon formed. The axillary abscesses so frequently occurring in the other method are unknown in this

Lastly, although very analagous in its results to the plan of M. Larrey, it possesses the advantage of more rapid performance.

*Amputations and Disarticulations of the Inferior Extremities.* 1st. Of the great and other toes, in the continuity of the first, and of the five metatarsal bones. The amputation of the great toe was generally performed at its metatarso-phalangeal articulation. This plan is liable to many serious objections: the head of the first metatarsal bone forms, after the operation on the internal part of the foot, a very salient angle which renders the union of the flaps very difficult, and consequently the cicatrization tedious. Besides after the cure the shoe, being no longer supported by the toe, presses strongly against the head of this bone, or the latter strikes every now and then against any projecting object; hence a constant source of irritation, and often inconvenient permanent excoriations which may produce disorganization of the soft parts and caries of the bone. For these reasons I prefer amputation in the continuity of the first metatarsal bone. There is, I grant, an objection, and not an unreasonable one to this, namely, the utility of the head of this bone, which, after the removal of the toe, affords to the metatarsus and the whole foot a large point of support inside and in front, and it has even been said that its removal always causes the turning of the foot inwards. This is indeed a serious inconvenience, and were it constant, as has been alleged, I should reject at once this plan of operating. Such, however, is not the case, and I have never seen it after all the operations of this kind that I have performed. Should it occur, it may be remedied by wearing a shoe of which the sole was thicker at that point than any other. The operation is done in the following manner:

The patient being laid on a bed and held by assistants, an inner flap is made from the flesh situated on the inside of the first metatarsal bone, by a superior internal incision, commencing behind the head of the metatarsal bone, and terminating near the articulation of the great toe, by a second incision precisely similar, and lastly, by a third incision perpendicular to the two first, made at their anterior extremity and uniting them. The external flap is made by two other incisions, dorsal and plantar, between the first and second metatarsal bones. The flaps are elevated, the bone isolated and denuded at its anterior part to some distance behind its head. A thin piece of wood is slipped into the interosseous space, in order to protect the parts from the saw, and the first metatarsal bone is divided obliquely from within outwards and from behind forwards.

The same operation is applicable to the fifth bone of the metatarsus, if its anterior portion were carious, or any disease existed requiring the extirpation of the whole of the toe.

The affection most frequently demanding the amputation of the great toe is white swelling with caries of its metatarso-phalangeal articulation. Sometimes the disease is confined to the phalanx of the toe or its articular surface, and sometimes extends over the articular surface, and even to the body of the metatarsus, whose cartilages are often destroyed. I think therefore, that the plan I have adopted from choice and from physiological reasons, may sometimes become indispensable from the nature of the disease.

2d. Of the four remaining toes. I shall merely observe here, that when these toes are affected with a disease extending to their metatarso-phalangeal articulation, I perform the operation by which I remove the middle and ring fingers, when it is desired to remove at the same time the heads of the metacarpal bones

supporting them. But it has been established as a principle, that as regards these toes, it is always better to amputate them at their metatarso-phalangeal articulation, than at the articulation of their phalanges. I differ from this opinion, at least in a majority of cases; having seen this operation followed by very severe symptoms, which sometimes are even fatal. Therefore, according to circumstances, I either remove the anterior portion of the metatarsal bone, or perform the simple ablation of one or two of the last phalanges. The operation is thus rendered much less dangerous, and as the disease is generally situated in the two last phalanges, the end proposed is fulfilled. In the same manner, I have modified the treatment of curvature or permanent contraction of the second toe, when it depends on a vicious direction of the two last phalanges, and not on an affection of the plantar aponeurosis. When this affection is not congenital, it appears to arise principally from the use of shoes which are too short and narrow, especially in persons whose second toe is immoderately long, as is frequently the case.

The manual part of the operation is the same as for amputation of the fingers at their phalangeal articulations, that is, instead of making lateral flaps, as in a metatarso or metacarpo-phalangeal amputation, we make an inferior flap from the plantar face of the toe, and a superior from the dorsal face; but in such a manner, that the inferior flap may be longer and cover nearly the whole of the wound. The intention of this disposition is to avoid the pressure of the cicatrix by the sole of the shoe on the ground, in walking or standing.

3rd. Of the five metatarsal bones, at their tarso-metatarsal articulation (called *partial amputation of the foot*). Chopart devised the partial amputation of the foot at the second row of the tarsus, that is, at the line of articulation of the os calcis and astragalus with the cuboides and scaphoides. But neither he nor his imitators had calculated the serious inconveniences and dangers of the operation. Every one feels the importance of preserving as much as possible an organ so useful and so necessary as the foot. On the posterior part, as is well known, rests the principal part of the weight of the body. Now by Chopart's plan, that is, by the removal of a part of the tarsus, we deprive the patient of the support which he requires to walk or stand; so that the whole limb becomes very inconvenient and nearly useless. But, again, the insertion of the posterior and anterior muscles of the leg, which are the antagonists of the gastrocnemius and soleus, being divided, the foot is necessarily turned considerably backwards. Lastly, I have often seen very serious inflammatory and nervous symptoms follow this amputation performed on the articulations of a very complicated and uneven mechanism. Such are the principal reasons for which I have entirely rejected this method, and admitted as a general rule, 1st., that partial amputation of the foot at the tarso-metatarsal articulations is infinitely preferable; 2d., that the knife should be applied nearer to the heel only when the nature of the disease imperiously requires it.

Moreover the importance of preserving as much of the foot as possible, and the inconveniences of a contrary course, appear to have been evident to the ancient surgeons; those of the middle ages already conceived the idea of merely removing the anterior portion; but the barbarous means used were deservedly rejected. The amputation at the tarso-metatarsal articulation is said to have been first performed in 1720. It is certain that it was done by Percy in 1789, by Hey in 1799, and M. Sauson, one of the surgeons of the Hotel-Dieu of Paris, who saw it performed in 1813 by a military surgeon who

wished to perform, and thought he did, Chopart's operation. In 1815 only, it was properly described, and established on fixed principles, which are generally known.

4th. Of the leg. Here, as in the fore-arm I prefer the circular operation. The point at which it is proper to perform it is not left to the arbitrary choice of the operator, the shape, structure, and functions of the parts imperiously indicate it. It should be always performed at the junction of the upper third of the leg with the inferior two thirds, if we wish to preserve to the stump the action of the tendons of the flexor muscles which descend thus far. We are speaking now of the point at which the bone is to be divided, and not at which the knife is to be applied to divide the soft parts; this distinction is applicable, moreover, to all amputations. In the leg, as in the arm, fore-arm, and thigh, the point of incision of the integuments must be proportioned to the thickness of the soft parts. Generally, it is about two inches below the spot at which the bone is divided. But, all other things being equal, we should preserve more skin in an amputation of the leg than in that of the thigh, because the muscles contract less, and the flesh, supported by two bones, is less readily removed from the centre of the stump.

The rule just laid down is founded on diverse reasons; we have already spoken of the necessity of preserving the mobility of the stump. Again, if we amputate above the spot indicated, we meet with the popliteal vessels and the superior fibulo-tibial articulation: below, we leave a stump uselessly long and embarrassing in walking. Sometimes injuries of the leg are very high up, and then we must amputate above this spot, or at the inferior part of the thigh. This latter plan is liable to many objections; in order to avoid them we carry the saw, according to M. Larrey's method, even through the condyles of the tibia, and then remove the remaining portion of the fibula. We should carefully avoid the ligament of the patella, in order that the patient may flex the knee and use a wooden leg.

The operation which I perform consists of the following stages. 1st. The circular incision of the integuments. 2d. The circular section of the muscles and other parts down to the bone. 3d. The division of the muscles and adherent fibrous and interosseous organs. 4th. The use of the three tailed retractor. 5th. The incision of the periosteum. 6th. Lastly, the division of the bones by the saw.

Surgeons have for a long time endeavored to devise a *flap operation* applicable to the leg. Since its invention in 1679, by an English surgeon named Lowdham, and described by Verdinn, it has been successively corrected and modified by Garengeot, Lafaye, and O'Halloran. It had, for a long time, been banished from practice, when a professor of the faculty of Paris, a few years ago, vainly endeavored to revive it. I have never performed it, but have imagined an operation which should consist, 1st. In a vertical incision upon the tibia, commencing a little below the point at which the bone is to be divided, and three inches in length. 2d. Another incision parallel to the latter and dividing deeply the whole thickness of the calf of the leg. 3d. Lastly, a third circular incision meeting the two preceding ones at their inferior extremity; the flap should then be raised up, and after the section of the bone, brought down and closed over the stump.

Differing from many distinguished surgeons, at the same time and same

stroke I divide the integuments and all the soft parts as far as the bone, and thus avoid a long and difficult dissection of the skin, spare the patient pain, and shorten the operation. To these advantages may be added one still greater, perhaps, that of not destroying the natural adhesions of the skin, and consequently preserving unhurt its nutritive cellular membrane. This may be done where there is but a single bone, as in the arm or thigh; but the rule cannot apply to the case of two parallel bones. Thus you may observe in the directions given for the fore-arm and leg, that there is one stage more, that is the previous circular section of the integuments, and their subsequent dissection to a greater or less extent. Moreover, the blade of the knife is directed very obliquely in the second stage of the operation, a circumstance which is not observed in amputation of the arm and thigh. It is, because the muscles of the fore-arm and leg possess but little contractility, with difficulty isolated and removed from the centre of the wound; and lastly because it is highly important to preserve integuments sufficient to cover the wound exactly.

In order to accomplish this end, that is, to have a cone of integuments and flesh sufficient to cover the wound exactly, we must here, as in the amputation of the fore-arm, demi-flex the leg on the thigh, and the latter on the pelvis. We shall hereafter see the inconvenience resulting from a neglect of this rule.

5th. Of the leg, at the knee-joint. The horror formerly entertained by the idea of amputation at the elbow and knee joint, seems to be passing away. I have for a long time, and with much success, performed the former, and it is now generally admitted. As to the latter, it has as yet no partisan among surgeons. M. Larrey formally rejects it. From considerations drawn from the structure of the joint and the organization of the soft parts surrounding it, I am of the same opinion, and prefer, when it is impossible to choose the spot for amputation, to divide the condyles of the tibia, or the lower part of the thigh. Of thirteen cases of this disarticulation, twelve appear to have been successful; but their history is not sufficiently circumstantial to carry credit with it. We must therefore wait for a more extensive and perfect experience.

6th. Of the thigh at the hip-joint. Circumstances may exist, in which the only alternative left to the patient is the frightful and always uncertain operation of disarticulation of the hip-joint. It is always with repugnance, and after having abandoned all hope of success by any other means, that the surgeon decides on this mutilation, the greatest that the man can undergo. It had only been done a few times, and then merely when some injury, or gangrene or suppuration had destroyed nearly all the parts surrounding the articulation, when M. Larrey had the boldness to perform it immediately, (in cases of soldiers,) where the thigh had been disorganized by gun-shot wounds, as far as its superior articulation. His plan consists now in the formation of two flaps, one external and the other internal, and the ligature of the femoral artery in the groin, previous to commencing the operation. M. Larrey has laid down this precaution as a rule, inasmuch, says he, as it permits the surgeon to operate with more safety, and exposes the patient to less risk. He performs it as follows:

The patient being laid on his back, the pelvis entirely resting on the edge of the bed or table, the operator standing on the outside of the limb, makes an incision parallel to the femoral artery, commencing under the crural arch, exposes this artery, and secures it by ligature. Armed with a long knife, he plunges it perpendicularly to the lower part of the incision previously made

for securing the artery; he grazes the internal part of the femur on a level with the trochanter minor, and brings the instrument out at a point diametrically opposite to that of its introduction. Directing then its edge downwards and outwards, he makes from the internal and upper fleshy parts of the thigh a flap about six inches in length, but which of course varies with the size of the limb. An assistant draws this flap inwards. The anterior portion of the fibrous capsule is then divided, the bone luxated; then the knife passed between the articular surfaces, serves to divide the external part of the capsule and terminates by making from the flesh of the thigh a flap of the same length as the preceding, in the formation of which we must be careful to graze the great trochanter, turning the knife slightly in order to avoid this process. The arteries are then tied, and the flaps brought together.

Mr. Guthrie has performed this operation, but in another way, which has succeeded, and which consists, after having made pressure on the crural artery, in dividing the skin by two semicircular incisions which commence four inches below the anterior superior spinous process of the ilium, pass obliquely on either side of the limb, and meet on its posterior surface. The muscles are then divided on each side in the same direction, and the operation terminated by the disarticulation of the femur. The femoral artery is then first secured, and the others successively in proportion to their size.

Beclard, after having made pressure on the artery, commenced by making an external posterior flap, by plunging his knife obliquely from without inwards and from before backwards, from the vicinity of the tuberosity of the ilium to the internal extremity of the ischiatic notch, grazing the posterior face of the neck of the femur. A second flap was formed in the same manner in front, and the operator ended by the section of the capsule and the disarticulation.

The methods consisting in two flaps are in some measure necessary whenever it is possible to make two similar flaps. But it is very difficult to attain this end by the method with internal and external flaps, for a great part of the latter is formed merely by the skin covering the great trochanter, whilst the former contains nearly all the flesh forming the upper part of the thigh. Again, by this method there remains on a level with the cotyloid cavity a considerable vacuum, which does not allow so prompt an union of the wound. These objections joined to the extent of the wound explain why patients who have undergone this operation have nearly all fallen victims to the primary symptoms, occasioned by the violence of the local irritation.

The following operation is the one which I prefer in disarticulation of the thigh: the surgeon stands on the inside of the limb and uses, if he be ambidexter, the right hand for the right leg, and the left hand for the left leg. The crural artery is compressed upon the ramus of the pubis by an assistant. The operator himself sustains the thigh and inclines it more or less in flexion, extension or abduction. He makes on the inside a semilunar incision, with its convexity downwards, commencing near the anterior superior spinous process of the ilium and ending at the tuberosity of the ischium; at first merely divides the skin which is retracted by an assistant, cuts immediately the muscles in the same direction, thus making an internal flap, four or five inches long, raises it up, divides the capsule, traverses the articulation, and ends by forming the external flap.

Having thus sketched the operations I have devised, and modifications I

have made, we will now point out the greater or less serious objections attached to some operations adopted by other surgeons.

1st. You know that in the partial amputation of the foot according to Chopart's method, an incision is made in the line going from the astragalo-scaphoid articulation to that of the os calcis with the cuboid, but at about half an inch in front of this line, in order to make a dorsal flap. In order to render the operation more rapid and brilliant, it has been proposed to divide the skin and astragalo-scaphoid articulation at the same time. Nothing certainly is more easy, but the integuments would retract over the dorsal face of the foot, and expose the bones, from which very serious accidents might arise.

2d. In disarticulation of the two last phalanges of the fingers, many surgeons have thought that in certain cases it might be useful to commence on the palmar face, and to do this they pierce the integuments placed before the articulation with the bistoury laid *flat* to make an anterior flap. This plan is exposed to the danger of striking against the projections of the bone, breaking the point of the instrument and causing unnecessary pain. We have already said what must be thought of the previous incision proposed to be performed on the first phalanx some time before the disarticulation of the second, in order to procure the adhesion of the flexor tendons.

3rd. In individual amputation of the fingers at their metacarpo-phalangeal articulations, some surgeons plunge the point of the bistoury perpendicularly from the dorsal to the palmar face of the hand, twice, on the right and left of the articulation, to make two flaps. This plan is more inconvenient and painful than that I have proposed.

4th. In extirpation of the hand, or disarticulation of the wrist, the circular or the flap operation is now generally performed. In the latter case some surgeons prefer a single flap, others a double one. Lastly the double flap operation is performed in two ways. In that with a single flap, we attack the articulation on its posterior or dorsal surface, cutting at one stroke the integuments and tendons, and finishing, after having passed the knife through the joint by an anterior single flap, about three fingers in breadth, and rounded from within outwards. In the first operation with two flaps we begin also on the posterior face of the joint, taking care to make a convex flap which should be longer, and finish by an anterior shorter flap, or rather by two flaps of the same length approximating to each other. Lastly, an operation, which belongs to one of the surgeons of a Paris hospital consists in supinating the hand, attacking the joint at its anterior surface, plunging a catling transversely, from one apophysis to the other, the edge turned towards the palm of the hand, and making a flap from the flesh of this part, then opening the joint and finishing by the posterior flap.

In these three methods, it is always difficult to form an anterior flap and give it the desired shape and length, on account of the density of the tissues and the projections of the scaphoid, trapezium, pisiform, and unciform bones. The single flap and first of the double flap operations present the fewest objections, because the knife, having once traversed the articulation, can easily divide the tendons near the latter before cutting the integuments and forming the anterior flap. The last we have pointed out is unquestionably the most simple, easily executed, and advantageous in its results. For my own part, I prefer the circular operation as described by Sabatier as the most certain,

rapid, and unequalled as regards the ease with which the opposite parts of the wound can be brought together.

5th. The greater part of the operations relative to the disarticulation of the humerus, may be referred to two general methods, one consisting in a single, the other in a double flap. The first, belonging to Ledran, has fallen into disuse. The second is performed in two ways: some make a superior external and an inferior internal flap. I have simplified this, by making at one cut the upper flap, which formerly required three incisions; but it still is liable to many inconveniences, and I never employ it but under peculiar circumstances.

The best method consists in making an anterior and posterior flap. Desault adopted it, but he began by the anterior flap; and the danger of isolating first the parts in which the most important vessels are found may be easily conceived.

One of our most distinguished surgeons performs this operation in the following manner: the arm being nearly pendent on the side of the body, with one hand he raises the posterior fold of the axilla, upon which he applies the knife perpendicularly from below upwards. The point of the instrument soon meets with the inferior surface of the acromion. Then at the same time elevating the flesh still more, he gives the instrument an oblique direction from below upwards and from behind forwards, so that the point may pierce the skin in the space which separates the acromion from the coracoid process, and the joint is thus separated; he then makes the first, the posterior flap. I think that the difficulties presented by this plan are very great, and that few persons can familiarise themselves sufficiently with this mode of extirpation of the arm to perform it with the only advantage it possesses, celerity, without any fear of accidents.

6th. Abernethy and Græfe have proposed the circular operation in extirpation of the thigh; but that with two flaps is generally preferred. M. Larrey makes first an incision parallel to the crural artery, ties that vessel, and then starting from that incision makes two flaps, one external, the other internal. This distinguished surgeon lays it down as a rule, to tie the artery before commencing the operation, as it gives the surgeon more time, and is less dangerous to the patient. This is certainly an excellent reason, but experience has proved that compression of the artery on the horizontal ramus of the pubis fulfils the same end, and it seems superfluous to complicate an operation, already so serious, by a secondary operation which necessarily increases its duration. After a patient investigation of all the different plans proposed and adopted, I have been led to prefer that consisting in the formation of anterior and posterior flaps, which independently of many advantages already enumerated in another part of this chapter, makes these flaps more equal and symmetrical.

We have now arrived at an essential consideration in amputations, namely, *the means of suspending temporarily the flow of blood during the operation*; and secondly, *the means of preventing all hæmorrhage after the amputation*.

1st. We may easily conceive the fear of the ancient surgeons, when we remember that they possessed no means of suspending the flow of blood during an operation. Archigenus of Apamea is said to have been the first to propose a *circular ligature* around the *limb*; to sprinkle it with cold water; and even

he had the idea, bold in his day, to previously secure the vessel. A. Paré in later days used the ligature of the limb, a faithless and painful method, to which this father of French surgery attributed the advantages of not only arresting the course of the blood, but also of diminishing the pain by benumbing the limb. During the siege of Besançon, Morel devised the *field tourniquet*, by adding to the ligature of Paré a plate and two short sticks, by which it could be twisted. Lastly, J. L. Petit made a great improvement by the invention of the *tourniquet*, which merely compresses two opposite points of the limb. Therefore the means of suspending temporarily the course of the blood are now reduced to two, and we employ, either *compression*, or a *previous ligature*. Compression is effected either by mechanical instruments, or the hand. Two indispensable conditions are required for the use of compression by either means; the superficial position of the artery, and its super position on a bone or some solid part which may furnish a firm support.

This being granted, which is preferable, the mechanical or manual compression? Experience and facts must answer this question. Wherever, and in whatever way I may perform an amputation, I always require an assistant to compress previously the arterial trunk of the limb, and never have regretted the proceeding, nor seen hæmorrhage from the principal vessel. This compression should always be entrusted to an intelligent assistant and one who possesses great coolness. Great strength is unnecessary. The essential part is to compress firmly and perpendicularly to the resisting surface. Therefore should he be perfectly acquainted with the inclination of the bony planes on which the vessels rest. For example, that of the upper surface of the horizontal ramus of the pubis look upwards and forwards, that of the first rib upwards and slightly outwards; so that in the groin, compression should be made from above downwards, and from before backwards, and the sub-clavian depression from above downwards, and from without inwards. If compression sometimes fail, it is because it is not practised according to those principles which are equally requisite for mechanical instruments.

Some amputations may be performed without employing compression, even when large vessels are to be divided. Such are those in which the division of the vessel is in the last stage of the operation, and when intelligent assistants by firmly grasping the parts can compress them and prevent the effusion of blood before the completion of the flap. But as a general rule, and applicable to all operations, we should only undertake, without having previously interrupted the circulation, amputations in which small arteries may be divided, and which can be instantly secured.

However, in many cases we must have recourse to previous ligature and compression by instruments. I know but one case in which the previous ligature may be necessary: namely, when from the disorganization of the parts, and the artery particularly, we may not be able, after amputation, to place a ligature firmly on the surface of the stump. We must then commence by tying the arterial trunk above the spot which has been selected as proper for the amputation. As to the mechanical means of compression, the *tourniquet* of Petit is far preferable to all others in use. In whatever manner compression may be effected, it should be continued until all the arteries are secured. Then, instead of suddenly removing it, it is to be gradually diminished, so as to be immediately reapplied in case of any loss of blood.

In all amputations of the thoracic and abdominal extremities, manual compression is performed on two principal points: the axillary and brachial arteries in the former case, and on the crural artery in the latter. Compression of the axillary artery behind the clavicle, on the first rib, or in front of the clavicle, between the deltoid and great pectoral muscles, on the 2d and 3d rib, is not always sufficiently secure; and therefore, in disarticulation of the humerus I always charge an assistant to grasp with his hand the anterior flap at the moment of dividing it, and to compress the artery with his thumb in the thickness of the flap. Behind the clavicle on the first rib, compression is more painful to the patient, more difficult and tiresome to the assistant. It is better, unless for particular reasons, to effect it in front of the clavicle. Garenggeot and Ledran tied the principal artery previous to extirpating the arm. This practice is no longer in use. When compressing the crural artery on the horizontal ramus of the pubis, we should be careful to not press on any inguinal ganglion in order to spare unnecessary pain to the patient. In fat people, it is very difficult to obliterate completely the femoral artery, and mechanical means must be employed. The assistant to whom the compression is entrusted should not apply his fingers longitudinally or parallel to its diameter, but at a right or obtuse angle. We will not here treat of the arterial hæmorrhage which may occur during an operation; it cannot take place in amputation, unless the compression has been improperly or ineffectually made. For many years, also, surgeons have adopted the plan of tying the vessels as they were divided in the course of an operation. But writers, whilst treating of arterial hæmorrhage, have entirely overlooked that which is furnished by the veins. They have, therefore, neither indicated its mechanism, nor the most simple and effectual means of arresting it.

It sometimes happens, that at the moment of dividing the parts in which the flow of the blood has been arrested by compression, a considerable gush of blood takes place. The inexperienced surgeon may be alarmed, and by his agitation increase the very disaster he so much fears. The color of the blood should guide the operator; if it be black, it proceeds from the lower part of the limb, and is a matter of small importance; but when we operate on parts abundantly furnished with veins, and in which the circulation has not been arrested, the blood sometimes continues to flow; it covers the whole surface of the wound and arrests the progress of the operation. This frequently happens in laryngotomy or tracheotomy. Again, when large veins are divided, the blood gushes forth in torrents, the patient becomes pale and appears about to expire in the hands of the surgeon. This is often seen in amputations of the upper part of the limbs, during the extirpation of fungous tumors, of the maxillary sinus, cancer of the neck, of the breast, &c.

Now it is in the patient himself that we must seek for the cause of this venous hæmorrhage; the flow of blood depends more on his exertions than on the size of the divided veins. In fact in a majority of operations, the patient suspends the respiratory movements, fortifies himself against pain, and the blood, unable to pass through the lungs, is arrested in the vena cava, and distending these vessels as well as those which empty into them, it regurgitates and finds no exit but in the divided veins. The most rational and certain plan of arresting it, is to desire the patient to breathe, in order to restore the nervous circulation. The lungs are hardly dilated once or twice, when the

bleeding ceases, but is again renewed on a renewal of the exertions. It is therefore an important rule, to make the patient breathe with his mouth widely open, during an operation, and desire him to amply inflate his lungs, without making any effort to arrest free inspiration and expiration.

*2d. Of the means of permanently arresting hæmorrhage.*—The surgeon's first care after an operation is to obliterate the divided vessels, which might furnish a dreadful loss of blood. Many hemostatic means have been proposed during the different ages of surgery. Such are refrigerants, absorbents, astringents, escharotics, the actual cautery, compression, ligature, torsion of the arteries, &c.

Hippocrates proposed merely a mild regimen and the elevation of the stump. Celsus used a sponge wetted with vinegar. It is said that Archigenus of Apamea previously tied the vessels; this fact is doubtful, for it supposes an anatomical knowledge of the circulation, foreign to his day. Paulus of Ægina applied a red-hot iron; this may have arrested even the flow of blood from large arteries, but it must have recurred on the separation of the slough. The Arabian surgeons employed knives heated to redness. Theodric of Cervia applied opiate preparations to the stump. Guy de Chauliac desired to remove the limb by gangrene; for this purpose he enveloped the whole extremity with a plaster of pitch and applied a ligature very tightly at the point of separation, so that the limb was entirely strangulated. Lastly, our celebrated countryman Ambrose Pare completely revolutionized this important branch of our art. Although in his day the circulation of the blood was but imperfectly understood, he proposed the ligature of the vessels at the surface of the stump; a method considered even now as the most simple and certain that can be used. The manner of performing requires no explanation from me. Ligatures of different materials and various sizes serve generally to secure the vessel and arrest the hæmorrhage. It has been supposed, in latter times, that animal ligatures on account of their analogy with our tissues might be easily absorbed, and that by cutting them very near to the arteries, union by the first intention might be effected. Experience and observation have not confirmed this idea.

Much importance is attached to the shape of ligatures: many surgeons making them of thread, placed in parallel lines on the same plane like a riband, so that they may be flat, and not divide the vessel too suddenly; others pretend that they should be round, in order to divide the internal and middle coats of the artery, and hasten their separation. It is of very little importance, as the act of tying them always, whatever may be their shape, reduces them to a rounded form.

The surgeon should be careful not to include in the ligature any large nerves or veins, as from the first intolerable pain and very serious symptoms may follow; and that of the latter is often productive of phlebitis and accidents which may be fatal. Lastly, we must be careful not to seize an artery by merely one side, with one branch of the forceps alone in its canal. It has happened that a portion only of the circumference of the artery having been included in the ligature, bleeding takes place immediately after the dressing of the wound.

If, after securing the principal arteries of a limb, blood be still poured from some small branches beyond our reach, we must have recourse to the

actual cautery, as the only means of arresting the hæmorrhage. The ligature of an artery is sometimes very difficult after an operation, in consequence of some condition inherent in the artery itself. A tense aponeurosis may prevent it, and require division to disengage the vessel. Thus I frequently divide the interosseous ligaments of the leg and fore-arm, in order to isolate the anterior and posterior tibial arteries, and even the interosseous arteries which sometimes are closely applied to them.

Let us now consider an important part of ligatures, namely, the parts they are to embrace, and the degree of tightness necessary. We know that the obliteration of a vessel takes place by the formation of a coagulum extending as high as the first collateral branch. When the artery has been tied too tightly, or too exactly separated from the surrounding elastic cellular tissue, its outer coat is too easily divided, the coagulum as yet fluid escapes, and the hæmorrhage returns. If, on the contrary, the artery be not sufficiently compressed, its outer coat and the cellular tissue included in the ligature diminish in size, become more dense, and the blood establishes in the centre of the vessel and the ligature a canal through which it flows in greater or less quantity. If we include in the ligature muscular fibres, they are too easily divided. The adipose cellular tissue is subject to the same inconvenience. Should any portions of fibrous tissue be comprised, it does not indeed affect the success of the operation, but is too slowly divided and generally retains the ligature for weeks or even months in the parts.

It now remains merely to say a few words concerning a hemostatic measure lastly proposed, namely, the *torsion* of arteries.

It has been observed that lacerated wounds seldom pour out much blood; this depends undoubtedly on some new character being given to the coats of the vessels by the peculiar nature of the accident. Starting with this fact, a surgeon of modern days has tried to prove that, by a similar action on these organs, analogous results must be obtained. Arteries were lacerated, torn, crushed, cauterised on animals, without any effect more than a temporary suspension of the hæmorrhage. After numerous experiments of this nature he conceived the idea of twisting the vessel carefully: the first case succeeded, and since that time an immense number of experiments have been made on animals. It is done in the following manner:

The free extremity of the artery being held by a pair of *artery forceps*, of which the two branches are held together by a slide, it is gently drawn out to the extent of five or six lines, more or less. The surrounding tissues are separated by ordinary forceps; then holding the artery near the wound with the latter forceps in one hand, the artery forceps are twisted six, ten, fifteen, or twenty times on their axis, more or less, according to the size of the artery, that is, until that portion of the vessel included between the instruments is ruptured; the operation is then terminated. It is not absolutely necessary to rupture the artery when its calibre is small, but it is a more certain method in those of some size.

In performing this torsion, we should be careful to seize both sides of the artery with the forceps, and also, to leave no blood between the two instruments, as it is incompressible, and by pressure would cause the bursting of the membranes. That portion should therefore be emptied of blood. The second forceps are not used by some surgeons; this is objectionable, as the

torsion extends beyond the surface of the wound, the nervous filaments and cellular tissue in contact with the vessel are lacerated, the operation is more painful, and may be followed by inflammation. If a collateral branch be near, it may be ruptured, as has frequently happened in experiments on animals. It is therefore much better in all cases to make use of the forceps, as the most effectual means of performing the torsion.

Let us now inquire the real value of this method in arresting hæmorrhage. When M. Amussat proposed it in 1829, he had made numberless experiments on different animals, such as dogs, horses, rabbits, &c.; experiments which he has since continued, and had always succeeded in arresting hæmorrhage from the largest arteries, as the crural, brachial, carotids, &c. Since then he has applied it to man in several amputations performed in the presence of different surgeons, amongst others, in an extirpation of the testicle, four amputations of the thigh, one disarticulation of the arm, several extirpations of the mammæ, &c. No secondary hæmorrhage occurred in any of these operations; union by the first intention was effected (in seven days) only in the youngest of the children. The four were perfectly cured, and exhibited to the National Institute on the 21st January, 1831. When this plan was known abroad, it was soon tried by several distinguished surgeons. M. Lieber, surgeon in chief of the New Hospital of Berlin, repeated the experiments of M. Amussat with the same results. At the same period M. Fricke at Hamburg, MM. Waust and Ansieaux at Liege, MM. Rust and Dieffenback at Berlin, applied it to man with varied success. In October of the same year, (1829), M. Schrader of Dresden performed torsion of the temporal arteries, the mammary, and in November of the brachial arteries. In no case was there secondary hæmorrhage. In France, M. Delpech was unsuccessful in two cases in which he tried this plan. But here the failure was no argument against the operation; for one of the patients exhausted by disease and a cancerous ulcer, covered with melanotic tumors which occupied the whole surface of the fractured limb, died on the 44th day after the operation; the other who suffered amputation for a comminuted fracture of the leg, died on the 18th day; and in neither case was there any secondary hæmorrhage. Towards the close of 1831, in six amputations performed at the Hospital St. Louis, torsion only succeeded once, and could not be performed or failed in the other five. Ordered by the Institute to make a report on this plan, I made a number of experiments at the Hotel-Dieu, and arrived at this conclusion: that in man it may be safely applied to arteries of small calibre, but is unworthy of confidence in those of larger size. In three or four amputations at the Hospital St. Antoine, no hæmorrhage occurred; many other surgeons have given it a trial, as MM. Guerin, at Paris, Bedor and Fourcade, at Troyes, Lallemand, at Montpellier, Key at Guy's Hospital, &c.

In amputations, and indeed in all large and bloody operations, instead of dressing the wound immediately after the arteries are secured, I prefer waiting one or several hours, for the following reasons:

It frequently happens that notwithstanding all the care taken by the operator to secure every bleeding vessel, secondary hæmorrhage occurs after some time; this is always distressing to the patient, as all the dressings must be removed in order to arrest it. We can never be certain that this will not happen. Now when the limb is dressed, the hæmorrhage can only be ascer-

tained when all the apparatus is soaked with blood, that is when this loss of blood has produced a serious and perchance fatal effect on the patient. The secondary hæmorrhage may be explained in this way. Sometimes an artery has not been tied, and yet pours out no blood; the surgeon does not discover its extremity on the surface of the stump: having retired deeply in the flesh, it allows no blood to escape. We then wait in vain for several minutes, no new discharge takes place; but in one or two hours, or even in less time, the irritation attracts the fluids towards the wound and hæmorrhage takes place. This stoppage of the flow of blood from a divided artery often depends on a deep moral impression produced by the idea of the operation on the patient, or more or less violent spasms which he may suffer during its continuance. Some persons fall into syncope from fear, or at the sight of the blood. Under such circumstances we should wait for two or three hours before dressing the wound. Hæmorrhage may occur from a considerable afflux of blood to the part, and the dilatation of vessels hitherto unperceived. It may also happen from the ineffectual application of the ligature, &c. By taking the precaution here recommended, secondary hæmorrhage may be nearly in every case prevented.

*Of the dressing.*—Formerly, with the double intention of more certainly arresting the hæmorrhage and exciting what was considered a useful suppuration, especially in amputations required by long standing disease, the wound was filled with pellets of charpie, kept in by a bandage. Acute pain, violent inflammation, accompanied by serious sympathetic symptoms, the exposure of the bone, and the conical shape of the stump, were the frequent consequences of this mode of dressing. Since a few years some surgeons have fallen into the opposite extreme, by praising a plan which has for its object to avoid all suppuration and effect the immediate union of the divided parts. Many practitioners have been deceived by such seductive expectations, but the delusion has given way to experience, and a happy medium is now generally adopted. The proper plan is to combine the advantages of both plans; in order to do this, the ligatures are to be collected in one bundle and placed in the most depending angle of the wound; if this bundle be not sufficiently large, we add, but rarely, however, a small cylinder of lint or muslin; the integuments are then brought over the stump and there fastened by adhesive plaister. The fluids then are discharged by means of the ligatures which serve as a spout, and no effusion nor infiltration takes place, neither do abscesses form in the stump. Immediate reunion takes place throughout a great extent of the wound; suppuration occurs merely in the course of the ligatures, and generally ceases when the latter come away.

Former surgeons were unacquainted with the difficulties which make operators in our days hesitate between union, by the first and second intention, of wounds after amputations. Their operations could have no reference to the former plan, as they frequently did not leave flesh enough to cover the bones. They merely expected the formation of a cicatrix after suppuration, which cicatrix was always weak and easily destroyed. In later times this cicatrix was more skilfully obtained, but always after a more or less copious suppuration, and the interposition between the lips of the wound of various foreign bodies. The plan of bringing the flaps together in order to procure immediate adhesion, is due to B. Bell, who proposed it in 1772, and it was since laid down

as a general rule by Alanson in 1779. Since that time it has been constantly followed in England. Introduced into Germany by Graefe, it was there received with enthusiasm. In France we were slower in adopting it. But being successfully employed in several cases by the celebrated Desault, and then by several military surgeons, it soon had numerous partisans. The idea of sparing pain, of avoiding a tedious and abundant suppuration, and removing in a few days a large wound, carried away many men and soon more than one voice proclaimed its advantages. Cases of brilliant and rapid success poured in from all quarters. I confess that, for a long time, this plausible doctrine guided my conduct; but experience, and the observation and comparison of a large mass of facts, have proved to me how ill founded are the advantages which this plan is supposed to possess; and I am convinced that more patients are lost by its exclusive adoption, than by following the method we have devised. Of thirty operations according to our method, six have died; whilst nine have perished of twenty-nine, one whom immediate union had been attempted. This disproportion is great.

Nevertheless immediate union may be advantageous in amputations for an injury, on the field of battle, for instance, because in these cases things are in a very different condition; the individual is healthy and vigorous, his constitution has not been worn out by former disease, or a suppuration of more or less standing, which has become, as it were, a necessary habit to the economy. In the civil hospitals, a great majority of the patients are affected with organic lesions, or have been weakened by suppuration and pain for several months. By amputation we suddenly suppress a cause of irritation which had modified the whole organism; the economy can seldom accustom itself to so sudden a change, and almost immediately some visceral inflammation takes place. It is often difficult to recognize these inflammations, for they preserve of their peculiar character only the phenomena of suppuration and especially intermittent chills. We may, indeed, establish an artificial discharge, some days previously to the operation, but this generally fails and cannot replace the powerful influence of a disease requiring the sacrifice of a limb.

Can it be supposed, also, that because the lips of a wound have been accurately brought together either by simple dressing or a suture, that no fluid can escape, that no secretion can take place? Certainly not. The lips of the wound unite more readily than the interior, the matter of an inevitable distillation from the capillaries of the muscles accumulates beneath the skin, penetrates into the interstices of the tissues, and acting like a foreign body, frequently gives rise to large abscesses which endanger the success of the operation; or the resulting irritation occasions a number of small ulcers on the internal surface of the flesh; or, again, a small artery pours out blood, which finding no exit is infiltrated in the limb, and accumulates in greater or less quantity under the skin. In all cases, the fluid at last destroys the adhesion of the edges of the wound, or it must be destroyed by an instrument. If there be any circumstances favorable to this method, it is certainly when torsion has been employed, and in which no foreign body remains; this, in the numerous experiments made by surgeons of divers nations, has succeeded but in a very small number of cases.

Amputations may be followed by many different affections, known under the name of *consecutive* or *secondary affections*. Such are hæmorrhage, ex-

cessive inflammation of the stump, fistulous sinuses, abscesses in the extremity of the amputated limb, necrosis, exfoliation, the projection of the bone, phlebitis, inflammation of the internal organs, collections of pus in different parts of the body, hospital gangrene, &c. Of all the complications which can interrupt the progress of cicatrization and constitute too frequently causes of death, some are common to many operations, others peculiar to amputations; some are occasioned by external, some by internal causes, inherent to the idiosyncrasy and constitution of the patients; some are physical, others moral. Upon many points we cannot add much to what we have already said when treating of burns, gun-shot wounds, &c., and upon others, our limits do not allow us to enter into much detail. We shall, therefore, terminate this chapter by some short remarks on secondary hæmorrhage, and some accidents peculiar to certain amputations.

*Secondary hæmorrhage* is one of the most grievous occurrences which can tend to mar the success of an operation. It generally occurs when we least expect it, and when the surgeon and patient are anxiously expecting a rapid cure. It appears at divers periods, which cannot be foreseen, sometimes in a few moments, or a few hours after the operation, as has been remarked, sometimes after many days or weeks, and even months. T. L. Petit observed it twenty days after an amputation of the thigh, which had been performed very high up. A few years ago, in the hospital of La Charite, it appeared two months after an amputation of the leg, at the bottom of a fistulous sinus, which had not completely closed and which had ulcerated one side of the popliteal artery.

Besides the causes of which we have already spoken elsewhere, secondary hæmorrhage recognizes many others, such as too deep a moral impression, exciting drinks, the irritation of the wound from too great compression. I have called this last variety *active hæmorrhage from lesion of the tissues*. It generally manifests itself during the first hours after an operation, sometimes later, but especially at the period of invasion and during the traumatic fever. This accident may also proceed from the insufficiency of the hæmorrhagic measures previously employed; thus after cauterizing a vessel, it frequently manifests itself on the separation of the eschar. The inflammation and suppuration of the interior of the arteries of the stump tend especially to the expulsion of the contained coagulum and consequently to secondary hæmorrhage. An inflammation which continues and keeps up suppuration in the vicinity of an artery will suffice to ulcerate it and give a passage for the blood. The period of the separation of the ligatures requires double attention; the coagulum frequently has not acquired sufficient firmness, the end of the artery is not solidly closed, or else the ligature around this end has softened its parietes, it yields to the impulsion of the blood and hæmorrhage takes place.

Secondary hæmorrhage is more difficult to arrest than that which occurs immediately after an amputation, because the tissues which have commenced to inflame or are already inflamed, have acquired new characters. The cellular tissue has lost its natural elasticity and flexibility; it has become thick, dense, sometimes lardaceous from inflammation, and is very easily divided by the ligature. Thus hæmorrhage recurs whenever these means are used. Immediate ligature is in such cases generally impracticable, and the most advisable plan is to tie the principal artery of the limb at some distance

from the stump. This I have been obliged to do several times, and it has been very generally successful. Again, it must not be forgotten that this secondary hæmorrhage depends on numerous and various causes, which it is important to ascertain in order to apply the most effectual remedial agents.

We have spoken, when treating of the amputation of the leg, of the necessity of preserving more integuments there than elsewhere, and of keeping the limb during the operation in a demiflexed position. We think it proper to point out here the consequences of a neglect of this caution. If the skin does not extend sufficiently far over the flesh, (and this remark applies to other amputations) the muscles become inflamed, swollen, and project beyond it, whilst the inflamed integuments lose their elasticity and contract upon themselves. It follows thence, that the muscles are compressed in their passage through the wound, and we soon observe in the stump all the effects of an inflammation accompanied by strangulation. When amputation has been performed with the limb extended, and that after the operation it is demiflexed, the flesh of the posterior part of the stump, which retracts but little, slide from above downwards along the bones, become relatively too long, and passing beyond the skin when inflammation comes on, present a most favorable condition for the development of the symptoms just pointed out. This may be remedied by applying a sufficient number of leeches around the stump, and incising on the sides the skin and aponeurotic envelope. Another frequent accident following amputation of the leg, is an acute inflammation, sometimes gangrene and perforation of the skin at the point at which it rests on the acute angle formed by the tibia. It is to obviate this inconvenience that it is advised to close the wound towards the fibula; but this does not always succeed. For this reason, M. Larrey divides the bone as high as possible, in order to diminish the bony projection, and avoid necrosis of the tibia, which occurs much more frequently than that of the fibula. Some surgeons with the same intention remove at the time of the operation, a portion of the anterior angle of the bone. In all cases whenever the accident occurs, we should unhesitatingly, incise the skin opposite the projection of the tibia, in order to prevent its becoming gangrenous from pressure.

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## CHAPTER XLV.

### ON HYDROCELE AND ITS PRINCIPAL VARIETIES.

Nothing is more simple than the diagnosis of simple hydrocele, nothing more firmly established than its treatment; for these reasons we should say but little concerning it if the varieties and complications which it frequently presents were not deserving of your attention. The name of hydrocele is given to watery tumors of the scrotum; in one case, it is effused into the cellules of the cellular tissue, this is hydrocele from infiltration; in another, it is collected in a sac, this is hydrocele from effusion. We also meet in practice with a third species of hydrocele distinguished from the others by the accumulation of serum in serous or accidental cavities, developed either

in the middle of the spermatic chord, or in the testicle or the epididymis. Let me here remark that each of the species here spoken of, may present many varieties, of which the characteristic marks will be pointed out.

Previously to making any remarks on hydrocele from infiltration, let us designate the characters of the principal varieties which we have established in the cellular tissue which plays so important a part in this hydrocele. I have observed in the general cellular tissue four varieties, which are, 1st, the adipose cellular tissue, existing nearly isolated in some animals, as the sheep, developed in the omentum, strongly marked in some individuals. When inflammation attacks this tissue, it generally terminates by a kind of wasting and putrefaction of the inflamed parts. This is observed in strangulated hernia when the omentum is left outside, and in sheep which have been inoculated or vaccinated in order to prevent them from being attacked by certain diseases.

2d. The fibrous cellular tissue containing neither adeps nor serum. This tissue in man is principally found around the articulations. When inflamed it is generally accompanied by strangulation. In the dog and some carnivorous animals the cellular tissue is nearly every where fibrous.

3rd. The elastic cellular tissue containing none of the elements of which we have spoken. It is seen around the tendons which are unprovided with synovial burse. Inflammations affecting it have a great tendency to spread, as may be seen in the palm of the hand, when inflammation of the tendons readily extends to the fore-arm, &c.

4th. The serous cellular tissue, always free from adeps, inelastic and continually moistened by serum. It is found in the eyelids, the genitals, the scrotum, &c. Inflammation of this tissue often terminates by suppuration. In it is seated hydrocele from infiltration whether idiopathic or symptomatic.

Considered as regards its situation this hydrocele occupies the spermatic chord, or the middle septum of cellular tissue, or lastly in the sub-cutaneous serous areolæ. In the first case, the tumor is circumscribed, fluctuating and confined to one chord; in the second, it is elongated, extended from the ring to the base of the scrotum, preserving the impression made by the finger, only occupying one testicle; lastly in the third, the tumor is voluminous, doughy, extends rapidly to the whole scrotum without being arrested by the median line. The knowledge of these different cases is important in the treatment, for supposing we wish to give exit to some infiltrated fluid, we must make, in the two first varieties, an incision of greater or less extent, whilst in the third a simple puncture will frequently evacuate all the fluid contained in the sub-cutaneous areolæ, on account of the free communication between them. Hydrocele, from idiopathic infiltration, generally occurs only in newly-born children and in old men. The disease may be confined to one side or attack the whole of the scrotum.

Hydrocele from effusion, of which we shall treat particularly, is fluctuating; it ascends from the most dependent portion of the scrotum towards the inguinal canal, is almost always developed in front of the testicle, and offers resistance only when the serous sac and other coats being distended and rendered thin, resist the effort of the fluid and react upon it. These dispositions however, may vary, as will be seen by the following case.

CASE I.—A man came to the Hotel-Dieu, after having been treated in another hospital for hydrocele, which had been punctured. He said the operation was very painful. Blood alone, and no serum, passed through the canula; the scrotum, instead of decreasing in size, had immediately grown much larger. It had become hot, painful and tense, and required a severe antiphlogistic treatment to restore it to its state previous to the operation.

Placing a lighted candle behind the tumor, I saw that it was transparent, and presented in front, about the situation of the former puncture, an opacity formed, as I supposed, by the testicle. Holding this substance between two fingers, the tunica vaginalis was easily emptied by a puncture made more posteriorly.

We have stated in the commencement of this chapter, that the disease under consideration presents complications and varieties worthy of attention; for example, hydrocele from effusion of the tunica vaginalis may be complicated with encysted hydrocele of the spermatic chord. This has been a frequent source of erroneous diagnosis; frequently situated opposite to the inguinal ring, and sometimes extending to the canal, it has often been mistaken for inguinal hernia.

As long as these diseases are separate, they are easily distinguished; the tumor of the chord is above, that of the serous coat of the testicle below. When they approach and mingle with each other, the hydrocele of the tunica vaginalis passes in front of the other. Sometimes great care is requisite to ascertain the disease. By placing the individual on his back, the tumor, generally rounded, circumscribed, may be perceived, isolated and distinct from the intestine or omentum; add to these symptoms the transparency and fluctuation presented by this kind of tumor. Such are the principal characteristics of the disease. The diagnosis is sometimes exceedingly difficult, as the following case will show.

CASE II.—*Encysted Hydrocele of the Spermatic Chord.*—A child, of twelve years of age, was operated on in the Hotel-Dieu in 1828, for hydrocele of the tunica vaginalis of the left side. He was treated by injection, and discharged cured. Some months after, there appeared in the groin, opposite to the inguinal ring, a small, soft, fluctuating tumor; the color of the skin was unchanged. The disease was mistaken for hernia, for a truss was recommended. Notwithstanding its use, the tumor increased, and the patient entered the Hotel-Dieu in October, 1829, in the following condition:

There was a round and yet slightly elongated tumor about the size of a large pigeon's egg, opposite to the inguinal ring; it commenced at about half an inch from this point, and terminated near the epididymis. Notwithstanding its tension, it was fluctuating, and the color of the skin was unchanged. Coughing produced no effect on the tumor. It could not be pushed into the inguinal canal, but it could be felt to be isolated; and lastly, it was very transparent. Feeling confident that it was encysted hydrocele, I determined to treat it by incision. The operation was performed on the 13th of October. An incision was very carefully made, as in hernia, in the skin covering the tumor. We were exposed to two dangers; an error of diagnosis, and injury of the constituent parts of the chord, whose relation with the sac could not be ascertained. The subjacent layers were successively divided, and the sac was at last reached. A jet of yellow serum indicated arrival at its interior,

The aperture was enlarged, the finger introduced into the cyst discovered no communication. The serum was completely evacuated, and the sac filled with charpie to excite inflammation and consequent adhesion of its parietes. No bad symptom ensued. The charpie was renewed. In a few days a moderate inflammation attacked the cyst, and copious suppuration took place. Twelve days after, it had cicatrized. (Dr. Paillard.)

The uncertainty as to the nature of the tumor, whatever signs we may possess to ascertain it, should in a measure indicate the treatment; in fact, injection is one of the best, most simple and prompt in encysted hydrocele. But if we have erred in our diagnosis, and thrown an irritating fluid into a hernial sac, dreadful accidents may arise; this is no supposition; an irritating fluid has been frequently thrown into a hydrocele of the tunica vaginalis which had preserved its communication with the peritoneum. Extreme caution must therefore be used not to endanger the life of the patient; if we are obliged to inject, the fingers should be applied to the inguinal ring in order to interrupt the anormal communication.

When the least doubt exists we must have recourse to some other plan. The incision of the cyst removes all uneasiness in this respect, and deserves on that account, the preference in a majority of cases.

It is useful to observe the difficulty, if not the impossibility of determining precisely the relations of the vessels of the spermatic chord with encysted hydrocele of the chord. Hence in the operation by incision, the parts should be divided very slowly and carefully.

Hydrocele presents many important varieties in form. Thus the tumor, generally single and regular, is sometimes strangulated at its middle like a wallet, the two portions communicating with each other.

We sometimes find in the interior of simple hydrocele cells, in greater or less abundance, and a kind of cellular structure containing serum, so that when we make a puncture, only a portion of the effused matter escapes, and in order to evacuate the tumor completely, every successive division would require a puncture. In cases of this kind presenting a disposition analogous to that pointed out in hernial sac, and there called multilocular incision, as in the preceding case, should be preferred to all other plans, as is proved by this case.

CASE III.—A man was admitted into the Hotel-Dieu, with a tumor on the left side of the scrotum. Eighteen months previously he had received a blow on the testicle. From that period the organ became unequally swollen. On examination I found an uneven, fluid, fluctuating, transparent tumor. Attributing this inequality to the resistance of the tunica vaginalis, I plunged a trocar into the most voluminous part of the tumor; a yellowish pus escaped, but the tumor was only half emptied. By touching the most projecting part, I found a distinct fluctuation, I made a second puncture. A turbid fluid escaped, the left side of the scrotum returned to its natural size. The former fluid easily coagulated by heat; the latter remained unchanged, and on analysis proved to be entirely albumen. The chord was in the same state as that of the opposite side and presented no symptom of effusion.

This is a highly important case, for it has frequently happened that hydroceles considered as multilocular, were merely hydroceles of the tunica vaginalis, complicated with encysted hydrocele of the chord. Experience has

also shown me that there are hydroceles of which the sac cannot be completely emptied by one puncture, and that this is owing to the multiplicity of cells and a kind of cellular tissue retaining the fluid.

Hydrocele of the tunica vaginalis presents remarkable differences as it occurs in adults or is congenital. Before the fœtus has arrived at maturity the testicle is in the abdomen, whence it descends after birth. The extension of peritoneum by which it is accompanied, and which constitutes the tunica vaginalis, generally closes soon after the descent. But some fluid may also pass into it from the abdomen. Hydrocele then occurs, called congenital, disappearing under pressure because the water is thrown into the belly.

I have said that this hydrocele may appear while the testicle is still in the abdomen, and is found behind the superior orifice of the inguinal canal. This is easily understood. The peritoneal covering of the testicle, which corresponds to the abdominal aperture of the inguinal canal is pressed upon, either by the fluid contained in the belly, by the intestines or omentum, gradually yields to this pressure, elongates, is engaged in the canal through which the testicle passes, and finally reaches the bottom of the scrotum. We then see a fluctuating, translucent, soft pyriform tumor, which entirely disappears under pressure, or the horizontal position, but which when left to itself and the individual stands erect, soon reappears.

I have also seen another variety of congenital hydrocele of which the character is the same elongation of the peritoneum which constitutes the tunica vaginalis, whilst the testicle yet in the inguinal canal, is about descending.

The tumor in these two varieties of hydrocele is only covered by the integuments of the scrotum, the subjacent cellular tissue, and the cellulo-fibrous layer of the *fascia superficialis*. The upper portion is engaged in the inguinal ring, and the testicle adheres to the posterior part of its neck, as it would at the bottom of the tunica vaginalis. Lastly, the abdominal orifice of the hydrocele communicates with the cavity of the peritoneum by a small aperture.

These two varieties require a careful examination, as they may easily be confounded with hernia.

Among the complications of hydrocele, hernia must not be forgotten; it occurs chiefly in old men. The hydrocele generally passes in front of the hernia; and sometimes, but rarely, behind it. Some surgeons have proposed to leave the tunica vaginalis in such cases untouched and to open merely the hernial sac. I have found that we only spare the hydrocele at the expense of the extent of the incision in the sac, at the bottom of which the fluid afterwards collects. Severe inflammation and other symptoms ensue which might have been avoided by opening at the same time the serous coat of the testicle. By these means, the destruction of the strangulation and the radical cure of the hernia are effected.

It sometimes happens, when the hydrocele is in front of the hernia, that a portion of the omentum or intestine passes through the openings in the tissue enveloping the tunica vaginalis, and projects into the fluid constituting the hydrocele. The secondary tumors are covered by the hernial sac and serous layer of the coat of the testicle.

As the hydrocele may be partly or entirely covered by a hernial sac more or less filled with omentum, in puncturing it we must be careful not to punc-

ture the sac, nor the testicle. The relations of the two sacs, in this case, are highly important to be ascertained. Indeed, these relations are not always the same; thus sometimes, although the hydrocele forms the most posterior and inferior portion of the whole tumor, the watery tumor is often found in front and outside of the hernia. In other cases, the tunica vaginalis penetrates into the hydrocele, and forms a true aqueous hernia in its cavity. The contrary may take place, and the tunica vaginalis then yields at one of its points corresponding to the hernia, and makes a laceration through which a portion of the latter passes. Frequently then, the hardness and elasticity of the edges of this rupture as well as its narrowness are such, that the parts constituting this species of hernia by prolongation are often irritated, contused, and constricted in their passage; symptoms of strangulations occur, which are erroneously attributed to the constriction of the ring.

I have met with many of these cases. It is important to distinguish them and remember them when we perform the operations for hydrocele and strangulated hernia; we thus avoid plunging the trocar into a hernial sac, cutting the coats of a hydrocele for those of a hernia, and enlarging the ring when the strangulation is produced by the contraction of the laceration of the tunica vaginalis upon the parts which have penetrated into its cavity.

Among the complications of hydrocele, we shall merely mention sarcocele, of which a remarkable case was given in the first volume. But several less frequent and less understood causes demand more attention. Serous cysts may be developed in one side of the scrotum, enlarging it considerably. Scirrhus of the testicle has been supposed to exist in similar cases, and the testicle been extirpated. Sometimes these cysts appear in the midst of the organ itself. This is what Morgagni calls hydatids of the testicle. He attributes the formation of hydrocele to the rupture of these cysts; having observed, says he, in all cases of this disease hydatids of the testicle entire or torn, or else remains of old hydatids of white tubercles, he concluded that the rupture of these hydatids was the most general, if not the only cause of hydrocele. The value of this explanation is not worthy of discussion in the present state of science; we shall merely observe that a hydatid cyst developed in the substance of the chord or of one of the testicles, may, by its softness, resistance, more or less marked transparency, the inequalities and other characters it may present, give rise to the supposition of the existence of a hydrocele of the chord or tunica vaginalis. They may be easily confounded with hydroceles of which the cavity is divided by septa into several cells. I have seen several members of the same family affected with this singular disease; treated them by incision of the cyst, and they were all cured.

Purulent or miticerous cysts, scrofulous testicles and other products of chronic inflammation of the testis, which have sometimes been called encysted hydrocele of that organ, constitute changes totally different from that of which we are treating. These purulent cysts require either the incision of the parietes, or the extirpation of the cyst.

The state of the tunica vaginalis presents degrees of disorganization which it is important to study. In the commencement of the disease it is thin, transparent, and easily pierced. At a later period, this envelope or rather the cellular tissue of the external surface frequently is much thickened, and nearly as dense as cartilage. In that case transparency no longer is present, and

after the puncture, the coat instead of collapsing, remains like a shell around the organ. Sometimes I have seen these serous cysts become the seat of more or less copious sanguine effusion, or present plates of ossification of various extent.

CASE IV.—During the year 1820, Mr. Ch. de Lille, about 40 years of age, came to me for advice. He had in one side of the scrotum a round, uneven, hard, resisting, opaque tumor, about as large as the fist of a child of twelve years of age, and which, united to the testicle, was, as well as this organ, in a morbid condition and suspended by a chord. From these symptoms we might suppose either the existence of hydrocele complicated with cartilaginous degeneration of the tunica vaginalis, or sarcocele or hydro-sarcocele. They were the only ones indicated by the disease itself, and the diagnosis might have been very obscure, but in this case the history given by the patient served to remove all doubts.

The disease had commenced at the age of two and twenty, that is at an age in which carcinomatous degeneration seldom occurs; it was not painful, but merely inconvenient from its weight; lastly, its cure by puncture, had been several times attempted, either followed or not by injection, and whenever it had been emptied, it was ascertained that the testicle was sound, but that its covering became more and more thickened.

From these data no mistake could be committed; the patient had hydrocele accompanied by cartilaginous degeneration of the tunica vaginalis. I performed the operation of incision; a small quantity of yellowish transparent serum escaped. The cavity of the cartilaginous shell into which the membrane was transformed, and of which the parietes were not more than four or five lines in thickness, was divided by sword-like prolongations, rudiments of septa which would have become organized, and separated the principal into several secondary cavities. In less than a month the patient was cured.

Of the different plans proposed for the radical cure of hydrocele, that most generally in use is by injection. I have sometimes succeeded by a blister to the scrotum. This produces an irritation extending to the tunica vaginalis, causes the absorption of the fluid, and the consequent adhesion of the opposite sides. It is not a matter of indifference what is used for injection. I have derived most advantage from the following: in a pint of strong wine of Roussillon, boil two ounces of Province roses, and sometimes increase the strength by the addition of a little brandy. I make three injections, each one lasting three minutes. The only precaution, which I never omit, is to be certain that the point of the canula is in the cavity of the tunica vaginalis; should it have slipped out, it may have entered the cellular tissue, and no injection must be performed under those circumstances. From a neglect of this caution, gangrene has sometimes followed the operation, as will be seen in the following case.

CASE.—A man was admitted into the hospital with hydrocele. It was punctured, but the injection was thrown not into the tunica vaginalis but into the cellular tissue; an intense inflammation supervened which was with great difficulty arrested. The effusion having returned, the man came again to the Hôtel-Dieu, in 1833. I performed the operation by incision; at the end of twenty-four hours the patient was seized with vomiting, and soon after hæmorrhage appeared. I removed the dressing, washed the wound and placed

on it compresses wetted with cold water; I used no tampon as the blood came from the inguinal ring. This is a plan very common in Germany, to expose the limb to the air, and wet it with cold water, in hæmorrhage. It is inapplicable to hæmorrhage from large vessels; but in that from small vessels combined with symptoms of inflammation it is useful. Our patient was at the stage of inflammation; the bleeding did not return. It would have been otherwise had we used a tampon. A man whose thigh was amputated, received a blow on the stump, blood immediately flowed from it; I undressed the limb, but could not discover the bleeding vessel. I applied a tampon, the pain and hæmorrhage returned; I removed it, they ceased. Twice this was done with the same consequences. It was then very evident, that the dressing kept up the tension of the parts and consequently the hæmorrhage (which I have named hæmorrhage from irritation); therefore it was not re-applied. This is a hæmorrhage which must be treated medically by emollient means, venesection, the application of cold water, and the removal of all irritating measures.

## CHAPTER XLVI.

### ON THE TREATMENT OF GOITRE BY THE SETON.

INDIVIDUALS of a lymphatic constitution, marked by the softness and whiteness of their skin, a well rounded form, by indolent and relaxed habits are subject to goitre. Women are more liable to the disease than men, and children than adults. The gland, which in the healthy state weighs from one to two ounces, frequently in the morbid state reaches the weight of one or two pounds. In the vallies of Savoy and the Valais where goitre is endemic, it spares no sex, nor age; and so great is the influence of climate in its production, that an adult who might settle in that country, would be liable to the disease. Several causes have been assigned for this disease. Fodéré, in his curious details of the countries in which this affection is prevalent, admits perhaps too exclusively, the humidity of the atmosphere added to the humidity of the temperature; the inhabitants of these countries, says he, are almost continually in a vapor bath. A warm moist temperature during a great part of the year may certainly affect our organs, but goitre occurs in persons under different circumstances.

In the month of March, 1833, two women came to the Hotel-Dieu; one, 26 years of age, had labored under goitre for several years. The gland presented the form of a large, elastic, round and uneven tumor. The base appeared large. The tumor at first was small, but rapidly increased to the size of both fists. The voice was rendered hoarse and rough from the mechanical pressure. The return of the venous blood was embarrassed whilst the course of the arterial blood was unimpeded, hence the woman was subject to head-ache, vertigo and fainting.

The other woman had had the same disease for twelve or fifteen months. Both sides of the thyroid gland were affected. A seton was passed through

each tumor and after a prolonged suppuration of several months she was entirely cured.

The first patient was treated in the same manner, with a similar success.

I will now enter into some details concerning the operation, and my opinion of this remedy, and some other therapeutic agents which have been celebrated in goitre. Latterly, iodine has been lauded with a kind of enthusiasm, and it would seem that no goitre can resist its energetic effects; in many cases it fails, and the slightest reflection might foretel this result. Goitre depends on various causes: sometimes, it is a simple hypertrophy of the thyroid gland; sometimes, a scirrhus degeneration; and again, it may be a cyst filled with divers contents. Iodine cannot act similarly in diseases so different, therefore, as we have said, it does not succeed in many cases, any better than the powder of Sancy, calcined sponge, mercurial frictions, camphorated, ammoniated and opiate liniments, plaisters of cicuta, and a host of other pharmaceutic means equally celebrated. It is just to declare that iodine has effected cures.

Of all the remedies I have ever used, that from which I have derived most advantage, is decidedly the seton. It has lately been published as new by professor Quadri of Naples. This gentleman has undoubtedly committed an involuntary error; for he has used it many years since, in a patient whose case we have detailed.

Some time after the application of the seton the goitre diminishes, and the resolution which is gradually effected, is complete in a few months; it may even take place after the removal of the seton and the cicatrization of the wounds. How does the seton act? This is difficult to determine. Is it by inflammation of the tissue of the thyroid gland? Is it by the discharge of the organ from suppuration? This is a matter of little importance; the essential point is to cure the disease.

When the seton is passed through the thyroid gland, a copious flow of venous blood follows. This circumstance is at first alarming, but the discharge soon ceases. It resembles that from the nose after the extirpation of polypi of the nasal fossæ. By desiring the patient to breathe freely, in order to restore the venous irritation, a cold application, or slight compression, this hæmorrhage, caused by the lesion of the venous plexus in front of the thyroid gland, is arrested. The seton should remain several months; but its duration depends on the progress of the disease towards a cure. In the application of the seton we should carefully remember the position of the thyroid arteries.

Now shall we say what has been said of iodine and other specifics, that it will always cure goitre? By no means. The scirrhus state in which this gland is sometimes found can never be remedied by its use; but hypertrophy, cysts, and hydatids, in which iodine and its preparations, as well as other pretended specifics so often fail, are the forms of the disease in which the seton may be very frequently employed with great advantage.

## CHAPTER XLVII.

ON THE ARSENICAL PREPARATIONS IN CANCEROUS AND OTHER CORRODING  
ULCERATIONS.

WE frequently see in the Hotel-Dieu patients who seek advice for corroding ulcers of the nose, lips, cheeks and other parts of the body. These ulcerations produced by venereal, scrofulous and hepatic affections, either alone or so combined as to constitute a simple or compound disease, are frequently the horror of the practitioner on account of the inefficiency of remedial agents. Hence from their numerous relapses, and especially those of a cancerous nature, even after their total removal by the knife, surgeons have had recourse to remedies of a very dangerous, or extremely active nature.

In the list of the remedies, arsenic enjoys undoubtedly the first place. It is employed both internally and externally, but always with fear, so dangerous is the least error, the slightest modification of the mode of administration, or the slightest imprudence on the part of the patient. Notwithstanding, therefore, its great value, physicians have generally used it with great reluctance. It is, nevertheless, important to determine the therapeutic effects of this heroic remedy, to point out the cases in which it may be injurious. Such a work demands a host of experiments which we may one day make; we shall now merely treat of its external use which has been for a long time known to science. Most of the prescriptions bequeathed to us by former physicians are bad, or their application is liable to serious objections, or their usefulness does not counterbalance their danger. Such are the powder of Rousselot,\* that of Pere Come, modified by several surgeons, and particularly by M. Patrix, who has described the best manner of employing the arsenical paste; the powder of Justamond,† of Pierre Alliot, of Plukket, the cerate of Hellmund, &c. &c. preparations of which arsenious acid is generally the base.

This poison has been mixed with divers other substances, of which some injure its action and others constitute a remedy of disagreeable or difficult application.

One of the first effects, and often one of the first inconveniences of arsenical preparations, is to act as an *escharotic*, or caustic, to destroy the parts to a greater or less depth, and sometimes produce deformity. The preparations which we employ have not that effect. They act by modifying the diseased surfaces, not by producing a slough. This is one of their chief advantages.

The preparations I use are either in powder or liquid; the arsenious acid is the base of all. The calomel may be counted as something; but still it should never be omitted. These two remedies, arsenic and calomel, are necessary to

## \* POWDER OF ROUSSELOT.

℞ White Arsenic powdered	1 part	
Cinnabar	16 parts	
Dragons blood	8 "	Mix.

## † POWDER OF JUSTAMOND.

℞ White oxide of arsenic powdered	2 parts	
Sulphuret of antimony	4 "	Mix.

Translator.

the preparation, without our being able to assign precisely to either the part which it plays. The powder is prepared as follows :

Of arsenic or arsenious acid . . . . .	4 parts
Of calomel . . . . .	96—100 parts.

The arsenic may be increased to five or six per cent.

The liquid is merely the solution of these remedies in distilled water ; it is mixed with powdered gum arabic so as to give the preparation the form of a paste. In the liquid form, I generally employ a larger proportion of arsenic ; thus into a hundred parts, I introduce, 6, 8, 10, or 12 parts of arsenious acid, the rest is calomel, and I have even used larger proportions.

**CASE.**—A girl of 15 years of age was admitted into the Hotel-Dieu in March 1833, for a suspicious looking ulcer on the left side of the lower lip. The ulcer extended about an inch, its edges were jagged and inverted, its surface uneven and grayish ; it was formed at the expense of the skin and subjacent cellular tissue, and extended as far as the mucous membrane of the lip, resting on an indurated base. The disease had existed for seven years. A portion of the ulcer was covered by a yellow crust formed by the dessication of the discharge. A poultice was applied to loosen this crust. In a few days after the first application of the arsenical powder, a slight inflammation took place. The surface of the ulcer was advantageously modified. A second application was followed by some symptoms of poisoning ; the patient had nausea and vomiting. Every one is familiar with the dangers of the use of arsenic, and in order to guard against them as much as possible, I had put the patient exclusively on a milk diet for some time previously. The symptoms disappeared and on the separation of the preparation the wound was nearly healed.

In these cases I prescribe the free use of milk ; and also the application of a piece of linen on the wound on account of the vicinity of the mouth, which is not to be removed until the separation of the powder. The patient is nourished by a sucking bottle.

The mode of application of these preparations is very simple. A poultice is first applied to separate the crust covering the ulcer ; then a small piece of charpie dusted with the powder is laid on the ulcerated surface. Should this surface be not very large, it is wholly covered ; in other cases, we cover one third, one fourth, one half, and so on gradually, until the whole is covered.

The solution, or rather the paste, is applied in the same manner.

This application, after considerable pain, inflammation, &c., ordinarily falls off spontaneously in eight to ten days. It is to be renewed according to circumstances. Generally five or six applications are required, often two or three are sufficient.

## CHAPTER XLVIII.

### ON SYMPTOMATIC GANGRENE CONSEQUENT TO ARTERITIS.

THAT variety of gangrene which has been alternately named spontaneous, senile, dry gangrene, without any known cause, had been, until recently exclusively considered under the relation of its external appearance. Hence

we were generally limited to two therapeutic indications ; to arrest the gangrene by topical applications, and remove the diseased parts, without suspecting that there might be different ways of effecting the same object. Struck by the obscurity presented by this disease, we have endeavored to enlighten it by pathological anatomy, and were soon convinced that its cause, although unperceived and for a long time concealed, existed, and was to be found in the inflammation of the principal arteries of the limb affected, which were seen inflamed, red, the blood coagulated, the artery obliterated, and the circulation completely interrupted. The coagulation of the blood may occur in different ways, either by its contact with the inflamed artery, or by its mixture with the concrete lymph, or by an ulceration of the artery. Autopsy has shown all these circumstances. When amputation is performed for this affection, the vessels filled by coagula of fibrin, or a mixture of pus and fibrin, pour out no blood, and the ligatures are perfectly useless.

The etiology of symptomatic gangrene was unknown until modern days. Old age and debility were regarded as the principal causes of the disease ; but this opinion cannot be maintained, since children are sometimes attacked with it. The ossification of the arteries has been supposed to cause it ; but observation shows this to be merely a coincidence. In fact, the mere ossification of the arteries is not sufficient to sensibly interrupt the course of the blood ; and it frequently occurs without any appreciable change in the circulation. How often do we dissect bodies in which all the arteries of a limb may be ossified and no gangrene exist. The true cause of the disease consists in the obliteration of the arteries and the suspension of the course of the blood in its vessels. How does this occur ? Let us now enquire. Examine individuals affected with symptomatic gangrene, you will find nearly always that they have abused the use of alcoholic liquors, stimulating food, or have labored under chronic diseases of the heart, the valves of the aorta and large vessels ; causes most frequently exciting the irritation and inflammation of the arterial system. In a majority of cases, the gangrene is preceded by pain, sometimes very severe, fever and other inflammatory symptoms. Lastly, inspection always shows the existence of inflammation of the arterial coats. This may undoubtedly occur in arteries which are already diseased, indurated, ossified, as is often met with in old persons ; but it frequently occurs in the arteries of young subjects, without any traces of disorganization. In short, it may coincide with a calcareous incrustation of the vessels and old age, or be independent of these conditions.

Lastly, experiments made on living animals produce the same effects, cause artificially symptomatic gangrene, like that which occurs spontaneously. M. Cruvelheir has proved that by injecting irritating substances into the arteries of an animal, inflammation of the internal coat is produced, and the consequent mortification of the parts to which they are distributed.

CASE.—*Arteritis ; Coagulation of the Blood ; Symptomatic Gangrene ; Death.*—Rigolet, 40 years of age, was admitted into the hospital on the 15th of July 1832, with incipient gangrene of the leg. She was a woman of delicate constitution but had always enjoyed good health. She said that she recently had cholera ; but on being questioned as to the symptoms, stated that she merely had had violent cramps in the right leg. A heavy, dull pain had been previously felt in the fossa iliaca of the same side : thence it descended

along the inner part of the thigh, to the posterior part of the leg, and lastly reached the sole of the foot and toes. These parts had been tormented by formication, lancinating pains, and lastly by a burning pain. At that period, eight or ten days previous to her entrance into the hospital, the foot had become cold; violet spots had appeared; the pain was so severe that she could not sleep; the symptoms had increased so much that she decided on entering the Hotel-Dieu.

On the 16th the right foot and leg were swelled as far up as the knee, to double the size of the other; the skin was tense, and shining as in phlegmonous erysipelas. It was of a violet color, very dark towards the toes, less intense higher up, and scattered in plates over the limb. The epidermis in some spots was raised; the leg was intensely cold, the sensibility diminishing in the direct ratio of the temperature. The femoral artery of the right side could scarcely be felt, and seemed converted throughout its whole course into a hard and scarcely compressible cord. I pronounced the disease to be arteritis of which the gangrene was merely a symptom.

(Venesection to twelve ounces, gum water, emollient poultice to the whole limb.)

The bleeding quieted the pains and restored sleep. It was repeated the next day; on the 18th the effect was more evident; the pain had nearly disappeared; the swelling had diminished; the heat and sensibility had returned in several spots. But upon the mortified parts had appeared some vesicles filled with a dark fluid, which when ruptured, exposed the skin black, gangrenous, exhaling a foetid odor. In order to arrest the decomposition and mark the fetor, the parts were bathed with camphorated spirits. 22d, she was again bled.

On the following days, the gangrene seemed arrested at about four fingers' breadth below the knee. All below this point was probably mortified. The movements of the foot were gone; the leg alone could be flexed and extended on the thigh. Still, whether the nerves were yet untouched, or that there existed a feeling similar to that after amputation, the patient at intervals complained of acute pain in the foot.

Until that time the treatment had not caused the gangrene to recede; but at least it appeared to be arrested. Towards the close of July, notwithstanding repeated bleedings, the icy coldness, the fore-runner of gangrene, attacked the knee and gradually ascended. On the 11th of August the mortification occupied the patella; the cold was felt two inches above it; the pulsations of the femoral artery were imperceptible. 16th, the inferior third of the thigh was attacked; her strength rapidly gave way; diarrhea supervened, and death finally released her on the 19th day of August.

*Necropsy.*—Corpse dry and emaciated; the leg gangrenous, although less swollen than in the commencement, is yet one third larger than the other; the epidermis nearly totally removed; the derma is black, dry, hard, very compact, exhaling no odor but that of camphor. Three sloughs, of which the patient scarcely complained, were situated on the right side of the pelvis; the first near the tuberosity of the ischium; the second near the coccyx; the third, as large as one's hand, extended obliquely towards the crista of the ilium, scarcely passing beyond the median line of the left side. The vessels of the sound limb were first examined. In the middle of the thigh the artery although of

normal appearance was contracted, occupied by a filiform, roseate coagulum, apparently formed after death. Towards the crural arch the artery recovered its calibre; it was hard, incompressible, filled by a red coagulum, slightly adhering to its inner coat, but grayish in the centre. This extended upwards as far as the origin of the primitive iliac, and slightly projected into the left iliac, but did not obliterate it. The right internal iliac was also closed by a similar coagulum. The crural veins of that side was filled with a reddish coagulum. The vessels of the left limb, the aorta and heart were nearly empty.

Between the sound and gangrenous parts was a space of two to three inches, in which cold had been felt during life; there the cellular tissue was marbled with a grayish red color, and the capillaries were highly injected. Below this, on the verge of the gangrene, this injection disappeared. The epidermis of the leg was totally removed; the derma black, hard, dry as parchment, the subcutaneous cellular tissue of a grayish yellow, the aponeuroses paler, slightly softened; the muscles of a lively red, moist, furrowed by cellular layers of a more than ordinary white appearance; the nerves roseate; the vessels about the popliteal space containing, first, a coagulum, analogous to the upper gray coagulum, and a little lower down a reddish sanies. The deep seated cellular tissue was gorged in some places with this sanies; in others, changed into brown spongy sloughs; but generally it presented a yellow grayish and nearly normal appearance; the bones of a pale gray color adhered firmly to the periosteum; the marrow of the same color; nothing morbid was observed in the viscera, but some redness of the small intestines.

It may be conceived that in this gangrene, following the suspension of the course of the blood, the parts deprived of their vitality, in consequence of the absence of this nutritious fluid, are generally deprived of a great part of their moisture, that they shrink and dessicate, and form at the extremity of the remaining living parts, species of carbonized appendages, which are sometimes so hard as to sound on percussion. It is, therefore, not surprising that the odor from this kind of gangrene should not resemble that resulting from the excess of inflammation of the parts.

The symptoms of symptomatic gangrene are very remarkable. In the commencement it is a purely local affection, and we may easily understand the perplexity of surgeons deprived of the lights of pathology, and who could find no external lesion nor disease of the viscera sufficient to explain the result. The respiration and circulation preserve their regularity; the brain and digestive organs perform their functions as in health. It is only as the disease advances, and as absorption takes place, that the whole economy is affected and death occurs.

The progress of the gangrene is heralded by remarkable uneasiness, numbness, a sensation of cold and paleness of the parts. It is not a corpse-like coldness, and one which only takes place because the mortified part assumes the temperature of the surrounding air; it is colder than this, and lower than the temperature indicated by the thermometer placed in running water. The thermometer applied to the limb, falls as we approach the gangrene. Again, when the heat is wanting, the sensibility is lost, and gangrene is about to commence. Pain, sometimes acute, intolerable, lacerating, accompanied by very inconvenient formication, often exists in this disease.

These phenomena are soon followed by slight swelling, wales, a violet color of the parts; at other times there is no swelling, and the parts are pale and shrunk. Vesicles make their appearance; beneath them is found a slough; sometimes they are not seen, and then black spots appear at the onset, and change into eschars; the sensibility of the parts is destroyed; there is withering, dessication, mummification, as the disease attacks the fingers, toes, &c.

But the most important symptoms are those which occur in the arteries. The pulse is imperceptible or even entirely gone. In the direction of the artery we feel a hard round cord, and as the pulsation ceases and this cord extends, we may calculate on the certain progress of the disease. However, it should be remarked that the hard cord felt over the track of the crural artery and referred to this vessel, is sometimes owing to the engorgement of the vein. This fact was observed in the foregoing case, and should not be forgotten. The sloughs on the pelvis, in that case, also presented a singular feature, that they were confined to one side; the obliteration of the corresponding arteries accounts for this disposition. Women are less subject to gangrene than men. It was formerly supposed to be more frequent in winter, as it was thought to resemble that produced by congelation. This theory and its consequences are equally false; for it occurs by far more frequently in summer. Indeed this very fact induced me to conclude, *apriori*, that there was something more than a mere embarrassment in the circulation.

The treatment has changed with the etiology of the disease. Pott, who wrote some valuable observations on senile gangrene, treated it by a combination of bark and opium. Finding the former of these remedies injurious, he used the opium alone, with success in several cases. Notwithstanding his distinguished skill, fatal terminations were frequent.

For fifteen years, I have tried every kind of stimulant, both externally and internally, and whether there was arteritis or ossification; the disease always was aggravated by their exhibition. I had determined on a different course, when an old woman of sixty odd years of age was admitted into the Hotel-Dieu with senile gangrene of the toes of the left foot. For several months the bark and opiates, both externally and internally, were administered without any improvement. The toes were mortified at their extremities and desiccated; the adjoining were swollen and of a violet color, and a pungent and disagreeable smell proceeded from the gangrene. The remaining parts of the toes, the back and sole of the foot were successively attacked, first by swelling and then by gangrene. There was nothing particular in the state of the heart, lungs, and large vessels. Still the pains continued; the anodynes, antispasmodics, tonics, and antiseptics, recommended by writers, could not arrest the progress of the mortification. The pulse was full and hard, the countenance flushed and animated; I ordered her bled to eight ounces. By this operation, the pain was soothed, sleep restored, the progress of the gangrene suspended, and the improvement so great, that the patient had never felt so well since the commencement of the disease. This state lasted for about two weeks, when all the symptoms reappeared. A second bleeding was then performed with a like success. From that period it was repeated whenever the disease threatened a relapse. By this plan the progress of the

gangrene was definitely arrested; the mortified parts separated, the wound healed, and the patient left the hospital, with the advice to recur to bleeding whenever symptoms of her old disease threatened a return of it.

Since then we have used repeated venesection, and by this treatment relieved and cured two thirds and even three fourths of our patients.

The following case is a proof of the efficacy of this plan, which fails but in few cases.

CASE II.—M . . . . (Pierre Esprit) 71 years of age, was admitted in March 1833. For some days previously he had experienced a sensation of great cold in the left great toe, soon followed by pain which rapidly increased. The toe was at the same time swollen, and of a violet color. The pain increased daily. A vesicle containing a fluid of deep brown color soon appeared on the internal middle part of the great toe; it burst, and beneath was seen an eschar which gradually attacked the whole of the inner surface of the toe. This eschar was hard and dry; the pain extremely acute throughout the whole toe and foot, deprived the patient of sleep and appetite, and excited some fever. There was no symptom of disease of the heart or large vessels; the crural artery of the diseased side was hard and evidently ossified.

M . . . . said that he had never been sick in his life; has had no contusion, no violence offered to the toe, and can attribute the disease to no cause. Persuaded that this was a case of senile gangrene, produced by an arteritis followed by an obliteration of the coagula formed in the principal arteries of the lower extremity, I prescribed a large bleeding, and emollient poultices to the affected parts. He was much relieved by the loss of blood. He slept well that night and his appetite, which had been gone for fifteen days, immediately returned.

This condition suffered no change. The pain returned no more. The gangrene progressed no further and a red circle or line indicated its arrest. Emollient and refreshing drinks, poultices, and moderate regimen, were continued without interruption until the separation of the slough, which occupied the whole of the skin of the inner face of the great toe as well as the subcutaneous cellular tissue; and at the close of the month of April M . . . . . was discharged cured.

Opium is not a remedy to be despised, and it may even be stated that anti-phlogistics and anodynes combined according to the situation and strength of the patient, constitute the best treatment of senile gangrene, whatever period it may have attained. Refreshing acidulated drinks, emollient topical applications, in short, the whole series of general and local anti-phlogistic remedies should be used to second the effect of the principal means of which we have spoken; namely general bleeding and opium.

A very interesting question is here presented; if the gangrene be not arrested, is it not proper to amputate all the parts affected, or even threatened, in order to preserve the rest? This has been done several times by a distinguished surgeon; why is not his example followed? We answer, because, in the first case, by acting on gangrene from an external cause, we at once remove the disease and its cause; in senile gangrene, the cause is beyond the reach of the knife.

It need not be asked, indeed if amputation can arrest the gangrene, when the latter is merely a symptom, but if amputation is of any avail in arteritis

the question thus proposed is answered beforehand. Amputation should never be performed unless the disease is exactly limited and the cause producing it entirely removed.

## CHAPTER XLIX.

### ON LUXATIONS OF THE LOWER EXTREMITY OF THE ULNA.

LUXATIONS of the ulna in front of the radius are very rare. In the course of many years practice I have never seen but two cases.

CASE.—M. Blot, quarter master of the gendarmerie, of Gisors, 32 years of age, of a sanguine temperament and athletic frame, was leading a patrol, at midnight on a very dark night, when meeting a stage coach, and the horse, being frightened by the lamp reared and fell backwards with his rider. Accustomed, as he said, to this kind of accidents, he extricated himself from beneath the horse immediately; but his right arm remained between the head of the horse and the ground, and was severely contused. The pain, at the moment was so acute that M. Blot thought his arm was broken. He got up, placed his arm in a sling, and thus returned to Gisors, a distance of three leagues. Dr. Fournier, a distinguished practitioner, first saw the patient, four hours after the accident. He found a luxation of the ulna. He attempted its reduction assisted by two friends, making counter extension on the elbow flexed to a right angle, and extension by the hand. This was continued for twenty or thirty minutes, without success. M. Fournier then ordered a bread poultice, to diminish the irritation and swelling already considerable, and retired. M. Dufay, (who had been previously called,) came in an hour, examined the wrist, made a second attempt, but soon desisted. The surgeons met at nine the next morning. The poultice had given some relief. The attempts at reduction were again unsuccessfully made, and it was determined to send the patient to Paris.

Blot made the journey in a carriage at night, and he assured me, although it appears singular, that he suffered less from the motion of the vehicle than when tranquil in bed. He arrived at the Hotel-Dieu in the morning, thirty-four hours after the accident.

He then presented the following symptoms: the fore-arm was much swollen; the hand in a position between pronation and supination; the lower part of the fore-arm was deformed, rounded, and its greater diameter consequently diminished; an anormal projection elevated the skin beneath the anterior middle part of the wrist; the internal malleolus could not be felt; its place was occupied by a deep depression. By following the ulna with the finger from the elbow to the hand, it could be perceived to be directed obliquely forwards and outwards, crossing and passing over the lower part of the radius. The luxation of the ulna forwards was evident.

The radius remained in situ, and the relations of the hand to this bone were perfectly natural. The carpus projected neither forwards nor backwards. The movements of pronation and supination were completely lost. Lastly,

we remarked two contusions with ecchymosis; one corresponding to the inferior third and internal face of the ulna; the other to the union of the radius with the hand, and the external surface.

This being ascertained, we proceeded to the reduction. The patient was seated in the angle of the wall, to which is fastened the iron ring used in similar cases; a cloth passed under the right axilla through this ring made an immovable counter extension; another cloth was applied to the bend of the elbow and given to assistants, in order that the fore-arm should remain flexed at a right angle on the arm; a napkin was attached to the wrist and three or four assistants made extension. The reduction could not be effected. The idea then occurred to me, of making extension myself on the hand by inclining it forcibly towards the radial side, whilst with my two thumbs I would endeavor to push the ulna inwards and backwards. In fact, by this plan the reduction was effected, the snapping of the bones was heard; the patient cried out, I am cured. The bandage was then removed from the wrist, the deformity had disappeared, he could pronate and supinate the hand. The apparatus for fracture of the fore-arm was applied, in order to preserve the reduction and prevent the swelling. On the third day he left Paris for Gisors.

This is a case which must be studied, and its nature ascertained when it presents itself to our observation, on account of its importance and rarity. I have sought in numerous registers for an analogous case, and found but one. A ship builder opposing his hand to a wall about to fall upon him, had the ulnar articulation forced, and came to the Hotel-Dieu with all the symptoms enumerated in the preceding case. The reduction was made in the same manner and with equal success. Thus, during twenty-four years that I have been a surgeon in this hospital, I have seen but two cases. Sir A. Cooper and M. Breschet cite but few examples. It is important that they should not be lost; for it is in luxations particularly that surgery is wanting.

The skin was not torn. In luxation of the ulna forwards, this accident must be very rare; great external violence is necessary; the radius must be fractured. The strength of the ligaments, the thickness of the flesh, and even of the skin in front, must present almost insurmountable obstacles. Such is not the case in luxations backwards. There, indeed, the ligaments are not so strong, the skin covers the bone almost immediately, and moreover it is more easily divided by the sharp projection of the styloid process. Should we in these cases of luxation with rupture of the integuments, reduce, resect, or amputate? I should prefer immediate reduction, free enlargement of the wound, for the most serious consequences are the inflammation and strangulation of the sub-aponeurotic tissues; I would have recourse to resection only in indispensable and well-marked cases; and never would perform amputation.

## CHAPTER L.

## ON LIGATURE OF THE PRINCIPAL ARTERIES.

THE ligature of the principal arterial trunks is one of the most brilliant achievements of modern surgery. Formerly the unhappy patient laboring under aneurism of these parts were devoted to an almost inevitable death, for a spontaneous cure was of very rare occurrence. Grant that aneurisms had been known to terminate by inflammation, abscess, gangrene of the aneurismal sac, or even by the compression exerted by this same sac, on the artery through the medium of a coagulum, these cases badly observed were lost to science.

A great difficulty, which must for a long time have arrested surgeons, was the restoration of the circulation; how could it be conceived that vitality could exist in a limb of which the brachial or femoral artery had been tied. The collateral arteries did not appear sufficient to supply their place. These fears were dispelled when Anel made known his method, and the mechanism of anastomosis was better understood. The brachial and femoral arteries were then successfully tied for aneurisms at the bend of the arm and in the popliteal space. But for many years the crural arch for the inferior, and the clavicle for the superior extremity, appeared to surgeons limits beyond which it was dangerous to pass. Bolder attempts soon dissipated these idle fears, and the ligature of the external iliac and the primitive iliac in the pelvis, that of the subclavian between or outside of the scalein muscles, attested the march of science. Anel's method was inapplicable to all cases. Thus, for example, aneurisms of the primitive iliac, the origin of the carotid or subclavian were amongst those in which a ligature between them and the centre of the circulation was inapplicable. The method applied successfully to the former was useless in the latter cases. Hence two important divisions, which will be the subject of this chapter. 1st. Of ligatures between the heart and the aneurismal tumors. 2d. Of ligatures between the tumor and the capillaries.

*1st Division. Ligatures between the heart and aneurismal tumors.*—We shall not treat of the general and local debilitating plan, (Valsalva's method,) but only remark, that when rigorously followed, it affects the action of the centre of the circulation less than that of the parietes of the aneurism. Thus I have observed, that when at the proper period, or when tired of its fruitless application, the surgeon wishes to commence to strengthen the patient, in order that he may undergo the operation, the tumor surrounded by parts of which the elasticity is lost suddenly, from the impetus of the blood filling the vessels, takes on a rapid increase, which may become fatal when situated in the subclavian and iliac regions. Pounded ice, ice water, and snow are sometimes useful applications in aneurism. This is not the case with adhesive preparations, astringent powders and the actual cautery, which are now generally abandoned.

Of later days, compression solely on the arteries above the tumor has been frequently practised.

Of the different instruments by which it may be effected, our compressor is that most usually used, and which fulfils best all the indications. Isolated

and free around the limb, it only touches the latter at two opposite points. Therefore it is particularly suited to cases in which we merely wish to moderate or suspend entirely the course of the blood in a principal trunk, leaving the collateral circulation free, in treating aneurism by compression. It is less certain when we desire to arrest the entire circulation of a limb. Some persons cannot endure the application of this instrument, and in a great number of cases we are obliged to have recourse to the ligatures, which is in fact, the most effectual of all the means hitherto proposed.

Anel's or Hunter's method is now generally followed. When an artery is tied according to this method, the ligature should be placed moderately distant from the aneurism, in order to find it perfectly healthy, and where it is as superficial as possible, in order to separate it more easily from the veins and adjacent nerves and give to the ligature a sufficient degree of tightness.

Another not less important precept is to preserve above the wound, enough collateral branches to maintain the circulation in the lower part of the limb after the operation, and to make the incisions so that the ligatures shall not be too near the large collateral branches, especially the upper ones, because their too immediate vicinity is one of the most frequent causes of secondary hæmorrhage. The external incision should be long enough to enable us to act freely on the vessel, and the aponeurosis should be divided to a greater extent than the skin.

The diagnosis of aneurism is easy when the disease is recent; but very difficult when it is of long standing, large and irregular. But if an artery is partly or completely surrounded by a cyst, an abscess, by a cellular or glandular engorgement, we must be particularly careful, for there is no region of the body in which the mistake has not occurred. Lastly, a small rupture may take place in the aneurismal sac; the blood is then gradually infiltrated, and extends into the cellular tissue, forming bloody tumors, free from pulsations and all the other phenomena of aneurism. I saw a curious case of this kind; the blood after having escaped from an opening in the aorta, was infiltrated in the cellular tissue of the neck, and had formed several tumors which discharged on bursting but little blood; this, however, frequently repeated, caused the death of the patient.

In April, 1810, a woman 66 years of age, remarkable for the flaccidity of her muscles, entered the Hotel-Dieu, to be treated for a gangrenous eschar on the inside of the left elbow, attended by œdematous infiltration and considerable debility of the arm of the same side, with absence of the pulse, which was attributed to the swelling of the limb, the ossification or the narrowness of the artery. She stated that two months previously she had fallen down, after which she felt some pain in the shoulder; but a surgeon whom she consulted said there was neither fracture nor luxation; the pain continuing six weeks afterwards she went to a bone setter, who pronounced her arm to be dislocated; performed violent movements with it, and then assured her that she was cured; lastly, that from that period her arm was swollen, and the slough on the elbow formed where one of the bandages had been applied.

The eschar was dressed; the arm covered with tonic fomentations and placed on an elevated pillow. The slough soon separated, and things remained in this state for some time. On the 21st day after her admission, she com-

plained for the first time of the inconvenience of a tumor which had formed in the axilla of the same side, she did not know at what period.

This voluminous tumor raised up the clavicle and great pectoral muscle, and kept the arm from the body; it was slightly painful, free from pulsation, and communicated the sensation of deep-seated fluctuation. I thought it might be a chronic abscess, but being warned by its locality, determined, before opening it, to make a puncture in order to ascertain its true nature. This I did with a very narrow, sharp bistoury, at the most projecting point of the tumor, where the fluctuation was most apparent. But instead of pus, arterial blood flowed along the blade of the bistoury. This was therefore very carefully withdrawn, an adhesive strip applied, and over that, a compress and bandage; the resolution of tying the subclavian artery was then adopted, and its performance postponed until the arrival of the surgeon in chief. (I was at that time only *chirurgien en second* or second surgeon.) He placed one hand beneath the anterior superior part of the dressing, and said that he distinctly felt the pulsations of an aneurismal tumor. The bandage was removed, no one could perceive the pulsations, not even the surgeon himself. We then began to doubt its being an aneurism, and to believe that I had merely opened a small artery, situated in the parietes of an abscess. Continuing, however, the examination, we discovered in that portion of the tumor which raised up the clavicle, slightly distinct pulsations, accompanied by a movement of dilatation, and nearer to the axilla, an obscure hissing noise, similar to that produced by the passage of the blood from an artery into an aneurismal tumor. We soon found two tumors; one small, situated beneath and along the clavicle, pulsating; the other large, fluctuating, and in which was with difficulty discovered and that only upon the line of separation from the other the hissing noise already spoken of; no doubt then existed, it was an aneurism.

I proposed the ligature of the subclavian between the *scaleni* muscles; the surgeon in chief withheld his consent, and thus deprived French surgery of the honor of having first performed this brilliant operation. Valsalva's method was adopted, and the patient immediately bled. For the space of four days she was so weak as to be unable to bear a second bleeding. At the end of this time, feeling some lancinating pain in the tumor, the dressing was removed, and found slightly tinged with fluid blood; an eschar of at least an inch in diameter had formed. I again urged the operation, it was again rejected. During the night two gentlemen who were watching the patient, perceiving that the dressing was becoming saturated with blood, they removed it; applied another piece of adhesive plaister much larger than the former one, directly over it, in order to supply the place of the eschar, which had separated at one point of its circumference, and the hæmorrhage was arrested without losing eight ounces of blood. She expired the next morning.

The examination of the body proved the existence of two tumors; one of them was formed by a dilatation of the subclavian artery to an extent of two inches; the other was the principal tumor, communicating with the former by a rupture of the artery.

CASE I.—*Consecutive false aneurism of the left axillary artery; the subclavian successfully tied.*—C. Chevalier, 37 years of age, by trade a joiner, was

admitted into the Hotel-Dieu on the 27th of February, 1819, with consecutive false aneurism of the left axillary artery.

Taken prisoner in Spain in 1811, he endeavored to escape, and in his flight received a sword cut on the posterior part of the shoulder. A great quantity of blood was lost, and he fainted. The hæmorrhage ceased, and a simple dressing was applied sometime afterwards, and in three weeks it had entirely healed, without any further loss of blood. Two months after the wound, Chevalier felt in the arm-pit a small tumor of the size of a walnut, without any change in the color of the skin, and pulsating. After the lapse of two years the tumor had attained the size of a hen's egg, and the pulsations were much stronger.

From the great exertions required by him to reach France, being obliged to walk 300 leagues on foot, the tumor increased rapidly. It became as large as a child's head; and he could no longer follow his trade; he determined therefore, to come to the Hotel-Dieu for advice, and was admitted on the 27th of February 1819, presenting the following symptoms.

On the posterior superior part of the left shoulder in the groove separating the *teres major* from the *teres minor* and *supra spinatus*, there was a small cicatrix; that of the wound many years previously. The tumor, however, did not incline to this side; but was developed in the arm pit, between the chest and the arm; it was as large as the head of a child one year old, unequally rounded, uneven on its lower and anterior part, covered by bluish and dilated veins; it was hard, and presented at every point of its surface strong pulsations, isochronous with those of the heart.

Anteriorly and lower down it was covered by the skin, anteriorly and above by the great pectoral muscle; it was supported internally by the chest, and covered outwardly by the arm, it ascended as high as the clavicle without leaving any sensible interval between it and the bone. The scapula clavicle and the whole shoulder were elevated by the tumor, and the depression behind the clavicle was considerably increased.

The limb of that side was somewhat more emaciated and weak than the other; there was a sensation of uneasiness in the axilla, numbness in the ends of the fingers, difficulty of motion on account of the development of the tumor; the heat and sensibility were natural, but the pulsations of the radial brachial arteries, &c., could not be felt.

On the contrary the pulsations of the subclavian were very strong, and by compressing this artery the pulsations in the tumor could be arrested. An attentive examination of the tumor convinced us that the only chance of success was to tie the subclavian artery.

This artery, throughout its course on the left side, presents three different parts; the first from its origin from the aorta, to its entrance between the *scaleni* muscles; the second from its entrance to its departure from these muscles; the third from this point of departure as far as the upper face of the first rib; an important distinction and almost unnoticed by writers.

This third part of the passage of the subclavian artery is near the skin in persons with a small and long neck, drooping and thin shoulders, deep seated in the contrary cases, and principally in those where the shoulders are elevated by a tumor in the axilla, as in the case of our patient. To this difficulty is added another common to all, namely, that the artery at this point is so surrounded by the nerves of the brachial plexus that it is difficult to iso-

late it. The second part of its course presents this advantage, that the subclavian penetrating alone the internal of the scalein, and being completely separated from the subclavian vein which passes in front of the scalenus anticus, and from the plexus of the nerves of the arm which are situated outwardly and backwardly, we can easily reach the artery by taking the scalenus anticus for our guide, and it may be tied without the danger of including any nerves.

The first division of the artery is so deeply hidden in the apex of the inverted cone forming the chest, so near the pleura and lungs, that it would be difficult to reach it without wounding those parts, and we should avoid, as far as possible, the attempt to tie this portion of the subclavian. From all these considerations I determined to tie the artery, in the present case, between the scalmi; and the patient having joyfully consented to the operation, it was done as follows:—The man lying on the bed, I made a slightly oblique incision from above downwards, and from within outwards, on the left side and lower part of the neck, at the distance of one inch above the clavicle. This incision divided the skin, the platysma myoides, the subcutaneous cellular tissue and three small vessels, which were immediately secured; the ligaments of which caused some pain at the base of the neck. Continuing the operation, I reached the cellular tissue and glands surrounding the artery and nerves of the brachial plexus. I then sought for the external edge of the scalenus anticus, and divided this muscle completely near its insertion, by means of a probe pointed bistoury; the artery was then exposed, could be felt, and its pulsations easily arrested by the finger.

A curved silver director was then passed under the artery, a probe armed with a triple silk ligature passed along the groove of the director and withdrawn on the opposite side. The ligature was then tightened and instantly the pulsations in the tumor ceased. The wound was dressed simply; the tumor covered with resolvent applications; the limb placed on a pillow surrounded by bags filled with hot sand.

During the day the patient complained only of slight pain in the throat. As a precautionary measure, some blood was taken from him; there is no pulsation in the tumor. He passed a good night. The limb preserved its heat, myotility and sensibility; some slight lancinating pains were felt in the tumor. For ten days after the operation, every thing went on well. On the 11th. the ligature was removed, without any loss of blood. On the 30th, the wound was nearly healed; he had begun to use his arm. The tumor was sensibly diminishing, but it presented a softness and fluctuation which made me dread suppuration and a spontaneous opening. It was therefore covered with compresses dipped in Goulard's solution, renewed every two hours.

On the 78th day the tumor was reduced to one fifth of its original size, the softness and fluctuation had disappeared. The warmth, myotility, and sensibility are the same as in the opposite side. The circulation of the arm, as of all limbs in which the principal artery has been tied, presents a peculiar character, the arteries do not evince the least pulsation, they feel however distended with blood. By passing through the numerous and small anastomoses which bring it from the upper to the lower parts of the limb, this fluid is no longer influenced by the heart's action.

After leaving the hospital, Chevalier again took up his trade of a joiner.

For three years he enjoyed good health; but at that period he was attacked, from severe labor, with inflammation and swelling in the arm pit. Uncertain as to the nature of his disease he came again to the Hotel-Dieu on the 14th of July, 1822. The axilla was filled by a tumor as large as the fist; the skin covering it was red, and thin, the apex of a violet color threatened immediate bursting. There was no pulsation in this tumor; the patient has had chills, fever, want of appetite, &c. Persuaded that the tumor was unconnected with the circulation, I wished to open it; but the patient preferred leaving this to the efforts of nature. An emollient poultice was therefore applied to the whole surface of the axilla. In two weeks it opened spontaneously, and discharged a large quantity of pus and matter, very analogous in color and consistence to inspissated grape juice, evidently formed from the old blood, uninfluenced by the circulation and changed by the process of suppuration around it. The opening was enlarged and barley water injected into the abscess. The fever and suppuration soon diminished, the appetite and sleep returned, the abscess healed, and the patient left the hospital on the 21st of October, 1822, in perfect health.

When an aneurism proceeds from the axillary artery, not far from the origin of the brachial, while the disease is still recent, the artery may be tied between the tumor and the clavicle; but when the disease is of long standing, or it arises from the axillary artery near the origin of this vessel, the subclavian artery must be tied. M. Pelletau attempted to tie the axillary artery immediately below the clavicle, for a large aneurism filling the axilla; in his patient a considerable space still existed between the tumor and the clavicle. M. Pelletau, having reached the artery, introduced his needle several times without being able to pass it around the vessel on account of its great depth. The operation was abandoned. The sufferings of the patient increased, the inflammation of the chest supervened, and he died on the 20th day. It must be confessed that it is sometimes impossible to tie the subclavian artery on account of the enormous development of the disease and the displacement of the clavicle. The celebrated Astley Cooper was once obliged to abandon a similar attempt.

More than twenty patients laboring under aneurism of the carotid, subclavian, brachial, external iliac, femoral, &c., have undergone the operation at the Hotel-Dieu, and gangrene has followed in only one case.

The compression and ligature of the nerves is the most frequent cause of this accident. Dr. Orpen relates a case of subclavian aneurism, in which the tumor, after having rapidly increased and beaten violently, had entirely lost its pulsations, and so greatly diminished in size as to be reduced to that of a small nut. The pulsation in the arteries of the limbs became imperceptible, the arm useless and extremely emaciated. Dr. Orpen supposed, and correctly, that in this patient, the diminution of the arm and loss of voluntary motion were owing to the pressure of the tumor on the cervical nerves, and not to the absence of a sufficient quantity of blood in consequence of the obliteration of the artery. Van Swieten relates a similar case.

Chevalier's case confirms the point established so positively by the beautiful dissections of Scarpe, namely, that the parts of the arterial system nearest the trunk have not less numerous and effectual communications between each other than more remote parts. Nature herself, always so fertile in

resources, had already proved that the obliteration of a main trunk was compatible with circulation and life of the limb. In M. Breschet's notes to Hodgson's work, is related a case in which the left subclavian and several of its most important branches had been obliterated by an aneurism of the aorta; a small aneurismal tumor was situated at the commencement of the subclavian, of which the cavity, from the place at which it left the small sac, was completely filled by a compact ligamentous substance, which extended into the vertebral, internal mammary, and superior intercostal arteries. The inferior thyroid was the first branch which remained open, and through it the blood passed through the superior thyroid into the subclavian, which although contracted was permeable at this spot. The limb was of ordinary strength and size, notwithstanding the obliteration from its commencement of its principal artery and most important branches.

CASE II.—*Ligature of the External Iliac Artery, read before the Academy of Sciences.*—At first sight, ligature of the external iliac seems more difficult and dangerous than that of the subclavian artery; but in performing it, it is found generally difficult and not more dangerous. The parietes of the abdomen are opened in the high operation for stone; in almost all the operations for hernia the peritoneum itself is divided; why should we not follow the same course to cure a disease as serious as either of these? The spot at which the incision should be made, and the disposition of the peritoneum enable us to expose easily the artery and avoid that membrane.

Many different operations have been adopted; the first consists in making in the abdominal parietes an incision parallel to the direction of the artery, starting from the point at which it passes under the crural arch, and ascending parallel to the external edge of the rectus muscle towards the umbilicus.

In the second we divide the abdominal parietes in the direction of the iliac artery parallel to the crural arch, and at the distance of half an inch from the latter; this is Abernethy's method. The third plan, says Astley Cooper, consists in making in the parietes of the abdomen above the crural arch a crescentic incision, commencing above the anterior superior spinous process of the ilium and terminating above the inguinal ring.

Bogros has proposed to make in the parietes of the abdomen, immediately above the crural arch, an incision of two inches in length, of which the external incision is at the same distance from the spine of the ilium that the internal incision is from the symphysis pubis. The tendon of the great oblique being divided parallel to Poupart's ligament, the operator pushes aside the vessels of the testicle, and reaches the artery which may be readily tied. But it must be confessed, that this incision, exactly perpendicular to the direction of the vessel allows us to place the ligature at the distance only of one inch from the crural arch.

The incision according to the first plan gives an opening parallel to the iliac artery, but which can have merely the width produced by the separation of the edges of the wound, rendering it difficult to find the artery, to separate it from the adjacent parts, as well as to apply the ligature. It presents also the danger of opening the peritoneum, which as it departs from the crural arch towards the umbilicus, adheres more intimately to the abdominal parietes.

The incision parallel to the crural arch being perpendicular to the iliac

artery, gives greater facility to all the stages of the operation, moreover it strikes precisely the line at which the peritoneum leaves the abdominal parietes to be reflected over the pelvis, in the midst of a soft and adipose cellular tissue, which occupies the triangular space formed by the parts at their separation. It gives a greater facility to turn aside the peritoneum, and is less liable to open this membrane; it may, however, when the incision is carried too much beyond the inguinal ring, wound the epigastric artery.

The ligature of the artery may be performed higher up, but we run a risk of wounding the peritoneum; by performing it lower down, we avoid this danger; but the ligature is so near the tumor, and the origin of the epigastric artery, that the aneurismal sac may be secondarily affected by inflammation and open into the wound, and the inferior portion being traversed by the blood from the epigastric artery, may preserve its calibre and maintain or even restore the circulation and pulsation in the aneurismal tumor.

In all these operations we separate the artery from the corpus pampiniforme on its outside; the vein and lumbar plexus on the inside, by means of the finger rather than the bistoury; the laxity of the cellular tissue renders this separation easy, which might be dangerous if we used a cutting instrument.

The termination of the external iliac artery is more easily found in the female than in the male; it is not so deep in the former; which must be attributed to the larger dimensions and smaller depth of the female pelvis. The operation is performed with less difficulty in thin than in corpulent individuals.

Berger (François), formerly a soldier, but now a stone cutter and saltpetre manufacturer, according to circumstances, 45 years of age, of a strong constitution, sanguine and nervous temperament, impatient and irascible disposition, having always enjoyed uninterrupted good health, in the month of June, 1815, exerted himself in raising a plank, of which the end was leaning against his left groin. He felt at this part an acute but momentary pain, which did not prevent his continuing to work. However, after the lapse of two months, Berger felt in the left groin, about two inches below the crural arch, a tumor as large as a filbert, perfectly indolent, on which account he paid no attention to it.

This tumor increased almost imperceptibly until the month of June, 1816.

At that period, the patient having made a severe exertion in lifting a beam, the tumor suddenly became as large as a hen's egg; lastly, three weeks previous to his admission into the hospital, he fell on the edge of a large copper kettle used in the crystalization of saltpetre, and by a kind of fatality, struck on the tumor. This caused a development of the tumor so great as to alarm the patient and induce him to ask the advice of a surgeon, who after having ascertained the nature of the disease, sent him to the Hotel-Dieu, on the 23rd of August, 1816.

The tumor situated, as has been said, in the left groin and over the femoral artery, had then the size and shape of a large pear, of which the base was upwards; it commenced a little above the crural arch, and extended four inches below it; it was two inches and a half in width; and projected two inches above the level of the adjacent parts; it presented dilatations and contractions perfectly isochronous with the movements of the heart. By pressing on the termination of the abdominal aorta or on that part of the external iliac corresponding to the horizontal ramus of the pubis, all movement

in the tumor was suspended, which, at the same time, diminished in volume and tension; by compressing the femoral artery below it, the pulsations became stronger, the tumor larger and more tense.

By compressing the tumor, it partly disappeared, and we then felt that its parietes were unequal and nearly of cartilaginous hardness; on removing the pressure, it rapidly regained its original size; it was moreover perfectly indolent and had not changed the color of the skin.

There then existed no doubt as to its being an aneurism of the femoral artery; and as it had for some months past made very rapid progress, there could be no doubt as to the danger of leaving it to itself, and of the necessity of doing something.

Two methods could be adopted, compression and ligature. If compression did not succeed, it might at least prepare the way for the success of the ligature; it was therefore determined to try it and assist its operation by the application of ice to the tumor. Convinced by many attempts of the ease with which we can compress, with the fingers, the external iliac artery, above the crural arch, on the horizontal ramus of the pubis, at my suggestion, Sirheury, one of our most ingenious cuttlers, made an instrument by means of which, one end being supported by the sacrum, the termination of the external iliac was compressed by a pad, at the other regulated by a screw. This was then applied, the circulation entirely arrested in the limb below it as well as in the tumor, upon which was applied, in a bladder, some pounded ice. Such was the first apparatus used in Berger's case; its imperfection soon became manifest. The pulsations in the aneurismal tumor which had been arrested on the first application of the instrument, reappeared whenever the patient spoke, coughed, or used the slightest exertion. His body, although on a horizontal plane slipped towards the foot of the bed, impelled to this movement by the compression, from the pain of which, by this means, he endeavored to escape. Lastly, when the compression was perfect it became so fatiguing that it could scarcely be endured for fifteen or twenty minutes during the application of the ice, whilst he could bear it for half an hour if the ice was not applied.

The pain produced by the compression was felt for some minutes after its removal; and even was then greater. This pain, evidently owing to the compression of the crural nerves, ceased entirely in five or six minutes. This intermittent compression was continued until the 18th of September, when it became so painful that we were obliged to abandon its use. At that time the tumor had sensibly decreased. The patient was permitted to rise from bed during several days. He then experienced in the knee joint and left side a sensation of uneasiness and stiffness which disappeared in 48 hours.

These difficulties did not make me abandon the hope of effecting a cure by pressure. A new machine, more simple than the first, analogous to the bandage of Camper, and made on the same principles by M. Verdier, a very skillful truss-maker, was used on Berger. It consisted of an elastic steel band, forming the five sixths of an oval. The right extremity enlarged and flattened rested on the hip of the same side, the left extremity narrower and turned downwards was furnished with a pad exactly answering to the spot at which the external iliac artery passes over the body of the pubis. The whole action of the instrument consisted in its elasticity. It was applied on the 20th of September.

It was easily seen that it had the advantage over the first instrument of following all the movements of the body; an advantage which gave the compression an exactness and fixedness which would have attained the desired end had Berger been more resolute and less impatient.

The application of pounded ice was recommenced, and renewed as often as was requisite.

The patient could not bear the application of this second machine with more ease than the first; he even complained more of it, and from the 9th of October, that is, ten days after its first use, Berger frequently demanded the operation. In vain I represented to him the advantages of a plan which would cure him without any operation; he refused to submit to the compression, and incessantly solicited the operation. At last, yielding to his entreaties, I determined to perform it, and for this purpose, permitted him to rest for several days. This time I wished to employ in the restoration of the tone of his nervous system, prepare him for the operation and make some experiments on the dead body previous to operating on the living.

The aneurismal tumor was then reduced to two thirds of its size, and the force of the pulsations sensibly diminished.

On the 9th and 10th of October he had some pain in the tumor extending to the middle of the thigh, occurring at intervals and severe enough to awake him suddenly; it ceased on the 13th, but on the back part of the thigh and along the course of the sciatic nerve, the pain, although less severe, presented the same character. The patient was habitually constipated; on the 14th and 15th two enemata were administered, which brought away only some dry and black matter.

As the operation was to be performed on the next day, he was ordered an ounce of syrup of diacodium, which procured him a tranquil sleep of six hours.

The patient was laid in a horizontal position, an assistant placed so as to be able to suspend, at least momentarily, the circulation of the lower limb by compression on the termination of the abdominal aorta. I then commenced at one inch below and in front of the anterior superior spinous process of the ilium, an incision parallel to the crural arch, which was carried as far as the outer extremity of the inguinal ring. The skin, aponeurosis, and muscles were successively divided with great caution; I soon reached the cellular tissue, which was yellowish, slightly injected, remarkably dense, and containing a large number of lymphatic ganglia with which it formed a thick layer adhering closely to the external iliac artery, from which circumstance there was some difficulty in exposing the artery. The cellular tissue was removed layer by layer; but in order to assist this very delicate dissection several small incisions of the crural arch, which was extremely tense, became necessary. The artery being then disengaged externally from the cellular tissue and corpus pampiniforme, separated internally from the iliac vein by means of the index finger, it was raised by the two index fingers whilst an assistant passed a grooved director beneath it. By pressing the artery on the director, all pulsation was suspended in the tumor. A ligature was then placed at about an inch from the diseased spot. A precautionary ligature (*ligature d'attente*) was then placed in the same manner at the distance of half an inch from the former. When the first ligature was secured, all pulsation immediately ceased in the tumor.

One thing remarkable occurred during the operation; that when the patient forcibly contracted the muscles of the abdomen, the edges of the wound were brought nearly into contact, and the peritoneum protruded. This required the fingers of an assistant to thrust back the peritoneum, and to keep the wound open. The first ligature was placed in the inferior angle of the wound, the second in the superior. Both were enveloped in a small compress. The wound was covered with muslin spread with simple cerate, over that some fine charpie, and the dressing finished by triangular compresses and a bandage.

The first symptoms experienced by the patient were evidently nervous; they had occurred during the course of the disease, and had complicated all the other symptoms of the case.

Berger bore the operation with great fortitude; but after the dressing complained of some sickness of stomach, a slight tendency to syncope.

He was carried to bed, his head raised by pillows, the thighs and legs flexed on the pelvis, the left limb surrounded by bags filled with hot ashes and cloths. He was ordered mucilaginous drinks and light soup.

During the whole of the day he felt no numbness in the limb. The sensibility and myotility were perfect. The heat did not abate for a moment, and even seemed greater than that of the opposite side to the patient; but the hand could discover no difference. His countenance, however, was changed; he had pain in the abdomen, and principally in the epigastric region. There was continual eructation of gas. In the middle of the day he felt a general heat, some thirst, his face became very flushed; pulse frequent and hard. In the evening, the epigastric region was tumefied, and resonant on percussion; he was very uneasy.

He was ordered an infusion of chamomile flowers and anise seed sweetened, dry friction over the epigastrium, and to be bled during the night should any symptoms of congestion of the brain or any other part supervene.

During the night pain in the epigastrium with copious discharge of gas, no sleep.

2d day. The limb still possessed its sensibility and mobility. It appeared warmer than the opposite one; the sand bags were removed, and hot flannels alone applied. Pain in the epigastrium still severe. The stomach was so much distended with gas that it appeared through the parietes of the abdomen; he had eructations. Pulse not so full as on the preceding evening, face shrunk, tongue dry, covered with a black coating, as also were the lips and teeth.

An enema of two ounces of tamarinds infused in eight ounces of water was prescribed: as it produced no effect a second was given. This was soon discharged colored by the fæces; causing also some discharge of flatus which relieved the patient and procured him a little sleep. The pain in the epigastrium soon returned accompanied by free eructation of flatus. In the middle of the day, the face became very red, the pulse hard and frequent, the pain of the epigastrium extended to the hypochondriac regions. He was bled ten ounces, ordered emollient enemata, and vegetable lemonade. These remedies calmed the pain slightly and he slept for a few hours.

In the evening he was slightly delirious; epigastrium still painful, tense and sonorous on percussion; he discharged gas almost continually from the mouth; tongue red, and dry, pulse hard and frequent. He was bled eight ounces

more in the middle of the night; the enemata, and repeated introduction of a gum elastic tube into the anus, caused the discharge of a great deal of gas, but no stercoral matter. He slept for a few hours.

3rd day. His countenance expressed less anxiety; he was more tranquil, pulse less frequent and hard; tongue not so dry; skin slightly moist; region of the stomach less tense and painful. Continue the lemonade; two enemata each containing half an ounce of castor oil were administered; they were retained, but a copious discharge of urine took place. During the evening he was much better, and that night slept for three hours.

4th day. Pulse nearly natural; tongue moist; pain in the epigastrium less severe; a good deal of flatus discharged by the mouth. The limb had lost none of its ordinary sensibility, contractility and warmth. He took some soup during the day, the lemonade and emollient enemata were continued, and a sound repeatedly introduced into the anus. Evening same state; he slept for several hours during the night, but was interrupted several times by fearful dreams.

5th day. The dressings being completely saturated with the suppuration, were removed without the least pain to the patient. At three lines from the upper angle of the wound, a small black spot of two lines in diameter was seen, probably resulting from the pressure of the bandage.

The aneurismal was reduced to one third of its original size, and was free from pulsations. The popliteal posterior tibial and the dorsal artery of the foot did not pulsate, but they could be felt full of blood. The limb preserved its sensibility and warmth. The pain in the epigastrium had entirely disappeared but the eructation continued; the tongue was red and dry, and the pulse still frequent. He had some cough, and at each effort experienced pain in the wound; the latter was dressed with cerate and fine lint, kept on by compresses and a triangular bandage. The lemonade and bouillon continued.

During the day he had slight delirium. Much agitated during the night. Two emollient enemata brought away a copious discharge of black hard fœces. After this evacuation, the delirium ceased.

6th day. In the morning, great dejection of countenance, tongue dry and brown; pulse frequent; lips and teeth covered with a fuliginous crust. The wound was dressed as before. The tumor presented for the first time a slight trembling. He was ordered for that day, small beer alternately with seltzer water. Evening, more tranquil. Night following slept several hours.

7th day. Tongue dry and red; pulse less frequent; voice somewhat changed. He had no difficulty of respiration; no pain in the thorax or abdomen, except at each attack of coughing there was some in the wound. The limb was warm and preserved its sensibility. Suppuration copious but of good appearance. The tumor presented a slight trembling as previously. Continue the seltzer water and beer; he took some soup. Two enemata occasioned at first a slight colic, soon followed two copious evacuations of yellow liquid matter; he had three more stools during the day; a little appetite was felt; he was allowed more soup; towards morning he had some sleep.

8th day. There was a general moistness; countenance good; pulse calm; tongue red and moist; suppuration although copious was healthy. The almost continual eructation which had tormented him had entirely ceased.

9th day. We observed on the left side of the abdomen, a few lines above

the wound, some extremely strong pulsations which appeared to proceed from the external iliac artery. The aneurismal tumor presented pulsations more distinct than usual, but we could perceive a daily diminution in its size. The small eschar which had formed at a few lines from the external angle of the wound had entirely separated. In order to restore his strength weakened by dieting, he was ordered two table spoonsfuls of Bordeaux wine (claret) morning and evening. From the 10th to the 12th day, the patient had at intervals hiccough, accompanied by no other unpleasant symptom, but recurring so often as to disturb his sleep. During the night of the 12th day, he felt some pain in the lower extremities, and although evanescent they occupied his imagination sufficiently to cause the hiccough to disappear entirely.

13th day. The quantity of pus furnished by the wound was observed to proceed from a small abscess, seated above its superior angle, on the inside of the crista of the ilium. By very slight pressure this was emptied. As the patient's appetite increased he was allowed more food. He passed a good night.

14th day. The pulsations which had been observed in the direction of the iliac artery had ceased. These pulsations were very evident on the opposite side. It was observed also that those of the tumor were irregular and intermittent, the intermissions lasting often for several seconds, and during this time, the arteries of the rest of the body presented no analogous symptom, which proved sufficiently that the intermission was owing to some entirely local embarrassment of the circulation.

15th day. The ligatures being gently raised up, came out of the wound for several lines; they were not however entirely removed. During the evening he had violent cephalalgia; having had no evacuation for several days, an emollient enema was prescribed as also a sinapism to the right arm. In a few hours he had two copious stools, the head-ache was removed and he slept well for the rest of the night.

16th day. The two ligatures came away spontaneously and at the same moment.\* The patient's appetite increasing he was allowed two cutlets and some soup; the claret wine, beer, and seltzer water were continued.

20th day. The pulsations in the tumor were perceptible to the sight and touch, suppuration very copious, it was dressed twice daily. Every two or three days emmollient injection were administered in order to overcome the habitual constipation of the patient.

23rd day. The angles of the wound had begun to cicatrize; some, too, luxuriant granulations were touched with nitrate of silver. On the morning and evening of that day a little blood was found mixed with the pus. The patient had not slept any during the night, and had been exceedingly agitated. About nine o'clock P. M. hæmorrhage took place soaking the whole dressing. About two ounces of blood were supposed to have been lost, but on a very

\* Practitioners have for a long time attached great importance to the temporary ligature (ligature d'attente). From this period I have never again employed it, being convinced that it is more likely to occasion than to prevent hæmorrhage; that it frequently divides the artery before the other ligature; lastly that it cannot arrest hæmorrhage, since it acts upon an inflamed part of the vessel, which has become scissible, and which may be easily divided by very slight constriction.

attentive examination, the point from which the blood proceeded could not be ascertained; the wound was dressed as on the preceding days.

24th day. In the morning a second bleeding more copious than the first took place; accompanied by pain in the wound. The blood appeared to come from the lower part of the wound, and was evidently arterial. Compression with the middle and index fingers of the right hand produced no effect, at an inch above the wound; below it, it arrested the flow of blood, and gave time to clean away the coagulated blood. The compression by a graduated compress and the elastic instrument of which we have spoken was substituted for that of the fingers; the wound was covered with a little charpie. The patient's countenance was changed, and the eructation had again appeared.

By raising the iliac artery on a sound, it could be distinctly seen and compressed by the finger. By pressure the pulsations in the tumor ceased. The artery was tied, and from that moment and during six days, the pulsations did not return. Again, compression on this artery above the ligature did not lessen the pulsations in the tumor; the blood producing them came from a more remote source; in fact, by compressing the abdominal aorta, they ceased; the blood therefore did not come from the end of the artery which had been tied, but from arteries between the ligature and the abdominal aorta. Now, what artery could thus have re-established the circulation of the blood, unless it were the internal iliac, with which anastomosed perhaps the internal mammary?

But by what vessel was the blood again carried into the aneurismal tumor?

The femoral artery did not pulsate below the tumor, and pressure upon it appeared to augment instead of diminishing the pulsations in the tumor.

Was the blood returned by the profunda femoris? The situation of this artery behind the tumor prevented the solution of this question. Lastly, was it by the epigastric artery? We know the double communication of this vessel with the internal mammary and obturator arteries; and even that a considerable branch sometimes extends from one to the other of these last arteries. This idea led us to examine attentively the course of the epigastric artery, and we felt, with astonishment, strong pulsations in this artery, through the parietes of the abdomen, and especially in the vicinity of the tumor. It therefore appeared that the epigastric artery was the principal agent of the return of the blood into the tumor, and that here, as sometimes happens in ligature of the primitive carotid, the great freedom of anastomosis, instead of facilitating, reproduced the disease. In the present case, this anastomosis might occasion a hæmorrhage eventually perhaps fatal.

Every one knows the secondary hæmorrhage, and that the loss of an equal or even less quantity of blood, is more serious than in a primitive hæmorrhage. I knew that a hæmorrhage, much less severe it is true, had ceased spontaneously in a patient of M. Moulland; but I also knew that a fatal case had occurred in the hands of the illustrious A. Cooper himself.

I wished to abandon my patient neither to the chance which had saved the former, nor to the fate of the latter. Here difficulties crowded upon me; did the blood proceed from the superior or inferior end of the artery? In the former case the temporary ligature having fallen off long since, and the artery having necessarily retracted after the division of its coats, it appeared almost

impossible to tie it again. It was much more probable that the hæmorrhage came from the inferior end ; but admitting this, we had yet to find the means of arresting it.

Ought we to tie the inferior end of the artery above the tumor ? But in addition to this end being very short, which would make it almost impossible to place the ligature without injuring the tumor, the end of the artery must be embedded in an inflamed cellular tissue, partaking also of this inflammation ; it must be so easily divisible, that a ligature most carefully applied, would almost immediately cut its coats, and the hæmorrhage return in a few hours. Again, if this ligature were placed below the origin of the epigastric artery, the latter might maintain the bleeding, by continuing to pour into the wound the blood which it received apparently from the internal mammary or obturator arteries. Ought we to tie the femoral artery below the tumor in order to prevent the reflux of the blood into the tumor ? But in the first place, it was doubtful if the source of the hæmorrhage was there ; again, this ligature would fall far below the origin of the profunda. Far from arresting the hæmorrhage, it seemed likely to increase it. Ought we to open the aneurismal tumor longitudinally as in the operations for aneurism by incision ? To perform this an essential condition was wanting ; that of being able to suspend the course of the blood in the limb during the operation ; also, the blood which certainly passed into the aneurismal tumor, from the epigastric artery and the femoral itself, would render the operation dangerous. Former experiments had shown that we could temporarily arrest the blood in the lower parts of the body by pressure on the abdominal aorta ; but in addition to the contraction of the muscles occasioning pain, the slightest motion of the patient, the least hesitation on the part of the assistant, might deprive us of this resource ; it appeared very difficult to tie the epigastric artery, the profunda femoris, and the femoral itself in the aneurismal tumor, without the danger of dividing them or some of their branches. These considerations led me to abandon the ligature, and trust to compression, which although generally less perfect than ligature, was at least free from the dangers accompanying the latter.

In order to be effectual, the compression should bear upon the precise point furnishing the blood. The difficulty was to find that point. In order to do this I again tried the compression above and below the wound ; the first allowed the blood to flow, the latter arrested it completely. The blood therefore came from the inferior end of the artery ; upon which compression was to be applied ; and this compression finding only opposed to it an impetus diminished by the resistance of the anastomosis presented much better chances of success.

An hour and a half had scarcely elapsed when the blood appeared for the third time ; the compression was increased and the blood again arrested. An hour afterwards, the pressure being relaxed, a fourth hæmorrhage took place ; the compression was increased and the blood suspended ; but carried to the degree necessary, the compression became extremely painful. Did not the same cause produce the extraordinary and unexpected return of the pulsation in the tumor and the hæmorrhage ? From what other cause in fact, could arise the return of the pulsations from the 6th day, and the hæmorrhage occurring eight days after the separation of the ligatures, and twenty three days after the operation ! The bandage was then removed and the wound cleansed ;

three coagula of blood were extracted, hard, dense, round, and apparently encysted, about the size of an ordinary musket ball; one was entirely composed of fibrin; at the moment of their extraction a gush of blood took place; the fore finger being carried to the bottom of the hand arrested the hemorrhage. Immediately some plugs dusted with powdered colophony were made and thrust to the bottom of the wound on withdrawing the finger; and thus not an additional drop of blood was lost. Other tampons were placed over these; the wound exactly filled and over the whole compresses and a bandage applied. The leg and thigh were flexed upon the pelvis and kept in this position by means of a pillow under the ham. He was ordered some weak punch and soup. Evening, things were in a good condition; no blood had been lost. His countenance was good, his mind tranquil, and pulse natural.

25th day. There was on the inner side of the bandage a quantity of blood which however had not as yet soaked through the dressing; plugs of lint were re-applied at this point and kept on by a new bandage. There was no numbness in the limb; it preserved its heat, sensibility and myotility; but the *morale* of the patient became again affected, his countenance changed, had slight pain in the epigastrium, great eructation of gas; the punch and soup continued.

Evening, he was more tranquil, but complained of uneasiness from the position he was obliged to maintain; felt some pain in the heel, which ceased on changing his posture. Epigastric pains and eructation had ceased. Night was calm and had some sleep.

26th day. Copious oozing of pus and blood had taken place between the skin and upper part of the dressing, the abdomen was slightly painful for some inches around the bandage. The patient was pretty well, had a little appetite; the soup was continued.

27th to 29th day, same state. 30th. Evening, the patient uneasy in every position, had suddenly moved about several times; a fifth hæmorrhage occurred. About two ounces were supposed to have been lost, but it was corrected by the tampon. The patient seemed not to mind it, he appeared fortified against accidents, and although much emaciated, his strength remained; he was ordered a glass of claret, and soup containing a potato. From this period the hæmorrhage never returned.

The patient complained on the following days of pain in the upper part of the left thigh, caused undoubtedly by the compression of the bandage, nevertheless the apparatus was kept on until the 32d day, and then only carefully and gradually removed. There was no appearance of blood in the pus.

The next morning several additional pieces of the dressing were removed, and merely the tampons contained in the wound left; the edges of the latter were red and excoriated at some points; these excoriations were covered with cerate; some lint, compresses and a triangular bandage completed the dressing.

33rd. The upper part of the left thigh was red, swollen, and slightly painful, the patient had no appetite, great thirst, tongue red and dry, pulse frequent; compresses wetted with Goulard's solution were applied to the thigh.

34th. Five days after the last hæmorrhage, and ten after the first, the remainder of the charpie was very carefully withdrawn from the wound, which was dressed with plugs of soft lint, kept in by some compresses and a bandage.

The removal of the dressing then allowed us to perceive, that not only the

aneurismal tumor no longer pulsated, but that it was empty and reduced to its parietes which presented a cartilaginous consistence. 35th. The state of the patient had improved; the pain and swelling of the thigh greatly diminished; the tongue was red but moist, the pulse less frequent, wound of healthy look, suppuration less abundant and natural, limb warm. 36th. The tumor in the thigh had become soft and flaccid; it could be touched without giving pain, and presented some fluctuation at its middle and upper part. Did this fluctuation depend on the formation of an abscess, or from some effusion of blood following the rupture of the aneurismal sac? This question was to be solved before proceeding to any active measures. If it were an abscess, it required opening; if caused by a collection of blood, would not this proceeding expose us to more hæmorrhage.

The inflammatory symptoms preceding this collection; the remission of these symptoms at the moment in which it appeared formed, led us to try the effect of a slight puncture in the upper part of the thigh, two inches below the aneurismal tumor. At first only a few drops of true sanies were discharged, of an extremely offensive smell; but a slight pressure below the opening gave exit to a great quantity of the same matter mixed with a very thick pus. The opening into the abscess was then enlarged. Moderate pressure caused the discharge of a quantity of pus mixed with some blood. The whole thigh was covered with an emollient poultice. He was ordered a decoction of bark and wine and water. The wound was dressed twice daily, and at each dressing moderate pressure gave exit to a large quantity of pus.

40th day. The pressure appearing insufficient to evacuate the pus completely, the opening was enlarged, the limb demi-flexed, the knee elevated on pillows, so that the upper portion of the thigh became the most depending part. At this period the patient began to feel in the external part of the thigh very acute pain, intermittent and sometimes extending from the head of the fibula to the external malleolus. This pain was particularly severe at the time of dressing. The limb was wrapped in flannel, and the pain seemed to have disappeared for a few days.

On the 40th day of the operation the bottom of the wound was filled up, its aperture contracted. Its edges were in immediate contact; suppuration not very abundant, the granulations grayish and pale; it was dressed with honeyed wine. Patient has little appetite; the pain in the knee and leg deprived him of sleep. Ordered an ounce of syrup of diacodium. On the following day the suppuration sensibly diminished, the appetite improved daily. From the 42d to the 48th day, the progress of the convalescence seemed arrested, the patient was morose and apparently despairing of his life. Several nervous symptoms were manifested and gave reason to fear a malignant fever. A change of air and scene seemed necessary, he was therefore removed to a more lively part of the city. This change and the food allowed him influenced so greatly his convalescence, that the suppuration had entirely ceased, and the wound cicatrized in eight days. He was then permitted to sit up every day for a few hours. 60th day, he rose from his bed without assistance. 64th day, the opening in the abscess being also nearly cicatrized, an œdematous engorgement took place around it, which was discussed by the use of alcoholic applications.

68th day. He walked alone, to his meals at some distance from the house,

feeling only a slight stiffness of the thigh. Thus after surmounting innumerable difficulties and dangers Berger at last was effectually cured.

On the 7th of July, 1819, three years after the operation, the patient was in the following state:

The limb preserved the same size, shape, and nearly the same strength as the opposite one. The heat, sensibility and myotility had undergone no change; the circulation was carried on, but without being made manifest by any sensible pulsations, although the arteries were full and resisting.

He frequently walked several leagues, and followed his trade without fatigue. He labored still under one inconvenience, namely a weakness of the parietes of the abdomen, at the cicatrix, for which he was obliged to wear a truss.

On the 15th of January 1827, eleven years after the operation, Berger was in a most satisfactory state and occupied at the laborious trade of a mason.

II. **LIGATURES.**—*Of Ligature of the Arteries between the Aneurismal Tumor and the Capillary Vessels, or beyond the Aneurism.*—Under certain circumstances, a ligature cannot be applied between the tumor and the heart, on account of the too great proximity of the aneurism to the centre of the circulation. No resource is then left to the surgeon but the application of a ligature between the tumor and the capillaries. The idea of this plan belongs to Brasdor, but Deschamps first performed on the living body. He tied the femoral artery below the tumor for an inguinal aneurism. The disease rapidly increased, and to prevent its rupture, and the death of the patient, Deschamps was obliged to open the aneurismal sac, and tie the artery above. This attempt, and that of Astley Cooper equally unsuccessful, had brought the operation into discredit, when some successful cases have again attracted public attention.

It appears beyond a doubt that the unfavorable results in these two cases was owing to the origin of some important branch from the diseased artery between the ligature and aneurismal sac. Therefore, we are now of opinion that the chances of cure are as numerous as possible, when no branch capable of maintaining the circulation in the sac exists between the latter and the tumor. This successful termination may even take place, although small branches may arise from the vicinity of the aneurism, by the extension of the coagulum, filling successively the latter and the trunk itself. The presence of considerable ramifications, capable of preventing the solidification of the blood in the tumor evidently render the operation useless. On the other hand it may be injurious and accelerate the march of the disease. It will be seen, that if the fluid impelled by the heart finds beyond the aneurism a narrow opening, although sufficient to admit it in a certain stream, it will make a continual effort, in which the tumor plays its part, to dilate this opening, and the result will be the dilatation of the parietes of the sac.

The plan of which we now treat does not apply to recent and diffuse traumatic aneurisms, or to varicose aneurisms, whilst it should be applied to spontaneous or circumscribed traumatic aneurisms, with solid cysts. The presence of the epigastric artery above and below the tumor is an obstacle to its application to the thigh.

By recapitulating the facts favorable to this plan, it will be found that of five cases no arterial branch arising between the ligature and the aneurismal

sac, three have been successful; that in the opposite case, especially those of the iliac fossa and groin, have not been arrested in their progress. In some others, and particularly in the inferior region of the neck, the progress of the disease has not only been slackened, but modified for eight months, and even for two years.

The following case, although unsuccessful, is interesting, since death could not be attributed to the plan, but rather fear, which suggested a most energetic antiphlogistic treatment (six bleedings in four days). Those also who assisted at the operation will remember it, as a rare example of the patience, sang-froid, and skill of the illustrious operator.

*CASE.—Subclavian Aneurism; Ligature of the Axillary Artery; Death; Autopsy.*—Ch. Paris, 40 years of age, a day laborer living in the country, of robust constitution, felt five months ago, after violent exertion, pain above the right shoulder; he ceased working, and on the third day a pulsating tumor of the size of the thumb, formed above the clavicle. During two months, his surgeon, who understood its nature, covered it with pounded ice; the man was bled three times and kept on strict diet; the tumor was reduced to the size of a French bean, when he again began to labor; it made no progress for three weeks, but then rapidly increased, rendering the movements of the arm very difficult. Paris remained quiet, and underwent no treatment until his admission into the Hotel-Dieu, on the 28th of May, 1829.

He was then in the following state: a large salient tumor, without any change of color in the skin, occupied the lower part of the neck, resting on the clavicle, which it slightly covered in front, without appearing to pass beyond it, below and behind, it ascended as far as the middle third of the neck. The tumor commenced at about half an inch from the right sternoclavicular articulation and the trachea, and extended to the internal edge of the trapezius muscle, thus occupying the whole of the subclavicular space; its vertical diameter was two inches and five lines; the transverse three inches five lines; it raised up the sterno-mastoid muscle. A species of hard and thick membrane resisting the sac, could be distinctly felt; the circumference was irregular; it extended further upwards and inwards than downwards and outwards, and approximated very closely to the cricoid cartilage. The finger could distinguish in every part of the tumor strong superficial pulsations isochronous with the pulse. Moderate pressure gave no pain, but diminished the size of the tumor, which presented some resistance to the fingers. The following was the state of the circumjacent parts: by seeking the carotid in the tumor, and nearly where this artery divides, it was easily found; but then, by tracing it towards its origin, the position and pulsations of the tumor prevented its discovery; by depressing forcibly the integuments of the neck over the track of the artery, and pushing the tumor slightly outwards, the carotid could be distinctly felt, because the artery presented a remarkable trembling, strongly contrasted with the pulsations of the sac. Carrying the examination towards the upper part of the sternum, the fingers felt, and the eye perceived the pulsations furnished by a large arterial trunk, situated partly in front and to the right of the trachea. This was probably the arteria innominata.

The pulsations of the axillary artery and the branches of the right side, were not different from those of the opposite side. The right arm was

swollen, especially the hand; benumbed, without change of temperature; the right hand demi-flexed, and its motions nearly lost. Auscultation and percussion announced a sound state of the lungs. The pulsations of the heart were simple, but strong and sonorous; the patient stated that he had never had palpitation nor any other symptom characteristic of disease of that organ. The digestive and cerebral functions were naturally performed. During the first fifteen days, he was twice bled, at each time twelve ounces, which seemed to weaken him greatly. He took but little nourishment; saturnine lotions and ice were constantly applied to the tumor. The tumor, however, sensibly increased, and prompt recourse to a surgical operation was evidently required in order to save the man's life.

Valsalva's method offered no better hopes of success. There remained, therefore, only the ligature of the artery; where was it to be applied? between the tumor and the heart? It would have been difficult, if not impossible to determine precisely the point of the subclavian, from which the tumor originated. The innominata itself was perhaps affected; the strong pulsations felt behind the sterno clavicular articulation caused this to be feared. Were we even certain of its integrity would it be safe to attempt to tie it? This bold operation performed by Mott of New York, and Graefe of Berlin, has not been sufficiently successful to inspire much confidence. We were therefore reduced to the last alternative of tying the axillary artery, between the tumor and the capillaries.

After having maturely examined this method, again dissected this region, and minutely studied the important relations of the axillary artery, the operation was performed on the 12th of June, 1829. An incision was made commencing near the internal extremity of the clavicle, two fingers' breadth below it, extending outwards nearly parallel to the bone; this incision was three inches in length. The operator divided successively the fibres of the great pectoral muscles, the venous and arterial branches, and then the upper third of the lesser pectoral muscle; on reaching the artery, it was found, as supposed by M. Sauson before the operation, that the aneurismal sac extended somewhat beyond the clavicle; lastly, the axillary artery was separated from its vein and the nerves of the brachial plexus. By means of a curved needle a ligature was passed around it; the patient felt no pain when the ligature was tied. Immediately after the securing of the ligature the pulsations in the tumor greatly increased, and the first twenty were very irregular, as remarked by M. Sauson, who kept his hand on the tumor; but they afterwards regained their natural force. The wound was simply dressed; the application of ice was continued and compresses soaked in a solution of acetate of lead. He was ordered at night a grain of extract of opium. Ten hours after the operation, his pulse was strong and amounted, as on the evening preceding, to 84 strokes per minute. He was bled four ounces.

13th of June. The patient was weak, complained of insomnia, uneasiness; the pulsations of the tumor had not sensibly diminished, but the tension was less; pulse beats 66 times per minute; the arm preserved its natural heat, but without any perceptible circulation. Evening, pulse 96; the nausea, insomnia, have disappeared; limb in the same state; a pricking sensation is felt in the fingers; tumor evidently diminished, pulsating although not so strongly as before. 15th. No change; remedies continued; some soup was

allowed. 16th, sleep; pulse 80; tumor and pulsations diminished; respiration free; great thirst; has had no alvine evacuation since the operation; except that, is doing well. 17th, morning, tumor and arm in the same state; wound dressed for the first time; eight ounces of blood were drawn from his arm (acetate of lead continued); two o'clock, P. M., dressing saturated with vermillion colored blood, easily coagulating; pulse quickened, face pale and haggard; (at half past six o'clock twelve ounces of blood were taken, refrigerants applied to the wound itself); 10 P. M., some blood oozed from the wound, at half past eleven P. M. eight ounces of blood withdrawn from the vein; 18th, four o'clock A. M., another slight oozing was soon arrested by compression; general paleness; icterose hue; great debility; respiration embarrassed cough dry and frequent, thirst, nausea; pulsations do not diminish in strength; no evacuation per anum; the acetate of lead discontinued; wound dressed and covered with ice; evening, no bad symptom, arm preserves its natural heat.

19th, Patient is very pale, pulse frequent, debility great, pulsations less strong in the external part of the tumor. Again bled four ounces.—Evening, cough less frequent; some sleep, felt pretty well, took a little soup. 20th, debility increases; evening, his extremities were cold, he was agitated, insomnia, slight delirium. At one o'clock, Paris felt his end approaching, and at half past two A. M. he expired.

*Autopsy.*—Thirty hours after death; great emaciation; the right arm was livid, oedematous; the epidermis detached at several points; the ends of the fingers black. The cavity of the pleuræ contained a little sanguinolent fluid; the anterior part of the lungs sound; the posterior red in patches, was hepaticized in the right lung and also covered by some recent false membranes.

The heart, extremely large was flabby; the ventricles much dilated; its parietes soft and thin contained no coagula; on the outside there was a white patch attributed to a former pericarditis.

The aorta was greatly dilated at its origin; this dilatation extended, but diminished gradually, as far as the diaphragm, where the vessel was of its ordinary size. Its internal surface red and granulated, presented cartilaginous patches of a deep red color; patches of ossification were also seen here and there; some erosions were found on the inner membrane. The innominate presented similar lesions, also much dilated, passing in front of the trachea, where it gave off the carotid which was sound. The subclavian dilated immediately at its origin formed the aneurismal sac. The tumor occupied the subclavicular space; it had partly destroyed the first rib, and as we have already said extended beyond the clavicle; outwardly it covered the nerves of the brachial plexus; inwardly it was covered by the clavicular portion of the sterno-mastoid muscle, the omo-hyoideus and scalenus anticus, which adhered intimately to the anterior parietes of the sac. But the last muscle presented an efficient obstacle to the development of the tumor towards the heart; for by passing the finger into the aneurismal sac, and then under the scalenus anticus, a marked contraction in the subclavian was felt. The parietes of the sac were thick and resisting inwardly, but at some points below the pleura formed its only covering. The cavity of the aneurism contained merely a clot of recent blood; it was lined in front by layers of fibrin. The coats of the artery forming the dilatation could in no wise be distinguished. The vertebral internal mammary, and inferior

thyroidal arteries were entirely obliterated. The axillary artery was sound at the point of the application of the ligature; an opening in the artery was perceived at this point, probably made during the dissection. Several students had also pulled at the ligature before commencing the autopsy, and this might have lacerated it. The remainder of the arterial system was sound. The digestive and urinary organs presented no marks of disorder; head was not examined.

Let us now examine the cause of the death of Paris with all the attention and impartiality which the case demands. We have seen that the pulsations immediately after tying the artery were extremely strong; still the sac was not ruptured, although its parietes were thinned in some places, and two days after the operation the pulsations sensibly diminished. Thus the tumor presented no alarming symptom. The patient did well until the fifth day; a slight hæmorrhage then occurred. The cause of this accident was unknown; the blood was supposed to come from the sac or the axillary artery; but it is more probable that it proceeded from small sized vessels; the autopsy did not decide this question positively.

Paris, weakened by bleeding and dieting, was still more so after the hæmorrhage; however, as a recurrence of the bleeding was feared, the ice and compresses were applied to the wound; twenty ounces of blood were withdrawn at three bleedings in the same day. Now it is very probable that these bleedings opposed the cure of the aneurismal tumor; for the plastic quality of the blood is necessary to its coagulation, and the more the patient is bled, the more this quality is lessened and consequently also the chance of cure. This same circumstance caused a greater liability to hæmorrhage. The greatest inconvenience of these repeated bleedings, was to reduce so much the strength of the patient as to render him unable to support any further loss of blood.

It might have been feared that the success of the operation was compromised by the existence of large branches furnished by the subclavian in front of the tumor, or by the tumor itself. The autopsy showed the obliteration of all these branches, as is frequently the case when the aneurism has attained a certain size, and situated so that compression can act on the arteries. Generally, as we cannot ascertain whether the branches furnished by an artery at the spot where it is aneurismal, are not obliterated, their existence should not contra-indicate the ligature between the tumor and the capillaries.

If, in detailing this curious case, we have pointed out the objections to the repeated bleedings, we should also mention that the great changes in the aorta and lungs must have greatly influenced the death of Paris.

Be it as it may his loss is to be lamented. Had the case been successful, others might have imitated it and many valuable lives been saved. The result, however, should not deter surgeons from renewing the operation of Brasdor. Were we always to judge of the value of an operation by one case, many of our surgical resources would be cut off. Astley Cooper failed in his first operation for tying the primitive carotid in a case of aneurism of that artery. This did not prevent Mr. Cline from attempting it, as well as Astley Cooper and other surgeons. They succeeded. Since that period they have been imitated by other surgeons, and ligature of the primitive carotid is no longer considered so serious an undertaking.

The first case of artificial anus operated upon by the method which has since been so often successful I lost.

We have seen in the account of the post-mortem examination of the above patient that the arteria innominata, although very large, was sound; it might have been tied; but we have already observed that two similar operations by Mott, of America, and Graefe, of Prussia, have failed. A third lately performed in Paris was not successful; the patient died of hæmorrhage. These failures are not encouraging. Still, instead of condemning we should rather praise those, who in desperate cases, would have recourse to so bold an operation. Additional cases of ligature of the innominata are required to give it weight.

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## CHAPTER LI.

### ON BURNS.

*On the means of conducting the Healing of Burns, with a view to their favorable Cicatrization.*—It is proved by observation that nature has two modes of effecting the consolidation of solutions of continuity. Whatever be the extent of the wound and the nature of the textures in which it has been made, provided the process of reparation does not exceed the powers of the individual, there takes place over the whole surface an inflammatory action, which constantly tends to approximate the bodies, and bring them into contact, intimately agglutinating them by a layer of lymph, by the organization of which the continuity is restored. This interposed structure itself at length disappears, and then there remains no other trace of the lesion than a mere line, which at last becomes imperceptible. This is *immediate reunion*, or *union by the first intention*.

But where there is a considerable loss of substance, or where, for various reasons, the first mode of union is designedly prevented, other phenomena present themselves; a new tissue is formed to supply the place of that which has been destroyed. This is fibro-cellular in its nature, and I have called it the *tissue of cicatrix*. If the work of reproduction go on regularly, and the loss of substance be nearly or altogether repaired, we then have a production to which I have given the name of *patulous tissue* (*tissu d'etale*) of the cicatrix. But where this is not the case, it causes deformities, bridges or bands between parts, in a word, bad cicatrices with the partial or total loss of the mobility of the part.

The result of cicatrization may occur in every case where a burn has caused loss of substance, but in different forms and degrees; these we will now proceed to examine.

*Burn of the 1st Degree.*—Heat acts in two ways in producing this degree of burn; either its action, more or less intense, is instantaneous, and gives rise to a true erysipelas, marked by sanguineous congestion of the skin, redness and sharp pain, constituting the *acute* stage of a burn; but this causes

neither solution of continuity nor loss of substance, and consequently requires no cicatrization to cure it. In other cases the heat, exercising a gentle but prolonged influence, as in women who make habitual use of chafing dishes, in old people and convalescents who sit much by the fire, in artisans of certain trades, in such persons I say, the heat produces different lesions of the skin, which ought rather to be regarded as deformities, and of which we will speak, hereafter. These results constitute what I call the *chronic form of burns* of the first degree.

2nd degree. This consists in vesication more or less extensive. The epidermis is detached from the rete mucosum and must perish. There is here loss of substance and there will be consequently a process of reproduction. But this is carried on in three different modes, that is to say, 1st, without suppuration, 2nd, with slight suppuration, or 3rd, with suppuration which is long and copious. It is very important to discriminate between these; for each presents different results, from which arise as many different indications.

In many cases while the epidermis which forms the vesication, though detached, has not been removed, but rests on the mucous surface after the evacuation of the fluid, there being no suppuration, a new epidermis is formed, the period varying from 24 hours to five or six days or even more. There remains then no trace of the burn, but redness, more or less marked, which usually disappears from the 12th to the 30th day. This termination is in all respects like that of a flying blister, and the rete mucosum being unaltered by suppuration, the color of the skin is preserved. In fact, in a negro, who suffers from a burn in this degree, the surface still remains black. But it is different in those burns of which I shall next speak.

When the action of the heat has been more intense, or being in other respects the same as if the epidermis had been removed by accident or ignorance and thus left the rete mucosum naked, inflammation more or less acute takes place, and we observe two orders of phenomena; or after an effusion of serum for some days, a suppuration follows, small in quantity and of short duration, and then the result is little different from that pointed out as accompanying the preceding degree; the wound becomes dry, a delicate pellicle, the element of the new epidermis extends itself over it, and all traces of the lesion are effaced; or secondly, under other circumstances, a copious suppuration takes place, which in many cases continues notwithstanding the utmost care for several months. Let us now examine in detail the phenomena of this latter case. The effect of this long and abundant suppuration differs in nothing from what takes place when a blister has been very long applied; either the rete mucosum is completely destroyed or deeply impaired in its organization; whilst at other times, it is destroyed in some parts, and preserved in an unimpaired state in others. In the first case the disorder has penetrated to the chorion, the burn has passed into the third degree, and the progress of cicatrization is the same as in this last, of which I shall soon speak. In the second case the coloring matter generally becomes of much deeper color than natural; hence those yellow or brown stains which remain after the cicatrization, stains, which are never removed, nor even modified, except to a very trifling extent. In the negro also, the skin become much deeper colored than natural. Lastly, in this third case, the surface of the chorion granulates unequally at every point where the rete mucosum has been completely destroyed. The cicatrix,

then presents a mottled appearance, being prominent and white at some points while at others it is depressed, and more or less brown.

A knowledge of these facts forms not only the basis of the indications to be fulfilled, and of the prognosis to be given, but also furnishes useful hints for general practice. Thus, for example, when we are obliged to apply a permanent blister on a part of the body which is exposed, especially in a female, it teaches us not to continue the suppuration long enough to leave a mark; and if the disease requires its longer presence, care must be taken to shift it from one place to another. I have thus kept blisters open in different parts of the body in young persons, in diseases imperatively requiring their use for a long period, without causing any scar.

After what I have said, you will comprehend what ought to be the treatment of this species of burn. It is evident that it ought to consist in emollients and antiphlogistics, even venesection, if it be rendered necessary by more than usual inflammation; great care being taken to avoid the application of irritants, or the removal of the detached epidermis, while we strive to suppress suppuration. For if we are only called in at a period when suppuration has already existed for some time, and the rete mucosum is completely disorganized or destroyed, other means become necessary. The granulations are to be repressed with nitrate of silver, and afterwards covered with linen with numerous holes in it, and spread with cerate; dessicating substances such as tend to accelerate cicatrization should be used; plates of sheet lead, by their equal pressure, may also be of great use. By these means we shall obtain an equal, flat cicatrix, free from deformity; but generally, time alone can remove the yellow and brown spots resulting from the great alteration of the rete mucosum, which has not been destroyed.

3d degree. This degree of burn is characterized by the total destruction of the epidermis, of the rete mucosum and a greater or less portion of the chorion; but this last is not destroyed through its whole extent. Mark well (said M. Dupuytren) the limit of the disorganization; it is by that we are enabled to explain the manner in which the cicatrix is formed, and the difference between this and what takes place in the cicatrices of the following degrees. In this case, in fact, the whole thickness of the true skin is not destroyed, nor, consequently, is a complete reproduction of the cutaneous tissue required, as in the fourth degree; there remains of this a layer of greater or less thickness, from which the new surface is produced. When the eschar which comprises the rete mucosum and a portion of the thickness of the true skin has separated, the surface of the wound presents a number of small red points on a white ground. This is the portion of the chorion which has not been destroyed. Soon these red points increase more and more, and at length altogether occupy the surface, which thus becomes uniformly red. The cicatrix, then, is made up of granulations, which are of cellular, vascular, and nervous texture, and by their progressive development they fill the cavity which the eschar had left.

But however instantaneous may have been the action of the heat, it never implicates all the tissues to a perfectly equal depth. It happens then, in this third degree, that at certain points the rete mucosum alone has been destroyed, and the chorion slightly affected; while in others this last is deeply implicated but not completely perforated. The inequalities thus produced in the

cellulo-vascular granulations of which I have spoken, are perceptible throughout the whole progress of the cure, and if left to themselves, produce a cicatrix more or less uneven.

It may be imagined that all the methods of cure recommended for the second degree apply equally here. It further, however, becomes necessary to take care that no preternatural adhesions are formed, and that none of the natural apertures become closed, by preventing the contact of the former by the interposition of some substance, as lint spread with cerate, and introducing into the latter, tents, canulas of gum elastic, or any other appropriate instrument.

For the last fifteen years, I have used with great advantage, an ivory tube introduced into the nostrils when the nose has been more or less burnt, or removed on account of a cancerous disease. It prevents the contact and adhesion of the parietes of the cavity, and thus renders the deformity less disgusting.

In order to correct the excessive growth of the granulations, the nitrate of silver is to be used as before, and very particular attention given to the mode of applying the dressings; these ought to be so arranged that the matter may be absorbed by them and remain the shortest possible time in contact with the wound. To accomplish this, I am in the habit of covering the surface with compresses pierced by numerous little holes very close to each other and spread with cerate; above this I apply a layer of dry charpie, and retain the whole *in situ*, not with a roller, but by means of bandages separate from each other. The pus thus passes through the apertures in the first compresses, is absorbed by the charpie, and may even escape between the interstices of the outer bandages. After a time the granulations become firmer, particularly at the base, and assume a fibrous structure. An epidermis next forms at the summit; at first very thin, and beneath which is generated a rete mucosum of bright red color, irritable, very liable to congestion, and the frequent seat of erysipelas. This rete mucosum is imperfectly formed, and for the most part wants the pigmentum or coloring matter; so that in the negro the cicatrix becomes white, and in the white of a paler color than the rest of the skin. In some cases, however, the pigmentum is found in superabundant quantity, giving to the skin a discoloration more or less deep. An entirely new formed rete mucosum often remains imperfect and constitutes an irremediable deformity. Lastly, the epidermis, at first very thin and liable to scale off, after a period, sometimes very short, acquires all the properties except the color of the original epidermis.

4th degree. This is characterized by complete destruction of the skin, through its whole thickness, the subjacent cellular tissue being laid bare, but remaining itself uninjured, or but very slightly affected.

The cicatrization in this degree takes place in various ways. 1st, after the separation of the eschar, the edges of the wound gradually approximate, and so unite. 2ndly, the edges remaining apart, a new cutaneous texture is formed at the expense of the cellular membrane beneath, which replaces the portion which had been lost. 3rdly, both the above processes simultaneously take place.

After the fall of the eschar, the bottom of the wound is formed by the cellular tissue; the edges exhibit a red circle, (the rete mucosum) which gradu-

ally diminishes, the skin of the surrounding parts yielding proportionally. After being dragged to a certain extent, however, they can be stretched no further, and then new texture is formed to fill up the void which still remains. Of course the looser the skin and cellular membrane adjoining the burn are the smaller is the cicatrix which is ultimately formed; while in parts which do not admit of the adjacent skin yielding, the gap left and the new tissue required must be proportionally larger. The cellular membrane which is situated at the bottom of the wound and which is in a state of granulation, undergoes a peculiar change and constitutes the chorion; when once this is formed the rest of the cicatrization goes on rapidly; a rete mucosum though imperfect, is formed, and this again is covered by an epidermis differing but little from the natural one. The production of this accidental chorion, however, costs much to nature; she is very long in effecting its organization, particularly in large wounds; but after this, all is rapid, and it is astonishing to see a wound which has lasted one, two, or more months, almost without any apparent change, all at once heal up in a few days. Much care however is required in directing the process, so great is the liability to deformity from the adhesions and contractions which occur.

The first thing to be attended to, is the position of the limb or of the part; and as a general rule, this must be laid in such a posture as diametrically to oppose the approximation of the edges of the wound, in order to obtain a cicatrix corresponding in size to the extent of skin destroyed, or even of greater extent; and thus to allow for the contractile power of the new tissue. It is unnecessary to give examples, the rule is too conspicuous to require them, and it must be put in force by different means in each different region of the body.

There are circumstances, however, under which it is impossible or very difficult to observe the requisite position; such, for instance, is the case where the skin is destroyed through the whole circumference and over a certain extent of a limb. Here in adopting any one position we lose the advantage of others; the only thing to be done in such circumstances, is to place the limb in such a manner that the cicatrix shall be, when forming, under the least possible restraint. Thus, if the burn occupy the whole circumference of the wrist, the limb ought to be kept extended rather than bent, because the former position will prove less inconvenient when the cicatrix is completed than the latter would. Occasionally the position may be varied and the limb kept for a time in one position and then in another. Cases are often to be met with in which the means necessary to produce a good cicatrix cannot be adopted, or at least persevered in, without great inconvenience, or even without danger to the life of the patient. This happens, for instance, when there is risk of his being worn out by long continued suppuration. So far from preventing the cicatrization we are then glad to accelerate it by facilitating an approximation of the edges; but it is right that the practitioner should take the precaution of explaining to the patient or his friends the reason which induces him to adopt this course, as well as the evil which must result from it.

There are some regions of the body where we cannot make use of position, and where it is always very difficult, and sometimes impossible to prevent deformity, such particularly is the face. If a burn of the fourth degree, for example, destroy a portion of the lower eyelid and cheek, it would be impossible to prevent the edges of the wound from approaching, and the eyelid may

be seen cicatrized in such a manner as to bring it almost into contact with the upper lip. Such was the case in a girl lately brought to me, and I had great difficulty in persuading the parents that the surgeon was not in fault.

However slender may be our resources, when we are deprived of position, to prevent vicious cicatrices and deformities, as people are prone to impute them to unskilfulness and ignorance, they should never be neglected. Thus 1st, it is necessary to retard as long as possible the separation of the eschar, for this, as long as it remains, keeps the borders of the wound apart. The process of cicatrization commences beneath it, while the inflammation of the edges of the wound extends into the adjacent tissues, by which they are less easily approximated when the eschar falls. This resource then, merits attention, but without being of very great importance.

2d. When the eschar has dropped off, the cicatrization must be hastened by frequent cauterization, by means of nitrate of silver. This speedily determines the formation of the new cellular tissue, and I have obtained great advantages from it in many cases. Far from increasing the deformity, as many have said, it tends to produce an equal smooth cicatrix; but care must be taken that the healing is not retarded by the contact of purulent matter, and this must therefore be carefully removed from the surface and the wound frequently dressed.

The position which has been adopted as proper for the cicatrization must be persevered in for a considerable time, a month, six weeks, or longer, after the entire healing of the wound. The force of retraction possessed by the cicatrix (a force, by the way, which has been much exaggerated) may produce such contraction of the wound as would lose the advantage previously gained; and the parts must therefore be very gradually suffered to return to their former freedom. In burns of the fourth degree, the adequate position of the parts must be maintained by bandages, varied according to circumstances, but so contrived as to counteract the contraction of the muscles. In burns of the second and third degrees, the adhesion of the neighbouring parts is prevented by merely keeping them separated by the interposition of dressings, and moving them from time to time; but in those of the fourth degree, such simple means will not suffice.

It will be perceived, continued M. Dupuytren, that if a burn of the fourth degree affect the circumference of any of the natural orifices, such as of the nostrils, or vagina, or the mouth, &c. it is not compression, such as that employed in other cases, that will suffice; but compression exercised from within outwards, and by the separation of the parietes of the openings by means of charpie, tents, sounds, sponges, ivory tubes, &c. These contrivances are the same as in burns of the third degree, but with these differences, that their necessity is much more urgent; that the diameter of the foreign body must always exceed that of the aperture into which it is introduced, and that their use must be continued long after the apparent cure, in order to overcome the force of contraction of the new textures.

Strips of adhesive plaisters have been employed as one of the means destined to fulfil the indications of which we are treating. But however useful they may be in approximating the edges of a wound, they are useless when used with the contrary intention. In the former case they resist any effort which tends

to lengthen them; but in the second they slip, and follow the integuments upon which they are applied.

*5th and 6th degrees.* When the burn is so deep as to implicate the muscles and tendons, most of the means I have pointed out become superfluous. The treatment in this case consists almost entirely in giving to the limb or part such position as shall be least inconvenient when the parts are cicatrized. Most frequently the disorganization is carried to such an extent that we have only to occupy ourselves in endeavoring to save the life of the sufferer by promoting the healing process in every way, without reference to what deformity may arise or the loss of function which may ensue. The treatment does not materially differ from that applicable to the cicatrization of stumps after amputation.

*2d. On the Physical, Anatomical and Pathological Characters of the Cicatrices following Burns.*—It is of great importance that we should obtain an accurate knowledge of the physical characters of cicatrices, in order to be able to calculate the effects which may result under particular circumstances. The cicatrix, then, is formed by the exudation of plastic lymph, which, becoming organized, exhibits the appearance of a thin pellicle of a reddish color and very fragile; beneath this is the cellulo-vascular tissue, which it covers. During several weeks, and sometimes during several months after its formation, the organization of the cicatrix goes on, becoming progressively more perfect; and it is only by a secondary organic action that it acquires the density necessary to qualify it to supply the place of the lost skin. The consecutive retraction only ceases when the cicatrix has become white and solid, such as it is to remain during the remainder of life. The cicatrices are covered by a slight epidermis, which is very adherent and shining, the existence of which may be demonstrated by maceration, or the application of a blister. Beneath this is that fibrous layer which I have called *tissue of the cicatrix*, on which the phenomena of the retraction depend. The cicatrix is pierced by only a small number of exhalant or absorbent pores; hence its surface is almost always dry, even when perspiration bedews the rest of the body. Neither do we find on the inner surfaces of the cicatrices those fibro-cellular apertures, which, in the natural state, exist under the skin, and beneath which are lodged the separate little nodules of fat. A tissue composed of laminæ more or less close, and destitute of adipose matter, unites the new skin to the subjacent parts, and a depression exists, which is in proportion to the loss of substance, and to the extent to which the adjacent parts were previously furnished with fat. When the lesion has penetrated to the muscles, tendons or bones, the cicatrix usually adheres intimately to these organs, and is dragged out of its place when they move, thus constraining their functions.

It is a remarkable fact, that, whenever parts of different organization run into a common cicatrix, they lose before passing into it their own proper texture, and degenerate into a homogeneous fibrous structure, which becomes blended with the new formation, to the inner surface of which they adhere. This disposition is especially remarkable in muscles, tendons, and other organs implicated in a burn of the fifth degree, or which contribute to form the stump of a limb destroyed by a burn of the sixth degree.

The causes of the indelible nature of certain cicatrices have already been

explained, as well as why they preserve during the rest of life the form as well as the organic characters which are proper to them. But a fact which ought to be particularly attended to, because a knowledge of it is of great importance under different circumstances, is, that they vary in appearance, and to a certain degree even in texture, according to the causes which produced the solution of continuity from which they have resulted. In spite of years, and notwithstanding the changes which take place in their organization, the eye of the practised surgeon can readily distinguish the cicatrices of burns from those of incised wounds, and those following cancerous ulcerations, syphilitic or scrofulous abscesses. You will easily understand of what importance it is, in legal medicine, to be able to make such distinctions, as well in determining the identity of individuals, as also in order to ascertain the cause which had produced the breach of surface.

The development of vascularity in cicatrices is very variable. In most instances they only exhibit very minute capillary ramifications, which are with much difficulty traversed by the finest injections; and in persons who have scars on the face it may be seen that they do not participate in the color produced on the surrounding skin by heat or by emotion. It is probable that cicatrices receive nerves but in a small number. They are not insensible to the impression of foreign bodies, and when inflamed become very painful. It is also well known that their susceptibility is very great to atmospheric impressions, and that they accurately announce by painful sensations the variations which occur in the thermometrical and hydrometrical states of the air.

Like all other anormal textures, cicatrices are easily irritated, and are even destroyed, particularly by inflammation, with prodigious rapidity. In most cases it requires only a few days, or even hours, to destroy the process of reparation of many months, and to restore to the solution of continuity its original dimensions. But this destruction is often superficial; it does not implicate the whole thickness of the texture which forms the cicatrix, and its reproduction is effected with great rapidity. As to the rest, cicatrices are usually exempt from exanthematous affections, such as small pox, measles, and scarlatina; remaining pale amid the general redness of these diseases; the reverse of this is only seen where the solution has been very superficial, the skin having been partly preserved. The intimate adherence of cicatrices to the subjacent parts, and their defective power of supporting inflammation, have led to the general rule in surgery, of avoiding to carry incisions either through them or into their immediate vicinity.

Cicatrices become causes of exemption from military service, when they adhere to muscles, tendons, or bones, so as to impede the execution of movements which ought to be perfectly free. So likewise extensive cicatrices, such as those which occupy considerable portions of a limb, ought to be regarded as disqualifying from active service, even although the movements remain unimpaired, for such large surfaces of new tissue could not be exposed without danger to prolonged friction, nor even to considerable perspiration, and other sources of fatigue connected with military life.

The cutaneous adhesions which unite together parts which have been burnt are at first soft, large and reddish; the successive changes of texture which the cicatrices, whence they are produced, undergo, gradually renders them more dense and solid.

They are more or less stretched by the movements of the parts; and by this kind of dragging they become elongated to a certain point, beyond which it is impossible to carry their extension farther. These adventitious bands are then completely organized and analogous to the membranes of the *palmipedes*. It is only when they have attained this definitive state that they can with propriety become the objects of surgical operations, with a view to their removal. There is not a season that I have not practised a certain number of such operations in this hospital, and taken occasion to illustrate the above principles.

3rd. *On the means of correcting deformities, and remedying the loss of function, resulting from vicious cicatrices, following burns.*—The cicatrization of burns, with loss of substance, left to itself, gives rise to a prodigious number of deformities, more or less severe, and to loss of function of corresponding extent, the consequence of inequalities, columns, bridles, adhesions, depressions, &c. But before speaking of the operations required for these, I shall briefly advert to the effect on the tissue of the integument, produced by the slow and gentle but long continued action of heat; or in other words, the effects of burns of the first degree in the *chronic state*.

The first effect of this is a sanguineous congestion of the skin, and this is followed after a longer or shorter time, by a withering of the parts which become soft and wrinkled. At a more advanced period wales (*vergetures*) manifest themselves, which are permanent, and at first become livid, yellow, copper colored or brown. They are the consequence of an unequal development of different points of the cutaneous capillary system. If the parts be removed from the action of heat, they may be dissipated either spontaneously or by the use of baths and discutient or astringent lotions. But if the exposure to heat be continued, they increase in number, extend in various directions, and form lines of a greater or less breadth, which cross each other, and leave spaces of various shapes and sizes between them, on which the skin is healthy and white; these lines become of a deep hue, and sometimes even black. In this state they form mottled spots, which are not only difficult to remove, but are sometimes not to be effaced when of long standing and dark colored. In this variety of the first degree of burn, in its chronic form, the epidermis is scarcely altered in its composition or color. If boiling water be poured on the part in the dead body, the epidermis becomes separated, and the mottling is seen to exist in the rete mucosum, in which texture therefore this degeneration has its seat.

The treatment of these mottled spots consists in the removal of the cause which has produced them, and in the long continued use of astringent lotions, particularly the acetate of lead. In general, however these means are insufficient, and we must then try the effect of combining them with methodical pressure.

It is not uncommon to see *varices* produced by this gradual but continued application of heat. When this happens, the same treatment only is required as when they arise from other causes.

Let us now pass on to burns with loss of substance, of the number and variety of which you may form some idea from the following resume of those which I have myself witnessed.

I have in some cases seen all the integuments of the base of the cranium.

and with them both ears and eyebrows forcibly dragged up by a cicatrix, attracting them towards the crown of the head; in others the upper eyelid and eyebrow immovably fixed on the forehead, the eyelids turned inside out, and bound down in that situation by adventitious adhesions; the commissures of the eyelids forcibly dragged from their place by cicatrices on the temple or nose; the ala of the nose pulled upwards, and the aperture of the nostril obliterated; the commissures of the mouth pulled upwards or downwards, or to one side; the upper lip united to the columna nasi; the same joined to the lower eyelid; the lower lip adherent to the chin; the ears glued to the temples; the aperture of the ear closed; the head bent forward upon the neck, and the chin adherent to the upper part of the chest; the head and shoulder brought together; the mammæ horribly deformed; the adhesions preventing their development; trunk bent forwards by bands extending from the thorax to the abdomen; the shoulder depressed towards the hip, and thus dragged up by a cicatrix occupying the side of the trunk; the elbow applied to the trunk by a cicatrix in the axilla; the fore-arm bent on the arm; the hand on the fore-arm, the fingers variously bent and united; the penis united to the integuments over the linea alba, and having a kind of adventitious sheath, like that of some quadrupeds; the thigh kept in a state of flexion by a cicatrix in the groin; the inguinal ring weakened so as to occasion hernia, the cicatrix acting in such a manner as to prevent the necessary support by bandaging; the leg bent on the thigh; the feet turned completely upwards or downwards by burns in childhood, on either surface of the limbs; the great toe pulled in upon the sole of the foot, so as to prevent the individual from walking. Such are the most striking deformities which I have seen, several of which I have sometimes witnessed in the same person. Most of them I have seen several times; but some are much more common than others, burns of the hands for instance, owing to the mechanical instinct which leads us to extend these parts when any danger is threatened; next in succession come the lower extremities, and then the upper.

Numerous and varied as are the deformities which result from burns, they are nevertheless resolvable into a small number of heads; all, in fact, consist either in cicatrices which are too *short*, too *salient* or which produce *præternatural adhesions* or *obliterations* of apertures, or lastly, which cause the *loss of parts*. These last are irremediable, and I have therefore nothing further to say with respect to them. As to the others, I have already pointed out their mechanism, and the means best adapted to prevent their formation; and I have now to consider what is to be done when they are already present.

The treatment most applicable to them consists in general in bringing back the parts to the condition which they previously possessed, by means of an operation. But the success of this proceeding does not depend exclusively on the manner of its performance, or on the exact observation of the established rules of art; it also depends on the disposition of the cicatrix which is the subject of our interference. As a general rule, the more superficial the adhesion, the easier and more effectual is the operation; while on the contrary, it is more difficult and uncertain in proportion to the depth of the burn. In this last case, indeed, the mere displacement may be obviated, but the movement of parts seriously injured or destroyed, it is nearly or altogether impossible to restore.

We have seen above at what epoch the cicatrix may with propriety become the subject of surgical interference; for instance, 1st, we must not attempt to correct the deformities of which we speak until some months, or even some years have elapsed after the formation of the cicatrix. This rule cannot be deviated from, without the risk of seeing the loss of substance recur, in consequence of the new textures being again destroyed; their organization remaining so incomplete as to lead to this result from very slight causes, and sometimes even spontaneously; 2dly, we must never operate unless we are sure of obtaining, by means of position and bandaging, a cicatrix which is larger and less deformed than the one we desire to correct. This precept applies particularly to the face, which, indeed, it is generally most prudent not to touch; in truth, art here presents but feeble prospects of assistance, and an attempt to form a cicatrix by new cutaneous tissues often leads to an increased deformity, by the addition of a cicatrix to the one already existing; 3dly, we ought not to perform an operation except where it is calculated to restore to the parts their form and functions; and we are therefore to abstain when joints are ankylosed, or muscles and tendons destroyed; at all events, we must under such circumstances, explain to the patient that though the deformity may perhaps be reduced, the use of the parts cannot be restored by any operation.

When the operation is deemed both necessary and practicable, the manner of conducting it varies according to circumstances. Some surgeons of the present day of great eminence, are of opinion that the tissue of cicatrix possesses in an extraordinary degree the power of contraction; which it always retains, whatever be the time which has elapsed since its formation, and which the resources of art are unable to vanquish. Hence they infer that any operation which allows the cicatrix to remain is illusory, and will be followed by the same retraction as before; and consequently, that in order to accomplish the end in view the whole of the original cicatrix must be entirely removed, and the edges of the wound brought together so as to be united by the first intention. The principle on which this opinion rests is very much exaggerated. It is true, however, that the new tissue is endowed with a power of retraction, but it is neither so great nor so durable as has been imagined. I have pointed out above the changes which the cicatrices undergo from their commencement to their complete organization. These changes require a long time, and it is during this period that the contraction is observed to take place. But when the cicatrices have acquired their full degree of solidity, when the adhesions, or bands, are definitively formed, their degree of contractile power scarcely differs from that of the natural textures; and it is partly on this account that I delay the operation till the organization of the cicatrix is completed.

The result of the doctrine which I am now combating would be, that, in a very large majority of cases, nothing could be done. In fact, if the cicatrix be very extensive (just the circumstances in which an operation is most required) it would be impossible to approximate the edges of the wound as directed; or if this end were accomplished, we should have a second cicatrix, with all the inconveniences of being too tight, thus occasioning dragging and constraint in the movements. Should we, then, on the other hand, leave the edges of the wound apart, that new cutaneous tissue may be formed? In most cases we should subject the patient to the most serious evils; by thus exposing

the subcutaneous cellular membrane, the muscles, tendons, aponeuroses, and even bones, such inflammation might be produced as would destroy the patient; neither, in many cases, would it be possible to procure a more extensive cicatrix than nature had previously formed, to repair the first loss. These considerations have led me to adopt the following mode of proceeding in these cases. If the cicatrix be too small:

1st. I make incisions across it at various points, and carried deep enough to divide it through the whole of the width and depth of the new structure; so that it may be readily extensible, but without any portion of it being removed.

2d. I stretch the parts in a direction opposite to that in which the disease had carried them, and thus cause cicatrization with the production of new cutaneous tissue. After the destruction of the contracted bands, the extension is effected by the application of the hand; while the parts are subsequently retained in their proper situation by apparatus and bandages. If the limb is found to possess its natural suppleness, and yields without much effort and without much pain, it may at once be placed in the position which it is intended to preserve; but if the parts be stiff, and the joints but little movable, they are only to be carried into their natural posture by slow and gradual extension. By not attending to this, very serious mischief may result; particularly horrible pain to the patient, violent inflammation, and even gangrene. Apparatus so contrived as (such as is used in club-foot), by being elastic, to keep up a gentle but permanent action, affords great assistance in this branch of surgery.

3d. The operation being completed, both surgeon and patient find themselves in the same circumstances as after the separation of the eschar in burns; that is to say, that the former ought to direct every effort towards the formation of a cicatrix by the means already pointed out, and to oppose by every means the approximation of the edges of the wound. It is not uncommon after the division of the principal bands, and when two or three incisions have sufficed for this, to see secondary bands manifest themselves; in which case we must not hesitate to divide them also, not leaving one. It is in consequence of this necessary precept that we frequently see practitioners unsuccessful, even though the operations have, in the first instance, been apparently well conducted; and thus have the patients failed to derive any advantage, after all their sufferings and courage.

If the object be to remedy salient cicatrices, it is to be effected by removing all the projecting parts; not, however, by transverse incisions, but by means of a thin double-edged bistoury, which is to be introduced flat beneath the middle of the cicatrix, and then carried first to one end of it and then to the other horizontally, so as completely to shave off the part. This being done, the edges of the wound are to be kept apart, and the surface frequently rubbed with caustic, so as to keep it always a little beneath the level of the integuments.

If there be merely unnatural adhesions, after having incised them, they are to be dissected out freely, and, in fact, beyond their origin, the parts are then to be kept separated, and pressure systematically kept up at the point whence the new cicatrix proceeds, viz.: at the angle where the parts join.

If we have to remedy the narrowing or obliteration of some natural aperture, this is to be done in the former case, by the introduction of tents or of

ivory tubes, variously contrived, but of a calibre much exceeding that of the natural opening, and which are to be left in long after the cicatrization is completed, on account of the great tendency of such orifices to contract. In the latter case, the canal is first to be restored by a cutting instrument or trochar, after which the means above mentioned are to be used.

The cicatrices formed by these various operations possess (like the original ones, produced by the burn) a strong tendency to contract, which continues until the organization be definitively completed, just as with respect to the former. Hence it becomes necessary that all the means of retaining the proper position be continued long after the healing of the new wound. It is also proper to employ baths, fomentations, emollient, oily embrocations, &c.; at first constantly, and afterwards only during the night; gradually discontinuing them as the patient is able to return to the proper exercise of the parts.

In burns of the second degree, the cicatrices are always without puckering and without approximation of the edges towards the centre, and consequently without the great deformities which follow the severer kinds of burn. They sometimes exhibit projecting inequalities, bands or adhesions, partial or complete occlusions of natural openings; but as these are always superficial, the operations are very simple and without the risk of implicating important organs. The first of these deformities is removed by shaving off the eminences with a sharp bistoury, and taking care by means of caustic and pressure, that the blemish does not recur. In the second, the parts are separated by cutting the tissue which joins them with a bistoury alone, or guided by a grooved director; or if the adhesion be loose and membranous, it may be divided with a pair of scissors, the only care requisite being not to involve any thing in the operation but the adventitious texture. The deformities resulting from the third degree of burn do not require to be treated differently from those of the second; but much more care is required in the division of the contiguous parts, because the cicatrix is much thinner, and more risk is incurred of wounding a nerve, artery, vein, or other subjacent part. A precept which applies to cicatrices of every degree, is, that when the adhesion is very extensive, (as when the arm is tied to the trunk, or the two thighs together,) it ought not to be separated at one operation, as a wound of such magnitude might lead to formidable consequences; we must here proceed by portions, waiting for the healing of the first wound before we proceed.

Such are the rules by which I am guided; and those who have attended my *clinique* during many years back have had abundant opportunities of witnessing the results. At present I shall content myself with detailing two recent cases in illustration.

Case I.—*Retraction of the fingers in consequence of a Burn; Adhesion to the palm of the hand; Operation; Cure.*—An infant, two and a half years old in good health, fell upon the fire with its hand resting on the hot coals. Notwithstanding the immediate assistance of the parents, the burn implicated the entire thickness of the dermis (4th degree of burns). The wound occupied three fourths of the inner surface of the hand; suppuration soon came on and it was dressed with a liniment of lime water and oil. By the advice of a practitioner, the fingers were maintained extended by a wooden splint. At the end of five weeks the wound had entirely cicatrized; the apparatus was

removed, and some days after the parents saw with surprise the cicatrix begin to contract, the little finger semi-flexed, and the ring-finger commencing to be so. No attempt was made to arrest the deformity, which at the end of eighteen months presented the following appearance. The little finger forcibly bent in such a manner that its dorsal surface turned inwards; the first phalanx partly adherent to the palm of the hand; the ring finger rather less flexed, the middle still less, and the fore finger nearly free. The skin of the palm of the hand was covered by an inextensible band.

The operation was thus performed: The fore-arm being held firmly by assistants the whole thickness of the cicatrix was cut across with a straight bistoury: after which the preternatural adhesions of the fingers were destroyed. That the extension might be easier and the success more certain, three other incisions were directed perpendicularly to the interdigital spaces, and meeting the great transverse incision. But little blood was lost, and in an hour after the operation the dressing was applied. A wooden palette, terminated by four divisions in the form of fingers, was fixed by a bandage on the dorsal face of the fore-arm and hand; each finger was separately extended, and maintained *in situ* by strips of bandage, the thumb alone remaining free. The wound was covered with linen, spread with cerate. Towards the end of the fourth month the child was presented at the public consultation, all the parts having recovered their natural situation and movements.

CASE II. *The hand bound to the fore-arm; Operation by transverse incision; Description of apparatus for effecting gradual extension; Complete cure.*—A child, ten years of age, was brought to the Hotel-Dieu in October 1831; The father stated that, when two years old, the infant fell near a pan containing boiling soup; the left arm was immersed in the fluid and much burnt. Six months after the wound had cicatrized; but the necessary precautions not having been taken, a band, which was formed by the cicatrix, retained the hand in a state of flexion, so that it formed nearly a right angle with the fore-arm. This adhesion continued undiminished. M. Dupuytren, before operating, remarked that many surgeons, both in France and England, think that such a deformity cannot be remedied without removing the adventitious band throughout its whole extent, and that transverse incisions are insufficient. The latter mode, however, was here adopted. The arm was extended, held by an assistant, and the band divided transversely, at three different points, by means of a bistoury; it extended from the middle of the fore-arm to the palm of the hand. Had the proceeding ceased here, it would, indeed, have been imperfect; but after the incisions had been made, a mode of dressing was adopted, consisting of a sort of inflexible apparatus which accommodated itself to the rotundity of the limb, and long enough to reach to the extremities of the fingers, supposing them to be fully extended. This apparel was kept in its place by numerous turns of bandage; a strap passing before the fingers, and attached at the other extremity to the apparatus in such manner that by a very slight effort the fingers and wrist could be extended as gently as might be desired and there maintained by the strap. The pain caused by this proceeding was not very intolerable. The next and following days the strap was tightened by one degree; then by two, three, and so on, until the wrist was fully extended, which was the case at the end of two months and a half, when the child was discharged completely cured, and using the left hand

almost as well as the right ; I say *almost*, because the want of habit had rendered it a little awkward.

A month ago the same operation was performed on a patient laboring under contraction (from a burn) of the thumb of the left hand, with equal success ; and another patient, aged 15, is now in the Hospital, presenting a deformity of the same kind. A similar method was adopted three weeks ago, with every prospect of the like success.

## CHAPTER LII.

### ON FRACTURES OF THE NECK OF THE THIGH BONE, THEIR CAUSES AND TREATMENT.

FRACTURES of the neck of the femur have attracted so much attention of late years that we are told in most *ex professo* treatises on such subjects, that they are as well understood as those of other parts of the thigh-bone. Those, however, who have witnessed the practice of the Hotel-Dieu during the past winter, must be aware that much additional light has lately been thrown upon the subject. If you examine, said M. Dupuytren, the age of different individuals who are at this moment in our wards with fractures of this part, you will perceive that they are all past 50 years of age ; and among those to be hereafter pointed out to you, you will remark that there are no children, and in general very few adults. But in both sexes you will find this accident more common after 60 years of age. Never in any instance were the predisposing and exciting causes more conspicuous than here. I have never seen fracture of the neck of the thigh in an infant, and very rarely in a young person. Sabatier, however, in his interesting memoir in the transactions of the old Academy of Medicine, mentions the case of a youth of 15, who had a fracture of this kind. These lesions, on the contrary, become more frequent as life advances, and are most common between 70 and 80 years of age. It is impossible but that there must be some cause for this difference in the period of fracture of the neck of the femur at different epochs of life.

This cause is well ascertained, and resides in the anatomical disposition of the parts, which is not the same at different ages. The neck of the femur in fact has not at all periods of life the same direction ; and this disposition of the parts is important to be known. In early life the axis of the neck approaches to that of the body of the bone ; the angle which it forms being the most open possible. The great trochanter makes but a very small projection ; and we shall see, by and by, that falls upon this part are the most frequent causes of fracture of the neck of the femur ; that the frequency of the accident is in direct proportion to the extent to which the trochanter projects ; and that such projection is in direct proportion to the length of the neck of the bone, and the greater or smaller angle which it forms with it. Now we know that the trochanter lies deep in children, and that it hides itself, so to speak, behind the prominence of the os coxæ ; the result of this is, that in falls on the side, the blow does not come upon it, and consequently the risk of the fracture is diminished. Another anatomical disposition

renders fracture of the neck still more difficult. The shorter the bone is, the less of a right angle it makes with the body, and consequently, the more it approaches the direction of the axis of the femur, and the causes of fracture have therefore less influence on the neck. There is also another reason why fractures of the neck are rare at an early age, namely, the great flexibility of the bony tissue, in consequence of the abundance of organic matter in the bone. In adult age, fracture of the neck of the femur is rare, but less so than in infancy, the earthy matters are more abundant than at an earlier age, but less so than they subsequently become. The neck also presents a different disposition; it is larger, and the angle which it forms with the body is much more marked than in the child. There results from this more projection of the great trochanter, and consequently more purchase for the causes tending to produce fracture to act upon. This greater length of the neck of the femur, however, and this projection of the trochanter vary further according to sex and individual peculiarities. Women have the neck of the femur longer, and consequently, a more projecting trochanter than men. The nearer in the male sex the formation approaches to that proper to the female, the more risk is there of fracture. If the relief of the muscles of the haunch in men presents an obstacle to the production of fracture, by diminishing the effect of falls upon the great trochanter, the thickness of the layer of fat in women fulfils the same indication; but when there is much emaciation present, women become more liable than men to the accident. Let us next inquire how it happens that old men are so much exposed to this kind of fracture. At this period of life the pelvis has acquired all its breadth; the trochanter major is more projecting; the neck of the femur longer, and inclined to a right angle. Besides, the skeleton of an old man weighs much less than that of a young adult, which depends upon the bones having lost much of their organic substance, having a greater quantity of earthy matters, and thus being more friable. In aged women, while the anatomical disposition retains the peculiarities formerly mentioned, the friability is even more marked than in men. Accordingly at the Salpetriere, which is an asylum for old women, there are more cases of this nature than at the Bicetre, which is a receptacle for old men. These considerations are of importance in reference to the theory of fractures. Thus in the child the cure may be effected in three weeks or a month, while in the adult it will require a much longer period; and in those advanced in life, a hundred or a hundred and twenty days, and even more, are required.

If we recapitulate briefly what we have said with respect to the predisposing causes of this fracture, we shall see that shortness of the neck of the femur, very considerable openness of the angle which it makes with the body, deficiency in the projection of the great trochanter, flexibility of the osseous tissue, abundance of adipose matter, render it almost impossible that fracture of the neck of the femur should take place in children. In women the less considerable obliquity of the neck, relatively to the axis of the body of the bone, the length and prominence of the great trochanter, explain the greater frequency of this accident in them than in men. Sir Astley Cooper has said that fracture of the neck of the femur rarely took place before the age of fifty; but there are many exceptions to this rule. There are also some other particular circumstances which predispose to fracture of the neck of the femur, such as rachitis and cancerous diathesis; but as these are common to all parts of the osseous system, it is unnecessary to dwell upon them here.

What then are the existing causes of this fracture? Almost all the patients whom we interrogate reply, that they have fallen on the great trochanter, and in such manner that they have been unable to protect themselves with the arm, as is usually done instinctively. The frequency of this cause has been recognised by all authors. Thus of 36 cases observed by Desault, 24 were produced by falls of this kind. In infants and young persons who have fallen on this part, and who have been preserved from fracture, we meet with decoliation of the epiphysis. Falls upon the trochanter are, however, far from being the sole cause of fracture of the neck of the femur; I shall point out others which play an important part; but I must first make a remark which has excited little attention; namely, that at the time the patients fracture the bone, they bruise the external parts. I this morning examined a woman who stuttered and answered badly the questions put to her; but on touching the great trochanter it gave her much pain, although the limb was not moved; and this led me to examine the part, when I found a large ecchymosis upon it. This fact is of some importance in directing us to the part which the patient has struck, when he is himself unable to give an account of his fall.

I have said that other causes might produce fracture of the neck. This is, in fact, what happens in a fall on the soles of the feet, or still more upon the knees; but in both cases it is necessary that the muscles be stretched and inflexible. Sir Astley Cooper observed that in London, fracture of the neck of the femur often arises from a false step off the edge of the pavement. Under such circumstances the head of the femur impinges strongly against the cotyloid cavity; from this there results an effort tending to diminish the angle which the neck makes with the body of the femur; I have also frequently observed a depression of the cotyloid cavity produced by the head of the femur in consequence of a fall on the feet or knees.

It is not from this cause, however, but from a fall on the haunch, that this accident generally happens. In this case the neck is placed between two opposite forces; the head of the bone being pressed on the one side by the weight of the body, while the great trochanter is opposed by that against which it strikes, and the point which most usually gives way is that immediately under the head of the bone, at the upper and internal part of its neck.

It has also been thought that this fracture may arise simply from a muscular exertion, and a case is quoted in which this is said to have taken place in a negro affected with tetanus. This fracture may likewise arise from causes directly applied. These are usually projectiles, and particularly cannon balls, several instances of which I saw after the days of July.

The diagnosis of fracture of the neck of the thigh bone is not free from difficulty. It sometimes happens that a fall on the haunch, accompanied by bruising of the muscles and joints, imitate this fracture, while on the other hand, the same cause may produce an actual solution of continuity and yet the patient be able to run and walk. It is thus that persons have been known, after they had fractured the neck of the femur, to be able to reach home without presenting any shortening; it is thus that displacement of the fragments does not take place till after some hours, or even many days, either in consequence of some movement on the part of the patient, or of the examination made with a view of ascertaining the nature of the malady.

What is the cause of the peculiarity mentioned by authors, which I have myself frequently seen, and of which Sabatier, in a memoir to the

Academy of Surgery, has given numerous examples? It is because the fracture takes place within the capsule, and the fragments remain in exact apposition. But it will be asked how does it happen that after some time they leave each other, and the fracture becomes evident? It is because the relations of the fragments are changed, either by the weight of the body or muscular action, or by the wearing away of some part of the fragments. The shortening and twisting of the limb leave then no doubt as to the fracture. The two preceding signs appear sometimes only after 50, 60, or 80 days of treatment by rest and extension, and are caused by the yielding of the callus to the contraction of the muscles or the weight of the body. Before we proceed let us say a few words with regard to the cause of this consecutive displacement.

It is known, that at the first period of its formation, the callus of long bones often yields, and produces deformities, when a perfect cure has been expected. Who has not seen oblique fractures of the femur give way under the weight imposed upon it when a patient began to walk again, at a time when all risk seemed to be at an end? The same thing happens in fracture of the neck of the femur. At the end of two or three months, the provisional callus yields beneath the weight, when the patient rests upon it, and shortening is the result. I have seen this at the end of two, three, or four months. It is therefore necessary that patients should be controlled by the proper apparatus, during 100, 120, or 140 days, or even more.

The weight of the limb, and still more that of the body on the broken part, is to be regarded as the great cause of displacement whether primitive or consecutive. But another active power in producing displacement consists in the prolonged action of the cause which has given rise to the fracture. It sometimes happens that it buries the upper fragment in the thickness of the spongy tissue of the superior extremity of the lower fragment, and consolidation takes place in this situation rather quickly. Numerous anatomical preparations in the museum of the Hotel-Dieu exhibit this phenomenon, and sufficiently demonstrate the reality of its existence. Lastly, there exists another cause of displacement in fractures of the neck of the femur, namely muscular action.

The primitive symptoms take place when in a fall upon the heel or knee; the shortening and displacement take place at the moment. In this case it is clear that, the upper fragment remaining in its place, the lower one is pushed up by the weight of the body. But a vertical fall is the least common cause of a fracture of the neck of the femur, and when, as is most common, the blow is received on the trochanter, the cause tends not to shorten but to lengthen the limb. There exists then, another cause of this shortening, which until now has been but little understood. It depends upon the adductor muscles, which, being designed to carry the limb outwards when it is rotated, are inserted on one side in the ischium, and on the other terminate behind and along the linea aspera of the femur. It is on them that the displacement, and in part at least the shortening depends. These two symptoms appear when the patient endeavors to rise, or else they depend on a slow tonic contraction of the muscles which no longer meet with any resistance in the lower fragment. It is thus that the shortening takes place, when after the formation of the callus, the patient executes movements, or attempts prematurely to

walk. Muscular action and the weight of the body are therefore the true causes of this occurrence.

When there is displacement, the fracture is always easily known; but when this does not take place, it may be suspected without being positively ascertained. Suppose the symptoms to be well marked, that there is shortening, outward deviation of the limb, inability to raise it, we must further ascertain whether the limb preserves the shortening or loses it on extension, if the great trochanter rotates on the axis of the femur or the extremity of the lever.

If the shortening is only some lines, it is difficult to distinguish it from that which is produced by an upward movement of the pelvis, caused by the contusion; the diagnosis becomes more evident if it extends to half an inch or more. However when the displacement is recent, it may depend on luxation of the head of the femur, or upon an ascent of the pelvis.

In luxation forwards, the head of the femur passes on the horizontal branch of the os pubis, then there is shortening; but the cause is detected by the hard tumor which may be felt to roll when the femur is moved. In luxation into the sub-pubic region the member is also turned outwards but it is elongated, and there is in this situation an enlargement and unusual tension of the muscles; the hip is hollow, while in the case of fracture it projects.

In luxation upwards and outwards, the head of the femur is in the external iliac fossa; the limb is shortened, but the point of the foot and the patella are turned inwards, the heel being thrown out.

It is true, that sometimes in the case of fracture the limb turns inwards. Ambrose Pare, who first gave an account of this accident, states that he found, in the case of a lady, the leg shorter and the great trochanter mounted on the ossa ilia; he thought it was a luxation, attempted its reduction, and applied a bandage. But after some days, violent pain came on, the limb was again shortened, and he found the foot turned inwards. J. L. Petit relates a similar case in his *Treatise on the Diseases of Bones*. Bichat makes Desault say that this variety is common. In the course of a long practice, having seen it but once or twice, I am inclined to think that Bichat was mistaken. But since this inward deviation has been observed, how is this fracture to be distinguished from luxation upwards and outwards? In luxation, the round head of the bone can be felt in the external iliac fossa. In fracture the thigh can be easily rotated; not so in luxation. In luxation the limb cannot be extended without great exertion, and when once reduced the displacement disappears. In fracture, its ordinary length may be soon obtained, but the shortening recurs on a suspension of the extension. These two diseases cannot then be mistaken for each other.

There is, finally, a luxation downwards and backwards, which I have only observed two or three times; the limb is then turned inwards, and sometimes a little elongated, and it cannot be brought into its ordinary state except by the effort of reduction, and once reduced the displacement does not again recur. Thus, the distinctive character is as follows: shortening produced by a fracture yields to the smallest effort at elongation; shortening produced by a luxation is more difficult to remove, but once reduced the deformity disappears.

After having detailed the symptoms, it is my duty to speak of the conse-

quences of fractures left to themselves, in order that you may understand the mechanism of the treatment. I have always seen persons affected with fracture of the neck of the femur which has not been treated labor under a shortening of one, two, three or four inches, and the turning of the foot outwards rendered progression very difficult; the great trochanter was elevated, approached the crest of the bone, and was carried backwards. But it is above all worthy of remark, that in these cases a false articulation is formed in the external iliac fossa.

Let us now inquire what are the material effects of these fractures upon the bones, beginning with the cotyloid cavity. I have found this cavity driven in several times by the head of the femur; this accident was produced by a fall on the knees. In this case the head of the femur impinges with violence against the bottom of the cavity, and being the more resistant, breaks it. The most remarkable case which I have observed was this; the bottom of the cotyloid cavity had been driven in, and the head of the femur, which remained entire, had passed completely into the pelvis; the neck, which had not experienced any injury, was so firmly retained in this accidental opening, that it was very difficult in the preparation to disengage it, and thus reduce this new kind of dislocation. In early youth, the violence might separate the pieces of which the os innominatum is composed, and whose point of union corresponds to the centre of the acetabulum.

In other cases the cotyloid cavity is broken without the head of the bone being displaced; but the most common effect of the fracture is to be seen at the upper extremity of the femur in the radiated comminution of the head of the bone, the neck remaining entire. The most common cause producing this accident is a gun-shot wound acting directly on the part; though it also arises from falls on the great trochanter, and even on the soles of the feet.

The neck, however, is much more frequently the seat of fracture because it forms a curved lever. Its diminished size towards its middle part also contributes to the production of the fracture. This may take place from below upwards, or from above downwards, depending upon the manner in which the fall occurs; but usually it is at the base of the neck that the fracture takes place: there are, however, infinite varieties in this respect. I request you to observe, that according to the seat of these fractures they are called *intra-capsular* or *extra-capsular*: and it is a distinction which has been much dwelt on, because many practitioners think that it is difficult or impossible that consolidation of the fracture can be effected when it has taken place within the capsule; while they admit that it is possible and even easy when it has taken place without the capsule.

Astley Cooper, whose authority is so imposing in surgery, says expressly, that in all cases of transverse fracture of the neck of the femur within the capsular ligament, which he has had occasion to examine, he has never found bony callus: "The dissections that I have been enabled to make, adds this distinguished surgeon, have convinced me that the fragments of the neck of the femur, when the fracture is intra-capsular, never unite by bony callus; the union takes place by a ligamentous substance, as in fracture of the patella."

Persuaded of its impossibility, he has also made experiments on living animals, which have confirmed his opinion: and the English surgeons have also adopted the opinion of their countrymen.

But to the facts which they adduce in support of this non-consolidation, numerous facts of an opposite nature may be advanced. A considerable number of anatomical preparations show intra-capsular fractures exceedingly well united; and those which exist in the cabinets of the faculty at Paris, and the museum of the Hotel-Dieu, prove that this consolidation with or without deformity is real. Sir Astley Cooper has probably only seen fractures of the neck of the femur which have not been cured, which have been treated ill, or not treated at all. This is the only way of explaining the opinion of the English surgeon, which is evidently erroneous.

An examination, however, of these anatomical preparations, though eminently calculated to convince us of the reality of this union of fracture within the capsule, does not appear to have produced this effect on the other English surgeons who have visited our museum. Mr. Cross says he has attentively examined the preparations in the School of Medicine at Paris, and that none of them appear to him to prove that bony union ever takes place where the head has been completely separated from the capsular ligament. When one has seen the preparations at the Hotel-Dieu, which every person may examine at leisure, if he then denies the possibility of consolidation within the capsule, I know not what proofs are required to produce conviction. For myself, I regard this consolidation as demonstrated, notwithstanding the contrary opinion of the English surgeons.

Theoretical and practical reasons having been brought forward in favor of and against the possibility of consolidation of the intra-capsular fracture of the neck of the femur, it will be proper to consider this point.

It has been said that the upper fragment contains few or no vessels, and that it then becomes a foreign body in the articulation. This assertion is incorrect; the head of the bone receives vessels from the bottom of the acetabulum by means of the round ligament. These, without being very numerous or large, may nevertheless be sufficient for the nutrition of the upper fragment: besides the synovial membrane embraces the cartilage, and forms at its base a small cul-de-sac which covers distinct lumps of red cellular membrane, well supplied by blood-vessels. The inferior fragment is well supplied by the nutritious artery of the bone, and the different vessels spread throughout its spongy texture.

It is therefore evident, that the lower fragment receives more blood-vessels than the upper, whose vitality is less active, more languishing, and that, in order to effect the consolidation, the inferior fragment, enjoying the free exercise of its vital functions, plays the most important part: but it is not less true that there is in the upper fragment sufficient nutrition not only for its life, but also for its share in the process of union.

The want of periosteum around this portion of the bone has also been assigned as another cause. This is a very great error: the neck of the femur possesses a periosteum, undoubtedly thin, but yet very evident, and which, though not enjoying a vitality equal to that of other bones, nevertheless has its full share. This thinness and isolation of the periosteum of the bone is therefore only a difficulty, but not an insurmountable obstacle to consolidation.

Others have said that the synovia constantly bathing the fragments rendered consolidation impossible. This might be a good reason if the same anatomical disposition in other parts were found to influence the formation of callus. Now, it is well known that fractures penetrating the joints unite perfectly

and that the same thing takes place in the olecranon and patella, where the synovia constantly bathes the parts. It is not therefore the presence of the synovia which opposes the bony union of the intra-scapular fracture. The true causes preventing or rendering difficult the exact solid union, and especially one free from deformity, are the displacement of the fragments, their want of relation and contact, whether the fracture be intra or extra-capsular.

*On the indications of Cure in Fractures of the Neck of the Femur.*—The celebrated Louis has said in the most eloquent manner, "Diagnosis holds the first rank in our science, and is the most useful and difficult part of it; without an exact and precise diagnosis theory is always faulty, and practice often incorrect." This remark, made by Louis in his memoir on fungus of the dura mater, is equally applicable to the present subject. All treatment which is not based on correct indications of cure, is purely empirical, and only becomes rational when it is founded on these indications.

At first sight one might suppose that it was the same in fractures of the neck of the thigh bone as in other solutions of continuity, that it was sufficient to replace the fragments, and maintain them in contact. But how many difficulties present themselves! How are fractures of this kind to be reduced? Are we to use powerful extension and counter extension? Certainly not; because we should thus increase the tension of the muscles, which is already very great. In luxations this may be effected by diverting the attention of the patient and seizing that moment to perform the reduction. But in fractures this cannot be done, because the attention of the patient is concentrated on the injury. Another method of overcoming muscular action is to place the limb in a state of flexion, as recommended by Pott in fractures generally. I believe I am the first who applied these rules to fracture of the neck of the femur; and am surprised that it should have escaped the sagacious mind of that celebrated surgeon.

I suppose that in a case of this kind extension and counter extension have been used. It is evident that if the limb be placed in a state of flexion, no difficulty is experienced in overcoming the displacement as to circumference and length, and consequently the outward turning of the foot, and the shortening. But how are the fragments to be kept in contact? Generally after the reduction of the fractures, splints and bandages are used, which tend to prevent a consecutive displacement.

This apparatus is applicable perfectly to fractures of the arm, leg, and even of the thigh; but is it equally so to fractures of the neck of the femur? To understand this, an examination of the parts is sufficient. The neck of the femur, situated in the centre of very thick soft parts, is inevitably beyond the action of all kinds of bandages and apparatus; and we may well be surprised that surgeons are daily taxing their ingenuity with some new invention. Desault saw that all of the machines used were almost or entirely useless; he says, that we must first act upon the pelvis by counter extension in order to raise the upper fragment, and then on the foot, to bring the lower fragment from above downwards; such is the origin of the apparatus for continual extension, which has since undergone many changes, but in principle has always been the same.

We are here brought back to the consideration of a question already discussed, that of the length of time necessary to establish the solidity of the

callus, sufficient to resist the weight of the body and muscular action. It cannot be uniformly answered, for many distinctions exist; if the fracture of the thigh bone be transverse, the fragments must be brought together and kept in contact: after 40 days reunion has taken place. The same is true as regards the tibia and the bones of the fore-arm; but if the fracture be oblique in these different places, 40, 50, 60 days will not suffice for the production of callus.

Why? Because in fractures of this nature there is no solid support. If therefore you do not keep the fragments in contact, long after forty days displacement will take place. This may be easily conceived; the bones touch each other by inclined planes; the weight of the body and muscular action tend to this displacement, because at the end of 40 days only a provisory callus will have been formed. If you then remove the apparatus, shortening will again occur, and it must be reapplied. Thus therefore 40 days are sufficient for ordinary fractures, and 70 and 80 for oblique fractures.

What has been said with respect to these fractures applies also to transverse fractures of the patella and olecranon. At the end of 40 days the limb is found in a good condition, but should the patient walk, the fragments separate, because the callus is not yet sufficiently strong.

I suppose that the fracture of the neck of the femur is transverse, and that this part is divided into two halves; it may then be easily reduced; but the difficulty is to retain it so, because the fragments are not placed fronting each other. Suppose, now, that the fracture is oblique; if the patient attempts to walk the lower fragment impinges slightly upon the upper one; this fragment then will offer some obstacle to its displacement; so that this is less easy than in a perpendicular fracture. Can the nature of the fracture be ascertained from mere inspection? No. So that we must act as if the fracture had the strongest tendency to consecutive displacement. Fractures therefore of the neck of the femur should be kept as long as possible in the apparatus.

What is the length of time necessary? This evidently depends on age and constitution. As a general rule, they require double the length of time requisite for fractures of the bodies of the long bones; even after this time I have seen displacement occur. The period should therefore be extended beyond 100 days, which is about the time the callus is perfectly formed; and in advanced age we may even extend it farther. With this intention I sometimes leave the limb 120 days and even more in the apparatus. The general indication is, then, to reduce the fragments and maintain them in contact. Pott fulfils this purpose by preventing the muscles from contracting. We must therefore not only reduce them, but keep them in contact. This is difficult in proportion as the fracture is perpendicular. When it is oblique there is less tendency to displacement; but as we cannot know its nature, we should employ double the time usual for oblique fractures of the bodies of the long bones; even more, we should add 20, 30, or 40 days, in order to obviate any consecutive displacement. When individuals have been thus treated, they have scarcely ever any shortening, consecutive displacement rarely takes place, and when it does it is very slight.

Two methods to which I now call your attention are used by surgeons to effect reduction of fracture of the neck of the femur. One generally employed is extension, the other, due to me, is demi-flexion. I have said above, that the most important indication is to reduce and keep the fragments in con-

tact; but two circumstances may occur, on which it is proper to dwell for a few moments; sometimes and generally there is great displacement, sometimes little or none. In the latter case the fracture is intra-capsular, and the fragments are but little separated or caught (*engrenes*) in each other: extension is then useless, but we should not be misled by this pretended fixedness of the parts; but apply the proper apparatus. Generally, however, there is displacement, perhaps only of a few lines, half an inch, an inch, or more; there can then be no doubt; and such are the cases in which the plan of which I have spoken becomes necessary.

In extension the patient is placed on his back, the pelvis firmly fixed, one or several assistants take hold of the lower extremity, and extend the limb, and at the same time rotate it inwardly; but during these attempts the muscles may contract, and resist the efforts of one, two, or several assistants: this plan is therefore defective. Traction moreover tends to produce displacement, and on its cessation the shortening immediately returns.

The best method of effecting the reduction of fractures in general and of that of the neck of the femur in particular, is to diminish the resistance of the muscles by placing them in a state of demi-flexion; which is done in the following manner.

The patient being in the same position, the pelvis fixed by assistants, the thigh is flexed on the abdomen by raising it, and exerting gentle extension, the leg is also flexed on the thigh. This is scarcely done when without difficulty the lower extremity regains its usual length, and the foot its natural position. If the demi-flexed position is best for reducing the fragments and maintaining them reduced, it follows that the best apparatus for fractures is that which keeps the muscles in the demi-flexed position. This is the principle laid down by Pott, but which he has singularly overlooked in the treatment of fractures of the neck of the femur.

Thus two methods are used, continual extension or continual relaxation. I use these words designedly. It is impossible to find two methods more diametrically opposite; the former is the basis of the treatment of Desault, the latter that of the treatment I have generally pursued.

In the former method, one power is applied to the pelvis, another to the foot, acting in opposite directions, in order to prevent any overlapping of the parts. With this intention has the immense variety of apparatus been invented, which have since become little more than objects of curiosity; such as the bed of Hippocrates; the *glossococoneum*, described by Ambrose Pare; the gutter of Fabricius Hildanus; the plan of Guy de Chauliac; the machine of Bellocq, Gooch, Aitken, Bruninghawsen, Vermandois, Heister, Petit, &c. and a host of others.

Desault thought that muscular action could be overcome by mechanical power. He first instituted this plan of treatment at La Charite, then at the Hotel-Dieu, and it was adopted by his numerous pupils. However, it was soon seen that it did not invariably succeed. I have before said that extension was wrong, and it may also be the cause of serious injury to the patient, from the action necessarily exerted on the integuments of the pelvis and the leg.

What is the consequence? Acute, insupportable pain sometimes followed by inflammation, suppuration, and gangrene, to which the patient often falls a victim.

Can these accidents be prevented? I have endeavored by all possible means to neutralize the effects of the compression, by padding the apparatus with cotton, and have not succeeded; I have therefore abandoned it, as an unnatural method. I may add that, however exactly it may be applied, it frequently leaves a shortened limb.

On reading the works of Pott, I was surprised to find that he had not applied his method of relaxation to fracture of the neck of the femur and thought he had forgotten it, determining myself to use it in this kind of fracture. The first apparatus I used consisted of two inclined planes of wood, covered by a cushion, and united by a hinge so as to vary the inclination to suit the case; but the pain caused by the hollow of the ham resting on its apex was too acute; and in one case the long and constant compression occasioned gangrene of the upper part of the calf of the leg.

I placed the patient on the injured side; but the weight of the body acting on the great trochanter, caused inflammation and gangrene; and as it thrust the lower fragment inwardly, the effect of position was destroyed. The other side was equally objectionable. At last I returned to the position on the back, notwithstanding the inconveniences resulting from the constant pressure of the soft parts covering the sacrum and coccyx; but these are common to all plans and far from being peculiar to this. The tonic action of the muscles was to be opposed, and at the same time the contraction prevented; the double inclined plane I now use combines these advantages; in it the thigh is flexed upon the pelvis and the leg on the thigh, nearly at a right angle. This position is certainly that in which the muscles are most relaxed; and it is remarkable that the outward deviation ceases, as soon as the limb is placed in it. Our apparatus is therefore formed in the following manner; a pillow doubled on itself, rounded like a bolster, is placed at the apex of two inclined planes composed of pillows placed above each other; and upon whose summit reposes the hollow of the ham. The leg is fixed by a cravat of which the ends are fastened to the bed frame, and another across the middle of the thigh. During the first month the thigh is to be raised daily or nearly so, by gently drawing down the lower fragment, so that it may preserve a perfect relation to the upper. When consolidation is supposed to be effected, the inclined plane is gradually diminished by taking away a pillow now and then, until it is entirely removed. The patient should remain in bed some days, and then only should be permitted to walk with every precaution. This plan of treatment generally leads to easy cures, free from inconvenience during its application, and generally the consolidation is without shortening, or with a shortening so slight as to be easily concealed by wearing a high heeled shoe. Let us now detail some cases in support of the principles advanced.

*CASE I.—Fracture of the Neck of the Femur; Cure, without shortening or deviation.*—M . . . . ., 58 years of age, of small stature, but of good constitution, being thrown down, fell on the left trochanter. She endeavored in vain to rise, and was immediately carried to the Hotel-Dieu.

On admission, she complained of acute pain in the right groin and thigh. Being placed on the bed, the left lower extremity rested on its outer side; the knee carried forcibly outwards, was an inch above that on the opposite side; the toes were turned outwards, and the heel corresponded to the space between the internal malleolus and tendon Achillis of the opposite side.

The pain in the groin was increased by the rotation given to the limb in order to determine the extent of the arc described by the great trochanter, an extent which was sensibly diminished; there was also considerable swelling at the upper part of the thigh, and inability to raise the left foot. As there were present sufficient symptoms of the nature of the fracture, we had not recourse to any other means of determining crepitation; this sign, besides being useless in this case, is always very difficult in this kind of fractures, where the bone is so thickly covered by the soft parts, and attempts to distinguish it often produce new injuries, either to the surrounding parts or to the capsule of the joint.

The patient was put in a bath, and then placed on the double inclined plane of pillows. A handkerchief folded like a cravat, and intended to fix both the pillows and the limb, was placed across the middle of the thigh, and its ends fastened obliquely to the frame of the bed; another around the instep, and fastened in the same manner as the preceding to the foot of the bed. (Orangeade and light soups were directed).

On the 11th of July the patient complained of slight pain in the knee, which was to be attributed to the situation to which it was not yet accustomed. There was no pain in the groin; the limb has lost its tendency to turn outwards, and by approximating the knees the patellæ were found to be even. On the following days, being habituated to the constraint caused by the fixed position of the limb, the woman complained of no pain; the apparatus was examined daily, and the limb kept in its proper situation. On the 9th of October (89th day of treatment), the bandages over the leg and instep were removed and the limb set at liberty. The patient could slightly raise the foot. By placing the legs alongside of each other, it was easily seen that the patellæ were on the same level.

On the 12th of October, the plane of pillows was gradually lowered; and on the 25th the woman could raise the limb with great ease. She was permitted to set in an arm chair without leaning at all on the fractured leg. On the 25th M. walked on crutches. There was no shortening nor twisting, and in a few days it will be impossible to distinguish which is the injured member.

This case is an incontestable argument against the opinion of those who have thought and written that union of fractures of the neck of the femur never took place without shortening; and the apparatus employed is decidedly the most simple and efficacious now in use. Its great advantage is in being free from pain or constraint; and patients wait patiently 100, 120 days, or even more, without complaining; a period of time apparently long, but nevertheless indispensable, as the accident mostly occurs in persons advanced in age, in whom the powers of restoration are less energetic than in youth.

*CASE II.—Fracture of the Neck of the Femur; Fall on the Great Trochanter; Evident Symptoms; Treatment by the Double Inclined Plane; Perfect Union; Cure on the 85th day.*—Bequend (P. T.), 67 years of age, of a strong constitution, and generally enjoying good health, was admitted into the Hotel-Dieu on the 9th of January 1831, for a fracture of the neck of the right femur. It had been caused by a fall on the great trochanter. At the moment of the accident, there was acute pain in the joint, inability to elevate the limb or to rise from the ground.

She was brought on the next morning to the hospital, the limb carefully examined and found in the following state :

It was shortened by at least two inches, rotated outwardly, demi-flexed, the heel placed above the malleolus of the opposite side, the great trochanter less projecting and drawn near the crest of the ilium. On applying one hand to the trochanter and rotating the limb, it was seen not to describe an arc of a circle, but to turn as if on a pivot. This sign, to which Desault attached so much importance, I do not think deserving of the value attributed to it, for it is difficult, on the one hand, to impart this circular motion to the thigh; and on the other, it varies as regards the seat of fracture; it is not very evident if it be near the great trochanter; and extremely so, on the contrary, if the lesion exist near the head of the bone.

The natural length and position could be easily given to the limb; but on ceasing the extension, the shortening returned: this circumstance alone was sufficient to distinguish the accident from a contusion, luxation or disease of the hip joint. The patient complained moreover of lively pain in the articulation: she was unable to elevate the whole leg, that is to say, to flex the thigh on the pelvis, the leg being extended on the thigh. A severe contusion existed in the region of the great trochanter.

The fracture being thus ascertained, was reduced by extension and counter extension, and the limb placed upon the double inclined plane already described: it recovered its natural direction from position alone, and was no longer rotated outwardly. The handkerchiefs were applied as in the previous case.

This apparatus possesses many advantages, among which the following are the most striking; it may be constructed and renewed with the greatest ease, it places the parts in their normal position, causes neither contusions nor eschars; it restores to the limb its natural shape, and preserves it by a constant, gentle, and gradual extension. After 75 days, the apparatus was gradually removed. It was soon perceived that the union was perfect, and by comparing the limbs, that they were of the same length. No unpleasant symptom occurred during the whole period of treatment. On the 4th of the following April, 85 days after her admission, she left the Hospital entirely cured. Let us now compare these results with those of fractures left to themselves. There is either no cure at all, or a cure with deformities rendering the limb incapable of performing its functions; such are the inevitable consequences of abandoning nature to her own resources. Indeed a bone once dislocated, is never spontaneously reduced. Some examples of spontaneous reduction of the lower jaw, the head of the humerus, the base of the phalanges, &c. only confirm this principle; they establish rather an inferiority than a capability, for they result from a weakening of the ligaments and muscles, which allows luxation to be effected with the same ease with which it is reduced. Muscles attached to a bone in its proper situation have a different action when that bone is luxated; and this action, far from restoring it to its natural position, generally tends to remove it still farther. Nature, which under other circumstances triumphs over difficulties and obstacles opposed to her laws, in these cases displays but feeble efforts to restore her functions. They always remain impossible or very limited. In vain new cavities are formed in order to replace the former ones; always imperfect, they

perform but illy their duty, and the muscles compressed, turned aside, removed or approximated to their insertions, cannot play their wonted part. This is not all; the upper extremity of the inferior fragment, by pressing on a part of the bone not originally destined to receive it, may cause irritation; tumefaction, abscesses, suppuration and caries may result, and death at last close the scene.

In the plan which I have adopted, on the contrary, all these accidents are prevented, the patient suffers but little, and at the end of a longer or shorter time, which varies only according to age and constitution, he recovers the use of his limb with so slight a deformity, that a stranger cannot always detect.

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## CHAPTER LIII.

### ON ARTIFICIAL ANUS: ITS ANATOMICAL CHARACTERS, EFFECTS, SEAT, PROGNOSIS, DIAGNOSIS, AND TREATMENT.

OF all the diseases to which man is liable, there is no one so inconvenient and disgusting as the artificial anus. How wretched is the patient from whom, despite of his will, the alimentary, bilious, and fecal matter contained in his intestines are constantly escaping. He endeavors in vain to palliate his horrible disease, by pockets, reservoirs, boxes, &c.; he must forego society, and be condemned to lead a solitary and miserable life.

But before giving an account of the manner in which I have generally succeeded in curing this disease, always disgusting, often dangerous, and in some cases inevitably fatal, it will be indispensable to explain the morbid anatomy of the intestine, and review the causes, prognosis, diagnosis, and remedies of other surgeons.

In health, the food in a given time passes through the whole length of the alimentary canal, and undergoes in each of its portions different but necessary changes, which furnish to the absorbing vessels the elements of nutrition: the residuum is then directed towards the anus, whence it is expelled by means of a power subject to the will. The length of time, the space passed over, the successive changes of the food, the absorption of the chyle, and lastly the expulsion of the mass, constitute a series of operations indispensable to the regular mechanism of the intestines.

It follows, that if on account of disease these numerous conditions are changed, reduced or disturbed, there will be imperfection and disorder in the digestion, and injury more or less serious to the nutrition, resulting from it; such is in fact what happens in artificial anus.

This disease consists in an original or accidental opening somewhere in the abdomen, communicating with the intestine, and giving exit to a part or the whole of the fecal matter. This anormal anus is rarely congenital. It mostly results from wounds with or without loss of substance, inflammation, abscesses, and especially by strangulations, which end in the destruction of a more or less extensive portion of the gut.

The artificial anus of which we are now treating is not so easily produced

as it may be imagined. Its production, indeed, demands the presence of many different circumstances; thus, it is necessary that the intestine which is to form it should be opposite the point in the abdominal parietes through which the stercoral matter is to issue. It must, moreover, be retained in the vicinity, or engaged and fixed in an aperture of the abdominal parietes, and a communication must exist between this aperture and that of the intestine. Lastly the edges of these two apertures must adhere to each other, or to the adjoining parts, conditions which very rarely happen simultaneously, as is proved by experience.

*Anatomy of artificial Anus.*—When once formed, an artificial anus presents a solution of continuity established at the expense of the intestines and the parietes of the abdomen, united and completely adherent to each other. This opening, by whatever cause it may have been produced, is almost always round, sometimes irregular; varying from a few lines to an inch or more in diameter. Generally, its edges are thick, depressed, adherent to the subjacent parts, turned towards the abdominal cavity, and continuous with the mucous membrane of the intestine. A reddish circle indicates the point of this union. The adjoining integuments are furrowed by radiating folds analogous to those found around cicatrices, which take their name from their resemblance to the vent of a hen; and almost always, notwithstanding the most scrupulous care, the fecal matter irritates them by contact, renders them erysipelatous, or excoriates them to different depths.

The adhesions indispensable to artificial anus are found at the edges of the opening, between the intestine and abdominal parietes. They are produced by an adhesive inflammation, which takes place immediately on the protrusion of the intestine. A few hours are sufficient to establish them, but many days are necessary for their solidity. They always commence on the serous surface of the intestine and abdomen, and gradually extend to the other divided tissues, and soon to the skin and mucous membrane. In hernia these adhesions precede the destruction of the parts, and frequently prevent effusion into the abdomen; in wounds, on the contrary, they occur only after the division of the intestine; but this solution of continuity is often followed by fatal effusions. In the majority of cases their extent varies from half a line to a line; in others, it is of some lines; and sometimes, but rarely, of half an inch. These adhesions are formed by a substance which passes successively from the glutinous to the cellular, and lastly to the fibrous state. Having attained this last degree of organization they are sufficiently strong to resist efficiently the majority of causes which might tend to separate the ends of the intestine from the parietes of the abdomen.

These adhesions never extend far from the ends of the intestine, whence it follows, that these ends being only contiguous and enveloped by a smooth membrane, as throughout the remainder of their extent, leave between them a kind of cul-de-sac, of which the opening looks towards the belly, and the fundus towards the skin. In certain subjects, it is in this cul-de-sac that the abdominal organs are implicated in the formation of herniæ, which raise, compress, thrust aside, and complicate more or less the accidental anus.

The abnormal anus, especially that formed by the destruction of the whole calibre of the intestine, whose opening appears immediately external, rarely remains in the state of a simple fistula. A tumor produced by the reversing of

the intestine is almost always formed at the accidental opening. It takes place the more easily, as this organ is loose in the abdominal cavity, large in proportion to the efforts at stool, and serious in the ratio of duration. There are sometimes two tumors, one produced by the reversing of the superior portion of the gut, and the other by that of the inferior portion. The latter is more rare than the former; it is less voluminous, and appears to be produced by the antiperistaltic movements which expel through the unnatural aperture the mucus of the lower part of the intestinal canal.

These tumors mostly appear under the form of cones more or less elongated, with the apex at the integuments, and at the base having a depressed opening, whence the fecal matter escapes, if they belong to the upper portion; mucus and even enemata if they are produced by the lower part. The length of these inversions is sometimes considerable; they have been seen of 16 to 18 inches and even two feet. Their surface is red like the internal surface of the gut, but colored by the irritation produced by the atmospheric air. When they are of long standing the mucous membrane covering them becomes dense and solid; covered by a light and dry epidermis, and assuming the characters of the cutaneous tissue. The volume of these tumors is seldom great, and varies according as their root is more or less compressed by the opening through which they have issued. When this compression is great, their vessels become engorged, and their size rapidly increased.

Desault has observed in many of these tumors a peristaltic movement similar to that of the intestines. The reversion of the gut in anormal anus is rather inconvenient and painful than dangerous. However when the opening in the abdominal muscles is too narrow, the issue to the fecal matter is constrained, and tenesmus and colic ensue.

On examining the opening of the skin and the fundus of the artificial anus, a species of funnel may be perceived, which has been accurately described by the celebrated Scarpa. It is formed of parts reduced to a homogeneous nature by inflammation and the contact of fæces. Its apex is at the skin, its base at the gut. Its length, direction, form, and dimensions, vary ad infinitum, and influence greatly the cure of artificial anus. In proportion as it is extended and capacious, nature tends to its cure, and to the assistance of art in relieving it.

At the bottom of this infundibulum are found the most remarkable and important characters of artificial anus. There exist the orifices of the two ends of the intestinal canal, and the septum separating them. Of these orifices one belongs to the upper end of the intestine; and which being constantly traversed by the food and fæcal matter, is larger and more free than the other. The second opening is in the lower portion of the gut, and receiving no alimentary or stercoral matter, or at least in very small quantity, it is generally narrow, contracted, and difficult to find.

To these orifices succeed the ends of the intestine which terminate them. These ends, villous and coated internally with mucus, thin, covered by the peritoneum, and outwardly lubricated by its serum, sometimes cross each other in the abdomen, are sometimes convoluted, sometimes parallel, but generally recede at an angle more or less acute; and at last are lost in the folds of the intestinal canal.

By continuing the examination there may be seen between the two orifices,

and on the same level, an angular projection more or less evident and near the entrance of the funnel of which we have spoken; this projection, called also a spur (*eperon*), and which has been described by Saviard and Moraud, results from the union at an acute angle of the corresponding parietes of the two parts of the intestinal canal which terminate at the artificial anus. Being formed by that part of the gut which either gangrene or wounds have spared on the mesenteric portion, this spur advances more or less towards the skin, according as the intestine has undergone more or less loss of substance and change in its direction. It is almost imperceptible and hidden in the bottom of the funnel when the gut has suffered but slightly from a wound or eschar, and when it coasts along the posterior face of the parietes of the abdomen preserving its natural curvature. It is very large, and reaches the level of the skin, when the intestine has been destroyed throughout its whole circumference, and when in consequence of this loss of substance its two ends meet at an acute angle, and become parallel. In the first case there is, across the two orifices of the intestine, a cylindroid groove, which may still direct any matter from the upper towards the lower end: this species of artificial anus is the most easily cured. In the second case, no vestige of this groove appears, and the spur situated between the two orifices of the intestine, becomes a barrier over which no matter can pass; thus the difficulties are increased, and the resources of art less certain. Whatever may have originally been the projection of the spur, after some time it ceases to divide into equal portions the bottom of the funnel into which the ends of the gut open. It gradually descends towards the lower portion, and at last hermetically closes its entrance.

On the side of the cavity of the gut, this spur presents always the form of a crescent, of which the angles directed towards the convexity of the new curve of the intestine are lost, either in the parietes of this organ or the edges of the deepest part of the wound in the abdomen. Examined on the side of the abdomen, it is seen to divide, and the two equal portions of which it is composed receive the mesentery between them. This division is the result of the mechanism of its formation. Produced by the contact, at a more or less acute angle, of the two halves of a fold of intestine, it is formed of one wall only on its cutting edge; every where else it is composed of two parietes which leave between them a triangular space. A fact of great importance follows from this last circumstance, namely, that the cavity of each of the ends is separated from the other by a double septum, whose abdominal surfaces are smooth and free from all adhesion. In order to pass from one cavity to the other, by traversing their parietes, we must also traverse the cavity of the peritoneum; thence arise the difficulties and dangers of the communication to be established between the ends of the gut, by dividing the septum which separates them. This spur and the double septum resulting from it are not so unchangeably fixed as to be unable to advance or recede. United to the mesentery they follow to a certain point the movements communicated by this ligament of which the arrangement demands particular attention. This membranous fold, extended from the anterior portion of the vertebral column to the curvature of the intestine, possesses, in its ordinary state, merely the length comprised between these two points. Notwithstanding its extensibility, it is always in a state of more or less tension, when the gut removed from its

ordinary situation escapes through the abdomen, as happens in the generality of herniæ and penetrating wounds of the abdomen with protrusion. Forced to follow the displaced intestine, the mesentery forms, from the vertebral column and the most remote point of the intestine, a cord, which, by its tension, keeps the body inclined forward, prevents its erect position, and still more any inclination backward.

In artificial anus, the end of this cord corresponding to the intestine is attached to the bottom of the re-entering angle which it forms on the abdominal side, precisely at the base of the spur separating the two apertures. In consequence of this arrangement the spur and intestine are continually drawn by the mesentery, and their tension must be in proportion to that of this membrane. We may thus readily perceive the beneficial influence that movements and position of the body backwards must exercise in the spontaneous cure of artificial anus.

The consequences of this tension, however, are sometimes less favorable. I have twice seen it rupture the adhesion of the intestine to the abdominal parietes, and give rise to fatal effusion of stercoraceous matter.

For a long time after the cure, this action of the mesentery continues and causes a singular phenomenon, which I will briefly describe. In many individuals cured spontaneously of artificial anus, who afterwards returned to the Hotel Dieu, and died of other diseases, I examined with curiosity the situation of the parts; but what was my astonishment, on finding the intestine free and floating in the abdominal cavity, instead of being adherent to its parietes. I should have thought myself mistaken, if the identity of the persons had not been well ascertained, and I had not discovered a fibrous cord extended from the point in the abdomen, corresponding to the artificial anus, to the intestine.

This cord, a few lines in diameter and some inches in length, larger at its extremities than in its central portion, covered by the peritoneum and formed entirely of a cellular and fibrous tissue, without any cavity, was evidently formed by the progressive elongation of the cellular tissue which had united the intestine to the parietes of the abdomen, and this elongation had been caused by the continual traction exercised upon the gut by the mesentery in the different movements which had taken place during life.

The changes of which we have just spoken are not the only ones which take place. The ends of the intestinal canal, perfectly similar to each other in the early stage of the disease, soon take on very different characters. The upper portion continuing to receive alimentary matter, not only preserves its calibre, appearance, and movements, but obliged to perform alone a function formerly executed by the whole canal, is rendered larger; its parietes being thicker and stronger become the seat of a more energetic circulation, as well as of a more active secretion and absorption. This excess of vitality extends even to the lymphatic ganglia and portions of the mesentery appertaining to it. The lower portion, on the contrary, more or less deprived of its functions, no longer exerted by alimentary or fecal matter, having nothing to contain or elaborate, collapses, or as it were withers, loses its thickness and solidity, and becomes the seat of an atrophy extending to the mesentery and lymphatic.

It must be nevertheless observed, that however reduced and atrophied the lower portion of the intestine may become, it is never entirely obliterated. The internal membrane, in contact with itself, secretes a whitish ropy mucus,

of an albuminous appearance, capable of remaining months and years in the place of its formation, without contracting any fecal odour, and which is expelled in the shape of long cylinders, either spontaneously or by a stimulant enema. M. Begin, however, a few years ago, observed at the Hospital of Val-de-Grace a fact which would seem to indicate that the complete disappearance of the intestinal cavity is not impossible. In a man 80 years of age, who had for more than 40 years labored under an artificial anus in the right groin, formed at the expense of the transverse colon, which was depressed to the level of the corresponding ring, this surgeon found the upper portion alone adherent to the wound. It was impossible to discover, either at the cicatrix or adjoining parts, any entrance into the lower portion. The latter, under the form of a white cord, of about the size of a writing quill and very solid, ascended towards the left kidney, and then descended after some convolutions to the anus. As it approached this opening its size increased, and its resistance was less. At its lower portion it was still open and contained a whitish mucus; but above it could not admit a very delicate probe, and along its ascending portion for the extent of six or eight inches, in the vicinity of the artificial anus, it was so completely obliterated as not to evince the least sign of an internal canal.

*Effects and consequences of artificial Anus.*—In health the intestine, loose and floating, although attached to the mesentery, describes in the abdomen a series of uniform curvatures, through which the food passes freely; on the occurrence of artificial anus, this series is immediately altered. A fold of intestine is elongated, and directed towards some open point in the abdominal parietes; it assumes the form of a triangle of which the base is formed by the mesentery, and the sides are measured, one by the stomachic, the other by the anal portion. It is well known that, in the most simple herniæ, this angular direction substituted for the uniform and regular curve of the gut causes much embarrassment in the circulation of the alimentary and fecal matter.

In the case of which we are now treating, the intestine, on account of the adhesions which it has contracted with some part of the abdominal parietes, is turned from its natural direction, and rendered immovable throughout a greater or less portion of its length. This immobility not only opposes the movements of the digestive tube, but has another effect not less remarkable, namely, that the portion of intestine engaged in the parietes of the abdomen becomes a fixed point on which the efforts of the intestinal canal are spent, and towards which they constantly propel all substances, whence there results a real acceleration of their passage from the stomach to the artificial anus. The most serious of these inconveniences is the shortening of the surface over which the alimentary matter must pass. They remain a shorter space of time in the intestinal cavity, are less completely digested, and their nutritive principles are absorbed less perfectly. Nutrition then becomes changed, and exhaustion seems to threaten a cessation of the organic functions. Who has not been struck with the mass of heterogeneous substances entirely digested, matter which may still be recognised, and food of which the original characters have undergone no change, which are discharged from the majority of cases of artificial anus? Add to these serious inconveniences and real dangers, the constant and involuntary discharges of bilious, mucous, alimentary and fæcal matter which follow each other uninterruptedly, according to

the state of repletion or vacuity of the canal, and the variable height at which the accidental anus is situated. From this flow of acrid and irritating substances result excoriations, fissures, erysipelas, an insupportable pruritus, various eruptions, which annoy the patient and increase the effluvium arising from his body and clothing. Ointments, washes, metallic or other reservoirs are but imperfect remedies; and compression, which may in some degree prevent the discharge and supply the place of a sphincter, becomes very dangerous in many cases.

Let us now inquire into the causes of this disease. Hippocrates, in his book on epidermis, gives a case produced by a penetrating wound of the abdomen, with lesion of the intestine; this is a frequent cause, especially in soldiers. When the gut is wounded and retained without the cavity of the abdomen, the alimentary or fæcal matter which it contains continues to flow through the opening; adhesions fasten it to the parietes of the belly: this is the most simple form of artificial anus. In rarer cases, where the wounded intestine remains in the abdominal cavity, it sometimes happens that the effused matter traverses a long passage before arriving at the external wound. But generally they are fatal, by producing an inflammation of the peritoneum.

Foreign bodies, inadvertently swallowed, sometimes irritate the coats of the intestine, and cause their adhesion to the peritoneum lining the abdomen, so as afterwards to give rise to stercoraceous abscesses whose aperture gradually becomes fistulous. In some very rare cases it has been observed that lumbrici contained in the lower portion of the small intestine have opened unnatural passages in order to reach the surface. The abscesses which occur in those cases are remarkable for the slowness with which the phenomena preceding their formation are developed.

But in the first rank of all the causes of artificial anus are to be placed, strangulated, inguinal, crural, obstructed, irreducible herniæ, and those whose inflammation terminates in gangrene. If the assistance of art be not interposed, to the phenomena of strangulation and intensity of the local inflammation there succeed gradually the diminution of the frequency and force of the pulse, the disappearance of general agitation and anxiety, and at the same time the surface of the tumor acquires a livid hue, its size increases as its resistance and sensibility diminish. The abscess then becomes more evident, and sloughs formed at some point of its extent give exit to fetid, stercoraceous matter, mixed with pus and intestinal gas. If the gangrenous hernia be opened with an instrument, the intestine is sometimes found dead, although as yet unbroken; sometimes its contents are effused into the hernial sac, and sometimes the hernia and its coverings constitutes a common mass, in a state of complete mortification.

In proportion as the evacuations find a free passage through the spontaneous opening in the intestine, or by the removal of the strangulation, tranquility returns, the sloughs cease to fall, the wound assumes a red color, the adjoining tissues approximate each other, and the artificial anus is established either definitively or temporarily, according to the loss of substance which the alimentary canal has experienced.

Artificial anus may sometimes result from an operation performed, when the surgeon is reduced to this last and deplorable extremity, in order to prevent the fatal issue of injuries of the intestines. It is thus that in wounds

with entire division of the gut, the establishment of accidental anus are justly considered by the majority of surgeons as offering a greater chance of cure than when sutures are used. After gangrene has taken place in hernia, the incision of the intestine, the removal of its strangulation, and the formation of an artificial anus, is an operation more advantageous and certain than the excision of the diseased parts, the destruction of adhesions formed by nature with the abdominal openings, and the practice of invaginations. The formation of an artificial anus is the only operation which the surgeon can propose with any advantage, in the case of children born with imperforate anus, when the obliteration of the lower part of the rectum does not permit the *fæces* to descend low enough to guide the bistoury or trochar, in order to give them issue.

Lastly, from analogy, artificial anus offers a resource, perhaps too much neglected, in many cases of organic changes in the parietes of the large intestines, of which the effect is to arrest the course of the *fæcal* matter and threaten inevitably the life of the patient. If the rectum, for example, were obliterated, and all endeavors to re-establish its continuity were to fail, would we not be authorized in making an incision into the left groin, drawing out the descending portion of the colon, and establishing an artificial anus?

*Seat.*—Artificial anus may be seated in any part of the abdominal surface. It is mostly found, however, near the openings through which the vessels or nerves pass out, for this simple reason, that herniæ, whence the disease generally arises, are more frequent at these points than elsewhere. Thus, it is most frequently to be met with in the groins, or the iliac and umbilical regions.

*Diagnosis.*—The existence of artificial anus scarcely ever gives rise to the least uncertainty. It suffices to remember the characters belonging to the apertures which constitute it, and to examine the nature of the fluids discharged; in order to recognise it. The disease is generally found in the spots which we have mentioned; and when elsewhere, it has been preceded, either by the protrusion and strangulation of the intestines, penetrating wounds of the belly, or abscesses which on bursting have given exit to these fluids. In less apparent cases when there exist only long and sinuous fistulæ, from which there issues nothing but pus colored by the intestinal fluids, the true nature of the disease may be easily recognised by going back to its origin, and the symptoms which preceded and accompanied its development; and lastly, by exploring carefully the track of the fistula and attentively examining the fluids which are expelled.

*Prognosis.*—Artificial anus is always a serious disease, and its issue sometimes fatal. The prognosis is always unfavorable, other things being equal, when the unnatural opening in the intestine results from an injury near the stomach. Absorption and assimilation will be then imperfectly executed, and insufficient for the wants of the organism in proportion to the briefness of the passage which the food must traverse in the canal destined for their elaboration. An opening in the rectum, colon, and cæcum has but little influence on assimilation; an injury to the ileum has more marked effects: lastly, the opening of the jejunum, and especially of its upper portions, into an artificial anus, is followed by rapid exhaustion and marasmus. We may discover which is the wounded intestine, by the consistence, odor, and degree of alteration of the matter discharged.

In another point of view, artificial anus, wherever it may be seated, is serious in proportion to the quantity of alimentary or fæcal matter which flows through the wound.

When both ends of the intestine are easily found, the prognosis is more favorable than when one end alone can be discovered.

The more simple the disease is, the freer is it from danger. Artificial anus, when seated in parts which may be easily cleansed, and which are fitted to receive exactly the apparatus intended to receive the discharges, are always less inconvenient than others.

In general, the effect upon the nutrition should serve as the basis of our prognosis; other circumstances are but secondary.

*Treatment of artificial Anus.*—If my propositions be true, and the facts on which they are established constant, I think I have demonstrated that the discharges of stercoraceous matter, and the obstacles in the way of their return to a natural passage, are caused: 1st. by the adhesion, the angular direction and immobility of the intestine being substituted for its regular and gentle curve, and its mobility in every direction: 2d. by the loss of substance which it has experienced, and the contraction which is the result: 3rd and lastly, by the spur and double septum which separates its two ends. These obstacles, however great, are not always insurmountable, and have more than once been conquered by both nature and art.

The loss of substance is undoubtedly irreparable; but in some cases it is supplied by the extension of the tissues, and the dilatation of the calibre of the gut. The adhesion to the abdominal parietes may so far relax as to permit the most favorable position for the restoration of the course of the fluid.

The projection of the spur and double septum may also be diminished by the traction of the mesentery, and the efforts of the contents of the canal in passing from the superior to the inferior portion.

A generous diet, such as has been recommended by Louis, in the intention of gradually increasing the communication between the ends of the intestine, purgatives administered by others, in order to overcome the obstacles to the freedom of this communication; the introduction of dossets of lint, gradually augmenting in size, after the manner of Desault, in order to dilate, the contraction separating them; motion and position of the body backwards practised by us, in order to put the mesentery on the stretch and obliterate the spur and septum resulting from it: compression on the external orifice of the artificial anus; have all either separately or conjointly effected cures. Far from denying this fact we are among the first to proclaim it; but under what circumstances have they succeeded? This point must be established, in order to distinguish the cases in which the efforts of nature and those of art are sufficient to cure artificial anus, from those in which these efforts fail and more efficacious means are required.

Before attacking the principal disease, the complications sometimes accompanying it are to be removed. Thus for example, if the tissues be indurated and the external orifice contracted by callosities, they must be restored to their natural state by means of rest, a strict attention to propriety, emollient fomentations, wool, and similar remedies. If the integuments be irritated, painful, affected with inflammation or erysipelas, the continued use of the

above means will generally dispel this irritation. When fistulas of any length exist, they must be divided and the abscesses opened.

But the most frequent complication and the most important to remove, is the reversion of the gut across the wound. This, however, may be effected by a horizontal position for some days, the taxis, or a gentle and continued compression. When we cannot succeed in reducing the intestine, the tumor may, as was done by Desault, be surrounded by a roller, moderately tight.

The greater number of cases of artificial anus, which consist merely in a simple perforation of some point of the circumference and length of the intestinal canal, are curable: these cases, indeed, only give rise to stercoral fistulas, behind which the gut remains nearly healthy, without having experienced any appreciable loss of substance, manifest contraction, or evident change in its direction. The efforts of nature alone, and a slight compression on the external wound, will generally obliterate these fistulas.

Such simple means will not suffice when the anormal anus is produced by the destruction or removal of a third or half of the circumference of the intestine, throughout a surface varying from several lines to an inch. The loss of substance and change of direction of the alimentary canal, as well as the projection of the spur separating the two portions of this organ, may still, by a proper course of treatment, be remedied, and the alimentary substances caused to return to their proper channel.

But such is not the case when there is loss or destruction of substance throughout four fifths, and, a fortiori, the whole circumference of the gut, with or without implicating the mesentery. Here, the loss of substance, the contraction, change of direction of the canal, and above all the projection of the spur and the septum present insurmountable obstacles to the establishment of the natural course of the alimentary substances. Compression, the most efficacious of all curative means proposed, when exact enough to close all exit, produces immediately all the symptoms of strangulation.

Thus, from the examination of cases observed at the Hotel-Dieu or collected from authors, I have concluded, that the number cured spontaneously, or by the means above mentioned, are to those which obstinately resist all treatment, as 3 : 1. It must be remarked that this last fourth of the patients consists of those who, on account of the discharge of the whole of the residuum of digestion through the abdominal aperture are the most seriously affected, and most imperiously require our aid. To this species of artificial anus, therefore, our attention should be directed; but, in order to proceed with certainty and utility, we must understand exactly the difficulties and obstacles to be surmounted. These are, the loss of substance and contraction of the intestine, the adhesion of its extremities to the parietes of the abdomen, the changes in its direction and mobility; and above all the spur and double septum between its ends.

At first sight it is evident that the loss of substance cannot be restored; and any attempt to produce adhesions between their extremities, so as to re-establish the continuity of the canal, not only compromises the cure but also the life of the patient.

The adhesions of the gut to the abdominal parietes should also remain undisturbed; our only resource is then to operate on the spur and septum.

The simple division of these parts would at first appear a prompt and easy method of restoring the communication of the two ends. It would, most assuredly, be by far preferable to any other, if these ends adhered to each other to a certain height. But on reflection, we will soon see that the patient would be exposed to immediate death from effusion of fæcal matter into the abdomen.

Reason and prudence therefore teach us to remove this spur and septum, by thrusting them into the abdomen, and imitating as far as possible the effects of the traction of the mesentery. If these attempts be unsuccessful, at least, in my opinion, they can be of no harm.

Impressed with this idea, I had an instrument constructed, of which I give here merely an idea since it is not proper to judge it from one case alone in which I have used it. It is composed of an ivory crescent, pointed and with very blunt edges, having an opening of three quarters of an inch, protected by linen and fastened to a handle two or three inches long terminating in an elongated plate, a little curved, and furnished at the end with some holes in order to receive tapes which pass around the pelvis.

CASE I.—In 1809 a man was admitted into the Hotel-Dieu, for a strangulated hernia which had resulted in artificial anus. I thought that the removal of the spur, after the manner of Desault, would be the most certain, energetic, and efficacious measure. With this idea, I used the instrument above described. The concavity of the crescent was applied to the spur, which was thus pressed from before backward by the tapes passed around the pelvis. But either its application or some other cause, excited pain, colic, and nausea. Obligated, therefore, to abandon the hope of removing the projection which separated the ends of the gut, its division or perforation alone remained. How was this to be done? By means of a punch which would open at the same time the intestine and the peritoneum? Its result would be a solution of continuity through which an inevitable effusion into the peritoneum would take place. This effusion must therefore be prevented. The ends of the intestine are covered on all sides by peritoneum, and this membrane forms around them an uninterrupted cavity. This circumstance presenting an insurmountable objection to all idea of instantaneous division or perforation, should teach us, as will be hereafter seen, to divide the double septum, separating the intestines without opening the peritoneal cavity.

The well known facility with which serous membranes take on adhesive inflammation and unite on their free surfaces, appeared to offer the long desired means of curing the most complete, and consequently the most inconvenient and dangerous species of artificial anus. The first step consisted in passing a needle through the parietes of both ends of the intestine as far as possible from the projection of the spur. This needle was to leave behind it in the parts a thread, which might be gradually increased, so as to afterwards admit a piece of braid. An opening capable of enlargement could then be made behind the projection, in the midst of new adhesions, by a perforating instrument, so as to establish between the ends of the gut such a communication that nothing could be discharged from the external wound.

After many experiments on animals, and particularly on dogs, this operation was, some years subsequently, practised on the patient whose case we will now relate.

CASE II.—Aucler (F.), 36 years of age, of an excellent constitution, had been affected since childhood with an inguinal hernia, but which had never been of any inconvenience to him. On the 13th of May 1813, having descended into a privy-sink to measure it, the stench made him vomit, he immediately felt a lively pain in the left groin, found his hernia much increased, and at the same time was seized with colic, hiccup, and the ordinary symptoms of strangulation. He had no sleep that night; the next day, a physician was called, who, disregarding the tumor, prescribed purgatives and antispasmodics, kept the patient in a deceptive security, and thus lost in fruitless and even dangerous remedies the most precious moments. Five days were thus passed; when Aucler determined to be carried to the Hotel-Dieu on the 17th of May 1813, at half past nine o'clock in the evening.

He had been scarcely placed in bed, when the symptoms of strangulation of the neck of the sac were recognised; and from his extreme prostration, it was feared that gangrene had taken place. The operation was immediately performed; and, as had been foreseen, the neck of the sac was strangulated, and a circular mortification produced at the seat of stricture. The necessary divisions having been performed, the organ, too much injured to admit of reduction, was left *in situ*. The symptoms of strangulation immediately ceased. He was, however, bled several times in order to avert a threatening peritonitis.

At first, only a small quantity of faecal matter issued from the wound; the destruction of nearly the whole of the gut comprised in the hernia soon gave a freer passage. An artificial anus was established, through which the whole of the substances were discharged. Things remained in this state for six weeks, without the least effort on the part of nature to afford relief. I then tried the effects of compression, but they were so violent as to oblige us to remove it in a few hours. The patient seemed condemned to labor always under artificial anus; and this idea tormented him so strongly, that he implored, at all hazards, any means calculated to remove his disgusting disease.

An accurate examination showed the ends of the intestine to be healthy, and separated merely by a very projecting spur and septum. I resolved therefore, on perforating this septum, and then pierce it with a needle carried as high as possible into the cavity of the upper end, its point being received in the cavity of the lower end and drawn out. A ligature with which the needle was armed was left in the opening thus made.

The operation was free from pain, and quickly performed. A few days after, a larger ligature was introduced through the aperture. From that time, gas began to escape from the natural anus. The size of the ligature was increased at each dressing, and in eight days the patient passed his faeces by the fundament.

Thus encouraged, I augmented the ligature so much, that one day the spur was ruptured. This laceration gave rise to no bad symptom; and the sudden increase of the communication between the ends of the gut rendered the passage of the substances more easy, but still did not prevent its partial discharge from the artificial anus.

Desirous of removing completely the disease, I thought that the portion of the septum above the aperture made by the needle ought also to take on the adhesive process; and that it might be divided with as little danger as the

part below ; and therefore determined to make the attempt. This consisted in an incision every three or four days at the distance of half a line from the upper part of the septum, by means of blunt scissors directed on the index finger. These incisions, small in extent, and not passing beyond the limits of the already established adhesions, increased the aperture of communication so much, that the fæces were discharged by the natural anus.

Compression exercised upon the artificial opening and carefully watched by the patient, would probably in time have entirely closed it ; but Aucler, desirous of hastening his cure, became so importunate that I at last yielded to his solicitations.

Some living fragments around the aperture were first tied, and then removed without inconvenience. The division of the septum was then extended higher up, and a few hours afterwards the patient was attacked with all the symptoms of acute peritonitis, which resisted all our efforts. Was this inflammation produced by one of those fortuitous causes which sometimes unfortunately coincide with an operation, and throw upon it all the responsibility of the event ? Was it the result of extension, by continuity of tissue, of inflammation of the incised parts, to the peritoneum ; and did it here occur, from the very cause, rendering it so frequent in the operation for stone, and the most simple hernia ; or, lastly, was it produced by an effusion of fæcal matter into the abdomen ? I was inclined to the latter opinion.

The autopsy, however, showed no solution of continuity through which the stercoraceous matter could have escaped into the peritoneum ; none was found in its cavity, which contained a quantity of purulent serum and flakes of albumen, such as are ordinarily produced by an acute peritonitis.

The communication between the ends of the gut was restored for the space of nearly two inches ; its two extremities, before separated, constituted now but a single cavity, in which could be seen a raphe, caused by the cicatrization of the incision made in the septum, and every thing indicated that but for this melancholy occurrence, the artificial anus would have been cured.

It would be absurd to lay claim to the priority of this operation, if persons, excited by motives and interests unworthy of investigation, had not pretended that the operation was not new. Schmalkalden, it is true, in 1798 had conceived and executed the project of perforating the septum separating the ends of the intestine ; but not only, in 1813, no one in France had spoken of this attempt, but it seemed also unknown in Germany, since no mention is made of it by Sprengel, in his excellent history of medicine. Physick of Philadelphia, attempted the same operation, but the first account of it was given in 1813, by Dorsey in his *Elements of Surgery*. It is useless to waste time in demonstrating, that during the war of that period, and the prohibitions caused by it, that ideas originating in Germany or America could serve as a basis to analogous attempts in France, when in the former country they were unknown, and in the latter occurred simultaneously with their first announcement in another hemisphere. The design of the operation I prefer is not only to procure the adhesion of the septum, to divide it, but also to so dispose of the edges of this incision as to prevent their reunion ; however, although the passage of the needle through the double septum and the ligature in the intestine were productive of no injury, and that the want of success in the case of Aucler was to be entirely attributed to the attempt to enlarge, by means

of scissors, the communication between the ends of the intestine, this plan and all others based on the use of the needle are liable to serious objections.

In the first place, it may be easily seen, that the needle and ligature passing through the parts before their adhesion, the communication they establish between the intestine and peritoneum might in some cases give rise to an effusion into the cavity of the latter. Again, it is very difficult, almost impossible to carry the needle high enough, in order to open, between the ends of the gut, a communication large enough in all patients for the passage of the faecal matter.

Secondly, the ligature can only cause the adhesion of those portions of the intestine which are in contact; and if, instead of being parallel, and touching, those ends should be separated from each other, it will be seen, that it will produce a perforation without adhesion, and a dangerous communication between the intestine and cavity of the peritoneum. For these reasons I have abandoned the use of the needle and ligature. Moreover, in the operation I have described, the spur separating the ends of the gut was destroyed only by a number of little operations; the parts were kept in a continual state of irritation, always dangerous, and liable to become suddenly fatal from extension of inflammation. Founding my opinion on the adhesive property of serous membranes, when in contact and in a state of inflammation, I thought that an instrument which would seize a large extent of both ends of the intestine, approximate, compress, and inflame it, and lastly divide the whole of the double septum behind the spur, would completely answer the end proposed. The adhesion must precede the division of the parts, and this division affected by pressure, could never extend beyond the adhesions previously established. It was to be feared indeed, that the inflammation, instead of being confined to the narrow limits of the instrument, might extend to the rest of the peritoneum; but we know, from the history of foreign bodies, such as needles, pins, &c. which perforate slowly the intestinal canal, and make their appearance outwardly, after having caused the adhesion and division by pressure of the parts included in their passage, that this extension of inflammation does not take place. Experiments performed on living animals also proved to me, very satisfactorily, that in the proposed operation the patient would run no greater risk than in those frequently performed on the abdomen.

At first I had an instrument made in the shape of scissors, of which the blades were cylindrical; but soon found that they slipped over the parts to which they were applied, instead of remaining in the proper position. I then armed one blade with steel points which were received into corresponding holes in the other; but these points were liable to the same objections as the needles, as they made numerous openings in the gut, through which gases and irritating fluids might infiltrate the cavity of the peritoneum. At last, after many attempts, the *enterotome*, or instrument intended to divide the approximated ends of the gut, was constructed. It is composed of three pieces, or two lateral branches and a screw with several threads. The branches are about seven inches in length; one of them, which may be called the male branch, is formed of a blade about four inches long, three lines wide, and half a line thick on its cutting edge. This edge is undulating, and terminates in a spheroidal enlargement. At the junction of the blade with the handle there is a mortice of some lines in extent, behind which is the handle itself, two or

three inches in length and divided throughout nearly its whole length by another mortice of four lines in width.

The female branch of the enterotome is slightly shorter than the male. It has on one edge a groove intended to receive the male blade. The bottom of this groove is furnished with undulations alternating with those of the male blade, and having at its extremity a cavity destined to receive the button-like termination of the latter. At the union of this blade with the handle, there is a pivot which is received into the mortice of the male branch; lastly comes the handle, having at its extremity a perforation to receive the screw.

The latter, or the third part of the enterotome is about one inch and a half in length, terminating in an oval head; it is passed through the long mortice of the male, and received into the perforation in the female branch; its action consists in approximating at will the blades of the instrument.

The mechanism of this instrument may be readily understood. Two branches which may be separated at pleasure, having blades with very blunt and undulating edges, are put in motion by a screw through their handles; and thus they seize and retain all substances which may be between them. The first effect of their pressure is to bring the parts in contact; this pressure may be carried as far as to deprive the parts of life, but yet not to immediately divide them, on account of the thickness of the edges.

Before using the instrument on man, I made some experiments on living animals; its effects surpassed my hopes. The parts were always divided in six or eight days, and whenever serous membranes were included between the branches of the enterotome, they were found to adhere on the second or third day, consequently, long before the division which happened only on the seventh or eighth.

This highly important adhesive inflammation extends on each side, along the whole length of the branches of the enterotome, as well as around its point, which it exactly circumscribes. It is accompanied by the signs of moderate inflammation, at first weak and easily destroyed; at the end of five or six days, this adhesion is pretty strong. It afterwards becomes cellular, and is as solid as a natural union.

The action of the enterotome and the division of the parts are never attended by acute pain; the inflammation is always limited to the vicinity of the parts, around which it forms a small areola, but never extends to the tissue of the organs. It operates by causing mortification of the included parts, and the solution of continuity resulting proceeds from the fall of a slough which is always found between the blades of the instrument.

The following case was that in which the first trial of the enterotome was made:

**CASE III.**—Menage, 36 years of age, labored from infancy under an inguinal hernia on the right side. It became strangulated on the 2d of January, 1815. The symptoms were very violent and continued until the sixth day, notwithstanding copious bleedings and frequent attempts at reduction. At this period the operation was performed at the hospital of Chateau-Dieu.

The gut was gangrenous, for on the next day a large quantity of stercoraceous matter escaped through the wound. The gangrene extended and destroyed successively the intestine, hernial sac, the cellular tissue and adjoining skin. However, the disease was arrested, and an artificial anus formed

through which every thing was discharged; the substances appeared at the aperture in about an hour and a half after having been swallowed, and were expelled not in the order of introduction or digestibility, but rather in proportion to the quantity of nutrition they contained. Thus, vegetables were discharged in an hour, and meats only in two hours, and in a more advanced state of digestion. His appetite was excessive, but as his food escaped nearly as soon as it was swallowed, it afforded no nourishment, and he grew rapidly weak and emaciated.

Seven or eight weeks after the operation, he had violent attacks of colic and alvine evacuations which occurred at long intervals; this state continuing for about a year, he determined to enter the *Hotel-Dieu*.

The artificial anus was then about half an inch in diameter; its entrance bordered by irregular tumors, resulting from the swelling of the mucous membrane of the intestine; and behind it there appeared a hernia, which protruded on the least exertion. It occasionally gave passage to an invagination of the gut; the adjacent skin was highly irritated; the sufferings of the patient very great, and the smell from the wound horrible.

Menage had but one wish; that was to be cured. After a few days, I endeavored to ascertain the respective situations of the two ends of the gut. These endeavors were at first fruitless, as they were drawn down by the hernia. However, after some attempts, the ends of the gut, the spur and septum were found. Then, without loss of time, I introduced as far as possible a branch of the enterotome into each of the ends, locked them, and gently approximated the blades; the patient felt no pain; the pressure was increased the next day; a slight colic followed. In a few days the forceps were observed to be slightly movable, and on the sixth day there was a stool. On the seventh or eighth, the enterotome fell off; its blades being separated merely by a membranous band removed from the intestine, and comprising all the tissues of the two portions.

This band, as thin and dry as a piece of parchment, was twenty lines long and two wide. By means of these dimensions it was seen exactly how deep the enterotome had penetrated, and the consequent loss of substance of the intestinal septum. From this moment the fecal matter flowed by the natural anus. As after some time the artificial anus did not heal, we had recourse to adhesive straps and the cautery of the edges with a solution of nitrate of silver. In four months Menage was presented to the Medical Faculty, entirely cured of his artificial anus, and the serious inconveniences which had resulted from it.

CASE IV.—A woman, about 50 years of age, of a lymphatic constitution, fell, about 15 years since, with the abdomen against a carriage. There was a severe contusion followed by a tumor in the inguinal region. This was soon discussed. Thirteen years elapsed without a bad symptom, when 18 months ago a new tumor appeared. A bandage was applied in order to reduce it. The tumor became painful, but there was no vomiting. After fifteen days had transpired, it increased in size, and an operation was performed; for what reason, I know not. She declared that she never had any hiccup, nausea, vomiting nor constipation, and it must be confessed that in the absence of those symptoms it is difficult to recognise a strangulated hernia. In thirty days, the patient was cured. About a month after this operation, a second

tumor, but smaller than the first, appeared; it was operated upon, and the patient cured. Six months afterwards, a third tumor manifested itself, and opened externally, and from that time the patient discharged constantly through this accidental opening stercoraceous gases and matter. On the contrary, but little escaped from the normal anus; sometimes nothing during a space of three months.

In this situation the patient entered the Hotel-Dieu on the 8th of March, 1852. There was in the crural region a round wound of which the edges were slightly fungous; it was not simple, but presented several openings from which the matter escaped; otherwise there was no engorgement nor tumor. Nothing could be felt in the belly. Had this woman a crural hernia? It may be doubted from the nature of the symptoms and the two operations, which showed neither omentum nor intestine. Was there then a cyst before the hernial sac? But here the symptoms rendered strangulation doubtful, unless we suppose a portion of the gut pinched up, as sometimes is the case. From these reasons I considered it to be an organic lesion of the coat of the intestine, of which the parietes, by wearing out, gave rise to a fistula and an artificial anus.

The digestive functions were unaltered; the patient ate and digested well; and on this subject a few remarks will be appropriate. Experience teaches us that there is a great difference between artificial anus of the small and large intestines. When seated in the large intestines, it is of slight inconvenience, and digestion is undisturbed; but it is otherwise in the small guts, and the disease becomes serious in proportion to its proximity to the stomach. When situated at the lower extremity of the small intestine, the matter discharged resembles highly the fæces, and the patient is but little weakened; when at its middle part, the fæcal character is less marked; and at the upper part of the small intestine the food passes out scarcely digested, and the patient soon perishes from exhaustion.

In the woman of whom we are now speaking, digestion was perfectly performed, and the strength but slightly affected. As the matter discharged had undergone nearly all the changes of chylification and chymification, we were led to think that the artificial anus was seated at the lower extremity of the small intestine.

Eight days since, there were three small apertures which have been divided and united in one, at which the ends of the intestine necessarily terminated. The enterotome appeared to offer the best chance of success, but there was some difficulty in finding the lower end of the gut; however, after several days, we were enabled to discover it, and introduce a sound into it.

She was carried to the operating theatre, and the branches of the enterotome successively introduced, and the screw gently tightened. By twisting the instrument slightly, it was seen that its movements were very limited, from which it was inferred that the septum had been included. The operation was rapid, and gave but little pain. At first view an enteritis or peritonitis would seem to be inevitable; yet it seldom occurs. It is very singular that the gut may be contused for the space of nearly six inches, without a bad symptom, whilst its division by scissors gives rise to fatal effusion. It is on the inflammation preceding the separation of the slough that our success depends.

For a long time our patient did well, the natural course of the discharges

was established; the enterotome had fallen off, when the horrible malady which devastated Paris and raged with so much fury in the Hotel-Dieu, attacked her and deprived her of the benefit of an operation which from its quickness and simplicity promised a most favorable termination.

The enterotome being now well known, it only remains to give some general rules as to its use; they may be reduced to three principal ones.

1st. To discover both ends of the intestine.

2d. To perform the division of their parietes which are in contact

3d. To effect the cicatrization of the external opening.

On reading the works of surgeons who have treated of hernia and artificial anus, nothing appears more easy than to find in all cases the lower end of the intestine. It would seem, from their description, very evident, and that nothing remained but to introduce a sound into it. On the contrary, I think it a very difficult matter. In a great number of cases, when the disease is of long standing, and the whole of the fæces are discharged through the abdominal opening, neither the spur nor the lower end of the intestine can be discovered; there appears to be but one canal opening in the fistula. The other, partly obliterated and concealed in the abdomen, has so small an opening that it is impossible to discover it if chance, rather than any anatomical knowledge of the parts, does not direct the instrument into it. No fixed rule relative to the position of the intestine can be laid down. According to the case the upper end is superior or inferior, internal or external as regards the lower end. Therefore, in order to discover the latter we must examine the internal surface of the wound, not be discouraged by one or several fruitless attempts, and persevere until we meet with success.

Amongst the means which facilitate the discovery of the orifice of the lower portion of the intestinal canal, enemata are of the first importance, when the artificial anus communicates with the large intestine. They are also useful, but less frequently, when the termination of the small intestine is affected. In cases in which the difficulty is apparently insurmountable, by means of the tampon, purgative enemata, and generous living, we may succeed in rendering more apparent the lower end of the intestine. After having discovered the two ends, we must ascertain that there exists no acute nor chronic inflammation of the mucous membrane of the intestines, peritoneum, nor any of the organs contained in the abdomen. The irritation produced by the instrument might aggravate the disease and be the cause of death. Before performing the operation, the patient should be restricted to a moderate diet and diluent drinks, with the use of baths and other general remedies suitable to the state of his constitution. Having taken these precautions, the instrument may be introduced. In order to do this the patient is laid on his back, the surgeon takes one blade of the enterotome with the right hand, and guiding it, with or without the index finger of the other, to one of the orifices of the intestine, introduces it according to circumstances one, two, three, or four inches in depth. It is then given to an assistant, and the second blade introduced in the same way and to the same depth into the other orifice. The blades are then brought together and locked after the manner of a pair of forceps. They are secured by giving the pivot in the handle a half turn. It now remains, in order to have a hold on the intestine, to approximate the blades by pressing on the handles as with scissors. The screw passing through the elongated mortice of the

end of the female branch is received into the hole corresponding to it in the male branch, and serves to tighten the enterotome to whatever degree may be deemed proper.

After having brought the parts in contact, in order to accustom them to their new situation, we must not be afraid of tightening the instrument after the first day so much as to extinguish all vitality in the tunics included by it; by this means we avoid prolonged pain and all danger of inflammation. This pressure must indeed be increased every other day, by giving a few turns to the screw, so as to completely destroy the circulation in the septum.

At first sight it might be supposed that the action of the enterotome was dangerous; however, the patient seldom experiences any pain but at the moment of its application. A few persons alone have experienced colic, nausea, and vomiting. Substances in the alimentary canal have followed their usual route, the inflammation of the peritoneum and intestine has not extended beyond the vicinity of the instrument, the functions of nutrition have gone on regularly, and we have never seen any chill, fever, or agitation.

The enterotome, which at first is firmly applied to the gut, becomes in a few days movable and projecting. This mobility increases progressively until it falls spontaneously, without traction, pain, or loss of blood. In the cases in which I have operated this generally happens from the seventh to the tenth day.

On examining the instrument we will find between the blades a membranous band, three or four inches in length, and a quarter of a line in thickness, flattened and withered, but which recovers its volume by maceration so as to display all the elements of the intestine which has been subjected to pressure.

This division and loss of substance destroy the spur and double septum which separate the ends of the gut, and restore the communication between them. Indeed frequently the first symptoms of this restoration in the inferior portion precede the fall of the enterotome; in all cases, slight colics take place, and evacuations, at first of the white and albuminous matter contained in the inferior, and soon after the fecal matter transmitted by the superior intestines.

These evacuations are, for the few first days, numerous, liquid, and attended with colic and tenesmus, phenomena caused undoubtedly by the irritation of the inferior portion, by the contact of feces to which it had been so long unaccustomed. These gradually cease, the discharges become more consistent and regular, the appetite moderates, and strength and plumpness take the place of weakness and emaciation.

After the fall of the enterotome, the artificial anus rapidly diminishes in extent, until a very small opening remains; but here it sometimes becomes stationary and resists all our efforts. Neither recision of the edges of the fistulous orifice, their union by suture, nor their repeated cauterization, nor instruments invented in order to keep them in contact, seem to exert any influence over their cure. Compression alone, by means of a truss or any hernial bandage under the pad of which are placed several compresses, has succeeded in cases where all other means have failed. During the application of the enterotome we should prescribe strict diet, diluent drinks, rest, emollient fomentations and mucilaginous enemata. Colic, fever, hiccough, nausea, and

vomiting must be combated by general and local bleeding, the strictest diet, and even narcotics and antispasmodics.

Should the patient after the entire cicatrization or contraction of the anormal opening feel suddenly colic, nausea, vomiting, and all the symptoms of retention of fæcal matter, we must, if they do not yield to internal remedies, divide the cicatrix and give a free exit to the accumulated substances.

CASE V.—Louis Trubert, a farmer, 42 years of age, married and the father of five children, was admitted on the 15th of March, 1824, into the Hotel-Dieu, for an artificial anus. He was naturally of a melancholy disposition, and extremely limited in his intellect. His aspect was yellow, and clayey, and his weakness and emaciation very great.

Some violent exertion, eighteen years previous to his admission into the hospital, had given rise to an inguinal hernia on the left side, which he neglected, and which fifteen years afterwards had acquired the size of a full grown fœtus, and was nearly entirely irreducible.

Irritated by its size, and impressed with the idea that he was the object of public derision on account of his disease, he determined to remove it by an operation. With this intention, he made a large incision in the scrotum, opened the hernial sac, and was only arrested by the appearance of a fold of intestine of about eighteen inches in length. A physician was called, who after enlarging the wound reduced the strangulated intestine. The patient recovered, but his hernia and mania persisting, his want of success only served to fix the idea more strongly in his mind.

On the 22d. of February, 1824, three years after his first attempt, Trubert, to use his own expression, fell to work, and with a common knife which he had sharpened he again divided the scrotum, seized the intestine which protruded and cut off a large portion of it.

The pain and discharge of blood and fæces again overcame his firmness; he threw aside the knife, and cried for a surgeon. The latter again enlarged the wound, sought the ends of the divided gut, and united them by some stitches, which succeeded not in the adhesion of the parts, but in the establishment of an artificial anus.

On his admission into the hospital, there was on the left side of the scrotum an elongated tumor, as large as the head of a fœtus at full term, and extending from the inguinal ring to the bottom of the testicles. It was hard, resistant, partly reducible, and presented anteriorly and inferiorly a wound of a deep red color, formed below by the scrotum, above by two ends of intestine folded on itself and in such a manner as to form several contours; they were placed along side of each other, the right discharging semi-fluid fæces mixed with undigested matter, such as pieces of carrots and vegetables. This discharge was continual and involuntary, the other end being contracted and without discharge.

The patient complained of severe pain in the wound and its vicinity, colic, and besides a permanent pain accompanied with tension in the left iliac region; he was moreover in a most disgustingly filthy condition, rendered worse by the habit of kneading his excrement, as is often the case with maniacs.

After some days the ends of the gut were reduced and a compressive bandage applied over the accidental opening; enemata were administered and

food cautiously given; the compression, however, was insupportable, and was abandoned.

Notwithstanding an increase of the quality of his diet, the patient daily grew thinner and weaker; I then determined to endeavor to ascertain the relation and situation of the two ends of the intestine, and found that the gastric end dipped into the bottom of the scrotum, forming there inextricable convolutions, and the rectal end was directed towards the inguinal canal.

At first our endeavors were limited to his nourishment and cleanliness, and on the 31st of May, being convinced, that notwithstanding his weakness and emaciation, there was still a chance for his recovery, I determined on the operation, which was performed in the presence of M. M. Larrey, Aumont, and Sauson.

The blades of the enterotome were introduced successively into each end of the intestinal canal and as deeply as possible. The blade placed in the gastric portion would enter only about two and a half inches or three inches, the instrument was therefore fixed at this depth. On the first day, there was slight pain in the belly, and a free discharge from the artificial anus. Second day there was slight œdema and redness around the anormal opening; a gleam of pleasure was evident in the countenance of the patient. Third, fourth and fifth days he seemed still better. Sixth and seventh had slight colic. Eighth day the instrument fell, and the two cavities of the intestine now formed but one.

As usual in the groove of the female branch, the septum of the intestines, composed of eight coats, was found; it was at least three inches long, black and dry. From this time enemata were administered every day. Some flatus passed through the inferior portion of the gut, but the fæces were discharged from the artificial anus, and the patient was still weak and emaciated. Fifteen days after the operation Trubert thought there was a discharge from the fundament, and the size of the tumor began to diminish; some time after, he suffered from violent attacks of colic, threatening to exhaust his little remaining strength; but the evacuations were established through the natural anus, they became regular, and he soon recovered his strength and plumpness.

The size of the tumor did not diminish as much as might have been expected: the artificial anus continued to discharge some fæces: persuaded that in order to oblige them to follow the natural direction it would be sufficient to close hermetically the accidental aperture, I applied a compress, which kept the edges of the wound in contact. The event justified the proceeding; nearly the whole of the matter was discharged by the natural anus, and afterwards, a little more pressure forced that which still distilled from the lips of the wound to follow the same route. Then all discharge ceased from the artificial anus; and for the first time since his admission into the hospital a smile was perceived on the countenance of the patient, hitherto stamped with pain and grief. The compress, however, sometimes fell off, and sometimes produced excoriations, obliging us to remove it. The discharge was then renewed through the artificial anus. This observation frequently repeated convinced me of the necessity of using some method sufficiently gentle to be borne, and firm enough to oppose the discharge: with this intention I had recourse to a hernial bandage, which proved entirely satisfactory. These divers plans for compression had not only the desired effect, but yet another, which was unexpected, namely to reduce the hernia, of which the

size had been so great an inconvenience. Since final restoration of the course of the fæces by the natural passage, the patient has recovered his strength and good looks, and this improvement coincided so exactly with the discharge from the rectum, that his countenance served as an index of the state of the function.

Thus in less than five months was cured a patient who had twice opened a large hernial sac, and once removed a large portion of the contained intestines, and who in consequence of this wound had been affected with artificial anus complicated by a hernia and inversion of the intestine. Brought to the last degree of marasmus by want of nutrition, he only began to recover his strength from the date of the restoration of the natural passage; and what is still more remarkable, he was relieved at the same time of an enormous hernia, of which the existence had suggested to him the idea of removing it himself.

We might easily multiply the cases of artificial anus cured by this method; but it will suffice to give the general result of the operations performed during a certain number of years.

From 1813 to 1824 forty-one operations of this nature have been performed, twenty-one by ourselves, and twenty by other surgeons, amongst whom we name with pleasure M. Lallemand, of Montpellier. Three fourths of them were in consequence of gangrene following strangulated hernia, and the remaining fourth of wounds with more or less considerable loss of substance of the alimentary canal. Of these forty-one cases three have died; one from supposed effusion of fæcal matter, one from indigestion, and a third from acute peritonitis. Of the thirty-eight remaining, the majority had not an unpleasant symptom: some it is true suffered from colic, nausea, and even vomiting, but they were soon relieved by effervescent draughts and the application of leeches to the anus, and emollient fomentations to the abdomen.

The cure has not been equally perfect in all these cases. In nine there have remained fistulas of various extent, obliging the patient to wear constantly a bandage in order to prevent the escape of flatus, mucous, bilious or fæcal matter. The other twenty-nine were radically cured in from two to six months. The fatality has therefore been one in fourteen; and taking away the one who perished accidentally from indigestion, it is reduced to one twentieth of the cases operated upon; a result much more favorable than generally obtained in great surgical operations. Lastly, it is to be remarked, that the last fourth of the patients, although less fortunate and obliged to wear a bandage with a pad, were in a situation incomparably preferable to that in which they had previously existed.

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## CHAPTER LIV.

### ON DIFFUSE PHLEGMON—ITS CHARACTERS AND TREATMENT.

I have frequently spoken in my clinical lectures, said M. Dupuytren, of a species of phlegmon to which I have given the name of *diffuse phlegmon*, a designation which has since been generally adopted here. This disease,

though very frequent and severe, has been passed over in silence by most authors, while it has been confounded by others with its complications, and described by modern writers under the names of phlegmonous erysipelas, erysipelatous phlegmon, traumatic erysipelas. Many have mistaken it for phlebitis, inflammation of the lymphatics, and some other affections.

The expression *diffuse* phlegmon has been adopted to distinguish this disease from that in which the phlegmon is circumscribed. Whence is this difference? An examination of the phenomena of each will explain it. Let us take as an example of circumscribed phlegmon, a patient whom you have seen in one of the wards.

CASE I.—*Circumscribed Phlegmon of the Thigh.*—This man, after some violent exertion, experienced pain in the upper and internal part of the thigh. To this pain soon succeeded redness, swelling and tension of the part, with local fever. Still these circumstances did not give rise to any general reaction. The disease increasing, the patient was prevented from working, and came into the hospital. Having often seen slight excoriations on the foot or leg cause frequently a considerable phlegmon in the groin when seated over some of the lymphatics, we examined these parts very attentively. We could find nothing to account for the disorder, and were inclined to admit the existence of an *idiopathic* phlegmon; that is, one developed by some local cause, either internal or external, but without any effect foreign to or removed from its situation.

At this spot the skin was red, hot, swollen and tense, the least pressure gave acute pain; and phlegmon, which for ages has been taken as the prototype of inflammation, justified entirely, in this case, the opinion of the ancients upon this disease. But I should also add, that in all inflammations the degree of the disease varies; thus, one or several of the symptoms of phlegmonous inflammation are often wanting; in internal phlegmasiæ, called *latent*, there is no pain; and that tumefaction is absent, or nearly so, in phlegmasiæ of the serous membranes, and especially of the arachnoid. Nevertheless, in this species of inflammation we observe a slight swelling and engorgement of the cellular tissue adjacent to the diseased membranes.

When the phlegmon is limited to a small space, as in furunculus, anthrax, &c., the fever is local and limited, and often gives rise to no general phenomena. But if it be large and extensive, if it occupy the arm-pit or hollow of the ham, a symptomatic reaction takes place, the fever becomes general. This phenomena, it is true, is not absolutely necessary for the diagnosis of an external phlegmon; but such is not the case in internal phlegmasiæ. Here reaction instructs us in our opinion; not that the want of general reaction suffices to remove all idea of their existence, for, as I have said, in chronic phlegmasiæ fever frequently does not exist, or is scarcely evident.

While treating of febrile complication, it may be useful to recal to you that in surgical operations, an amputation of the leg for instance, fever generally comes on about the third or fourth day; this is the *traumatic fever*, of which, easily distinguished when simple and isolated, the diagnosis becomes very difficult if it be accompanied, as is often the case, by an internal phlegmasia, such as pneumonia, hepatitis, &c. If this internal inflammation causes no local pain, and be not revealed by well marked symptoms, this complica-

tion is exceedingly embarrassing, and it is impossible to distinguish if the fever be the effect of the operation, of an internal inflammation, or of both at once. Soon, indeed, other symptoms appear, and the internal affection becomes evident; but the disease is generally then beyond the reach of art.

What we have just said will serve to give you a just idea of the principal characters of circumscribed phlegmon. In order to determine those of *diffuse* phlegmon, we will again recur to one of the numerous examples offered by this hospital, and then pass to the exposition of our notions of this disease, taking care to confirm by cases the principal points.

CASE II.—*Diffuse Phlegmon of the Left Leg*.—Damien, a washerwoman, aged 68, rather fat, met with a fall by which she bruised her leg pretty severely, but without producing any wound. The pain at first was slight, and accompanied by very circumscribed redness; these symptoms, however, went on increasing; the limb became swollen; fever supervened; and she was brought to the hospital, but not for twenty days after the accident. At this time the limb was the seat of very active inflammation, and the epidermis detached at several points. At the inner part, between the middle and lower third of the limb, there was a blackish rounded eschar, about two inches in extent. Around it, and at other points in the same situation, manifest fluctuation was present. The eschar was divided, and we then arrived at the depot, from which issued a considerable quantity of very foetid, sanious pus. A counter opening was made higher up, and this also gave exit to fluid of the same character. When the soft parts were pressed, it did not appear that any communication existed between these two collections. The limb was then dressed and placed on pillows; a small bleeding was practised, and injections administered, in consequence of the bowels having been confined for some days. On the fourth day the eschar became detached, and left a large opening, which gave vent to an immense quantity of foetid pus. On the fifth, the disease had made farther progress, and soon extended over the greater part of the limb, notwithstanding the repeated application of leeches.

In other situations, continued M. Dupuytren, diffuse erysipelatous phlegmon frequently terminates in resolution, but in the lower extremities suppuration always takes place. The cellular tissue of these parts passes as rapidly into suppuration as that about the eye-lids. This termination is very unfavorable in diffuse phlegmon, and brings with it the destruction of the cellular membrane. In fact, the pus is poured out, not into one cell, not into a general cavity, but into each little individual cell, forming a numberless collection of distinct depots. Thus, where suppuration takes place the cellular membrane is destroyed in large pieces; I have frequently removed portions half a foot long. The skin now becomes attenuated, and being deprived of nourishment, perishes from this cause, and not from inflammation.

This consecutive gangrene of the skin is very common in the lower extremities, particularly the leg, where the arteries of nutrition (the anterior and posterior tibial and peroneal) are deep-seated, and do not communicate with the skin, except by very minute anastomoses, and which are destroyed by the death of the subjacent cellular membrane. This gangrene, however, is extremely rare on the head, where, nevertheless, this kind of phlegmon is

frequent. The distribution of the arteries, however, is very different; situated between the skin and the occipito-frontalis aponeurosis, they are so united with the skin that it is difficult to separate them even in dissections.

If a phlegmon takes place in this situation its seat is always between the pericranium and aponeurosis; if suppuration occurs speedily, and is limited to the cellular membrane, without implicating the pericranium, the disease is not mortal; but, on the contrary, it is usually so if this part be destroyed or denuded. But the skin escapes destruction, because the arteries continue to supply it with sufficient nourishment; even if the whole of the cellular membrane of the cranium were to perish, it would not cut off the arterial supply to the skin.

The *causes* of diffuse phlegmon are numerous. It frequently results from bleeding, even when properly performed and with a clean instrument; so also the ligature of a vein may produce it; and in this as in the preceding case, the vein itself may or may not be inflamed. The inflammation in these instances may occupy the whole thickness of the limb, or only the course of the vessel, and then it is only *diffuse* in a longitudinal direction.

When diffuse phlegmon is the result of venesection, sometimes the opening made by the lancet closes, as is usually the case; sometimes it closes and afterwards opens, but most generally cicatrization does not take place. In all cases great tumefaction ensues, which is either limited to the fore-arm, or extends to the arm, arm-pit, &c., if its progress be not arrested. Sometimes the vein partakes of the inflammation, and again it is sometimes healthy. The following is a case arising from this cause.

**CASE III.—Diffuse Phlegmon of the Right Lower Extremity, following Venesection in the Foot.**—A washerwoman, 25 years of age, of good constitution and lymphatic temperament, was admitted into one of the medical wards for amenorrhœa. She was ordered to be bled in the foot; it was done, but in a very awkward manner. Three different attempts were made over the right external malleollis without success. A more skilful pupil came, who opened immediately the saphena on the left side. The first punctures were very painful; the pain continued, and ten days after the operation the right foot became much tumefied. The swelling increased and extended to the leg; the skin was red, hot, tense: she suffered from acute pain, insomnia, and raging fever. Leeches were applied and the foot and leg covered with emollient poultices. Nevertheless the inflammation reached the knee, the whole limb was of an enormous size, and fluctuation could be felt in some places. The extremity soon became the seat of the most intense phlogosis, the mind of the patient began to wander, delirium, nausea, vomiting, diarrhœa, and a morbid sensibility of the abdomen ensued. In this state she was brought into our wards, about twenty days after the accident.

She was bled immediately in the arm, and two long incisions made on the back part of the foot, giving exit to a quantity of fetid and sanious pus; lastly a third long and deep incision at the upper internal part of the leg, where was also a large collection of pus. The delirium continued all night, the next day she had vomiting (30 leeches to the epigastrium). 3rd day. The skin of the dorsal face of the foot sloughed off, and left the extensors of the toes denuded. The delirium had ceased, but the patient was exceedingly exhausted; the diarrhœa continued, and the thigh was highly swollen and

inflamed (40 leeches to this spot). 4th day. The fever has abated, thirst less, diarrhœa inconsiderable; but another purulent collection has formed on the external inferior part of the thigh. It was freely opened, and a prodigious quantity of pus discharged. As had been done with the other incisions, the lips of the wound were kept open, and the limb surrounded by a large emollient poultice.

As the sloughing of the skin daily increased, I feared that amputation would be necessary. Yet the patient retained her strength, despite the numerous causes of exhaustion. Again, where could the operation be performed? The disease had extended to the thigh, where purulent abscesses had formed. On the other hand, the fever was high, and there was still some diarrhœa. All these circumstances contraindicated the operation, and my attention was directed to diminish the intensity of the symptoms, arrest the diarrhœa, abate the fever, and support her strength. The limb was dressed twice during the day.

It was only after six weeks from the commencement of the disease, that the inflammation appeared to yield freely. The tendons of the extensors exfoliated and fell off with the dressings; the process of reproduction began, the diarrhœa and fever had ceased. We were therefore fortunate in having given nature time to develop her resources, and thus preserved the limb. At the end of two months she had recovered her natural color and appetite, and slept well; the incisions made in the leg and thigh were healed, the wound resulting from the loss of substance filled with healthy granulations. Simple dressings and perfect rest were ordered, and the granulations to be touched every three days with nitrate of silver. About the end of the third month a small abscess formed behind the right external malleolus; it was opened, and the pus evacuated. In eight days it had healed. Soon after the menses appeared, the patient rapidly recovered, and left the hospital about the middle of the fourth month, unable as yet to execute any but very slight movements with the diseased limb.

Diffuse phlegmon is the most frequent disease produced by morbid poisons applied to the skin or cellular membrane, as in the opening of bodies. It is sometimes unaccompanied by inflammation of the lymphatics, or engorgement of the axillary glands. Nevertheless, these are generally the first symptoms which attract notice.

Excessive fatigue during forced marches is also one of the most frequent causes of diffuse phlegmon, which then presents such intensity, and is accompanied by symptoms so severe, as almost invariably to prove fatal. This malignity is owing to two causes, one local, the other general; namely, the fatigue of the limb, and the exhaustion of nervous energy by the prolonged action of the muscles.

Persons laboring under comminuted fracture, particularly if produced by fire arms, are very liable to a consecutive inflammation situated in parts adjoining a fractured bone, and this often assumes the character of diffuse phlegmon. It is also frequently seen after capital operations, and as a complication of various injuries, especially burns. It has also been known to follow the application of the linimentum ammoniæ to leech bites. Numerous observations also show that it may arise from very slight punctures and wounds without any poisonous inoculation, or from a considerable muscular exertion,

or even from the friction of rough clothing. Lastly, diffuse phlegmon is sometimes developed spontaneously, or at least without any assignable cause.

I shall illustrate these statements by some examples.

CASE IV.—*Extensive Diffuse Phlegmon of the Left Upper Extremity from a Bite on the Little Finger.*—Boyer, aged 27, a mason, playing with some companions, threw one down, who getting angry bit him in the little finger of the left hand. The pain was very acute and the part bled freely. The pain continued, and the next day it was followed by tumefaction speedily extending to the hand and fore-arm.

Ten days after, the time at which he was brought to the Hotel-Dieu, the left arm was more than double its natural size; the skin was hot, very tense and painful; the little finger exhibited a small transverse wound at its anterior surface, which implicated the skin, cellular membrane, sheath of the tendons, and from which issued a small quantity of whitish pus. Obscure fluctuation was perceived in the palm of the hand. A longitudinal incision was made there, from which a considerable quantity of pus flowed. The limb was placed in a half bent position on a pillow, and covered with emollient cataplasms.

Besides these local symptoms, there was violent fever, with rapid pulse, hurried breathing, hot skin, &c. (A large bleeding was practised in the arm, soothing drinks, and rigorous diet ordered.)

The twelfth day of the accident the patient was much better. The general symptoms and those of strangulation were partly removed. During the night an opening of considerable size was made on the cubital edge of the hand; and the upper part of the fore-arm being still tense, thirty leeches were applied. (Local baths, cataplasms.)

On the 15th day there was very marked fluctuation near the head of the radius; a free incision was made in that situation, in which a piece of lint was placed after the exit of the pus. The fever had entirely disappeared.

On the 17th day the patient was affected with slight colic and diarrhoea. (Emollient enemata with eight drops of laudanum in each, rice water for his drink.)

In eight days the symptoms of intestinal irritation had ceased, the suppuration was healthy, but the inflammation still progressing: on the 29th day another opening had to be made at the front of the fore-arm, after which the health was speedily re-established, and the cure was perfect in two months from the time of the accident.

CASE V.—*Diffuse Phlegmon of Right Arm from a Thorn in the Middle Finger; Spontaneous Phlegmon of the Lower Extremity; Death.*—Renout, a female aged 47, presenting the appearance of premature decrepitude, accidentally introduced a thorn into the middle finger. She could not give any precise account of the symptoms which followed, but it appeared by her story that the finger had swelled, and that this soon extended to the hand, fore-arm and arm, and that she was seized with gastro-intestinal disturbance. At the time of her admission into the hospital, three weeks after the accident, the hand and all the upper extremity were about three times their natural size. The pulse was rapid, the skin hot and dry; the tongue parched, the conjunctivæ red, the abdomen tender. The house surgeon immediately bled her in the arm, and had the limb covered with poultices. Next day 40 leeches were

applied to the limb, particularly about the hand. The cataplasms, fomentations and semi-flexed position were continued, and gave great relief.

On the fifth day, however, the patient complained for the first time of pain in the knee. On examining it considerable swelling was perceived, with fluctuation, without any discoloration of the skin. Twenty leeches, fomentations, and semi-flexed position of the limb were ordered.

On the seventh day several purulent depots were opened in the hand and along the inferior edge of the wrist; the bones were denuded. The state of the patient now excited great apprehension. The tumefaction had much diminished in the upper extremity, but that of the lower limb had augmented and extended itself to the thigh. The gastric disturbance became intense, cerebral symptoms supervened, and the patient sank on the ninth day after her admission into the hospital, notwithstanding the most anxious and active attention shown to her case.

The facts just related, continued M. Dupuytren, give you some idea of the character of diffuse phlegmon; but we must enter more into particulars.

The onset of diffuse phlegmon, and especially of that which is spontaneous, is announced by a rigor of greater or less severity; this is followed by heat and fever. This fever becomes continued, only it has paroxysms and remissions two or three times a day, and these have often led to such erroneous views as to occasion their being treated by means of cinchona, on the idea of there being attacks of ague. It is not unimportant to keep in mind the distinction between symptomatic and intermittent fever.

A slight degree of pain of the skin frequently comes on 24 or 36 hours before the shivering. More than once where this pain has been the only symptom, I have been able to predict the disease. The skin then becomes of a roseate hue. This color is not uniform; and one might as readily anticipate an attack of erysipelas as of erysipelatous phlegmon if a little œdema did not show itself in the subjacent cellular tissue, accompanied by perceptible pitting on pressure. What practitioner not familiar with the affection could, from such appearances, foretell the approach of so terrible a disease?

The symptoms increase, the fever runs higher, the finger applied, pressed strongly upon the skin, no longer makes any depression, but meets with a marked resistance, the cellular membrane becomes hard, the color passes into a violet, and phlyctenæ make their appearance; the bowels are sluggish, the urine is diminished or suppressed, the patient is deprived of sleep, and his agitation is extreme.

For two, three or four days the disease seems now to be stationary. If at this time an incision be made into the part, a milky serum escapes; it is abundant, and with but little pus. A few days later, the serosity is scanty, while the pus is plentiful; yet a few days more, and there exudes a discharge as white as milk, and almost as consistent as lard. The cellular membrane is now struck with suppuration (*frappe de suppuration*), and this is equivalent to saying it is struck with death. Experience alone teaches us to distrust this deceitful stage; it has often enabled me to declare the existence of suppuration, contrary to the opinion of surgeons less accustomed to the disease.

At length, in a day or two, the skin bursts, the phlyctenæ pierce the integuments, a violet colored serum exudes. White or black sloughs are perceived

beneath, which rapidly extend; the surgeon then only becomes aware of these ravages, when they have already run their course.

The period of the separation of the skin is that at which fragments of the cellular tissue are detached. The skin is therefore separated, its adhesions destroyed, so that it can be raised by blowing under it. Beneath here and there little projections are seen, the only bond union of which remains, and these are composed of vessels and nerves which have resisted the destructive process. Great care must be taken not to destroy these last adhesions, as was done some fifty years ago.

At this period of the disease redness and sensibility still exist at some points in the skin; but here experience teaches us not to rely on these deceptive signs, for these portions of skin are like the others irrecoverably lost. After some days they fade, lose their sensibility, become violet colored, and fall from want of nourishment without pain.

The local ravages are now arrived at their term, but not so the danger of the patient. You may be satisfied of this from the example of a man in the hospital who had fallen upon his knee. An erysipelatous phlegmon supervened, and extended rapidly over the leg and thigh, notwithstanding the most active means. The aponeurosis of the thigh was exposed, the tibia and patella were laid bare to the periosteum, the entire limb was deprived of its cellular membrane and skin. What could the efforts of nature avail against such extensive mischief? Art was equally powerless. A suppuration of enormous extent, amounting sometimes to a pound and a half or even two pounds in the day, rapidly exhausted the strength; and this young man, though of the best possible constitution, unavoidably sunk under it. If, indeed, the suppuration had been the only bad symptom, something might have been hoped for from the combined efforts of nature and art; but copious perspirations and purging to the extent of ten or twenty stools daily, were conjoined with the preceding. In vain were these also combated, for yet another set of symptoms came on; almost always, indeed, towards the latter stage, does suppuration in the pleura, lungs, or liver fill up the melancholy picture. More than one half of such patients sink at last from internal inflammations, especially of the liver or lungs. Such is the history of this affection, which proves more than any other of the phlegmasiæ.

Let us now consider the chief points attending it. I have particularly alluded to the fever coming on in paroxysms, which appear two or three times a day; it is often mistaken for intermittent, but it is nevertheless a continued fever, and often accompanied by adynamic symptoms, which necessarily produce a change in our treatment. I have long insisted on this period of a deceitful arrest of the symptoms, about the fifth or sixth day, which keeps even the most experienced practitioners in doubt; and so far misleads the inexperienced as to induce them to think resolution is at hand when suppuration is already declared. I have also dwelt upon the fact, that while in circumscribed phlegmon the pus is contained in one or two cells, here it fills each particular cellule of the tissue, and, after the manner in which when the muscular structures become involved in the disease, strangulation takes place, which is speedily followed by gangrene, unless relieved by free incisions. These attacks, less dangerous in children, are always alarming in adults, almost con-

stantly fatal in elderly persons; while if the patient escapes, the convalescence is of the most lingering kind, the cicatrization very difficult to effect, and the cicatrix always prone to give way again.

But one of the most important points to be attended to is the state of the digestive organs which precedes, accompanies, or follows the breaking out of the disease. Already, before it became the doctrine of our schools, had I pointed out the changes which are found in the alimentary canal after death; I shall therefore pass on to what is most important in reference to the treatment.

*Treatment.*—This form of inflammation may depend upon a cause which is either external or internal, most commonly the former, but complicated with internal symptoms. If a contused or lacerated wound be made in a person otherwise healthy, and who has no affection of the *primæ viæ*, it is very uncommon to see diffuse phlegmon produced, or at all events it is easily combated; but on the contrary, if gastric symptoms precede or follow the accident, symptoms of this kind of phlegmon come on too often without our being able to repress them. If a wound without internal complication give rise to it, though it be contused or lacerated, it must have been irritated by exposure, by violence, or by the friction of the clothes; in short, it must have been *envenomed* in some way or other.

In the treatment, then, every thing calculated to cause irritation is to be sedulously avoided. If the wound appears to be becoming inflamed, if there be any engorgement of its edges, any tumefaction about it, leeches must be applied; and if the patient be robust, one or two general bleedings will be required. It is often useful to precede the application of leeches by general bleeding; if the order be reversed, the leeches, in place of unloading the part, frequently cause an increased flow of blood to it, and thus augment the evil.

Bleeding, general and local, in diffuse phlegmon, ought to be accompanied by general, or at all events local bathing. These must be of an emollient kind, such as poultices; or still better, cold, demulcent, and sedative applications to the part. If the cellular inflammation has commenced, the baths, leeches, cataplasms, sedatives, &c. must be again had recourse to; and this antiphlogistic treatment is that which is best adapted to the first stage or onset of the disease.

But if the wound be narrow, if the inflammation appear dependent upon strangulation of the parts, simple or crucial incisions must be practised without delay, and local inflammation is often then arrested, and its spreading prevented. Rigorous diet and diluents are also indicated. There is, however, a third expedient which I have been in the habit of using, namely, a large blister to the wound and skin adjoining it. The irritation which it produces, and the suppuration sometimes prevent the development of the diffuse phlegmon.

But if before or after its appearance there be gastric disturbance, if the tongue without being red at the point and edges is covered at the base with a yellowish coating, if there be loss of appetite, nausea, with little or no tenderness at the epigastrium, one or even two emetics may be advantageous; and gentle purgatives, if the intestinal canal be itself affected, by which the course

of the phlegmon is either suspended or rendered less troublesome. It is a truth of which you may be well assured, that emetics and purgatives, formerly too much employed, have now fallen into too great neglect.

If the phlegmon be fully developed, if after a contused or lacerated wound swelling of the parts comes on, if the cellular membrane adjoining be already œdematous, one or two small bleedings may still be of service; I say *small*, for by large abstractions of blood we run the risk of reducing the patient to an unpleasant state of depression. The remedies above mentioned are to be assiduously put in force; the parts to be freed by incisions, and maintained in an elevated, very elevated position, to obviate the congestion as much as possible, and the cold sedatives to be constantly used. As to the cataplasms, so much used at other hospitals, I regard them as often injurious by keeping up the local discharge. If the symptoms continue or increase, I cannot venture to recommend blisters, having seen results so different from them that I fear to apply them. Sometimes they produce a speedy resolution; but at others, though rarely it is true, they have been evidently the cause of sloughing. I am indeed the more anxious to insist on this point, because in various theses and other works the success I have obtained has been much exaggerated. It is not in phlegmon alone, but in almost all cases of erysipelas, that I recommend these remedies, and in fact use them with great advantage. But if they be sometimes hurtful in diffuse phlegmon, still more frequently they exert no influence of any kind over its development.

About the fourth or fifth day the cellular tissue is almost always struck with inflammation. Ought then the pus to be left in these little cells, or should we hasten to free it by incisions? Such incisions sometimes diminish the inflammation and suppuration which ensue; but on the other hand they often also increase them. It is necessary, then, at this stage also of the malady to insist upon the application of sedatives and refrigerants. But if the suppuration be definitively established, hesitate no longer; cut freely into those parts whose dependent situation renders them liable to become receivers of the pus; renew the dressings frequently, and take care at each time to remove all the pus by sponges.

If, notwithstanding all your efforts, the skin perishes for want of nourishment, it is then above all that we must endeavor to support the strength of our patient, for it is then especially that adynamic symptoms are most apt to appear. If you cannot prevent them, meet the first symptoms with unirritating tonics, and those which follow with gentle antispasmodics. Spirituous preparations and even wines are hurtful; substitute for them an aqueous infusion of cinchona, and apply the bark itself externally to the parts; if on the contrary gangrene is imminent from excess of inflammation, we must again recur to antiphlogistics and cold sedatives.

It is at this time that the state of the cellular membrane comes on which is designated by the expression "struck with suppuration." Sometimes enormous portions of the skin are detached; assist their removal, but carefully avoid any forcible pulling, and spare the attachments which remain between the skin and subjacent parts. These bands consist, as has been said, of vessels and nerves, and their laceration gives pain, or causes hæmorrhage, neither of which the patient can bear without injury. A new treatment now commences: it is here that the art of dressing becomes of importance.

Wherever the pus collects it must be freed by incisions, and evacuated by gentle compression, while the vitality of the skin must be stimulated by the application of cinchona or spirituous lotions. By the combined efforts of nature and art the skin, in successful cases, is seen to become as it were glued again to the subjacent parts, and we may then know that the danger is on the decline; and every thing is to be done to facilitate the cicatrization of the denuded parts. Sometimes the inflammation runs too high for this process, and then leeches and low diet must again be had recourse to. The exuberant granulations are to be kept down with nitrate of silver; and a solution of this is often very serviceable at this time, the strength being four, five, or six grains to the ounce.

The following is the plan of dressing which ought to be adopted: the edges and a very small portion of the surface of the wound are to be covered with little slips of bandage spread with cerate. In this way the laceration of incipient portions of cicatrix is prevented when the dressings are again removed. The rest of the surface of the wound must be covered with compresses of fine soft linen spread with cerate and pierced with a number of holes, in the manner I have been long accustomed to adopt in burns. The holes allow the matter to escape, which is thus prevented from remaining in contact with the wound; besides which, the greatest advantage is obtained in being able to remove all the dressings in one mass, and with the greatest ease.

During the whole period of treatment the greatest attention is required with regard to the diet of the patient, and prevent him from the least exposure to cold or damp. I have opened a number of bodies (said M. Dupuytren) of those who have sunk under this disease, and I have observed that of those who died towards the end of this affection, the phlegmon has seemed less the cause of death than some internal inflammation resulting from some imprudence. Pleurisy, pneumonia, and hepatic abscess were the most common, and then followed exposure to cold of the chest or limbs.

If the phlegmon be situated on the lower extremities the patient must not be allowed to get up and walk; these movements give rise to determinations of blood, and this may prove the immediate cause of a return of the phlegmon, or erysipelas, scarcely less troublesome. Even when the cicatrix is completely formed, the degree of motion permitted ought to be very limited. Large cicatrices are apt to be lacerated, and this occurs in a singular manner: a little phlyctena filled with pus opens at one point, and leaves a greyish ulcer, like those we see in syphilis; the ulceration extends rapidly, and makes such progress that in twenty-four hours, more or less, the cicatrix is entirely destroyed. It is true that it is renewed with much less difficulty than before; and this accident is not always disadvantageous to the patient, for the primary cicatrix is usually very weak and easily torn; but this weakness and proneness to laceration diminish every time it is reproduced, and sometimes it only acquires sufficient solidity after undergoing the process three or four times. It is then only that the patient can be regarded as completely out of danger. Therefore, to how many risks has he not been exposed? He might have sunk under the suppuration, fallen a victim to internal inflammation, to the consecutive effects of colliquative sweat and diarrhœa, and even from the onset, before the suppurative stage, to gangrene succeeding immediately the primary inflammatory symptoms.

## CHAPTER LV.

## ON URINARY CALCULUS.

*Principal Symptoms—Anatomy of the parts—Preliminary Treatment—Operation.*

Of all surgical operations, said M. Dupuytren, lithotomy is that which has most taxed the ingenuity of surgeons. Various methods, numerous modifications, and important discoveries constitute its history. It is not our intention here to recapitulate all that is known on this subject; dictionaries and works *ex professo* will give you the necessary information; and therefore in these lectures I shall merely treat of some improvements which I have myself introduced, and of the most interesting cases daily presented in this hospital.

Four principal methods now divide the attention of the medical world, the supra-pubic or hypogastric, the sub-pubic or lateral, the recto-vesical, and the destruction of the calculus in the bladder without any incision. I have tried them all, and am acquainted with their advantages and disadvantages; but before explaining them, it will be proper to enter into some details concerning the symptoms of the existence of calculus, the anatomy of the parts, and the precautions necessary previous to performing the operation.

The principal symptoms of calculus in the bladder are, an habitual sensation of weight, erratic, dull pain, deeply seated in the lesser pelvis and at the anus; difficulty and even impossibility to ride on horseback or in a rough carriage without great increase of pain; the frequent discharge of bloody urine, or of pure blood from the irritated bladder; the irregular interruption of the stream; pain referred to the glans penis or to the fossa navicularis, obliging the patient constantly to press the part, or to draw it out; lastly, all the local and general phenomena of chronic cystitis.

But none of the above symptoms separately, nor even all conjointly, indicate with certainty the existence of stone in the bladder. Chronic inflammation, especially when it attacks the fundus or neck of this organ, and complicated by the presence of fungous tumors, or the varicose development of the vesical veins, may so far simulate this affection as to deceive even the most skilful physician.

The examination of the bladder, or sounding, is then indispensable, and the information derived from this source is as valuable as it is various. The sound does not always reach the foreign body; it frequently fails in touching it, from being too short, or caught and retained in some region of the bladder little accessible to the instrument. Generally we must seek the stone in the most depending part, and if we fail in finding it, carry successively the end of the sound over the pubic region, the apex and sides of the bladder. The examination should be repeated, in both the distended and empty state of the organ.

The end of the catheter is generally closed, in order to prevent the flow of urine and keep the bladder distended; but towards the end of the examination it is often useful to empty it, holding at the same time the instrument

nearly immovable, and waiting to feel if the flow of urine does not bring the calculus against its extremity.

In obscure cases it is the duty of the enlightened and conscientious surgeon to repeat the examination at different periods, with solid and hollow sounds, of different sizes and curvatures, and never to perform the operation unless the existence of the stone be clearly ascertained.

CASE I.—A child, 18 months of age, was brought to the Hotel-Dieu in the beginning of January 1827. The mother stated that it suffered at intervals from acute pain in the region of the bladder, accompanied by great difficulty in making water. I sounded it, but could find no stone; some time after it was brought back and again sounded; sometimes it was thought that a calculus could be perceived, sometimes not. Lastly, the mother brought it a third time, begging me to deliver her child from its torments, the pain, as she said, being so great as sometimes to throw it into convulsions. It was admitted into the hospital. Some days after it was carried to the operating room, but before making a new examination, the following remarks were made: Yesterday, said M. Dupuytren, I thought I felt the calculus, and if it really exist it is the first case of so young a child which has ever come under my notice, for it has now suffered for more than six months: the stone will be found at the fundus of the bladder on the right side. This last remark is not made unintentionally, many of you witnessed the case which I now recal to your memory: a year ago, a child two and a half years of age was admitted into the house; he had suffered for some time with very acute pain. He was sounded, and a calculus thought to be detected: I examined and was convinced that I felt the stone; this I repeated several times; sometimes I found it, and sometimes did not. The operation was decided upon, and the child brought to the amphitheatre; there I again sounded him, and thinking that I felt the stone, immediatly cut him, but notwithstanding the most attentive search no stone was to be found. The wound was kept open, I continued the search, sometimes the sound appeared to strike a foreign body, and sometimes not.

The patient suffered at intervals excruciating pain: I supposed that the calculus, which I had always found on the right side had slipped into the right ureter, and disappeared at the time of the spasm; I thought that the contractions of the ureter were the cause of it. When he was calm the calculus could generally be felt; this confirmed my idea. However, the child grew thin, and was apparently sinking, when the pain suddenly disappeared. The patient recovered his strength and gaiety. Some time afterwards he fell sick, and was transferred to the children's hospital, where he died. On examining the body there were found in the fundus of the bladder, on the right side and near the orifice of the ureter, suppurated scrofulous tubercles, and also several in the lungs.

The present case somewhat resembles that just related. The calculus appears to be on the right side and sometimes disappears. We will sound the child as attentively as possible, and use for this purpose a long gunshot probe. The curvature of the catheter sometimes prevents it from passing easily over the different parts of the bladder; a hollow sound labors under the inconvenience of admitting the urine into its cavity, and also air, and the sound of these liquids of such different density, often leads to the supposition that the

metallic instrument is striking a calculus. A stylette, which may be curved at pleasure, and solid, is free from these objections.

After these remarks, the operator proceeded to search for the calculus. He first sounded with the stylette, then with the catheter, and with a hollow sound; nothing however could be discovered. The operation was delayed.

Five days afterwards a second attempt was made; the catheter and sound were turned in every direction without meeting the calculus; at last, in the fundus of the bladder, on the left, the sound appeared to strike a hard body. This was several times experienced both by myself and M. Sasoun. As the end of the instrument seemed to be retained by this foreign substance, I suspected that the sensation we felt was owing to the sound meeting one of the fleshy columns of the bladder; for without removing the end from this spot I moved it freely about without feeling any thing; returning then to the see-saw motion I again experienced the same sensation. My colleagues concurred in this opinion, and the child was sent back to its mother.

This case is interesting not only as regards the age of the child, but it also proves that catheterism, generally so accurate, may nevertheless sometimes give but confused notions; hence no means should be neglected which may lead to the detection of the calculus. Examination by the rectum, the patient being laid on his back, and the hypogastric region depressed by the hand of the surgeon, in some cases gives a good idea of the size, weight, and situation of the stone, as well as of the healthy or morbid state of the prostate, and the degree of elasticity or induration of the bladder.

Having ascertained the existence of the foreign body, it must be extracted *per vias naturales*, by sheathed forceps, or others, be broken up and destroyed in the cavity of the organ, or lastly, the soft parts must be divided, and it must be extracted through the opening thus effected.

Let us suppose that the attempts to break up the stone have been ineffectual, or impossible from causes of which we shall hereafter speak, cystotomy is the most certain method, and that most generally followed; but here are two obstacles which must be avoided, the too small or too great division of the parietes of the bladder. In the first case the parts are lacerated, contused, and inflammation is the result; in the second, infiltration of urine is to be apprehended.

Hæmorrhagy is no less important: as regards concomitant affections, it is difficult to foresee them; but we should not forget that an effect of the traumatic fever is to augment the morbid disposition which the viscera may conceal, and cause to burst forth diseases which otherwise would never have appeared. Thus we must carefully examine the state of all the organs, as well as also that of their functions.

We will now explain in a few words the anatomy of the parts, a perfect knowledge of which is evidently of the highest possible importance to the surgeon.

The *supra-pubic region*, bounded above by a horizontal line drawn from one spine of the ilium to the other, and below by the almost semicircular line described by Poupart's ligament inserted into the pubis, is covered by the skin, beneath which we find a cellular tissue varying in thickness from a few lines to two inches and more, some branches of the external pubic and tegumentary arteries. Beneath this cellular tissue exists the cellulo-fibrous

layer covering the great oblique muscle, then the aponeurosis of this muscle. The thick dense fibres of this aponeurosis cross each other to form the *linea alba*, a species of ligamentous band which serves as a support to the anterior part of the abdomen and unites the sternum to the symphysis pubis. Behind the aponeurosis, and on the sides of the *linea alba*, are seen the pyramidal muscles, but which do not exist in all persons. The outer edges of the recti muscles, directed downwards and inwards, are inserted into the spine of the pubes. Outside of them are seen the muscular fibres of the internal oblique and transversalis muscles, of which the aponeurotic expansion passes in front of the recti muscles, and join that of the external oblique in order to form the *linea alba*.

After removing the abdominal muscles, we next come to a dense cellular layer known by the name of *fascia internalis*; then to the peritoneum, which descends from the umbilical region. Having nearly arrived at the pubes, it is folded backwards, reaches the upper region of the bladder, and is reflected over the uterus and rectum.

The bladder, when empty, is nearly hidden behind the symphysis pubis; but when distended, it elevates the hypogastric region, and may reach and even extend beyond the umbilicus. On account of its globular form, it is more immediately in contact with the pubes and lower part of the abdomen, at the median line than any where else. When empty, it is very easy by introducing an instrument through the urethra to elevate its point above the symphysis pubis. By an incision into the lower part of the *linea alba* we may turn aside the deflection of the peritoneum, so as to come immediately upon the anterior surface of the viscus.

The *perineal or sub-pubic region* presents externally the form of a triangle of which the apex is at the lower part of the symphysis pubis; the sides are formed by the rami of the pubes and ischium, and the base rests upon the anus. The skin of the perineum is thin, covered with hairs, and possessed of elasticity. Beneath it is found a layer of cellular tissue covering a cellulofibrous expansion spread over the muscles of the perineum, the bulb and corpus spongiosum of the urethra. This expansion, constituting the inferior or superficial aponeurosis of the perineum, arises in front of the anus, between the sciatic projections of the anterior surface of the middle aponeurosis, is firmly united to the external edge of the arch of the pubis, and is continuous in front with the dartos. This aponeurosis is placed under the skin, in order to separate as it were the genital and urinary organs.

On removing the parts, we perceive, behind and on the median line, the external sphincter, which at its anterior extremity divides into two layers, of which the superficial one adheres to the subcutaneous aponeurosis, and the deep-seated is lost in the *acceleratores urinæ* and transverse muscles.

On the median line, and in front of the sphincter, the bulb of the urethra is seen, situated eight or ten lines from the anus, and covered by the *acceleratores urinæ*, which furnish it with a movable and very elastic sheath. After having covered the origin of the spongy portion of the urethra, these muscles separate in front and are inserted into the corresponding *corpus cavernosum*. Their action is to raise and compress the bulb of the urethra.

The transverse muscles of the perineum are seated a little more deeply, at the junction of the *acceleratores* and external sphincter. They consist of

two muscular bands, extended obliquely from without inwards, and from behind forwards, from the tuberosity of the ischium to the median line, where they are lost in each other and in the preceding muscles. On the sides of the perineum, and joined to the ascending rami of the pubes and ischium are found the roots of the corpora cavernosa, surrounded at their origin by the erectores penis muscles, in the same manner as the bulb by the acceleratores urinæ.

From the internal edges of the ascending rami of the ischium, and descending of the pubes, is detached an aponeurotic layer arising without and behind the external surface of the superior aponeurosis, on a level with the upper edge of the levator ani muscle: in front this aponeurotic layer, which has received the name of middle aponeurosis of the perineum, perineal ligament of Carcassonne, is continuous with the inferior pubic ligament; it then is spread over the sides of the bulb of the urethra, which it fastens to the median line, towards the margin of the anus, extending between the digestive, urinary, and genital organs, so as to form a second fibrous plane, pierced merely, like the superior aponeurosis, for the passage of the median organs. Under the symphysis pubis is always to be found a perforation occupied by the dorsal arteries and veins of the corpora cavernosa. This middle aponeurosis is very strong in front, weak behind; its upper surface corresponds to the levator ani muscle; externally, its lower margin gives origin to a fibrous layer, which descends perpendicularly over the side of the pelvis, and is inserted into the inner edge of the great sacro-sciatic ligament, thus enclosing in its thickness against the ramus of the ischium, the trunk of the internal pudic artery.

On the sides of the perineum, between the urethra covered by its muscles and the corpora cavernosa, there is a cellular triangular space extending from integuments to the prostate gland and bladder. This species of canal extends posteriorly along the rectum, having no limit in this direction but the levator ani and the superior perineal aponeurosis, and in front it is bounded by the junction of the corpora cavernosa. The transverse muscles of the perineum and the artery of the same name alone interrupt its regularity; on its external side is to be seen the superficial perineal artery. Behind we meet the extremities of the inferior and middle hæmorrhoidal arteries, as well as a considerable plexus of veins. Above these different planes is found the prostate resting on the anterior part of the rectum. The converging fibres of the levatores ani descend obliquely around these two organs, fix and support them, and form in this region an elastic plane opposing efficiently the combined action of the diaphragm and parietes of the abdomen. This muscular layer is strengthened superiorly by the prolongation of the pelvic aponeurosis, which descends from all parts of the cavity of the pelvis upon the levator ani, is applied to the circumference of the prostate, envelopes the rectum and closes the inferior strait. This layer, called the superior aponeurosis of the pelvis, *fascia pelvica*, recto-vesical aponeurosis, is well represented by a concave surface, pierced for the passage of the rectum, genital, and urinary organs.

The disposition of the parts which we have just studied, continued M. Dupuytren, is the more deserving of all your attention, as it explains the difference of danger in infiltration of urine. Thus, for example, a rupture of the corpus spongiosum and bulb of the urethra, perforating the superficial aponeurosis, gives rise merely to a subcutaneous effusion because the spongy

portion and bulb of the urethra, the external sphincter ani, the erectores penis, and corpora cavernosa are placed between the middle and superficial aponeurosis. Perforations of the membranous portion, or of the rectum above the external sphincter, cause, it is true, deeper abscesses and more extended over the sides of the perineum and margin of the anus, but still without any communication with the interior of the pelvis; whilst ruptures of the bladder, above the edge of the prostate, and incisions passing its limits permit urinary or stercoraceous effusions to glide beneath the peritoneum into the pelvic cellular tissue, and thus become the cause of death. The cause of these two different results is, that in the first case the membranous portion of the urethra, the prostate, and corresponding part of the rectum and levator ani are comprised between the middle and profound aponeurosis; and in the second, because above this latter aponeurosis there exist only the sub-peritoneal cellular tissue, and the folds formed by the peritoneum around the bladder and rectum.

A further examination of the parts will show you, on the median line, between the most inferior part of the rectum and the bulb of the urethra, a triangular space to which I now call your attention; its apex corresponds to the point of the prostate, where this body touches the rectum, and consequently about nine lines in depth beneath the skin. Its base, resting against the integuments, superficial aponeurosis, and external sphincter, extends about eight or ten lines from before backwards. Its anterior edge is convex, and described by the membranous portion of the urethra, directed obliquely downwards, and from behind forwards; its posterior edge, also convex and projecting forward, is represented by the lower part of the rectum. This triangle extends transversely from one tuberosity of the ischium to the other, and is about two inches and a few lines in extent. The muscular and aponeurotic interlacing of which we have spoken occupies its middle part, and its sides are bounded by the two transverse muscles. It is in this triangular space that the bilateral operation is performed.

It is of the highest importance in so serious an operation to remember perfectly, not only the disposition of the parts, but also their exact dimensions. The spongy portion of the urethra is about five, six, or seven inches in extent. Its membranous portion is seven to nine lines in length, curved under the symphysis pubis, and strengthened internally by muscular and aponeurotic fibres, sometimes offering a serious impediment to the introduction of the catheter. The prostate, which comes next, presents on its perineal side a convex surface, flattened posteriorly and perforated for the passage of the urethra. Its dimensions in middle life are generally thirteen lines in its antero-posterior, and nineteen in its transverse diameter.

It was formerly supposed that the neck of the bladder was situated immediately behind the arch of the pubes, but we now know that the prostate is separated from it by a distance of nearly nine lines: the effect of this situation of the neck of the bladder is to elongate the straight part of the urethra and render the sub-pubic curve less marked.

In the corresponding point of the anterior part of the prostate, the arch of the pubes is generally about twenty to twenty-two lines broad at its middle; the rami of the ischii are separated by an interval of nearly two inches; lastly, the posterior or rectal portion corresponds to a separation of the tubers

nearly equal to two inches and three lines. I must add, however, that their dimensions in adult and well formed persons are subject to great variations.

The *posterior or rectal region* forms the last division of the parts which we have just studied. Directed obliquely from above downwards, and a little from left to right, the rectum descends from the end of the colon to the height of the bladder, where it is nearly situated on the median line. During this passage it presents a long curvature applied to the concavity of the sacrum, and which embraces the fundus of the bladder as far as the point of the prostate. There the rectum is again curved, changes its direction, and is carried downwards and backwards between the fibres of the sphincters as far as the anus.

That portion of the anus extending from the mesocolon to the sphincters is fixed, free from peritoneum, and constantly corresponds posteriorly to the inferior part of the anterior surface of the sacrum, the coccyx and coccygeous muscle; in front it winds around the fundus of the bladder, from which it is separated by the ureters, vasa deferentia, and vesiculæ seminales, and lower down by the prostate, which is united to it by a lamellated cellular tissue. This portion of the rectum is often dilated in old men, so as to receive, as it were, the prostate, and form on its sides two projections liable to be injured in the lateral operation for stone.

The lower part of the rectum extends from the point of the prostate to the anus. It is surrounded by the sphincters and directed downwards and backwards; forms the posterior edge of the median triangle of the peritoneum which has been already mentioned, and on account of its obliquity is about ten lines to an inch or inch and a half in height.

That part of the bladder corresponding to the rectum is divided by the ureters and vasa deferentia into three distinct regions. Of these, two are lateral, convex, larger in front than behind, and situated outside of the ureters, vasa deferentia, and vesiculæ seminales. The third is on the median line, triangular, comprised between these parts, having its base directed upwards and backwards, whilst its apex, resting on the prostate, is directed to the rectum.

Separated behind, near the circumference of the prostate, by a distance of two or three lines, the ejaculatory ducts, whilst passing through the thickness of this gland, converge gradually, insomuch that near their orifice on the sides of the verumontanum they are in contact and so closely united as to be separated with difficulty.

If we measure the integuments towards the interior of the pelvis, the space comprised between the external surface of the perineum and the reflection of the peritoneum will generally be found of the following dimensions: for the triangle comprised between the anus and membranous portion of the excretory canal of the urine, a space of 8 or 10 lines; for the height of the prostate, from its point to the middle and posterior part of its circumference between the ureters, vasa deferentia, and vesiculæ seminales, seven to ten lines; lastly, between the most elevated portion of the prostate and the vesico-rectal reflection of the peritoneum, 15 to 18 lines. It is in the length of this line, of which the total height varies from two and a half inches to three inches and two lines, that the recto-vesical operation should be performed.

The different states of emptiness or distension of the bladder and rectum

cause but little change in these relations. The only case in which the recto-vesical serous reflection descends and approaches the prostate is that in which the rectum and bladder are at the same time contracted and reduced to a very small size. The peritoneum has then been seen nearly to touch the prostate, so that it would have been difficult not to wound it in exceeding the limits of this gland.

We have now explained in a general way the parts which may be wounded by the instrument in the operation of lithotomy: we will hereafter make known the consequences which must be drawn, relative to a choice between the different methods of operating.

It has been endeavored, continued M. Dupuytren, to establish by calculation the proportion of deaths; but general statistical results differ too much to merit any confidence. The following table exhibits the results to which I have arrived after having collected for ten years 356 cases of cystotomy, both in my own practice and that of the most distinguished men in Paris and its environs.

Sex.	Ages.	No. of Operations.	Cured.	Dead.	Ratio of Deaths to Cures.			
Male.	from 3 to 15 yrs.	97	88	9	1 to 11	9	100	
	15 30	59	51	8	1 7	13	$\frac{1}{2}$	
	30 50	45	35	10	1 to bet. 4 & 5	23		
	50 70	74	56	18	1 4	24		
	70 90	37	26	11	1 to bet. 3 & 4	29	$\frac{1}{2}$	
Female.	from 3 15	7	7	0	0 0	0	100	
	15 50	11	10	1	1 3 3-9	10		
	50 70	17	15	2	1 to bet. 8 & 9	12		
	70 90	9	7	2	1 to bet. 3 & 4	22		
Total.	3 90	356	295	61	1 to 6	17	100	
Men.	Id.	312	256	56	1 to bet. 5 & 6	18	100	
Wom.	Id.	44	39	5	1 to 9	11 $\frac{1}{2}$	100	

If we take the mean of the ratios expressed in this table, we arrive at the general result that the chances of death are to those of cure :: 1 : 5; or :: 1 : 6. This proportion, at first sight, seems considerable, but will appear much less so if we remember the importance of the parts, as well as the presence of local or general affections.

It will also be seen that the operation is most successful in childhood; then in youth, and middle age; whilst the favorable chances diminish rapidly with increase of years.

We will now say a few words on the preparation to which the patient should be subjected; the season of the year is of but slight importance; but

if possible, we should avoid performing the operation during the prevalence of an epidemic, and visceral or other inflammatory diseases. If the patient be affected with nephritic pains, they must be subdued by venesection, emollient drinks and baths. Bleeding is indicated when the pulse is full; the patient should be purged once or twice, and put upon a mild diet. The evening preceding the operation an enema to empty the large intestines should be administered; and the perineum, scrotum, and margin of the anus shaved.

The prognosis is different in different individuals; more favorable in women and children than in adults and old men: success is more certain when the operation has been rapidly done: persons of a nervous and irritable temperament bear it less easily. Patients who have had the disease for a long time, and whose constitutions are worn out, and, at the same time, labor under extensive affection of either the urinary or other organs, offer but slight hopes of success.

It now remains to operate: this is done differently according to the sex.

The hypogastric or high operation, to which I shall first call your attention, cannot be practised indiscriminately in all cases, and without regard to age, sex, constitution, volume of the stone, &c. We should have recourse to it only when the approximation of the tuberosities of the ischii, the presence of tumors in the inferior strait of the pelvis, or the great size of the calculus render its extraction below the pubes impossible. I may quote in support of my opinion the experience of Frere Come in this operation, in 84 cases of individuals of different ages, sex, station, and health; the result was one death of four and a half operations. This result is much less favorable than that now obtained in an equal number of lateral operations performed indiscriminately, as in the cases of Frere Come on children, women, adults and old men.

As regards the instruments and method of this surgeon, while granting them all their real advantages, continued M. Dupuytren, I am far from thinking that they have removed all the dangers of the operation; thus, in a thesis defended in 1812, for the chair of operative surgery vacated by the death of Sabatier, on the subject of lithotomy, I advanced the opinion that incisions in the perineum and neck of the bladder added to the dangers of the high operation all those of lateral method. Since then, I have thought that a catheter introduced into the bladder either through the urethra or perineum, increased the inconveniences and dangers of the high operation without being of any utility.

These two opinions have, for a long time, been the subject of controversy among physicians; some maintaining that an incision in the perineum, reduced to small dimensions, added nothing to the danger of the hypogastric operation; but that, as it terminated in the most depending part of the bladder, it afforded a more ready exit to the urine.

Among these objections, that which consisted in maintaining that the incision of the perineum and neck of the bladder did not render the operation more dangerous gave way to the results of the lateral operation, of which the mortality, under the same circumstances, is only one in six. Therefore, what is this opening in perineum in the supra-pubic operation if it be not the lateral operation? It is idle to assert that this incision reduced to smaller dimensions is less dangerous than the lateral operation; it is too well known that the danger of an incision is not measured by its extent.

The objection drawn from the facility which an incision in the perineum gives to the introduction of the spear-shaped sound is more plausible. Indeed, it cannot be denied, if this sound be indispensable, that it is more easily introduced into the bladder through an incision in the perineum. But the spear-shaped sound may be introduced by the urethra, as I have frequently done on the living subject. It is sufficient to give a greater curve to its extremity, and depress more strongly its handle, after having introduced it into the bladder; moreover, the spear-shaped sound is not indispensable for the performance of the high operation, as we shall presently clearly prove.

As to the facility presented by an incision in the perineum for the discharge of urine, it may be easily understood that a catheter introduced by the urethra would fulfil the same indication with much less danger. But the opinion entertained that an incision in the perineum and a sound introduced into the bladder divert the urine from the wound above the pubes, is a mere supposition contradicted daily by observation. Indeed, whatever may be the extent of the wound in the perineum, the urine is never entirely diverted from the supra-pubian wound. It seems as if whenever the bladder has been wounded in any part, this point becomes the centre of all the contractions of the organ, and thus in consequence of these contractions the urine is expelled. I have, therefore, for a long time, considered as useless the precautions taken to prevent the urine from flowing through the wound made in the bladder; nay, further, I consider as dangerous any means tending to diminish the facility of the passage of the urine by the wound, such as approximation, compression of its edges, sutures, or any similar method. I believe that they give rise to infiltration of urine, and subsequently to inflammation of the peritoneum or the cellular tissue of the pelvis, two of the most serious accidents complicating the operation for stone.

I think, in the high operation, that the best plan of proceeding is to leave the wound to itself, merely to keep its lips separated by a layer of thin linen, and relax them by position. The following case will explain the plan of operating which I prefer.

CASE II.—M. Le R...., aged 62 years, of middle stature, strong constitution, sanguineous temperament, of great activity, and accustomed to hard work, and generous living, had for a long time experienced frequent desire to make water, difficulty in so doing, and acute pain after the evacuation. For the last ten years to these symptoms was added hematuria, whenever he took a long walk or ride, or was guilty of any excess in eating or drinking.

For the last two years the symptoms have increased, the discharge of urine is almost continual and involuntary; he suffered from constant pain in the hypogastrium and perineum. At this time a surgeon sounded the patient, and found no stone; a year afterwards, another surgeon pronounced the disease to be catarrh of the bladder, and prescribed accordingly.

However, the affection grew daily worse, the urine came away by drops, accompanied by horrible pain. The violent suffering he experienced obliged him to keep in bed, where he was attacked by a slow fever, and daily became worse and more emaciated. His urine carefully examined, gave out a most pestilential ammoniacal odor, and was apparently composed of a mixture of urine, blood, pus, and vitiated mucus.

I was then sent for (1824) to see the patient, at that time living at Chantilly

the history of his symptoms, I concluded that there was a calculus in the bladder, and that it was either very large or situated in the neck of this organ. I sounded the patient, and the sound struck against the stone, before having penetrated into the cavity of the bladder. After several attempts, I could only partly succeed in introducing it. The sound placed between the foreign body and the parietes of the bladder seemed as if it were in a vice; and the finger introduced into the rectum discovered the fundus of the bladder filled, dilated, and hardened by the presence of the foreign body. I then examined the hypogastrium, after bending the body forward, and found behind the pubes, at the bottom of the median line, a hard, resistant, voluminous body.

The urine appeared purulent, but the inflammation, of which it was the product, might be an effect or symptom of the stone which would disappear on its removal. The size of the calculus left no doubt as to the propriety of performing the high operation.

The patient on learning the existence of a stone in his bladder, seemed rejoiced that all uncertainty about his case was at an end, and begged me to free him immediately from his enemy, by any means whatever. A bath and gentle laxative were prescribed; and the following evening I returned, accompanied by M. M. Sauson, Lemaire, Marx, and Souze.

The pubes were shaved, and the bladder, hypogastrium and rectum again examined. This examination confirming the one made the previous evening, I introduced a common silver catheter into the urethra, but it was prevented by the stone, situated opposite to the neck of the bladder, from entering that viscus. Standing therefore on the left side, M. Sauson being on the right of the patient, his legs were flexed on the thighs, and these on the abdomen. M. Sauson then introduced his forefinger into the rectum, raised the stone, and caused it to project as much as possible above the pubes.

I then made an incision three inches long, extending in the direction of the median line from the symphysis pubis. The adipose cellular tissue was next divided, then the aponeurosis of the muscles; the pyramidal were separated from the recti muscles, and divided transversely for several lines on each side, and between them I could feel the stone. Applying then the forefinger of the left hand to the symphysis pubis, and guiding upon a straight sharp pointed bistoury, I plunged it into the bladder just behind the symphysis. A white, thick, inodorous pus immediately escaped. I thought at first that I had opened an abscess of the cellular tissue surrounding the bladder; but the point of the bistoury had touched the stone; it had therefore reached the bladder, in which the incision was enlarged from below upwards for five or six lines; the index finger being then introduced, I found the parietes of the organ to be half an inch thick, and its cavity filled with an enormous calculus, and also, to my great satisfaction, that there was a space of two inches from the highest point of the incision and the upper part of the bladder, which is not generally covered by peritoneum. The incision was therefore enlarged by a probe-pointed bistoury.

I then proceeded to the extraction of the stone. It seemed fixed to the centre of the pelvis by its size, shape, and the contractions of the bladder. In this situation I separated the blades of the forceps, and introduced them successively on each side of the stone, and having joined them together, gave to the calculus a vibratory motion; then desiring M. Sauson to pull it firmly

upwards, it was extracted. Its shape was precisely that of the bladder, which it entirely filled, and was three and a half inches in height, three inches in length, and two and a half in thickness. M. Lemaire weighed it immediately, and found it to be six ounces and a half in weight; it consisted of the phosphate of magnesia and ammonia.

The dressing was of the simple kind; the patient was laid on his back, his legs slightly flexed by means of a kind of bolster placed under the hams; a large pledget of fine linen introduced through the wound into the bladder, and above that was placed a piece of perforated linen spread with cerate. No sound was introduced into the urethra, nor into the wound; no adhesive straps nor sutures were used; the patient was wrapped in cloths to receive the urine, and merely ordered a simple decoction of the root of the dog's grass (*triticum repens*) sweetened with syrup of gum. The abdomen was covered with flannels soaked in an emollient decoction.

He immediately expressed himself much relieved, and being free from pain slept for two hours. During the night the abdomen became painful, he had a chill followed by fever, without hiccough or nausea. He was bled largely from the arm, the urine flowed freely through the wound.

The next day he was pretty well; however, as the pulse was full and frequent, and the abdomen slightly tender, he was bled nine ounces; the lint in the wound was renewed frequently.

Fourth and fifth days, suppuration was established; it was abundant and healthy; the pledget was changed, and the dressing renewed morning and evening, the urine still flowing by the wound.

The urine soon began to pass by the urethra, the aperture and suppuration diminished. He recovered daily his appetite, strength, and good spirits. In short, at the end of a month's time he was completely cured.

The plan pursued by M. Dupuytren in the preceding case may easily be established as a general rule. The two following precepts have long been taught by this surgeon. 1st. If we determine on the high operation, it should be performed immediately, and not be considered as the *ultima ratio* of any other method. 2d. We should omit the incision in the perineum, and introduce the spear-shaped sound through the urethra (when this instrument is deemed necessary). In some cases it is proper to introduce afterwards into this canal an elastic catheter.

*Lateral Operation.*—Every thing has been already said concerning the lateral operation, continued M. Dupuytren, and notwithstanding all its success it is a dangerous operation. Convinced by my own experience that it might be advantageously modified, it occurred to me to divide the neck of the bladder in the direction of the symphysis pubis. In this operation, which I performed for the first time in 1816, the instruments do not differ from those usually used except in the substitution of a probe-pointed bistoury for the lithotomy of Frere Come.

The patient being tied and placed as in the ordinary operation, a grooved sound was introduced into the bladder, and given to an assistant who at the same time supported the testicles: the sound was held in a perfectly vertical direction. The operator, holding in the right hand an ordinary bistoury, and with the left keeping the skin of the perineum tense, made in it, and in the direction of the raphe, an incision about 18 lines in length. It commenced

at about two and a half inches from the anus, and terminated at nearly one inch from it. A second incision, parallel to and at the bottom of the first, divided the accelerator urinæ muscles and the adipose cellular tissue filling the space between the bulb of the urethra in front and the rectum behind: it exposed the membranous portion of the urethra. At the third step of the operation, the membranous portion was divided throughout its whole extent. The lithotome was then introduced on the sound, which was withdrawn, then the cutting edge of the former was turned upwards towards the symphysis pubis, and the operator pressing the handle withdrew it, and thus made an incision, dividing, 1st, the neck of the bladder, and the lower portion of the anterior wall of this organ: 2dly, the most remote part of the superior portion of the urethra, the part above the prostate, the cellular tissue placed between the anterior ligaments of the bladder, and the arterial or veirous branches in its passage.

There results from this operation a wound of a triangular shape, disposed in the following manner: the apex corresponding to the anterior inferior part of the body of the bladder, and the base to the skin of the perineum.

We will find in its passage, proceeding from below upwards, the skin of the perineum and the bulbo-cavernosi muscles, the bulb of the urethra, the sub-pubic ligament, the symphysis pubis, the anterior ligaments of the bladder, the cellular tissue, and vascular plexus, corresponding to these different parts. The posterior edge comprises the space between the posterior angle of the external incision and the anterior and inferior part of the bladder. Between these points, we find proceeding from below upwards, the skin of the adipose cellular tissue, the muscular plane resulting from the reunion and interlacing of the fibres of the external sphincter, accelerator urinæ and transverse muscles, the lower part of the prostate, with that of the portion of the urethra embraced by this gland, the posterior part of the meatus urinarius, the upper part of the neck of the bladder and prostate, the inferior part of the anterior wall of this organ; all divided by the bistoury or lithotome, except the lower part of the prostate and urethra corresponding to it. Nearly in the centre of the wound is found the membranous portion of the urethra, of which the superior and inferior parietes are divided at the same time. The calculus, when extracted, must therefore pass through a first aperture which is nearly vertical, and answers to part of the neck, and anterior inferior portion of the bladder; a second slightly oblique upwards and backwards, like the membranous portion of the urethra to which it belongs; a third horizontal, corresponding to the skin of the perineum.

Such is the method, continued M. Dupuytren, which I intended to substitute for the lateral operation. It was tried for the first time in 1816 on a patient 18 years of age, with entire success. In 1824 the double lithotome was substituted for the single; here the incision was made transversely from right to left. It was first used on the 24th. of April, of the same year, at the Hotel-Dieu.

CASE III.—Alexander Patrii, aged five and a half years, of a good constitution, had labored under calculus since the age of three years. The operation just described was performed with great ease, and a stone extracted of about the size and shape of a small almond; but little blood was lost. Du-

ring the day, the patient suffered some pain in the epigastrium, which was relieved by leeching, emollient poultices, and sweetened drinks. However, the pain reappeared, and was seated particularly in the abdomen; the tongue slightly red at the edges: I prescribed a plaister of mercurial ointment to the abdomen. He was bathed twice, and enemata of decoction of poppy heads administered. Lastly, twelve leeches were applied to the hypogastrium, and from that time no symptoms of gastro-intestinal irritation were perceived. The urine had flowed guttative on the third day of the operation; on the fifth, the prepuce was slightly swollen; on the tenth, the oedema had attacked the whole penis and scrotum; resolvents were applied to the parts; the swelling continued until the 18th day, when it suddenly disappeared, and the urine passed entirely by the urethra. On the 19th of May, twenty days after the operation, he left the hospital perfectly cured.

CASE IV.—On the 21st of October of the same year, this operation was performed, for the third time, on a child named Denis Cintrat, 11 years of age, enjoying otherwise good health. Two calculi were extracted, and he afterwards left the hospital cured.

Thus it may be seen that in the early cases the new method was successful. I was, however, perfectly aware of the objections to which it was liable. Indeed, it seemed, that by means of it we would avoid two of the most serious complications of the lateral operation; namely, division of the rectum, or of some of the arterial branches. The incision, being parallel to the rectum, could but seldom injure it, and only in the extremely rare cases in which this gut, being enlarged as it is often in old men, has left its natural situation; but again, if it were not exposed to this danger, might it not be frequently wounded by the first incision, which, being directed from before backwards, falls perpendicularly at a short distance from the anus, and consequently might easily injure the rectum. It was evident, also, that the first incision on the median line would be a safeguard against hæmorrhage; but in the second, how greatly the trunk of the internal pudic is exposed, which, not being protected by the ascending rami of the ischium, tends towards the median line, and which, during the operation, approximated to the bladder by the distention of this organ, is closely applied to the ramus of the bone, and cannot avoid the impending danger. Lastly, by this method, the divided sides of the urethra might be lacerated by a rough, or simply a large stone; the cellular tissue surrounding the neck of the bladder might be contused, the wound heal slowly, and inflammation and ecchymosis of the scrotum might add to the danger of the operation.

*Bilateral Operation.*—Convinced by reflection and experience of the serious nature of these objections, I determined to find a method of avoiding them. The greatest danger resulting from the longitudinal direction of the first incision, it struck me that by a transverse incision I should avoid wounding the rectum, inflammation of the scrotum and prepuce, as well as the more ordinary hæmorrhage, namely, from the branches of the transverse and internal pudic arteries. Here, however, arose another difficulty. The bladder was not so easy of access, and the opening would not permit the extraction of a large calculus. It was therefore necessary to give the incision another shape, and, desirous of preserving its transverse direction, I determined to

depress its extremities, giving it a semi-elliptic curve. As this incision might be extended on the sides of the anus as far as the volume of the stone would require, the principal difficulty was thus avoided.

The instruments used in the lateral operation required some modification. I therefore substituted for the ordinary staff one made much lighter, sloped at the end of the groove, enlarged at its middle, that is at its greatest curvature, for the extent of about two inches. Thus, it presents at the point in which the incision should be made in the urethra, a deep groove, with rounded, separated, and, as it were, inverted edges, which by its length and shape renders the section of the canal more easy. The end of the staff was free from the usual cul de sac, which frequently renders it difficult to disengage the lithotome from its groove. Lastly, the beak of the instrument was furnished with an olive-shaped enlargement, by means of which it passed more easily through the urethra.

For the incision into the bladder, I make use of the double lithotome, which being opened in the bladder, effects when withdrawn a division of the neck of this organ, the urethra and prostate, by a double incision perfectly symmetrical.

This instrument was constructed on the same plan as that of Frere Come, but with two blades slightly curved, as well as their sheath, on one surface. The handle turns on a central screw, by which the degree of expansion of the blades is regulated at will.

Twenty-six patients, on whom I operated soon after, were all perfectly cured. Such success was very gratifying, especially as I had used an imperfect instrument. The double lithotome preserved a transverse direction, approximated too nearly to the tuberosities of the ischium, and endangered the internal pudic. In vain were the blades bent, or did I depress my hand when withdrawing the instrument, the same inconvenience still existed. Numerous cutlers endeavored to effect this important improvement; but were all unsuccessful. At last M. Charriere, whose skill is well known, succeeded in making a double lithotome of which the blades when opened gave the long desired oblique direction to the incision. The following is an exact description of the instrument.

Like all the double lithotomes made previously by the same cutler, this opens by means of a single spring. This spring placed above, has on its lower surface a steel prong of which the two rounded branches separate like the letter V. Each one of these branches enters a hole made in the end of the heel of the blade, and may be raised or depressed with separating or approximating the blades themselves. The blade is divided into two parts of unequal length, forming a very obtuse angle. This angle is the point of articulation of the blade with the body of the instrument. The two small mortices which receive the corresponding part of the blade are directed obliquely from above downwards, and from within outwards, so that the blade when it leaves the sheath, follows an oblique line, and makes a curved incision. The separation of the blades is graduated by a very ingenious contrivance. The stem of the spring is divided, and in the division is a small steel slider, held by a screw-button. By making it slip in the groove of the spring, the degree of separation of the blades may be most accurately determined.

The advantages of the double lithotome may be easily perceived. Indeed, we can by one incision make an opening in the sides of the neck of the bladder, varying from six to twenty lines, beyond which limit it is not prudent to extend it. In order to perform the operation the patient must be placed as in the ordinary position for lithotomy. The staff is introduced and given in charge to an assistant who holds it in a perfectly vertical direction. Holding a double edged knife in the right hand, and with the other making the integuments of the perineum tense, the surgeon makes a semi-circular incision, beginning on the right side, between the anus and ischium, and terminating at a corresponding point on the left, passing five lines in front of the anus. The knife divides successively the subcutaneous cellular tissue, the superficial perineal aponeurosis, and the anterior point of the external sphincter ani.

The origin of the membranous portion of the urethra being exposed, the index finger of the left hand seeks the groove of the staff, and guides the point of the bistoury into it. During this first step of the operation, care must be taken to depress with the finger the lower edge of the wound, and also to remove and protect the rectum from the knife.

An incision is then made in the urethra, and the lithotome guided by the nail of the index finger of the left introduced into it, with the convexity of the curve corresponding to the anus. Having ascertained its proper situation as regards the groove, the surgeon takes hold of the handle of the staff, and raising under the symphysis pubis, carries the lithotome forward into the bladder.

The staff is then withdrawn, and the lithotome turned so as to present its concavity downwards. The surgeon then depresses the spring until it meets the handle, and withdraws it not horizontally, but gradually inclining it downwards. After this last incision the forefinger of the left hand carried into the bladder informs us as to the extent of the incision, and serves as a guide to the forceps.

The operation just described was successfully performed on several individuals; the following case, however, was not so fortunate, and we will therefore give it in detail.

CASE V.—B. . . . 63 years of age, married, by trade a locksmith, of a good constitution, and lymphatico-sanguineous temperament, had always enjoyed good health, although habitually working hard. Some years since began to pass with his urine small calculi, which, however, gave him no pain. In the beginning of the year 1827, he felt for the first time, pain in the bladder and difficulty in making water. Hæmaturia sometimes came on after hard work. The desire of making water became more and more urgent, and he could no longer retain it. There was pain after the discharge at the end of the penis. He came to Paris for advice, and was admitted into the Hotel-Dieu on the 22d of August, 1829.

The patient labored under all the symptoms of calculus; the sound gave notice of a hard, sonorous, resisting substance in the bladder; there was in short no doubt as to the nature of the disease. He asserted that his urine was limpid, but some of it being preserved, at the end of 24 hours deposited a copious sediment of purulent matter. This was an unfavorable circumstance, but did not contra-indicate the operation. The patient's general health being good, he was prepared for it by baths, diet, and a mild laxative.

On the 27th the operation was performed, and a small calculus extracted; two others of the same size were also withdrawn. The patient was then carried to bed.

About two o'clock in the afternoon of the same day, I visited the patient, and found him in a state of great suffering. He had had chills and tenesmus; the hypogastrium was tender, and tense; the perineum also tense and painful; a little blood escaped from the urethra. I suspected internal hæmorrhage, examined the wound and found it closed by a clot, which was removed, as well as some others which were deeper seated. Tepid water was then injected into the bladder. During this operation the pain was very acute, but some relief was experienced from its evacuation. By this means the bladder was freed of the blood which it contained. The patient's linen was changed, and he immediately fell asleep. I did not consider the bleeding dangerous, and the patient did not lose more than twelve ounces.

28th. The patient is pretty comfortable, and had slept part of the preceding night. There had been no more hæmorrhagy. The belly was tense and slightly painful; twenty leeches were applied to the groins.

29th. All the functions in good order, no pain in the abdomen, no febrile symptoms. The body was covered with perspiration: the pulse weak and almost imperceptible.

30th. His pulse has improved, he has no pain, nor chilliness, but a tendency to sleep; tongue slightly dry. His mind began to wander during the night. He was ordered punch, and a bath extending as high as the umbilicus; if his situation permit, immediately after the bath two blisters are to be applied to the legs. (Broth as his diet.)

31st. The blisters were not applied as he appeared a little better; he is still weak, slow in answering, but with less disposition to sleep.

September 3d. The patient does not complain of pain. However, he is exhausted, becoming emaciated, has a slow fever, the urine has commenced passing by the urethra. The wound is healthy. The belly hard and swollen (leeches were applied to the epigastrium, and the baths continued). I judged that there was inflammation of the cellular tissue of the bladder.

5th. Nine days after the operation. B... , although weak, appeared pretty well. He has not yet had a stool, he was therefore ordered a purgative enema. He also swallowed some old wine, and a little soup.

During two or three days he appeared to be doing well, but he soon became sleepless, and rapidly emaciated. Diarrhœa came on; a slough formed on the sacrum. Bark and other tonics were vainly administered; his pulse became more and more weak, delirium supervened, lasting twenty-four hours, and the patient expired on the morning of the 17th, 21 days after the operation.

*Autopsy, 32 hours after death.*—Corpse free from rigidity, flesh soft; slough on the sacrum small and shallow; considerable emaciation.

*Cranium.*—Meninges healthy. The cerebral substance firm, gritty and injected. There was but a small quantity of serosity.

*Chest.*—Ancient cellular adhesions at the apex of the left lung. The bronchiæ slightly red.

*Abdomen.*—At the greater curvature of the stomach there was a large, pale red patch in the mucous membrane, softened and easily detached. This ramollissement extended over a surface of at least three square inches. In

the duodenum small red spots or membranes were observed, becoming more numerous as we descended. Soon we found here and there small superficial ulcerations, very numerous towards the end of the small intestine; the cœcum was also filled with ulcers. The peritoneum was inflamed, thickened in some places, in others covered with albuminous flocculi. The cavity of the lesser pelvis contained about a pound and a half of purulent serum.

*Genito-urinary Apparatus.*—The wound going from the perineum to the bladder presented no sign of cicatrization; it was as large as on the first day. The whole of the perineum was infiltrated with blood, and the cellular tissue surrounding the rectum with pus. Putrefaction, which was already far advanced, prevented the discovery of the wounded vessel. Pus mixed with blood existed all around the wound. The prostate was not entirely divided; the opening into the neck of the bladder was about fourteen lines in extent; the mucous membrane lining this sac was red, thickened and injected, highly phlogosed, and nearly entirely covered by a false membrane strongly adherent to it. The ureters were healthy; no calculi were found.

Recapitulating what has been said on the bilateral operation, we will see that this method presents the following advantages:

1st. Its performance is more easy, quick and certain than the majority of other methods; in this point it even surpasses the lateral operation.

2d. The incision is made in the widest part of the perineal strait of the pelvis, and therefore at the most favorable point for the extraction of calculi, of any size whatsoever.

3d. It opens into the bladder a shorter and more direct passage than either the lateral or vertical incisions, and through which the instruments can be more easily managed. The urine can flow freely through this opening, and meets with no obstacle which might favor its extravasation into the cellular tissue.

4th. It has the advantage over lateral incisions of making in the neck of the bladder and prostate an opening large enough for the extraction of very voluminous calculi, without going beyond the circumference of this gland, or those limits beyond which its division becomes dangerous.

5th. It avoids more certainly than the lateral operation the ducti ejaculatorii, of which the lesion is a matter of some importance.

6th. Lastly, this operation may be performed on both sexes, and at all ages.

The bilateral operation has been performed 66 times at the Hotel-Dieu, and in private practice; of these 6 have died; 26 cases were successively happy in their result. The proportion of deaths is generally :: 1 : 12.

This experience is far from being extensive: but without pretending that the bilateral method guarantees us from hæmorrhages, infiltration of urine, and inflammations, so liable to occur from similar operations, it is evident that if it augment even very slightly the chances of success, that it is to be preferred to all other operations in the perineum, and especially to the lateral operation, at present so much in use.

In a subsequent lecture we shall treat of the recto-vesical operation, and of the different methods of destroying the stone in the bladder.

## CHAPTER LVI.

## ON GUN-SHOT WOUNDS.

THERE is not perhaps in the whole domain of surgery a subject so complex, embracing so many practical questions, and of which the diagnosis and treatment demand more extended knowledge, correct judgment, and skill, than wounds from warlike weapons in general, and from fire-arms particularly. Thus, notwithstanding the numerous cases which accidents in hunting, public festivals, duels, suicides, &c., have brought before the notice of M. Dupuytren for many years, he could not have established a practical theory from these isolated cases, caused mostly by the same weapons, the same projectiles, and presenting similar characters or occupying the same regions of the body. But three periods, celebrated by different names, the misfortunes of the country in 1814 and 1815, the glorious and bloody combats of 1830, and the unfortunate struggle of 1832, have given to this distinguished surgeon an opportunity of exercising his genius upon this important subject. Before treating of wounds, said M. Dupuytren, we will enter into some details concerning the effects of fire-arms in general. It will be then much easier to apply fixed rules to the injuries which they occasion. These effects depend upon two principal causes; the manner in which the gun has been loaded and the distance at which it is discharged.

If a gun be loaded with powder merely, and not wadded, the explosion is not very loud, but severe enough to contuse the skin violently if sufficiently near to it. If it be loaded with powder and wadded, the effects will vary according to the resistance and distance of the body which receives the injury. This is a fact, which I have myself seen. Two persons had a quarrel: one of them discharged a gun loaded only with powder at the belly of his adversary, who fell instantly dead. The shot was fired at the distance of one or two feet. Being questioned before a judiciary tribunal as to the cause of his death, we found on examination the clothes torn, the parietes of the abdomen pierced by a hole of more than an inch in diameter, the intestine opened; the wad of the gun was in the middle of the belly, and no other aperture existed; it was certified that the gun contained merely powder. Similar cases are well authenticated. It often happens that suicides in their hurry and agitation forget to put the ball into the pistol. The parietes of the mouth are then violently distended by the rarefaction of the air. Sometimes the wad traverses the palatine vault. If the shot is directed backwards, the vertebral column indeed is not injured but the velum pendulum is lacerated; and sometimes also the lower jaw bone is fractured. You all know that a certain quantity of water forcibly projected from the barrel of a gun, will stun and even kill birds. Even a tallow candle will at a short distance pierce a pretty thick board. The extreme rapidity communicated to the soft body here supplies its want of density, and overcomes the cohesion of the wood. A handful of coarse salt does not do much damage if the gun has not been loaded for a long time; but if the salt have had time to concrete, and the shot be near, the load may fly like a ball and do serious mischief.

Small shot of different sizes acts in two ways; it either strikes in mass, or as it is said, makes a ball (*fait balle*) which depends on the gun and the distance, or it scatters and falls separately. In the former case its effects are more severe than those of a ball. It was by an accident of this nature that a son of Marshal Moncey was killed, and every year we hear of new victims to imprudence or awkwardness. A ball will frequently pass through the lungs without causing death, whilst a load of shot lacerates these organs and inevitably destroys the patient. In the second case, that is, when the discharge is distant, accidents but rarely occur, unless some very important part be wounded. The eye, if struck by a single grain of shot is irrecoverably lost. If the heart, stomach, or intestines be wounded, serious injury might result; but this species of projectile seldom penetrates beyond the subcutaneous cellular tissue.

Buck-shot and small balls are similar to ordinary balls, and do not less injury when discharged at the proper distance; but, as there are generally many of them, the same discharge produces a greater number of wounds and increases the danger.

As it is principally the effects of musket-shot we are to examine in the study of gun-shot wounds, it will be proper to glance at the modifications experienced by projectiles in their course according to their velocity, direction, and the different points of their track. The velocity of a ball diminishes from the moment of its leaving the gun, until it falls to the ground. The air presents a certain resistance which tends to deviate it from a straight line and diminish its rapidity. Every body against which it strikes deprives it of a portion of velocity, and even arrests it suddenly if its thickness and solidity surpass the motive power; but this takes place only when the projectile falls perpendicularly on the plane of the surface which it meets. If this meeting be oblique, the ball flies off at an angle more or less obtuse. These elementary principles of physics should not be forgotten, as they explain many remarkable circumstances in gun-shot wounds, and we shall frequently apply them. It would be useless to expatiate here upon the degree of resistance offered by different bodies on account of their nature, density and form.

The action of grape shot, biscayans and bullets, does not differ from that of the projectiles of which we have spoken except in size, irregularity of shape, and the immense velocity with which they are propelled.

The second circumstance influencing the effects of gun-shot, is the distance at which they are discharged. When near, the injured body receives not only the projectile at the moment of its greatest impetus, but also all the force of the explosion itself with the wad. We have therefore at once, burn, laceration, and great contusion of the body. When at such a distance that the ball alone reaches its destination, its action will be severe in proportion to its proximity to the commencement of its career. Lastly, the projectile when arrived at the end of its flight produces merely a slight impression or contusion. Balls are frequently turned from their course by the form of the body against which they strike. If they meet obliquely a cylindrical surface, they are reflected in the same manner as from a plane. If on the contrary they meet the extremity of the diameter of a curved demi-cylinder, they follow this curve and pass off at the other extremity. The head and chest present a very well marked cylindrical form, and it often happens that a ball striking

one side of the forehead or chest travels between the bones and skin, and comes out at the opposite point without doing any internal injury. This phenomenon is owing undoubtedly to the resistance of the skin, which being elastic and at the same time very solid, prevents the ball from being reflected outwardly. All elastic bodies resist more or less the action of balls; clothing, especially when made of wool, protects in a certain degree the parts which it covers. It has been observed, that the hole made by the ball in the clothes, is smaller than at the corresponding point in the skin. The ball often penetrates deeply without perforating the clothing. In 1814, a French soldier wounded under the walls of Paris was brought to the Hotel-Dieu; on examining the upper part of the leg, we found a fragment of cloth buried amongst the bones. It was drawn out, and found to contain a ball which had driven before it a part of the gaiter of the soldier. Amongst the wounded received at La Pitie, in July 1830, one presented a similar case; a ball had penetrated the belly carrying before it the shirt, which was not torn, and was of great use in the extraction of the projectile. It was for want of a knowledge of this principle that the death of Charles 12th, king of Sweden, who was killed by a bullet passing through his head, was attributed to assassination, because there was a great difference between the aperture in his hat and his forehead.

This difference of elasticity of the organs explains also several other remarkable phenomena. A projectile of which the velocity is diminished strikes obliquely a round surface, as the thigh, and follows its course without leaving any mark on the pantaloons of the wounded man; yet the limb becomes numb and stiff, the man falls, and the thigh-bone is found to be fractured, and the soft parts reduced to pulp.

This is because the muscles, at the moment of receiving the blow, are in a state of tension, which renders them more liable to rupture; the skin covering them is not so easily broken, whilst the subjacent parts are killed and lacerated. Accidents of this nature have been attributed to the *wind of the ball*, that is the action of the air violently impelled by the projectile. This opinion, although firmly believed by soldiers, is entirely erroneous.

The ball striking a body of more or less density may undergo various modifications, become flattened, broken into fragments, and thus produce wounds which can hardly be accounted for. A man receives a gun-shot wound: the ball striking the lower part of the right leg, is divided into two portions by the spine of the tibia. Each of these portions passes through the calf, and lodges in the other leg. Thus five openings have been made by one ball. I saw several citizens wounded by fragments of a ball which had struck an iron bar which was near them. Sometimes also cast-iron balls meet very hard bodies and break into pieces; they then give rise to very severe wounds.

Such are the ordinary effects of fire-arms considered in a general manner. Let us now enquire if there are any circumstances which can add to their severity. The dangerous symptoms which sometimes follow a gun-shot wound have given rise from time immemorial to the belief in the existence of *poisoned balls*, and even in our day this error has its partisans. These foreign bodies do not act like poisonous substances; their presence merely excites and maintains an inflammation which is removed only by suppuration or the extraction of the body: such are pieces of clothing, wad, or fragments of balls. But the tissue sometimes becomes accustomed to them, if their form

be regular, their surface polished, and of small size. Balls have been found in the brain, heart, and most of the other organs. A remarkable process then takes place. A sword-like production is first spread around the ball; it is afterwards organized into a villous membrane, exuding pus, but which gradually becomes thinner, smooth, and furnishes from its internal surface only a little serum. The foreign body thus isolated from the organism, may remain an indefinite length of time. Sometimes, however, this serous cyst accidentally inflames, pus then forms and discharges outwardly. Fistulous sinuses are then formed, which remain as long as their cause exists. Let us examine this interesting subject.

I have frequently had an opportunity, said M. Dupuytren, of examining the state in which these bodies are found in the midst of our organs. Whenever they excite inflammation and suppuration, they are surrounded by a purulent cyst of a mucous nature, and after some time a fistulous communication is established between them and some point of the surface or interior of the body. On the contrary, whenever they excite neither inflammation nor suppuration, they are surrounded by a cyst, whose shape corresponds to their own, but of an organization similar to that of serous membranes. These cysts adhere by one surface to the soft parts at whose expense they have been formed; and the internal surface is in contact with the foreign body. Their cavity always contains a limpid serum and the foreign body. This remark is not only curious but important in practice.

Indeed, if in operations performed with a design of extracting these foreign bodies, the latter are merely removed after a simple incision into the cyst, and the wound be then closed, a new tumor is almost always reproduced in consequence of a collection of serum on its internal surface. Therefore, when these bodies are extracted the cyst must be either removed or filled with charpie, in order to excite inflammation, suppuration, and adhesion of its parietes.

But these foreign bodies do not always remain immoveable in the tissues; strange to say they become erratic. Their displacement may be slow or rapid. When rapid, they leave no trace of their passage. When slow, they travel around the serous cysts of which we have spoken. This mobility belongs not only to pointed, smooth and elongated bodies, but also to bodies of different shapes, spherical for example, but it is in general less as they approach a spheroidal form. The surgeon should not lose sight of this property. As it frequently happens that they become displaced from day to day, and that a body felt one day has disappeared on the next, we should never make incisions or attempt its extraction from the remembrance of a previous examination, but from the sensation experienced at the moment of operating. This displacement generally takes place from the interior towards the surface; sometimes, but rarely, from the periphery towards the centre.

It was thought that a ball impelled by a body in combustion preserved a degree of heat which must increase in proportion to its velocity: the wound, therefore, presented besides its peculiar characters those of a serious *burn*. The celebrated Ambrose Pare long ago demonstrated the absurdity of this opinion, by showing that balls passed through a heap of gunpowder without causing its explosion.

Let us now apply, continued M. Dupuytren, the ideas just exposed to

wounds probably so called. We must examine their general and distinct characters, their degree of danger, their different complications, the special causes which may influence their termination, and the treatment proper in each case.

If the part struck by the ball be supported by bone, as the front of the leg or the cranium, the skin may be, and indeed is, generally destroyed. In this case the contused tissue inflames, ulcerates, and cicatrizes. We have before spoken of the more serious effect of a ball which crushes a limb without breaking the skin. It is not rare to find the latter untouched, even when the muscles, viscera, &c. are reduced to pulp, and the bones fractured. It is contusion carried to its maximum. In the case of a woman wounded in July 1830, the humerus was fractured and the skin unhurt. In 1814 a soldier was received into this hospital, whose loins had been grazed by a cannon ball. There was seen in this region nothing but a considerable swelling without lesion of the integuments. Inflammation soon set in, all the soft parts became gangrenous, and on inspecting the corpse, that portion of the vertebral column was found broken into small pieces. It will be seen that in similar cases the resources of art are useless.

If the projectile, driven with great force, strikes the surface of the body obliquely, it makes a lacerated wound of greater or less extent, and hollowed like a groove; less obliquely, or directly, it penetrates its thickness, and if the impetus be expended, remains imbedded. The wound then presents but one orifice, and according to the remark of Percy, the bottom of it is larger than the orifice, on account of the continuance of the rotatory motion. It is well known that, like all spherical bodies when projected, balls are possessed of a double movement, one of projection describing the curve of a parabola, the other of rotation on its axis, which continues some time longer than the former. The combination of these two forces explains several remarkable phenomena. When a ball has nearly reached the end of its career, it rolls slowly over the ground; but if it meet an obstacle, it overthrows it violently, or rises itself several feet in height.

If a ball possess sufficient force to traverse the body, its passage is marked by two apertures. That of entrance, often pretty regular, presents dimensions proportional to the size of the wounding body. Its edges are driven in, and more violently contused than those of the aperture by which it escapes. The latter is generally less regular, larger, its edges project, are less contused and more unequally lacerated. The skin, at the point of entrance, is supported by the subjacent parts, which thus renders the solution of continuity more easy, and prevents laceration. Again, in explaining this phenomenon, the loss of force experienced by the projectile in its passage through the tissues must be remembered; for observation proves, that balls traversing solid parts divide them more evenly in proportion to their velocity. This difference of diameter between the two apertures holds good as regards wounds of the cranium, and not otherwise, as was supposed from an incomplete case related by Ledran.

Here I show you an interesting specimen proving the correctness of the assertion. It is the cranium of a young man who had shot himself with a pistol. The ball has entered the middle and lower part of the os frontis, passed through the cerebral substance, struck the os occipitis at the opposite point, been repelled by the elasticity of this bone, which although fractured

was not carried away, and was found in front of the tentorium cerebelli. The opening made in the external table of the frontal bone is clean and of the diameter of the projectile, while that in the internal table is much larger and more irregular. The fractured part of the occipital presents a still larger extent, especially outside. Notwithstanding this serious wound, the young man lived three hours after its reception.

The track of the ball is generally more or less sinuous, on account of the unequal retractility of the tissues, and change of position of the wounded. Levacher saw a ball strike the fore part of the thigh and come out at a point diametrically opposite, without fracturing the bone! Balls are often known to penetrate the integuments of the forehead and come out in the integuments of the occiput without breaking the skull, &c. Dr. Hennen, quoted by Samuel Cooper, has seen a still more extraordinary circumstance, a wound made by a ball entering near the thyroid cartilage, and traversing the whole circumference of the neck. It is easy to explain all these facts by the application of the known laws of motion. A ball meeting a bone acts upon it in different ways. Sometimes it merely produces a contusion, but this accident, although apparently slight, is often serious. The periosteum, if it has not been destroyed, inflames and separates, the bone becomes necrosed for a greater or less extent; if it be of a spongy texture, the inflammation is propagated to the internal vascular tissue, and may extend farther. In the cranium the two tables are almost always necrosed at the same time; the dura mater consecutively inflamed, &c.

When projectiles possess sufficient force to overcome the resistance of bones they produce very various accidents. When compact, and therefore inelastic, they are easily broken. The flat bones are sometimes perforated as neatly as though it were done by a punch; sometimes with fragments, like a ball striking a frail and thin substance, as a window glass for example. If it meet only one point of a long and hard bone or a prismatic bone, as for instance the tibia, it notches it, and this may happen without breaking it throughout the whole circumference. But the middle of the long bones is generally broken into fragments of different shapes and sizes. If the ball be nearly spent or strike the bone obliquely the latter may be fractured without scales. This was the case with General Rapp, whose left arm was broken across at its middle by a ball which remained imbedded in the flesh. A mason wounded on the 28th of July, 1830, in the attack on the Hotel-de-Ville, had his right thigh fractured nearly in a similar manner. The spongy tissue forming the thick bones and the ends of the long bones, less appropriate to resist a blow, is also less capable of dividing it over a large surface. The fragments are generally more numerous and smaller, but the injury almost always extends to the joint and circumjacent parts. Sometimes this spongy tissue is traversed without a fragment, presenting an opening like that made by a trephine. Lastly, if the resistance of the bone overcome the force of the projectile, the latter becomes misshapen in various ways, it is sometimes flattened or rendered angular, sometimes grooved, and at last terminates its career at the opposing point, or turns aside and injures the neighboring organs. If it meet the projecting edge of a bone, it may split. Balls have been divided by the spine of the tibia and come out separately on the opposite side of the leg. Still more, when they fracture the flat bones and strike them

obliquely, they may divide against the fragments. A soldier was received in the Hotel-Dieu in 1830, wounded by a ball which had fractured the right parietal bone, and divided into two parts, one of which escaped through the integuments, whilst the other penetrated the brain as far as the tentorium cerebelli. We had also at the same time in this hospital a wounded man, in whom the ball, after having fractured the occipital bone, divided into two fragments, which remained united, and as it were astride of the bone.

When on account of the resistance of the parts, or the almost exhausted force of the ball, it remains in the wound, it has a great influence on the consequences of the injury, and demands the surgeon's whole attention. It should always be removed, and this is sometimes a difficult business. But how can we ascertain its presence in the parts? The existence of two openings is not always a proof, for these kinds of wounds often conceal bodies of different natures; sometimes it is the projectile itself, alone or accompanied by a portion of wad or clothing, fragments of buttons or other bodies. It may have escaped through the wound and left these substances behind. This is to be expected when the clothes of the patient, instead of presenting a simple rent, have suffered loss of substance. As to the projectile, it cannot be in the wound when this presents two apertures, unless the gun have been loaded with more than one ball, or that the ball striking a bone has been split. The following is a curious case, showing how difficult the diagnosis may sometimes be. In the month of July, 1830, a citizen was wounded by a ball which entered above the clavicle and came out near the inferior angle of the scapula. He picked it up at some feet from him. He was cured in a few months. Presenting himself before the committee of indemnity he was examined, and a hard foreign body felt near the posterior wound; an incision was made and a fragment of a ball extracted. It was difficult to believe that it belonged to the ball picked up by the patient. Such, however, was our opinion, and on weighing the fragments they were found to be exactly equal in weight to an ordinary ball.

When the wound has only one opening, we may conclude that the projectile is contained in it. It may, however, happen that the body driving before it a portion of clothing has lodged in it as in a sac, and is withdrawn when the patient is undressed.

The smaller projectiles most frequently remain imbedded in the parts; this is generally the case with small shot, but rarely with projectiles larger than ordinary balls. I have seen one case to the contrary: on the 29th of July, a child fourteen years of age was wounded by a biscayan, which after traversing the chest stopped under the integuments of the back. He was brought to the hospital and the ball extracted, which was as it were wrapped in a considerable quantity of wadding. Again, we should consider as foreign bodies the fragments of bone separated from, or but feebly united to the soft parts. When of an irregular shape they are more injurious, as they lacerate and irritate the tissues.

There is nothing more diversified and extraordinary than the passage of projectiles through our organs. We have already spoken of balls describing the whole circumference of the head, neck and breast: here follows a still more remarkable case. In 1830, a man fighting on the bridge of Arcola, was struck by a ball which entered opposite to the internal angle of the left eye;

the wound, directed backwards and slightly to the right, seemed to pass through the head. However, this ball after passing below the cranium came out above the right shoulder; the cure was rapid. Another soldier, placed in ambush behind the parapet of the bridge of Notre-Dame, was struck by a ball in the head at the moment he was levelling his gun. The ball passed through the edge of his hat along the right side of his nose, pierced the upper-lip, broke four upper teeth and the lower jaw, came out behind the chin, entered the base of the neck behind the clavicle, and buried itself in the left shoulder. The man perished from inflammation of the chest. There are some organs, continued M. Dupuytren, so important that we would suppose their injury to be inevitably followed by sudden death. However, we sometimes meet with exceptions.

The immortal Harvey, in his researches on the circulation of the blood, found a ball buried in the substance of the heart of a deer. The wound was ancient, and the animal when killed appeared in good health. At the taking of the Louvre (1830), the young Duvin, 17 years of age, was struck by a ball which passed through the left side of the chest, immediately below the base of the heart. An enormous wound was produced; a rib had been broken, the lung perforated, as well as the scapula. However, after three or four days of intense agony, he recovered a little strength, and two months after the occurrence of the wound there was a chance of his recovery.

But the most extraordinary wound which came under our notice during the revolution of July was the following. A pioneer of the royal guard was struck at the gate of Saint Denis by a ball, which penetrated from above downwards the anterior part of belly. The neck of the bladder as well as the rectum were opened; the ball came out a little above and outside of the anus. From the two wounds urine and fæces were discharged at the same time; the ball had fractured the os pubis without entering the cavity of the abdomen. A series of severe symptoms followed, but they were happily subdued by energetic treatment. On the 35th day after the wound the patient appeared to be out of danger, when inflammation took place, and he perished on the 10th of September following.

A very remarkable circumstance observed in gun-shot wounds is, that all the soft parts situated in the track of the projectile are struck with gangrene from its immediate effect. A slough some lines in thickness is formed, and it must be removed by an inflammatory process followed by suppuration. This result is inevitable, and a knowledge of it of vast practical importance. It follows, that in this kind of wound union by the first intention is impossible, and that often an endeavor to obtain it would endanger the patient. It was undoubtedly this peculiar character of gun-shot wounds which gave rise to the belief in the burning effect of projectiles. Let us now examine, said M. Dupuytren, the progress of gun-shot wounds, and review successively their degrees and complications. When there is only *contusion* without a wound and disorganization of the tissues, art sometimes succeeds in preventing or restraining the inflammation. The cure is then effected without any solution of continuity in the skin. But most generally an acute inflammation ensues; the parts of which the organization has already suffered a severe injury become rapidly gangrenous; suppuration, which is both abundant and serious, is soon changed by contact with the atmospheric air. If the injury be of great

extent death is almost inevitable. The tissues of which the structure has been destroyed by the contusion cannot resist the eliminatory process. Gangrene sometimes extends further than their general state would have indicated, and then alone can we ascertain the whole extent and danger of the accident. These *wounds*, whether they implicate merely the soft parts or extend to the bones, belong to that class which must necessarily suppurate; but their cure is more easily effected when they are not very deep, contain no foreign body, and the general condition of the patient is satisfactory.

Traumatic inflammation at its onset is generally slower than ordinary contused wounds, a circumstance which long ago attracted the attention of A. Paré, and which gives to them a fallacious appearance of mildness. This inflammation, often more severe at the point of entrance than at that of the escape of the ball, becomes very intense. If the divided parts abound in fibrous tissues, a tumefaction takes place which may be very serious in its results. Thus swollen, the parts meet with an invincible resistance in their ligamentous envelope; they become strangulated and dead, that is, they are struck with gangrene from compression. Hence the necessity of enlarging promptly this species of wound, as proved by experience for many ages, in order to avoid the dangerous consequences of *strangulation*. One of the most frequent complications is that kind of gangrene called improperly *hospital gangrene*; for it is not exclusively confined to public establishments. The vast number of patients, natural unhealthiness of the place, want of cleanliness, and dampness especially, seem to be favorable to its appearance. In 1814 this disease raged at the Hotel-Dieu. This was not the case in 1830; many of the beds were unoccupied, and the patients were sufficiently far from each other not to vitiate the air. But as this gangrene may arise independently of the causes just enumerated, there must be some peculiar influence resulting from the wound itself, or the mode of action of the cause. Contused wounds (and above all gun-shot wounds) are most frequently attacked. When the process of cicatrization commences the parts are in a state of weakness proportionate to the violence of the contusion, and are thus very liable to be acted upon by general causes. If inflammation supervene, it soon becomes too violent, and gangrene attacks the most superficial layer of the wound; there is a great deal of pain and swelling; the surface of the wound becomes of a grayish color; an inorganic matter is deposited, a kind of pulp with a serous and fetid suppuration. This is accompanied by a sensation of burning, which induces the patient to expose his wound to a current of air. The fever is high, heat of the skin violent, insomnia complete.

Gun-shot wounds, especially of the limbs, are frequently complicated by *fractures*, which add greatly to their danger. A bone is seldom fractured simply; it is generally broken into numerous irregular fragments, often separated and driven into the flesh by the violence of the shock. If we add to these injuries those which the soft parts have suffered from the passage of the projectile, the laceration of muscles, tendons, aponeuroses, nerves and bloodvessels, we have a specimen of the most severe compound fracture. The danger is greatest in the leg and thigh, on account of the thickness of the muscles and aponeuroses, and number and size of the bones. Let us now examine the primary and secondary effects of the fracture and presence of the scales.

A violent inflammation takes place at the seat of fracture, and extends over the whole limb. Those parts which have most suffered from the contusion are often killed, and after the fall of the slough, a greater or less portion of bone is exposed; this is frequently seen in fractures of the leg. Suppuration becomes very copious, the pus bathes the fragments, which are necrosed; it is infiltrated in the fibrous tissue, in the intervals of the muscles. A still more serious accident sometimes adds to the already dangerous situation of the patient. If a fragment of bone be in the vicinity of an artery, the pressure kept up against its parietes causes its erosion, ulceration, and is followed by secondary hæmorrhage. This is most frequently seen in the leg and thigh. This hæmorrhage is generally more tardy than that resulting from the fall of the eschar. M. Pelletan relates a case in which it did not occur until the 70th day.

The primary *scales*, that is to say, those entirely separated by the wounding cause, left to themselves can never recover their vitality; they are foreign bodies buried in the flesh or the bones. In the flesh they give rise to copious suppuration, less so in the bones; but they then cause dangerous fistula, if they be not expelled, which is rarely the case, nor absorbed, which is still more rare, nor extracted by means of art. What happens in the case of *secondary scales*, or those which are still adherent? Some lose this adhesion, and are then primary. Some are still supplied with vessels and nerves, are then almost always amalgamated with the callus, and contribute towards its formation. The *tertiary scales*, or those *in consequence of necrosis*, remain in situ until the process of elimination separates them. The ends of the fractured bone cannot unite until the termination of this process. However, consolidation will take place; the periosteum, cellular tissue, all the soft parts tumefy, inflame, harden, and acquire at some points at first a fibrous, then a cartilaginous, and lastly an osseous consistence. These bony nuclei extend, and a *ferrule* unites the two ends by their circumference, or else by their extremities. If the necrosed fragments be too large to be expelled, they are inclosed like necrosis surrounded by new bone, and as in that case there is a sequestrum, and newly formed bone and callus. This sequestrum occasions and keeps up fistulous openings; as I have observed for many years in the patients brought to the Hotel-Dieu.

In this case, the limb is generally shortened or deformed; the callus is large and unequal; at two or three points of its circumference are fistulous openings: a probe introduced meets the sequestra, and the sound produced is that resulting from the contact of a metallic instrument and a bone deprived of life. The indications here are to enlarge the aperture, apply the trephine, and extract the dead bone.

Generally, in gun-shot wounds, *suppuration* is very abundant, and the pus escapes with difficulty, either because the track of the ball is long and tortuous, or because the swelling keeps the surfaces too nearly approximated to each other. It then accumulates in the parts, forms abscesses, becomes effused, and is productive of great mischief. The patients die in great number during this period of suppuration, either from exhaustion or some visceral disease, or lastly from the absorption of pus or inflammation of the veins. To these two last causes are to be attributed the purulent abscesses found in the lungs, liver, muscles, &c., the collections of pus which frequently fill

the cavities of the serous membranes, and the synovial cavities of the joints. Many writers have for a long time pointed out these alterations as consequent to gun-shot wounds; but modern pathological anatomy has pointed out their true nature and causes.

Lastly, we must reckon among the serious complications hæmorrhage, especially when secondary, tetanus, coma, erysipelas, diffuse phlegmon, inflammations of the internal organs, &c.

When a ball lodges among living parts, the first sensation is not one of pain, but a kind of numbness, accompanied by heaviness in the wounded part, a sensation similar to that experienced from a blow with a stick. Generally, persons wounded are only aware of the accident from seeing the flow of blood. Sometimes, when very severe injury is inflicted, as by a cannon shot or biscayan, or when large joints are wounded, this state of *stupor* is not confined to the wounded part, but seizes the individual, who no longer is conscious of what is going on, and falls into a state of complete apathy, indifference, and insensibility. Such was the case of the horseman spoken of by Quesnay; amputation of his thigh was proposed to him as the only chance of his life; he replied, *that it was not his business*. Incisions and the most severe operations do not draw from the patient a single indication of pain. The skin becomes pale and cold; sometimes of an icteric and leaden hue; horripilation, fainting, and syncope supervene; the pulse is small, corded, irregular, and often intermittent; the respiration is slow, the countenance bewildered, mouth open, the eyes fixed, and the features shrunk. This serious injury to the vital principle should be looked upon as the index of a fatal termination, if it be not removed in a few hours.

Should reaction come on, the patient rouses from this state of general stupor; the wound, until now pale, wan, or violet colored, becomes inflamed, pours out sanguineous and fetid fluids, and is soon the seat of an emphysematous tumefaction, extending more or less towards the trunk. There is an irregular fever, mixed with chills and heat, a delirium sometimes evanescent, sometimes furious, vomiting, general jaundice, suppression of urine. The patient then perishes in an ataxic state carried to the highest degree. The effects of the stupor seem not to end with life. The wounded part and its vicinity assume rapidly a livid color, and exhale an odour of gangrene and putrefaction at once. This cadaverous lividity attacks the whole body, which appears struck with a general putrefaction far advanced, at a time when a patient dying from any ordinary disease would evince no symptom of it.

This disorder has been supposed to result from the shock to the nervous system; and in this light this stupor would be likened to cerebral disturbance, of which it would be only a shadow: such however is not the case; cerebral disturbance has its peculiar characters, so also has stupor. In the former case there is lesion of the functions of an organ; in the second, injury done to the vital principle. The latter is a state analogous to that developed in consequence of a severe visceral inflammation, a typhoid fever, gangrene, an extensive burn, and in general, any deep and severe lesion. A proof that this stupor is independent of all mechanical agitation, is, that in individuals who have received the same wounds, under the same circumstances, it may or may not occur, and seems to depend much more on the mental state of the wounded than the circumstances of the wound. Thus it is generally observed, other

things being equal, in patients possessing but little moral energy; in the army, it affects principally the young soldiers.

Gun-shot wounds generally *bleed* less than ordinary contused wounds. Even when a large sized artery is opened, the blood does not always flow; its parietes partaking of the contusion or disorganization of the surrounding tissues form lacerated fragments or eschars which obstruct and close its calibre; moreover, if the whole circumference of the vascular tube be divided, it retracts as in lacerated wounds.

A limb may be fractured or carried away near the body, with effusion of blood; and sometimes the obliteration of the vessel extends so far that amputation may be performed without a necessity of tying the vessels. But those circumstances which prevent loss of blood when the artery is of small or moderate size, are insufficient when the wounded vessel is of large diameter. A young man was wounded in the attack on the Hotel-de-Ville in 1830, by a ball, which penetrated the thigh and opened the femoral artery. He was in a dying state from loss of blood, on his arrival at the Hotel-Dieu. The vessel was secured in less than two minutes, but the patient could not recover from the profound syncope into which he had fallen, and expired. After what has been said on primitive hæmorrhage, it must be acknowledged that Baron Larrey by inventing flying ambulances, which traverse the field of battle and afford instant succor to the wounded soldier, has made a vast improvement in military surgery.

Unless the projectile has injured a very large vessel, primitive hæmorrhage is rare in this kind of wound. The greatest danger consists in secondary hæmorrhage. This occurs in two different ways, whether the artery be completely divided, or only partially so. In the former case the slough, as we have said, produced immediately by the shot, and the coagulum of blood formed in the cavity, as far as the first collateral branch, obliterates the circulation throughout the whole of this extent. But it sometimes happens that from certain causes the circulation becomes very active, the coagulum is expelled, the slough thrown off, and hæmorrhage ensues. In other cases, the causes preventing hæmorrhage persist until the whole of the internal surface of the wound, and consequently the lacerated and disorganized portions of the artery, are detached and eliminated by the suppurative process. But then if the end of the obliterated artery be too short, its union not sufficiently firm, or any imprudence on the part of the patient destroy this union, &c., the artery is opened and the man exposed to more or less danger.

Secondary hæmorrhage generally comes on about the 10th, 15th, and even the 20th day, without any precursory symptoms, except sometimes a slight sanguineous exhalation from the wound. Wounds of arteries therefore require great attention, in order that efficacious treatment may be promptly employed in case of accident.

It should not be forgotten that secondary is much more dangerous than primitive hæmorrhage, either on account of the weak state of the patient, or the inflammation of the arteries and neighboring tissues.

Indeed, as primitive hæmorrhage takes place on the surface, the vessel which pours out the blood may be easily seen and secured; the elasticity of the healthy cellular tissue permits it to be drawn out. The cellular tissue and coats of the artery being as yet unchanged, the ligature does not fall until

after six or eight days, when the coagulum is organized and danger no longer to be dreaded. Such is not the case in secondary hæmorrhage. The tissues have retracted, the vessel is therefore discovered with difficulty; as well as the cellular tissue, it has lost its natural extensibility; the ligature cuts it easily, and falls before the obliteration is perfect; the bleeding often occurs at one or more hours after the operation.

In similar cases the artery must be tied between the injury and the heart; as no other method will be found of the least benefit. Secondary hemorrhage sometimes takes place from small sized vessels. In 1830, I saw this occur in the case of an officer wounded in a branch of the temporal artery; compression merely served to suspend the flow of blood. The trunk of the vessel was secured, and all hemorrhage ceased from that period. In many other cases balls had passed through the neck, and we were astonished to see how projectiles could pass between so many vessels and nerves without injuring any of them. In one case, a young man twenty years of age, delighted at reaching the 12th day without any accident, was walking about, eating, and talking to every one, although he had been told that the least imprudence might cost him his life. He was suddenly seized with hemorrhage, which defied our attempts to arrest it. He died in a few hours.

It sometimes happens that an artery and its accompanying vein are wounded at the same time at contiguous points of their circumference; a communication is then formed between them, and the blood passes directly from the artery to the vein. Thence results a *varicose*, or *arterioso venous aneurism*. Nerves divided by gun-shot wounds partake of the disorganization of the other tissues. To this cause must undoubtedly be attributed the slight pain felt by the patient at the moment of receiving the wound, and the sensation of weight and numbness properly compared by Ambrose Pare to that produced by the fall of a beam, or blow with a stick, as we have elsewhere remarked.

One of the most dreadful and most generally fatal complications is *tetanus*, of which it may be here proper to mention the principal symptoms. All wounds may give rise to it; but it mostly follows punctured, lacerated or contused wounds, &c., complicated by the presence of foreign bodies in the fibrous tissues, those especially which injure the nerves without completely destroying them. The state of the patient's mind has no doubt great influence over the development of the disease; highly wrought feelings, lively emotion, before or after the wound, have a great share in producing it. A stimulating and irritating regimen, worms in the intestines, &c. are also undoubtedly a cause of tetanus. But these causes are only predisposing and accessory; the true and proximate cause consists in a change of temperature to a high degree of heat. This effect is the more remarkable when that change is sudden. This cause exerts a marked influence in wounds which suppurate copiously, and when the body is in a state of free perspiration. Thus in warm countries, the Antilles for instance, where there is so great a variation between the temperature of the day and night, this disease commits great ravages, and carries off yearly many patients. This influence is also observed on battle fields, bivouacs, where, after having experienced the heat of the day, the wounded are exposed to the night air, which is at once cold and damp. It is seen in the wards of civil and military hospitals, in which when badly

ventilated a current of cold air is directed upon the bed of the patient. It seldom occurs during uniform temperatures, whether hot or cold. But these are not the only physical causes of tetanus; any sudden, acute or exciting noise, a sudden cry to arms, discharges of guns, and especially of cannon, the ringing of bells during the night, give rise to an agitation which more than once determine the development of the disease.

This malady consists in involuntary, permanent, and painful contractions, alternately stronger and weaker, constituting exacerbations and remissions, characterised principally by more or less marked spasm and relaxation of the muscles of the affected parts. It is generally preceded by anxiety, horripilation, sudden jerking movements, spasms, rigidity, and evanescent contractions. It does not affect all at once and simultaneously all parts of the body, but attacks at first some one part before extending to the others. It commences either in the wounded portion, or else some spot remote from it; in the former case it is announced by a sensation of rigidity, which hourly increases; to this are added, at longer intervals, contractions and painful twitchings; and the disease attacks gradually all the muscular system. In the second case, which is most frequent, the muscles of the pharynx are first affected, thence result a violent *dysphagia*. It then extends to the muscles which elevate the lower jaw, and we then have locking of the jaw, or *trismus*. The appearance of traumatic tetanus after the cicatrization of the wound is rare. I have, however, seen some cases of it.

*Strangulation* is one of the most frequent complications of wounds, and especially of the punctured kind. The degree of strangulation is proportionate to the increase of volume of the parts, that is, to the intensity of the inflammation, and this accident is the more to be feared when the parts are so organized as to become rapidly developed, and the surrounding tissues are resisting. Thus there is no organic structure more liable to occasion and render it very intense than the alternate superposition of fibrous, resisting, inextensible tissues, and cellular and vascular tissues susceptible of great increase of volume from inflammation; such a structure in a word as we find in the limbs, from the shoulder to the fingers and from the hip to the toes. Two orders of tissue are then affected in strangulation. The inflamed parts by compression; the neighboring parts by distension. If the compression and distension run very high, both become gangrenous on account of the interruption of the circulation and nervous influence, resulting from the compression of the blood-vessels and nerves. The termination by gangrene is announced by the cessation of pain, the remission of the fever, the appearance of vesicles containing a violet colored and fetid serosity, the insensibility of the parts, coldness, general prostration, &c. Sometimes, however, and even when the majority of these symptoms are met with, mortification is only at hand; there is merely suspension of life, and as it were local and temporary asphyxia. Here it is sufficient to restore the circulation, to remove all the symptoms, and this may frequently be effected by enlarging the wound.

Happily the inflammation accompanying strangulation is far from always terminating in gangrene. Sometimes, but rarely, it terminates by resolution, more frequently by suppuration, and still more by induration. The second mode of termination is announced by pulsations in the tumor, by the remission of pain, and the general and local fever. But this remission is of

short duration; the pus by collecting soon renews the strangulation, which may become as violent as the former one. As to induration it always leaves after it a hard engorgement more or less painful, which, either on account of its nature or the nature of the tissues affected, ends frequently in white tumors.

Even after escaping all the danger just detailed, the patient is by no means safe. We have already seen with what difficulty the ends of fractured bones unite, what causes oppose this union, how fistulous sinuses and deep seated abscesses of the limbs are formed, by means of which bones are denuded and afterwards necrosed. This is not all; fractures of the bones in which the spongy tissue abounds, present phenomena which are not observed in those of compact tissue. These phenomena are produced by the inflammation of the cellulovascular membrane lining the areolæ of this tissue, and the numerous veins which traverse it. This inflammation, always followed by necrosis of the bone, sometimes extends to great distances, and much more certainly in gun-shot wounds, where the projectile, by breaking the bone, communicates to it a violent shock.

The large joints present all the conditions of structure calculated to give to the wounds under consideration a degree of danger to be found nowhere else. That of the wrist and foot is more enveloped by numerous tendons and synovial sheaths; that of the knee is remarkable from the extent of bone and synovial membrane, the number and strength of its means of union; that of the shoulder and hip is enveloped by thick and strong muscles. Therefore should we expect, even when externally and in the soft parts nothing indicates serious injury, to find the articulating ends of the bone broken into a number of fragments, the ligaments and synovial membranes extensively lacerated and torn. Such are the different degrees, complications consecutive to accidents, and principal causes of the danger of gun-shot wounds, causes implanted in their nature and peculiar characters. But besides these causes there exist others which, although foreign to the nature of wounds, have over them a powerful influence. Such are temperature, diet, the mental disposition of the wounded man, and accidental moral impressions.

Is a high degree of heat, as is generally supposed, prejudicial to wounds, and especially to gun-shot wounds? It is a generally received opinion, that it is favorable to the development of gangrene, and fever, rapidly fatal to the patient. Experience, however, formally contradicts these purely speculative ideas, and demonstrates to all military surgeons, that these wounds heal much more quickly in summer than in winter, in warm climates than in cold ones, in closed apartments than in the open air. Cold inflames the wound, opposes the process of cicatrization, keeps its edges red, swollen and painful, prevents the formation of good pus, and retards indefinitely the cure. Heat on the contrary renders the tissues more pliable, determines to them regenerating fluids, favors the exhalation of those which are to compose the cicatrix, and establishes a more speedy cure. Again, gangrene, so much feared, is not so common as is supposed.

It will be easily conceived that the state of the patient's *mind* will have a great influence over his fate. In the young soldier the remembrance of his parents, of the object of his affections, from whom he is perhaps forever separated; in the old warrior, the loss of a battle and its consequences will give

rise to profound melancholy and depression which may amount to despair. Add to this privations of all kinds, the want of surgical assistance, inclemency of weather, long and forced marches, in a word, all the disasters of war. In civil wars, enthusiasm on the one hand, carried to the highest degree; on the other despondency, gloomy reflections on the present, and anxiety for the future, are equally fatal in their effects upon the conqueror and the conquered. Thus in 1830, the mortality was comparatively much smaller among the citizens than the soldiers; in 1832, it was comparatively greater among the citizens wounded on the 5th and 6th of June, than among those of July 1830. Here the only cause of the difference is to be attributed to the mental situation of the wounded; and the joy of triumph is seen to yield to the grief of having shed a fellow citizen's blood.

*Accidental moral impressions* are not less dangerous. Joy, fear, any sudden emotion, &c., often produces a fatal result. Many examples of this were seen in 1830 and 1832. Another fertile cause of accidents, which too often, in civil hospitals, paralyze the efforts of the surgeon, is *error in diet*. It would be useless to expatiate here on abuses which all our exertions have hitherto been unable to eradicate.

Let us now, continued M. Dupuytren, examine gun-shot wounds, *in relation to their situation*; they will present many peculiar phenomena and special indications in proportion to the regions they may occupy.

*Wounds of the Head* affect the different regions of the cranium or of the face; in the cranium, the soft parts, the hard parts and the brain, separately or collectively; in the face, the base of the cranium, the frontal sinus, the orbit, and the eye, the upper and lower jaws. When affecting merely the soft parts, they are in general not very serious of themselves; but in the first place are tedious in healing, and afterwards are frequently complicated by erysipelas or diffuse phlegmon, tetanus, hæmorrhage, and different accidents resulting from the lesion of nerves, aponeurotic and cellular membranes, which are easily inflamed.

*Erysipelas of the Head* is a very frequent consequence of gun-shot wounds. Its commencement is announced by chills, fever, sometimes delirium; the skin soon becomes slightly red, sometimes more œdematous than red; there is swelling, heat, and tension of the cellular tissue, generally nausea and vomiting. How can this be prevented or remedied? If the opening of the wound be narrow, a crucial incision must be made over it, even after the invasion of the disease. If any gastric disturbance be present, an emetic will be proper. If the patient be young and vigorous and the inflammation intense, this must be preceded by one or more general bleedings. Mild purgatives will be very useful when the intestinal canal is overloaded. Flying blisters should then be applied over the diseased spot; they have sometimes succeeded in arresting its progress, but are also sometimes insufficient, and then a permanent suppuration must be established.

*Diffuse Phlegmon*, common after accidents of all kinds, is not seated in the head as in the limbs, in the sub-cutaneous cellular tissue, but in the sub-aponeurotic cellular tissue: this is a distinction of high importance. Its ordinary precursors are chills, cephalalgia, nausea, and vomiting. An acute sensibility of the hair is observed, the scalp is swollen, and impressions left by the fingers remain in it. The fever is continued with paroxysms and

delirium; the ears and forehead are attacked; after two or three days, pus is infiltrated into the subcutaneous cellular tissue; in seven or eight the soft parts are separated from the cranium, and there is a manifest fluctuation. Large quantities of fetid pus are discharged. Then the distension diminishes, the patient is relieved; but in two, three, or four days, enormous patches of gangrenous cellular tissue appear at the openings; when drawn out the suppuration becomes very copious, and the patient perishes from exhaustion, repeated loss of blood, or acute inflammation of the encephalon. Dissection shows pus effused into the cavity of the arachnoid upon the surface of the brain, the dura mater separated from the internal surface of the cranium; externally, the pericranium destroyed, the bones denuded and necrosed, but the subcutaneous cellular tissue, the vessels distributed to it, and the skin perfectly sound. From this sketch it will be perceived how important it is, when the inflammation cannot be arrested, to practise numerous incisions in the wound itself, and its vicinity, the temples, mastoid processes, and towards the occiput.

When the wounding cause has been sufficient to injure the bone, it is either limited to the parietes of the cranium, or penetrates as far as the brain. The bony vault of the cranium is not every where of the same thickness, and consequently does not every where offer the same resistance. A ball may strike the cranium perpendicularly without fracturing the bone, but this wound is always serious, on account of the concussion or contusion of the brain which manifests itself in three or four days, or of the cerebral inflammation which is frequently developed after 15, 20, or 25 days. If it follow an oblique course, it may cause serious injury in a greater or less extent of the soft parts, and moreover a primitive or consecutive necrosis; the lesion is therefore compound. A ball may penetrate the osseous tissue and lodge there, without penetrating the brain. Lastly, if the projectile enter the cerebral substance, there is either instantaneous death, or development of serious symptoms, according to the depth of the injury or the importance of the wounded parts.

We will now examine the general, immediate and consecutive effects of gun-shot wounds of the head upon the brain. These effects are concussion, compression, contusion and inflammation.

Simple *concussion* is not accompanied by any material lesion of the brain, and consists in a more or less prolonged incapacity from the effects of the shock; it is one of the most common results of blows, falls, lesions by pointed, cutting or contusing weapons, by gun-shot wounds when the projectile does not traverse the cranium; falls and blows on other parts of the body, as on the feet, knees, sacrum, &c. Several degrees are remarked in the phenomena of commotion.—*1st degree.* Dimness of vision, tinnitus aurium, the almost natural closing of the eyelids, and sudden weakness in the lower extremities; then lassitude during three or four days, vague pains, inappetency, a remarkable inaptitude to labor, the necessity of keeping the feet separated in order to increase the base of support, &c., are the principal symptoms. To combat these, we should use cautiously aromatics, stimulants, &c., as their abuse might lead to serious consequences, and cause inflammation of the brain or its membranes. The after treatment consists in avoiding all excesses of diet, fatigue or coition, and restriction to a moderate regimen; and this is to be persevered in for some time.

2d degree. Whatever may be here the cause, the patient suddenly falls senseless, and is so perfectly unconscious of existence, that on returning to sensibility he remembers nothing of what has passed; there is prostration, the muscles are affected not only with quivering, but also lose the faculty of acting: spasms frequently exist, involuntary evacuations of fæces and urine. There is no longer perception of light, sounds, odours, or taste; the voluntary movements are gone; the circulation and respiration are however maintained, and that is the reason why death does not take place, the principal nerves of organic life arising from the sides of the medulla oblongata. At the moment of concussion, palpitations are experienced; the respiration at first altered, irregular, soon recovers its regularity, and goes on so gently with so little noise and motion of the thorax, that the patient seems not to breathe. This is a characteristic sign. The eyelids are generally closed, from loss of action of the levator muscles. On opening them the eye is found still brilliant, but the dilated pupil, insensible to the impression of light. Sensibility is blunted, but not extinguished; if we pinch the skin the patient, by an automatic movement, will shrink from the pain produced. There is sometimes vomiting.

The primitive symptoms of the first degree last only a few minutes or seconds; in the second, the effects continue one, two, three or more days. It is during the duration of these first symptoms that an error may be and often has been committed; namely, on founding concussion and compression, and attributing to a *pretended absorption* of blood the restoration to health after a severe simple concussion.

Let us then recapitulate, for these signs are very characteristic; that in concussion the patient remains in the position in which he is placed, appears buried in a profound and tranquil sleep; without movement of the thoracic parietes; his countenance pale, eyelids paralyzed; pupil insensible to friction; it is sometimes harassed by light but does not contract. The patient swallows, but only when the liquid has been introduced into the pharynx, otherwise it remains in the mouth. There is scarcely any motion of the heart; the pulse is so slow and soft as to disappear under the slightest pressure, but it is regular; digestion is suspended, as also the excretions; there is frequently retention, and consequently incontinence of urine, retention of fæcal matter. If you pinch the patient he takes no notice of the first or second attempt; it must be repeated, and forcibly, in order to induce him to draw away the limb; rarely he carries his hand to the spot. These effects, at first very remarkable, gradually diminish; then the limb is quickly drawn away if it be pinched; the pulse is stronger and more frequent; the pupil is sensible to light even through the eyelids; the patient places his hand before his eyes; changes his position; speech returns; he asks for food and falls again asleep for 24 hours, more or less; after one or two similar attacks, the intellect begins to be restored; but he is incapable of fixed attention; he begins a phrase and does not finish it. In four, five, or six days he is convalescent, but the consequences last much longer; and sometimes months are required for his total restoration to health.

These slight stimulants are not sufficient; immediate venesection is contra-indicated, and would cause death. After the expiration of an hour, if the functions are somewhat restored, in robust and sanguineous persons this measure may remove the danger of compression of the brain from a stasis

of the blood; if the patient be weak, leeches behind the ears and elsewhere, as revulsives, &c., sinapisms, pediluvia, stimulating cataplasms, enemata, purgatives, nauseating drinks, frictions, and excitants internally and externally. Good effects are obtained from blisters to the nape of the neck. The patient sometimes loses the recollection of proper names, things, &c., but this faculty returns after some time.

*3d degree.* In this degree the patient generally perishes quickly; he falls instantly, deprived of all his senses, and voluntary motions. Convulsive movements ensue, involuntary evacuations; the pulse disappears and returns at intervals, respiration gradually grows weaker, and in a few seconds life is extinct. *Venesection* here is inevitable death. *Frictions and spiritous lotions* are useless.

An examination of the body evinces no effusion on the brain, compression, contusion nor disorganization. This organ has merely lost its consistence, and is very easily lacerated.

If in patients who have died of apoplexy, the cranium be opened, not with a hammer but with a saw, the brain appears larger than the case containing it, or at least it preserves its size and shape. In concussion, on the contrary, the brain is smaller, is collapsed, and occupies less space; because here it contains less blood, and being deprived of its stimulus, falls into debility. No appearance of separation, laceration or contusion, however, can be observed, either with the microscope or the naked eye.

In the description just given of concussion, the brain has been taken as an example, because the effects are there more evident than in other organs, and through the medium of the nerves, extend to all other parts of the body. But it is by no means the only organ exposed to the accident; the spinal marrow may be also affected, but as it presides merely over motion and sensation its effects are limited to paralysis of the parts to which its nerves extend. Thus we observe more or less complete debility of the lower limbs, the bladder and rectum, in cases of concussion of the lower part of the spinal marrow; of the parietes of the belly and chest, in concussion of the back; last, with paralysis of the parietes of the chest and belly, concussion of the diaphragmatic nerves, when the projectile has injured the upper part of the cervical column; producing cessation of respiration and consequent death. Again, concussion may take place in the nervous plexuses; its effects then are numbness, a diminution of sensibility and myotility, &c. which may become absolute in mobility and insensibility; such are, for example, cases of concussion of the brachial and sciatic plexuses, resulting in more or less complete impotency of the upper and lower limb.

Lastly, the nervous parts are not alone subject to concussion; the liver is, on account of its size and texture, after the brain, most frequently affected. The phenomena are here undoubtedly very different from those observed in the other organs, but they may be all referred to a weakening of the organ, or a suspension, disturbance, or alteration of its functions; there is inappetency, languor and feebleness of digestion, nausea or vomiting, sensation of weight in the hypochondrium, grayish stools, saffron colored urine. Symptoms of reaction sometimes supervene; there is then pain in the right hypochondrium, to which are added nausea, and pain in the shoulder; dejections or vomiting of bilious matter take place; the fever increases; and we have a more

or less acute hepatitis, which is more or less dangerous. The spleen and kidneys may be affected by concussion but much more rarely. Their symptoms are similar to those of concussion of the preceding organs. Their diagnosis is moreover extremely obscure.

When *compression* of the brain is slow and gradual it may reach a considerable height; when rapid, its effects are immediate, dangerous, often fatal, however slight may be the cause. After a blow, with or without division of the flesh and bones, effusion takes place in the interior of the cranium; if it be limited, there is hemiplegia of the opposite side; if there exist the same quantity on both sides at once, there is neither hemiplegia nor paralysis, but rigidity of the muscles, &c.

Thus the general effects of compression are null or nearly so when it occurs gradually; rapid and dangerous, if it be itself rapid. When the compression is slight, the intellect may remain; when perfect, it is annihilated: there is loss of the senses of susceptibility to impressions, profound coma, stertorous respiration, the functions of the thorax are impeded on account of the inertia of the brain.

In *concussion*, as we have said, the patient is tranquil, his face is pale, the upper eyelid depressed, the pupils highly dilated, respiration so gentle as almost to be imperceptible; pulsations of the heart and arteries scarcely sensible.

In *compression*, the patient is agitated, face of a violet red color, pupil contracted, respiration loud and laborious; there is stertor: the thorax, as it were, loaded with mucus; all the muscles in action to maintain respiration; the pulse is full, hard, and frequent.

A slight and even a more severe degree of compression is not always fatal; it may be cured by venesection, purgatives and revulsives.

In the second degree, the struggle is more violent, the result more uncertain; sometimes the effused blood loses its serum, and is absorbed: if the foreign body cannot be absorbed, nature accustoms herself to it.

If from a sudden cause, the fracture of the bone for example, blood and pus are collected at one point, the trephine should be applied and the bone elevated, if nature cannot become habituated to the cause; but we cannot always be certain of the spot where the effusion exists: fractures, contusions take place from a counter-stroke, and the difficulty here is very great. When the effusion is extensive and there is no hemiplegia, the trephine is useless.

The trephine, said M. Dupuytren, so often fruitlessly used and then proscribed by Desault, is therefore frequently insufficient to remove the cause of the disease, and always dangerous, less from itself than from inflammation, following the admission of air.

It should therefore be applied only to elevate the bone, or give exit to a sudden and considerable effusion, at a limited and well ascertained spot in the cranium. If a foreign body have passed through two thirds of the thickness of the skull, if a ball remains planted in the bone, or the point of a knife be broken off in the cranium, a crown of a trephine may assist in their extraction; it is also indicated, as we have said, in cases of a small, circumscribed, pediculated fungous tumor of the dura mater, which would have pierced the bone; but then the danger is always very great.

*Contusion* of the brain is often confounded with concussion. Contusion is

a true organic lesion produced by a round body, or one of large surface. The parts covering the brain are of different consistence; the external soft parts and especially the bones may resist the violence of the blow; but it is not so with the brain, and its contusion may take place without lesion of the soft or hard parts; which, indeed, is generally the case. These external parts may change their form without any solution of the integuments, or fracture of the bones, and the brain may undergo from compression that disorganization characterising contusion. Like concussion, contusion possesses also several degrees.

In the mildest form, some parts are changed, a little blood is effused; a cure may follow; but when the tissue is deeply disorganized, and the quantity of blood more considerable, death generally results from this injury, rendered fatal by inflammation, suppuration, and the consequent compression. The dangerous symptoms do not appear until the fourth or fifth day, that is when inflammation takes place, and the danger consists less in the importance of the injured organ than in its consequences.

Contusion differs essentially from concussion and compression. Before pointing its distinguishing signs, let us examine into its causes and effects.

Whether there be or not lesion of the external parts, it is generally produced, as we have said, by bodies more or less round, or extensive; the causes are therefore analogous to those producing concussion; hence it is almost impossible to distinguish concussion from contusion, especially in the commencement. Concussion almost always complicates contusion; but if there be not concussion, the patient does not experience any immediate injury. The effects of concussion diminish gradually from the date of the injury, whilst the contrary obtains in contusion, as the dangerous symptoms do not appear until some days after the accident. The patient feels a constant pain in the contused spot: paroxysmal fever with delirium comes on; debility, sometimes coma, from compression. If venesection has been judiciously practised, and purgatives properly administered, these symptoms sometimes disappear and the patient gets well; the inflammation is thus prevented or moderated, and the absorption of pus determined. But then the injury is limited and not profound; if it be more extensive and severe, the inflammation of the brain is generally fatal.

If the contusion were always direct, we might perhaps determine pretty precisely the point which it occupies, and where the opening should be made; but as it often is produced by a counter-stroke, this is extremely difficult.

Inflammation of the brain is often complicated with arachnitis; there are then chills, contraction of the pupil, acute sensibility to light, &c. After death the substance of the brain is found converted into pulp mingled with blood; if the patient has lived some time, around this disorganization some inflammation exists. The substance of the brain is moreover more dense, yellow, and studded with red spots, &c.

If the contusion be very extensive, and the two lobes of the brain affected, death follows from concussion or the effect of the contusion. When only one lobe is injured, three or four days generally elapse without any bad symptoms. If the pupils are contracted, there is stertor and absence of the signs of concussion, contusion is to be feared, and recourse must be had to general and local bleedings, and emeto-cathartics. If inflammation has taken place, we

must still employ bleedings and revulsives to the limbs and intestinal canal. If coma evince a collection of pus, and we can ascertain the precise seat of the disease, the trephine must be used; not that this operation gives a great chance of cure; for if a little pus flow through the opening, the discharge does not prevent the new formation of purulent matter, and the trephine often gives rise to inflammation of the arachnoid.

If the contusion be produced by a fracture, the bony fragments should be elevated, and a free exit thus afforded to the pus.

*Recapitulation.*—Contusion is one of the most serious affections of the brain; serious less on account of its immediate effects than on account of the inflammation which follows and causes a considerable production of purulent matter. Thus, concussion, compression, and contusion become causes of inflammation; independently of these causes, it is determined by the presence of scaly portions of depressed bony projectiles; and lastly by vicious habits, stimulating food, abuses in diet, drinks, and the passions, &c. Inflammation is consequently one of the most common diseases of the organs in general, and particularly of the brain.

A constant attendant on contusion, *inflammation*, generally accompanies all other lesions of that organ.

We have already spoken of erysipelas, a complication so frequent, that scarcely one or two escape out of three wounded. Erysipelatous or diffuse phlegmon is more rare, but much more dangerous.

The pericranium may be also the seat of an inflammatory process, the bones also may become inflamed and suppurate.

A spent ball, or one striking obliquely, a blow with a stick, a fall with or without a wound may produce this injury, even when the bones have been slightly contused; the contused part often becomes necrosed; if the external table alone be affected, frequently the process of separating the sequestrum, exceeding its ordinary limits, gives rise to suppuration in the diploic structure, and is the cause of death.

If the contusion be more severe, and the entire thickness of the bone be necrosed at the end of twenty, twenty-five or thirty days, another inflammation supervenes almost always fatal from the collection of suppuration between the bones and dura mater, determining compression or arachnitis; the pus, in this case, is not formed at the expense of the *dead bone*, but at the expense of the dura mater, which although of a fibrous nature, does sometimes take on inflammation.

Let us explain ourselves. The bone is either necrosed immediately, or after the lapse of some time; this bone is a foreign body placed between the external and internal parts, and adheres to the other osseous parts which still enjoy vitality. Now if we examine the process of separation of a slough in the soft parts, we find that it is by inflammation. A circle of inflammation is described around the eschar, extending as far internally as externally, and giving rise to a more or less copious suppuration. The separation of the necrosed bone and the dura mater must then take place by inflammation; if the suppuration be not copious, it gives but little inconvenience; on the contrary, if copious, it injures by its quantity (compression), or by contiguity of tissue and inflammation (arachnitis, compression, death).

What name shall be given to this secondary inflammation? *Ostitis*! No;

the inflammation is in the dura mater. If the denuded and contused bone appear blackish, or gray and sonorous, it is almost certain that the necrosis extends to the internal surface; and then we can and ought to prevent the effects of inflammation and suppuration by the application of the trephine. But under the dura mater is another serous tissue, the arachnoid; beneath the latter, a cellular serous, exceedingly delicate tissue; under this tissue the brain. It is useless here to describe the symptoms of inflammation of the different tissues and organs, as it would be merely repeating that which may be found in every work on the subject.

*Wounds of the Face* are not in general dangerous of themselves. I have seen this part almost entirely carried away and the patient recover rapidly. They are, however, frequently fatal on account of the consecutive symptoms. Another result of these wounds is the abundance and fetor of the suppuration, which being constantly mixed with the saliva and carried into the stomach, is productive of serious gastric and general disturbance. Let us now examine the difference of wounds in the different regions of the face.

*Wounds of the Nose* give to the face more or less hideous appearance, whilst those of the forehead adorn it; hence the necessity of preventing by all possible means deformities of the nose. When it is divided, the parts should be brought together and held by some stitches of the interrupted suture. If the base of the organ be destroyed, art is nearly powerless, for the loss of substance cannot be remedied. If the nose be crushed, this fracture with depression produces great deformity; it may be prevented by means of a tube or bougie covered with linen and introduced into the nostrils.

*Wounds of the Orbit* often produce horrible disorder, and more frequently death. When applied close, the pistol acts as in the mouth, by the expansion of the air and the discharge. The eyelids and the orbit are lacerated, fractured, and the eye hangs out upon the cheek, as was seen in the case of a young man wounded in July, the orbit of whose eye had been broken into several fragments at its base, the eye was extirpated, the eyelids approximated to each other, and the man cured. Small shot lodged in the eyelids are generally productive of no mischief: they may either be left or extracted; when they penetrate obliquely the cornea or sclerotica, there results an albugo of more or less extent. If they strike perpendicularly, they pass through, and lodge in the interior, or are lost in the globe of the eye, and we can neither ascertain their existence nor attempt to extract them, unless they have remained in the anterior chamber; in the latter case they may be perceived before or after the consequent inflammation, and be extracted. Even in the least severe cases, wounds from small shot cause loss of sight, deformity of the iris or obliteration of the pupil. But frequently acute pain supervenes which cannot be relieved by any means, then violent inflammation, enormous swelling and agonizing pain. We are then reduced to the alternative of making a crucial incision into the organ itself, or seeing it burst or discharge its contents. Inflammation often extends to the brain, and death is the consequence. We have already fully detailed the effects of gun-shot wounds of the *mouth*, and pointed out the action of the expansion of the air, the action of the powder and projectile on the pharynx, palate, tongue, lower jaw, &c.

*Wounds of the Lower Jaw* are very frequent. If the bone be carried

away in front, the wound is less serious than if the ball fractured the rest of the body and the rami. Danger arises, first, from the compound nature of the wound, the lesion of numerous nerves, the difficulty of removing the fragments: secondly, from the inflammation and fetid suppuration, consecutive diarrhoea, &c. These wounds should be treated in the following manner. The lower lip must be divided as far as the os hyoides, the edges of the wound widely separated, as in *amputation of the lower jaw*, the bony fragments removed; the lips and chin should then be brought together, leaving below an opening for the free escape of matter. This plan is equally applicable to wounds of the shoulder, where the head of the humerus may be divided, and the fragments of bone removed by making a large flap of the deltoid and raising it up; the danger is thus diminished and the limb saved.

*Wounds of the Ear* present some peculiar characters which are deserving of remark. The membrane of the tympanum is often ruptured by explosions of cannon, and blood is discharged from the ear and mouth. Deafness is the result, but generally the noise merely gives rise to a hardness of hearing: it is owing to rupture of this membrane that some persons have the power of passing tobacco smoke through the ear.

Wounds of the organ of hearing are mostly followed by fistula or suppuration from the ear or mastoid process, owing to the presence of the projectile or some spiculæ of bone, and cease only when these are removed. Hearing may be entirely destroyed by the entrance of a single grain of shot into the ear, but this species of projectile seldom goes beyond the external ear. The ear may be wholly or partly removed by a sabre wound; however slight may be its union it should be reapplied. Punctured wounds of the ear are most liable to erysipelas.

We will now consider wounds of the *Upper Jaw*, of which the following are remarkable cases. A young man was struck in 1850 by a ball at the base of the left nostril, which passed obliquely through his face, and came out on the right side of his neck: he was cured. He says that his sight is diminished, and that he has lost the sense of smelling. There is paralysis of the right half of the face; he can speak and move his tongue.

In another case the ball traversed the right malar bone, and came out in the opposite parotideal region; the patient was a boy of fifteen years of age; there remained nothing but a slight tumefaction in the malar region, the nose was uninjured, all the senses perfect. Balls may penetrate and lodge in the *antrum*: when the patient moves it follows his movements; the opening should then be enlarged and the ball extracted. The *cheeks* may be either grazed or pierced by a ball from one side to the other; the teeth are then generally broken.

*Wounds of the Neck* are very numerous and dangerous. The neck may be divided into four regions; in the *anterior*, the larynx, trachea, and pharynx may be wounded; on the sides, the great vessels and nerves; in the *lateral* the nerves going to the brachial plexus and the vertebral arteries. In the *posterior* region thick and strong muscles; here, however, they are not of much danger. In the centre the vertebral column, the medulla oblongata and spinalis. The neck is protected by the clothing, especially in soldiers; therefore in July, they were less frequently and dangerously wounded than the citizens, who for the most part fought with their necks bare, either from habit or on account of the heat. The wounds cannot always be enlarged on account

of the vicinity of the large vessels and nerves, the general treatment must be so much the more active.

Incised wounds of the neck are common in the anterior part of the neck, especially in suicides. Many are fatal from their depth and the division of the carotids; these arteries, however, sometimes escape, as they recede from the weapon on account of the elasticity of the cellular tissues, and roll upon the round surface of the bodies of the vertebræ. Unless you be present at the moment of the injury, nothing can of course be done.

Fifteen or twenty years ago, a medical student was bathing with some companions and drowned; tracheotomy was performed, the carotid artery was opened. Lesion of the jugular vein and nerves seldom takes place without lesion of the carotid; the danger is then much greater. The pharynx above the os hyoides, and the larynx below may be wounded; hence the passage of food and air.

The wound should be closed, the head kept flexed upon the breast by a bandage, the patient seated and supported by pillows; in a word the bandage must not act. But this plan has its disadvantages; if the approximation be too great the lips of the wound fold inwardly, the skin comes in contact with skin, and no union can take place; or else the lower edge of the wound is turned backwards, acts as a valve and causes asphyxia. For these reasons, I have always used the suture, taking care to leave a passage for the blood and pus. On the sides of the neck, the muscles, but especially the numerous nerves and the roots of the cervical and brachial plexuses may be injured: these wounds are dangerous; while superficial wounds of the same parts seldom are.

The lesion of nerves is followed by pain, and paralysis limited to certain muscles. I have seen at Saint Cloud patients who were unable to carry the arm forward or backward, and who complained of continual numbness. In this region the wound should be enlarged, not transversely but according to the course of the nerves and arteries. The vertebral artery and branches of the carotid may be wounded, and the result is either primary hæmorrhage, which frequently ceases, or secondary, which carries off the patient. Ligature of the primitive carotid does not always arrest the hæmorrhage, on account of the great number of anastomoses; should we therefore dispense with the ligature? Both ends should if possible be secured, if not one at least; for because a measure does not always succeed, it does not follow that it should be proscribed. The inflammatory swelling sometimes tends to arrest the flow of blood.

The muscles and spinous processes sometimes protect the back of the neck; if great vessels or the spinal marrow be not implicated these wounds are seldom dangerous.

*Wounds of the Shoulder* are very numerous; and as it is a part not well protected by clothing, they ought to be more frequent. Superficial wounds of the shoulder are seldom important; deep seated wounds of the same part are on the contrary the most severe among the severe. Several regions may be here distinguished. Thus superficial wounds may affect the anterior, posterior, superior, inferior and external parts. If the superior part has been wounded from before backward, and the wound formed a groove implicating merely the skin, the cure is here much more tedious than in any other part;

the reason of this consists in the great mobility of the part, easily causing a rupture of the cicatrix. Profound wounds which have the same direction, injure the blood-vessels and nerves, give rise to hæmorrhage, partial paralysis, pain, numbness of the muscles, &c. Even superficial wounds of the arm-pit are generally very serious on account of the lesion of nerves and blood-vessels. If the brachial or axillary artery be divided, immediate or secondary hæmorrhage generally carries off the patient. Wounds of the back part of the shoulder are very numerous, and should not be imputed to a want of courage, as they frequently occur at the moment of taking aim. Transverse wounds of this region are not serious if the skin alone be injured; if the muscles be implicated, they are more tedious in getting well. Wounds of the fossa infra and supra spinata should be enlarged and opened at several spots, but are not dangerous. The spine of the scapula may be injured without great inconvenience, except the loss of a few scales of bone. Sometimes the spine itself is separated and carried away. I have seen one of these wounds running along the fossa supra spinata, traversing the spinous apophysis, and coming out at the fossa infra spinata; if the insertion of the trapezius be divided, the motion of the arm is impeded. The same remark is true as regards the latissimus dorsi muscle.

*Wounds of the upper part of the Shoulder* are more severe. A woman had the deltoid muscle and the head of the humerus carried away; she was apparently in a fair way of recovery, but her existence was terminated by suppuration and inflammation of the thorax.

Still higher, the acromion is most frequently implicated, and I have seen it separated, furrowed, broken into fragments, &c.

In the anterior region wounds are more dangerous, as this region is generally struck perpendicularly, whilst the others are obliquely. The ball frequently reaches the bone and articulation, and whether it remains or is extracted the danger is great. If it remain it occasions inflammation and copious suppuration. When deep seated the danger proceeds from the injury done to the scapulo-humeral articulation.

If the coracoid process or the acromion be injured there will be inflammation, strangulation, suppuration and fistulæ; the wound should then be enlarged, the patient bled, the abscesses opened, and proper diet observed, &c. in conjunction with baths, *douches*, &c. and other local applications. We can readily conceive the danger when the joint is opened; inflammation and strangulation oppose the free exit of pus, despite of large openings; and how else are the fragments to be sought for and extracted? if they remain, they give rise to pain, fever, &c. It is therefore important to know what is the state of the head of the humerus. If it be merely perforated, the danger is less; but it is generally broken into many fragments; these cause suppuration and afterwards exhaustion, sweats, and diarrhœa. We should therefore endeavor to prevent the danger by our primary treatment.

If the head of the bone be only moderately fractured the wound should be enlarged as much as possible, avoiding the tendons, vessels and nerves, the fragments extracted, and counter openings made in a depending position. Disarticulation has been advised in cases of comminuted fracture of the head of the bone, but it is difficult to persuade the patient, and the surgeon does not always dare to undertake this operation; the wounded man, indeed, can

seldom conceive why he should lose his arm on account of a small opening. The perfect use of the arm and fingers renders him incredulous of such serious mischief. But is it necessary to remove every thing? I am convinced, said M. Dupuytren, that a method analogous to that which I have applied to the lower jaw might be advantageously practised; that is, to make a large incision, expose and remove the fragments.

*Wounds of the Arm* are less dangerous, for the following reasons: 1st, they are further from the centre, nearer the extremities. 2d, the anatomy of the arm explains the difference. Being cylindrical, small, furnished with only one aponeurotic layer beneath the skin and subcutaneous cellular tissue, the wound can be more conveniently enlarged. 3rd, all the tendinous parts are parallel to its axis, therefore an enlargement may be made without danger. 4th, the bone is single, the fragments may be more readily removed, and are generally near the surface.

Thus, the most severe wounds of the arm do not require amputation; and if we are obliged sometimes to perform it, it is because there is an accompanying injury of the elbow joint. But the arm contains nerves and large vessels going to distant parts, and which in their course give off numerous branches. Now, these vessels and nerves may be wounded; the brachial artery, median, ulnar and radial nerves may be divided; hence hemorrhage and paralysis of different parts. The nerves are much less exposed in the thigh.

Punctured wounds of the arm are rare and present no danger but strangulation. Sometimes they are complicated, according to their direction, with injury of the artery or the vein. I have seen at least twenty arterioso-venous aneurisms in consequence of this kind of wound. Injuries of the nerves cause long and violent suffering.

Incised wounds are frequently much more serious; sometimes the bones themselves are divided; this is uncommon, but the wound is then very dangerous; more frequently the bone arrests the blow; if both arteries and nerves be divided at once amputation is absolutely necessary.

Small-shot wounds are only dangerous when an artery or nerve is implicated. When the radial nerve is injured, there is loss of sensation and motion in the corresponding part of the hand, which can neither be extended nor supinated. On the inner side the wound is more dangerous on account of the presence of blood vessels and nerves.

The following question here naturally presents itself. Can divided nerves reunite? I have twice seen the radial nerve divided, and sensation and motion return after a lapse of two years; but here the division was simple, and without loss of substance. We know that nerves have a great tendency to cross each other, and this influence might be transmitted by the cicatrix. In gun-shot wounds I have never seen any case proving this possibility; however I do not pretend to say it cannot take place.

*Wounds of the posterior part of the Arm* are of slight importance. When made by grape or cannon shot they are more severe, and yet if the soft parts only be injured they seldom require amputation.

The danger is far greater when the bone is implicated; the fracture is generally comminuted and more severe in proportion to the number of fragments and the injury of the soft parts, but do not often demand amputation

unless both the blood vessels and nerves be wounded, and there be great destruction of the hard and soft parts. The conclusion is, therefore, that if amputation should be immediately performed in wounds of other parts, it should never be hastily undertaken in those of the arm.

Amputation is indicated, on the contrary, in cases of wounds by cannon-shot which have nearly separated the whole arm, even when the remaining flap contains vessels and nerves which are uninjured.

When the cavity of the elbow joint is opened amputation should be performed without delay. If the bones of the fore-arm, wrist, or hand be broken into pieces by a ball, and the soft parts lacerated, amputation must be performed above the injury, and it must be remembered that these parts possess an exquisite sensibility, that acute inflammation takes place, often accompanied by gangrene, and that in the majority of cases death is the result of an attempt to save the limb, too often useless. Wounds of the fingers generally require immediate amputation. In parts of such sensibility they are always dangerous. Tetanus frequently has its origin from wounds of that organ.

*Wounds of the Chest* with penetration of the projectile are very common; and the greater number of men left dead on the field of battle, perish from wounds of this nature. Their frequency and danger depend evidently on the volume of this region, its elevated position, and the importance of the wounded organs. The lungs, heart and great vessels are rarely injured without instantaneous suffocation, or fatal hæmorrhage. Persons thus wounded ordinarily fall over immediately, apparently dead, pouring out blood from the wound and the mouth; if respiration continue, it is short, very laborious, interrupted by sobs; the countenance is pale, distorted, covered with a cold sweat; the patient often lies in a profound stupor, which only ends in death. If life be prolonged, the air passing through the wound is infiltrated into the meshes of the cellular tissue, and frequently causes, in a few hours, emphysema of the whole of the body, which sometimes attains an enormous size.

Even when the ball merely strikes the parietes of the thorax without entering its cavity, it produces a greater or less concussion and disturbance of the organs of respiration. This contusion frequently gives rise to a spitting of blood, which should not be considered as the sign of a penetrating wound. If the ball meet a rib, it is generally broken, and its extremities may lacerate the pleura, the lung, and mask the true nature of the wound. A ball may pass through the chest without wounding the lungs. These cases and many others demand on the part of the surgeon a minute scrutiny, great skill and correctness of judgment. Again, the nature of the symptoms should guide our diagnosis much more than the situation of the external wound.

Fractures of the ribs or other bones comprising the parietes of the thorax add greatly to the severity of the wound. I have seen patients in whom the ribs alone have been fractured, without injury of the lungs, perish despite of all our efforts; and others, in whom the bones were untouched, recover from some very severe wounds of the respiratory apparatus. This difference results from the mobility of the osseous parietes; a mobility which constantly irritates the neighboring tissue, and develops an inflammation which extends to the internal organs.

A ball or grape shot may produce in the chest, as in the belly and limbs, all the effects of contusion of the fourth degree; these take place when the pro-

jectile strikes the cavity obliquely. The contained viscera are more or less contused, lacerated, disorganized, the heart and lungs reduced to a jelly, without the least sign of external injury. When they are crushed, all the parts are as it were reduced to a heterogeneous mass, whose organization and vitality are destroyed, and instant death generally follows. Yet men have survived for some time, and even imperfectly recover; generally, however, they perish from secondary symptoms. These accidents may occur with or without alteration of the skin. All things being equal, the chances of cure are greater when there is no communication with the interior of the thorax.

Internal hæmorrhage is one of the worst complications of wounds of the thorax. The danger proceeds not only from the quantity of blood lost, but also from the secondary inflammation thus produced, which is always very rapid, and the consequent effusion. The most prominent symptoms of hæmorrhage are imminent suffocation, an extreme anxiety, fainting, paleness, and change of the countenance, small corded pulse, jerking cough; and when the effusion is considerable, the dilatation of the side of the thorax, the separation and elevation of the ribs, the noise of the fluid against the thoracic parietes on motion of the patient, sensible to auscultation and even to the patient himself. The first indication in these cases, especially if the vessel be situated in the thickness of the thoracic parietes, is to secure it by a ligature, if possible, before bringing together the edges of the wound.

*Wounds of the Abdomen* are also very common on account of the great size of this region and the softness of its parietes, which oppose but a slight resistance to a ball. Their danger depends on the injury of internal organs, and the consequences of this injury; immediate inflammation resulting from a wound of the liver, spleen and large intestines; secondary inflammation of the peritoneum and all its reflections following the effusion of bile, fæcal matter, stercoral gases, gastric mucus, in cases of perforation of the gall bladder, stomach, small and large intestines; internal hæmorrhage from the lesion of vessels, &c.

Many of the phenomena observed in wounds of the thorax may be also remarked here. Thus the organs of the abdomen may present all the marks of *contusion* in its different degrees, and even of *attrition*, without any apparent external injury. A French soldier was wounded in 1814, under the walls of Paris; a cannon ball struck obliquely his left side without producing any external wound; he was immediately carried to the ambulance at La Villette, and on examining the part which had received the blow it was found to be of a violet colour, fluctuating extensively, and deeply disorganized. The patient was taken to the Hotel-Dieu. When I saw him again in the evening, the skin was of a brownish hue, the left lower extremity was insensible and immovable; there was vomiting, bloody urine, difficult and painful respiration, and general stupor. He died in a few days.

After death we found the subcutaneous cellular tissue, the belly of the sacro-lumbalis muscle, the parietes of the abdomen and left kidney reduced to a jelly; the lumbar nerves lacerated, the transverse processes of the lumbar vertebræ and the last ribs crushed; the abdominal cavity and wounded side of the chest filled with blackish blood; the skin alone had resisted the action of the ball.

In a great majority of cases, however, the skin is injured as well as the

internal parts; we then have according to the size and velocity of the ball violet, brown, livid, unequal lacerated wounds, covered with black blood, and apparently entirely deprived of vitality. They present in a word, all the characters of *contused wounds* which have been already described.

A ball striking obliquely the anterior part of the abdomen, sometimes occasions under peculiar circumstances a very remarkable phenomenon, I mean the *rupture* of the contained viscera. It is difficult to conceive how flexible and moveable organs, like the alimentary canal, can be ruptured by external violence without a wound of the abdominal parietes. Yet numerous examples of this species of wound sets aside all doubt. It must be remarked, however, that in whatever manner they may take place, ruptures of the intestinal canal are not always followed by effusion of *fæces* into the peritoneal cavity, and that cures often occur from adhesion established between the lacerated and adjoining parts.

*Stupor*, a remarkable effect of severe wounds, and which we have already described, is especially remarkable in those of the cavity of the abdomen.

Let us now consider *Wounds of the Pelvis*.—This bony cavity, which is as it were an appendix to that of the abdomen, contains several important organs, and is therefore liable to dangerous wounds. When a ball passes through this region, it fractures the bones, constituting a serious injury; for the bones are deep-seated, covered with a large mass of soft parts, surrounded by large blood-vessels and nerves. The organs which they enclose are perforated, and pour into the cavity the fluids or solids which they may contain, producing secondary inflammation almost inevitably resulting in death. Great vessels are opened, and the hæmorrhage cannot be arrested; the nerves are wounded, and paralysis of one or several organs ensues, or of the lower extremities. If the ball lodge in the bone or soft parts, it gives rise to all the terminations pointed out in the other regions, such as necrosis, inflammation of the periosteum, of the cellular tissue, large and deep abscesses, fistulous sinuses, &c. The perforation of the bladder is followed by effusion of urine; that of the rectum by extravasation of *fæces*; accidents promptly fatal. Rare exceptions sometimes occur. A private of the royal guard, treated in the Hotel-Dieu in 1830, survived nearly 40 days after a double lesion of the bladder and large intestine. This extraordinary case was accounted for by remembering that the ball, fired from a window, had an oblique direction downward, and had not penetrated the cavity of the peritoneum.

We will now glance over *Wounds of the Lower Extremities*.—The size of the *hip joint*, its proximity to the trunk, the numerous organs composing it, render a wound of this part extremely dangerous. Amputation, which is often imperiously demanded, leaves a very extensive wound; large vessels and nerves are divided, and yet there are many living proofs of the efficacy of this dreadful remedy. Fracture of the *thigh bone* is always very serious. This bone being of a compact structure, if the ball possess much velocity it is broken into splinters, and a comminuted fracture results, the more dangerous inasmuch as it is complicated with a wound of the integuments. There scarcely exists a fracture which is not comminuted, produced by a ball striking the shaft of the bone perpendicularly. Generally, the fracture is simple, only when the ball strikes obliquely. Now, what happens? At the moment of the wound the individual falls, the ends of the broken

bone are forcibly carried against the surrounding tissues and lacerate them. Every motion gives rise to a new laceration and most horrible pain. From these circumstances the inflammation runs very high; the suppuration is copious and unhealthy; the patient sinks, and death is inevitable. Amputation is therefore, in many cases, our only resource. The disorder of the soft parts, the injury of arteries and large nerves, are motives to hasten the operation, for it should be early performed, in order to prevent the development of secondary symptoms.

If the bone of the *leg* be fractured the danger varies according to the situation and extent of the injury. At its upper part the tibia is of considerable size, and spongy; a ball may therefore pass through without fracturing it. In similar cases, a cure may follow without a bad symptom. If the ball strike directly the broader surface of the bone, towards its middle, it may still perforate it without a complete fracture; but the portions of bone remaining on each side not being sufficiently strong to bear the weight of the body, yield, and the fracture becomes complete.

This bone, however, is mostly broken, like the *os femoris*, into splinters. The fragments then are numerous, and they should be carefully removed in order to abridge the consequences of the injury and prevent its complications. Rouge, a printer, had his leg broken by a ball on the 28th of July in the Place de Greve. Being of a very irritable constitution, the nervous symptoms with which he was attacked were with difficulty subdued, and we were forced to forego amputation as the case demanded. Symptoms highly exacerbated by the imagination of the patient supervened, and an attack of fever terminated his existence on the 31st of August.

In gun-shot wounds of the *knee joint* amputation is indispensable. If there be a settled point in military surgery, it is the incurability of these wounds.

Wounds of the *lower part of the leg*, involving the ankle joint, are very dangerous and generally require amputation. The remarks made as regards wounds of the hands and fingers apply equally to those of the feet and toes, and we will dismiss the subject.

Let us now recapitulate the principal points relative to wounds of the limbs.

1st. Wounds implicating merely the soft parts and sparing the large vessels are seldom dangerous, and heal kindly, provided the openings are sufficiently enlarged.

2d. There is always more or less danger when the bones are involved. But fracture of the principal bone of a limb increases so much the danger of the case that we expect only one cure in four cases, and for two reasons: 1st, because this fracture is almost always accompanied by a wound; and secondly, because it is almost always comminuted. Every one knows that compound fractures, produced by what cause soever, are often so severe as to require amputation; the contact of the air, inflammation, excessive suppuration, and even gangrene, which result from them, are often productive of fatal results.

3d. If a bone be fractured at a joint or in its vicinity, and the joint be opened, the wound is exceedingly dangerous, and the subsequent symptoms generally demand amputation.

4th. When great vessels are wounded, the patient soon perishes from hæmorrhage unless they are secured. This is a frequent cause of death on

the field of battle. The division of veins seldom gives rise to hæmorrhage unless large trunks have been injured, or the patient been subjected to much motion.

It would be superfluous to speak here of the consequences of the destruction of a muscle, the division of a tendon, the section of a principal nerve, &c. They are seen every day in civil practice, and every one understands them.

*Treatment of Gun-shot Wounds and their Complications.*—The treatment of these wounds, like that of other surgical diseases, is divided into general and local. The former comprises rest of body and mind, diet in its different gradations, drinks of diverse nature, pure atmosphere, loss of blood, &c. The latter is directed to the means of arresting hæmorrhage, of preventing or removing strangulation, inflammation, and gangrene: the enlargement of the wound, extraction of foreign bodies, amputation, ligature, dressing and cicatrization of wounds, position of the limb, topical applications, &c. It may also be remarked in a general way that, in the same manner as we distinguish three principal stages of these wounds, one of stupor or nervous debility, the second of reaction or inflammation, and the third of suppuration or exhaustion, the treatment should consist successively of slight stimulants, then antiphlogistics, and lastly tonics and roborants.

*Rest*, especially when there is a fracture, is of the highest importance. A *tranquil mind* is no less necessary, for reasons already pointed out in this chapter. A *pure atmosphere* is also of the greatest moment. Therefore the most healthy situations should be selected and the wards kept scrupulously clean. It is much better that the wounded should lie in large tents, if possible, than be heaped in hospitals, to fall victims to gangrene and ataxic and adynamic fevers. *Ventilation* should, however, be cautiously conducted, lest dangerous consequences ensue. Currents of air, established by means of air-holes or windows opposite to each other, are frequently fatal, by giving rise to inflammation of the internal organs. We have already said that tetanus often follows the action of these currents and the sudden transition from the heat of the day to the freshness of the night. For the same reasons the patients should be prevented from throwing off their bed-clothes lest they be exposed to the agency of the causes just mentioned.

The *diet* demands the strictest attention. The sudden change from health to disease, the certain occurrence of fever, disorder of the internal functions, and many other considerations render diet absolutely indispensable. A modern system much abused introduced an extremely severe regimen, which experience has proved to be injurious. Absolute diet in persons who have not been gradually prepared for it is productive of bad effects. The strength of the patient should be supported by soup, fresh vegetables, &c; we must reduce, suspend, or increase the nourishment according to circumstances and the stage of the disease, the habits, age, and constitution of the patient. A sick Russian will eat with impunity more than a healthy Spaniard. In 1814, the wounded Cossacks admitted into the Hotel-Dieu received rations sufficient for able-bodied soldiers, and in addition rations of brandy, which seemed to have no effect upon the most severe wounds. The *drink* should vary according to the stage of the disease. At first, drinks slightly exciting, diluent when inflammation supervenes, tonic during the period of suppuration. The bowels should be kept naturally open, in order to prevent the uneasiness of

retention of *fæces*, and hæmorrhage which might follow violent efforts to make water or evacuate the intestinal canal.

Observation has shown that during the first three days following the wound, a fever of more or less intensity takes place, known by the name of *traumatic*, and which sometimes runs so high that the surgeon should never neglect to endeavor to prevent or moderate it. The nature of this fever is manifestly inflammatory. After diet, rest and drinks, *venesection* is the most effectual means of subduing it. It may be established as a general precept that patients wounded by balls or other projectiles should be bled and bled even copiously, having regard to the state of the patient. If there be stupor, he would perish from the opening of a vein: we must then wait for reaction. If a copious hæmorrhage take place, the indication is thereby fulfilled. But in all other cases we must guard against inflammatory symptoms, and general bleeding is the best means of accomplishing our end.

Wounds of important organs, as the lungs, brain, liver, &c. require large and repeated bleedings. The old surgeons were not afraid to bleed ten, fifteen, twenty times, or even oftener in the early stages of these wounds, and were sometimes successful in apparently desperate cases. This practice has been followed in some cases of severe wounds of the thorax, with the happiest results. Experience has proved the absurdity of sucking a wound of the chest in order to extract the effused blood, and shown that the chances of cure are much greater when it is closed immediately by a suitable dressing, and the introduction of the air prevented as much as possible.

Let us now take up the most difficult and complex question in military surgery, namely, that relating to *Amputation*. The first problem to be solved in wounds of the limbs, is to point out the cases requiring amputation; for when this operation is deemed indispensable, it should be performed without delay, unless there exist great stupor or disturbance. What circumstances, therefore, render it necessary? When and how should it be performed? What should be the after treatment—should we attempt or not union by the first intention?

In my opinion amputation is absolutely necessary: 1st. When a ball having nearly reached the end of its career, and stricken a limb obliquely, has fractured the bone and extensively bruised the soft parts, without, however, injuring the skin. 2d. All ball or grape shot wounds in which a limb has been dreadfully mutilated, completely removed, or holds merely by such fragments, require amputation. There is then an unequal, lacerated wound, parts struck with mortification, projecting bones, in a word an enormous wound, of which the copious suppuration is fatal to the patient, who in the most successful cases recovers only after a tedious treatment and with an unseemly cicatrix. Notwithstanding all these advantages the rule admits some exceptions. Thus if a projectile have carried away the arm at or near the shoulder, and at the same time the acromion or coracoid process and spine of the scapula, amputation is evidently impracticable; for where is it to be performed? The same is true as regards the hip-joint. What must then be done? Remove all foreign bodies and fragments of bone from the wound; arrest the hæmorrhage if it be present, prevent its occurrence if it do not actually exist, for it is most probable that it will afterwards take place. The artery should be tied an inch or inch and a half above the injury. But these precautions cannot remove the danger accompanying these wounds, and arising 1st. from the concussion and stupor, which often cause death; 2d. because

the patient after escaping the primary danger may not be able to bear up against the violence of the inflammation, and abundance of the suppuration; 3rd. if the patient survive all these perils, he may sink under the process of cicatrization, which, difficult in an ordinary amputation, is often impossible in gun-shot wounds; 4th. and lastly, he is threatened by the development of internal inflammations, frequently fatal in their result.

3rd. The majority of writers deem amputation indispensable when great vessels are wounded. I do not, said M. Dupuytren, concur altogether in that opinion. For instance, if the femoral artery be opened at its middle portion, I think we should endeavor to save the limb by tying it above. Although a single ligature may suffice, it is much more prudent to secure both ends of the vessel. We have thus been frequently successful in comminuted fractures, not complicated by a wound. But if the lesion of the artery be complicated with a wound, the case is much more serious. Thus, in recapitulation, I should say, if the artery alone be injured, it should be tied; if the artery be wounded, and also the bone slightly, still use the ligature; in severe injury of the bone with a wound, comminuted fracture, amputate; in severe injury of the bone, and division of the artery, we should, *a fortiori*, amputate.

4th. Wounds of the principal nerves are not necessarily followed by amputation. Which, indeed, are these nerves? The radial nerve? Even when this nerve is injured, a certain degree of motion remains in the wrist, and the preservation of the limb secures the patient from the dangers of the operation. The median? The patient escapes with permanent contraction or paralysis. The brachial plexus? It can scarcely be injured without wounding the vessels at the same time. Here amputation is indispensable; but were the nerves alone injured, it would be much better to preserve a slightly useful arm, than subject the patient to the risk of the operation. Lastly, it is not more required in lesion of the sciatic nerve. Paralysis, indeed, results from its complete division; but the danger in amputation of the thigh is so great that it is much more prudent not to expose the patient to it.

5th. If a large part of the soft parts, vessels and principal nerves have been removed, amputation is evidently indicated.

6th. If a long bone is broken into numerous fragments at its middle part, should we preserve or sacrifice the limb? The following is, in my opinion, a general rule in these cases. If the bone be broken only in one or two places, the fragments few, the nerves and vessels unhurt, the disturbance slight in the soft parts, the wound should be enlarged and the preservation of the limb attempted. In contrary cases, amputate immediately. It is true patients have recovered after having refused to submit to any operation; but these cases are too rare to be admitted as precedents. In the army or on fields of battle, which are so different from civil hospitals, we should not hesitate for a moment. The patient is exposed to danger from numerous and serious perils; immediate or secondary hæmorrhage, violent inflammation, strangulation and its consequences, copious suppuration, colliquative sweats and diarrhæa, internal phlegmasiæ. Death generally occurs on the 20th, 30th, or 40th, day.

7th. Amputation is again required when the spongy portion of a bone near a large joint, or this joint itself, has been penetrated by a ball, especially if it have been largely fractured. The same is to be done in severe injuries of the phalanges; which though of apparently unimportant size, from their exquisite sensibility frequently excite tetanus and other nervous accidents. In the large

joints if one bone alone be injured its resection may be substituted for amputation. This operation, however, is impracticable in the inferior extremities; it would not be prudent to perform it at the wrist, even when the bones of the forearm alone have been injured by a projectile traversing the radio-ulnar diameter of the limb; it would be perfectly proper if the projectile had carried away the posterior part of the elbow joint. It has been also successfully applied to the lower jaw, but is especially suited to comminuted fractures of the head and neck of the humerus.

8th. In all the cases just enumerated, and in all those in which amputation is indicated, it should be performed immediately. We thus make but one wound; the patient has not thought of preserving his limb, and cares but little to part with it. If, on the other hand, he be allowed time to reflect on his situation and the loss he is about to undergo, he suffers doubly from the sacrifice.

Injuries resulting immediately from gun-shot wounds are not the only ones which may require amputation. Many circumstances may occur during the course of the disease which may render it necessary: thus, 1st. This operation may be demanded when the inflammation terminating in gangrene, the latter occupies the entire circumference of the limb, or being limited to the soft parts only, after the separation of the slough, leaves the bone extensively denuded. In these cases there is no necessity for waiting until the gangrene is arrested, provided the operation be performed sufficiently far from the seat of the injury, and in sound tissues. 2d. The operation is indicated, when in the suppurative stage it becomes apparent that the patient can no longer resist its influence. It should then be performed quickly, and not wait until debility and exhaustion have advanced far, or some internal complication be developed. 3d. It also becomes necessary when a wound, dangerous of itself, is complicated by secondary hæmorrhage, unless it can be arrested by securing the artery at some distance from the wound.

Here an important question arises. Should we after amputation endeavor, or not, to procure union by the first intention? Wounds resulting from a primary amputation should be immediately united, if the tissues in which it has been performed be perfectly healthy. In this case, indeed, nothing contra-indicates it; the patient is not debilitated; no copious suppuration has been established which it would be dangerous to suppress suddenly.

But is it supposed that union by the first intention can be effected, in the full acceptation of the word? I have interrogated many of the most decided partisans of this method, and who have all agreed that there invariably takes place more or less suppuration after 15, 20, or 30 days, even in the most favorable cases. This fact I have also always observed, but it takes away nothing from the merits of our operation, which diminishes the extent of the wound and of the suppuration, shortens the cure and removes the danger. However, we will now point out what may be considered as objections to it. In the first place we are obliged to secure even the smallest vessels; and however careful we may be some one may escape, and immediate or secondary hæmorrhage supervene. If hæmorrhage take place, the situation is worse; the effusion and infiltration of blood destroys the adhesion of the parts; it is exceedingly difficult and sometimes impossible to find the bleeding vessel. The infiltrated fluid causes inflammation, and an unhealthy suppuration;

chills and fever come on, and render the situation of the patient one of great danger.

What we have said of the circumstances favoring *strangulation* and its effects leads to the knowledge of the preventive and curative indications of this accident. It may be prevented by general and local blood-letting, emollient poultices, purgatives, revulsives, &c. This same treatment is also proper to moderate its intensity when its development cannot be prevented.

But the most efficacious, undoubtedly, of all these means is *to enlarge* the wound (debrider). The loss of blood resulting from the incision serves to lessen the engorgement of the parts; thus, far from arresting it, it should be promoted as long as the patient can bear it without danger.

No one denies the utility and even absolute necessity of enlargement when strangulation exists and is intense, but some practitioners have thought that it should not be used as a preventive means, and that by its indiscriminate employment the patient was subjected to much unnecessary pain. Certainly it should not be performed without judgment; but there are cases in which it is imperiously demanded, as well on account of the nature of the projectile as of the parts wounded. Thus, in deep wounds, with narrow openings, involving the aponeurotic and superimposed cellular tissue, produced by any cause whatsoever, it is indispensable. Experience proves, indeed, that they generally give rise to symptoms of strangulation, and that serious danger may result by deferring the enlargement of the wound as a preventive means. In these cases, it is almost always a curative remedy, by preventing the unfavorable symptoms which might result from the strangulation.

Again, it is not only in wounds that this operation becomes necessary; there is strangulation in all the inflammations, as well external as internal, which are developed under aponeuroses and in the midst of fibrous tissues. It appears in and under the skin, principally in grooms and others taking care of horses; such are especially furmicle and the non-contagious anthrax.

The end of the enlargement of the wound is to remove the compression of the inflamed parts, and consequently also their tension. Hence it may be perceived that it is principally directed against aponeurotic, fibrous and other parts opposing the free development of the inflammatory action.

This operation requires no other instruments except the bistoury and director; but in many cases the finger advantageously supplies the place of the latter. It very rarely happens that the common bistoury is not sufficient: if it is too short a longer one must be selected, so as to operate at greater depth in wounds to be dilated. Whatever may be its length it should have a button at its extremity, especially when it is necessary to enlarge wounds of some standing, to avoid injuring by its point deep seated parts. The button should be placed nearer the back than the edge of the instrument, that it may not interfere with its operation; but when it is necessary to enlarge parts entirely, the ordinary straight bistoury is indispensable. The sound canula designed to direct it should also have dimensions proportioned to the depth to which it is to be carried. Whenever it is possible to conduct it upon the finger, it is better to make use of that than of the sound, as it is a surer guide. If the entire parts are to be cut through which have not undergone any solution of continuity, we ought to incise them from without towards the interior by thrusting the sharp edge of the instrument through them. Accord-

ing to the case, a single incision may suffice, or several may be required. One may be sufficient when the contraction is circumscribed to a moderate extent, but two or more are necessary when the constriction and inflammation are extensive, as when diffuse phlegmon is developed under the aponeuroses of the extremities. There are even circumstances under which we are obliged to multiply still more the number of incisions and increase their extent, to prevent the destruction of all the parts affected by gangrene. Crucial incisions are necessary in certain cases of inflammation complicated with circumscribed constriction, as in anthrax and furunculus.

After incisions, whether simple or multiplied, linear or crucial, pressure should be made in order to evacuate the serous, purulent, or other fluids, either infiltrated or collected in cavities, as their presence, besides producing inflammation, may create a new constriction. Many persons may think that they have dearly purchased relief by the vivid pain which pressure creates; nevertheless, it is the only means of obtaining a speedy cure. If a wound pre-exists, the enlargement must be made from within towards the surface; here the bistoury is conducted by the director on the finger, or a bistoury with the button at its extremity separates the parts in a manner similar to the sound. When enlargements are made upon the surface, their direction, whether lineal or crucial, is of little consequence, but not so when we operate at great depths, they must then be made parallel to the direction of the vessels, nerves, muscles, tendons, &c., and as far as practicable at a distance from them, in order to avoid hemorrhagies, paralysis, and loss of function, of which so many examples have been cited. Thus, I have seen at Saint Cloud a patient deprived of the use of the great pectoral muscle by its tendon being cut through near its insertion into the humerus, whilst enlarging a wound to extract a ball which was not to be found.

To be effectual, dilatation must be practised throughout the whole length of wounds in which it is necessary, and over the whole extent of surface which the constriction occupies. If it is not carried to the depth and length of the evil there results but incomplete and momentary relief. But while it is proper to conform to this rule it is necessary nevertheless to avoid the rashness of those who for the least wound or smallest occurrence of constriction divide a limb throughout its whole length, and by this practice run the risk of useless suffering, dangerous hemorrhagies, interminable suppuration, and finally only accomplish a cure by the formation of large cicatrices, muscular and other hernias, and debility greater or less of different parts, &c.

If incision is practised only to relieve constriction, the blood must be allowed to flow as long as the patient can bear its loss with impunity. If it has been performed in order to extract foreign bodies, we must immediately proceed to search for them by the means hereafter to be noticed.

Union by the first intention of parts liberated by incision, is an error we have seen committed. There is in fact inconsistency in operating to remove compression and afterwards bringing about reunion, or in other words to reproduce the effects the practice was intended to remove. Such an occurrence we have witnessed in a case of sub-aponeurotic phlegmon developed at the anterior inferior part of the forearm, where an immediate union of the edges of the incision, made to liberate the tension, renewed all its inconveniences. In another case of phlegmon of the leg, the reunion of the incisions by the first

intention gave rise to a purulent collection in the interior of the limb. Parts thus liberated must be left to themselves, or there should be placed between the lips of the wound a pledget of linen spread with cerate, and simple dressings solely applied, which will permit the exit of pus if formed, and bring about a more tardy union.

What has been said with regard to liberating incisions, has a special application to wounds of the extremities. But is this operation practicable in other regions? The cranium being covered with a close fibrous tissue, wounds implicating it require imperiously either incisions or preventive enlargements, or division when the constriction is prominent. We will remark here, lest it should be omitted, 1st. That in whatever region the dilatation is practised, which consists in making incisions at the entrance and termination of openings, they ought to be principally performed at the terminating orifice. The reason is plain, for all foreign bodies formed from or introduced by the projectile are found located near this opening; hence larger incisions are necessary to facilitate its exit. 2d. Another general rule to be laid down, is to enlarge most extensively the opening which is most dependent, both to facilitate the removal of foreign bodies and to evacuate pus. In wounds of the chest by penetrating weapons, far from enlarging they should immediately be closed, at least if the intercostal artery is not wounded. But when the wound is produced by fire arms, a different course is to be pursued; then in fact the openings and the tract of the wound are covered with a layer of mortified substance; inflammation will arise and be followed by the removal of the sloughs, by suppuration, and sometimes by the escape of foreign bodies: nature is opposed to reunion, and this reunion is at least useless if not dangerous.

In the abdomen enlargement is contra-indicated, because by increasing the opening, additional risk is encountered of allowing the viscera to escape from the cavity, and of destroying the salutary adhesions which the wound has contracted, and which oppose their exit. In the pelvis it is impossible; the bone cannot be operated upon, and the only attempts made must be confined to enlarging the openings in the soft parts in cases where it is thought possible to remove extraneous bodies. But you are aware of the difficulty of affording free issue to pus formed in this cavity; this is one of the principal causes of the great severity of wounds in this region. As to the articulations it is rare for them to be wounded without affecting the bones. Should they enclose a foreign body, the wound must be enlarged and an effort made to extract it. If they are merely grazed beware how you open them. But we have said that almost always, the bones composing them are affected at the same time, and then enlargement and the extraction of laminated fragments cannot be dispensed with, provided there is a reasonable hope that amputation may be avoided.

To recapitulate: by incisions, dilatation, and liberation from constriction, three principal indications are proposed. 1st. To prevent the resistance which the inextensible fibrous tissues oppose to swelling, or the inflammatory tumefaction of soft parts; this is *preventive liberation*: or to remove the resistance when it exists, and there is constriction; this is *curative liberation*. 2d. To afford an easy exit to the products of suppuration. 3rd. To facilitate the search for and extraction of extraneous bodies. With regard to this last

indication, enlargement is especially applicable to wounds of which the aperture and track are too small to admit the introduction of the finger or exploring instruments, to those of which the track is too irregular to arrive directly upon the substance to be removed, and finally in those complicated with fracture of bones to facilitate the removal of splinters.

Bodies found in wounds are of two kinds : one class consists of the projectiles themselves, and matters introduced along with them, such as pieces of clothing, leather, buttons, coins, &c., as also the primitive splinters; the second is composed of the secondary and tertiary splinters. We will not reconsider at this time the evidences of the presence of projectiles, nor the difficulty of being assured of their existence. Let us proceed to the *search for and extraction of foreign bodies* in general. The patient must be placed as far as is practicable in the position assumed at the moment of being wounded. According to the advice of Ambrose Pare, the best instrument to use is the finger, because the sense of touch is more accurate than when a metallic instrument is employed. But if the finger cannot penetrate to the location of the substance, neither the sound canula, nor that with a stilet should be employed, for fear of wounding the parts, but a simple female sound is most proper. If the finger can reach and feel the body, the dressing forceps will generally be sufficient to remove it; but if it be deeply imbedded or altered in shape, the bullet forceps are preferable, because this instrument seizes it completely and produces less pain during extraction. If the depth at which it lies is very great, or the track be sinuous, or the direction of its course devious, counter openings must be made. But it should not be forgotten that if it cannot be found, or cannot be seized and extracted without great difficulty, and without occasioning intense pain, it is much better to desist entirely, or defer the operation to a more convenient period. When the sloughs are separated, and suppuration established, the body becomes more apparent and movable, consequently more easily seized and extracted. The projectile being withdrawn from the wound, all other foreign substances accompanying it must also be taken out, but often, however great may be the care practised, there will remain fragments of bone, portions of dead tendons, of clothing, wadding, &c. These are not expelled until months afterwards by the effort of nature, and then it is that reunion is accomplished. Besides, as has been said, balls, shot, &c., can remain encysted a long time, or during lifetime, within the tissues of our organs, without being productive of inconvenience or affecting health. We will now examine the indications which are presented by projectiles imbedded in the bones. If the ball remains in the spongy tissue, it is recognized by the want of two orifices; the only one existing is that leading to the interior of the bone; the resonance and resistance communicated to the sound and stilet are conclusive; the impinging of steel upon lead gives out a flat sound, against compact bone a clear sound, and the resonance emitted is very different. Against spongy structure there is no resonance, but soft yielding resistance is experienced distinct from that presented by balls or bone. Should a ball be discovered, if it is covered by an envelope from the clothes, it can be drawn to the opening and removed. Such an occurrence is rare. If this does not happen when the ball is fixed and immovable the *piercer* is very useful, as it easily penetrates it. The ball is then withdrawn by communicating a rotatory motion to it, and with management the extraction is accomplished. But what is to be done if this will not succeed? The integument must be

separated by a crucial incision, the flaps raised and dissected, and the crown of a trephine applied to the orifice in the bone in order to increase the canal; then the ball may be removed by the piercer. The same course is to be pursued when the ball is imbedded in a flat bone as in the cranium between the two tables.

If the ball has traversed the bone and escaped, no particular treatment is to be pursued, the bony canal is not to be enlarged, for the osseous tissue has not the property of tumefying as much as the soft parts, and consequently of producing constriction. But things are to be managed differently when the bone is broken into fragments and splinters more or less numerous are separated. This is not the place to set forth the signs of comminuted fractures; in this case they are the same as in those from other causes, and farther aid is afforded by the touch or an instrument.

Let us pass to the indications. The first consists in the enlargement of the openings of entrance and escape. If the latter does not exist, the ball remains either in the bone or soft parts, where its force is spent. The ball is then to be searched for and extracted along with the fragments of bone. But if the dilatation having been made, and the efforts to find it are very difficult, if they occasion suffering, if irritable persons are the subjects, we repeat what has been said already, it is necessary to abandon all attempts, and not to run the risk of spasms, convulsions, and tetanus. The wound having been enlarged, the osseous fragments are to be felt for with the finger and their mobility ascertained. If it is apparent, then the pincers or piercer are to be used. If it is partial, that is if secondary scales are found adherent to the flesh, tendons or aponeuroses, but detached in mass from the bone, they should be seized, and if possible the fleshy pedicle cut with scissors or the bistoury. But, says M. Dupuytren, if the distance is too great to allow the action of cutting instruments, is it right to pull them away? I have done this sometimes, but have found that the inconvenience more than counterbalances the advantages of so doing; a profuse flow of blood, great pain, excessive complaint, spasmodic contractions and other accidents are its ordinary effects, and should induce us to avoid it.

The tertiary scales not being separated at the time of the accident, their removal cannot be attempted. These arise from necrosis, and not becoming loose until the end of forty or fifty days cannot come away before that time. But they may then be surrounded by callus, if the portions are too large, and be expelled by the suppuration.

In the course of our lectures the phenomena of *sequestrum* and *provisional callus* have been examined. But if the provisional callus has not been able to form in consequence of the frequent movements of the wounded limb, or of deep seated constriction of the soft parts and of the vessels, the long continuance of the disease exhausts the patience of both the surgeon and sufferer, and may be protracted to six months or a year. At length the fragments becoming movable, they should be seized and removed, and then the two perpendicular ends of bone approach and unite. The limb remains shortened, but this is not to be prevented; all that can be done is to preserve its straightness unaltered. The callus which then forms by means of the cellular and vascular granulations is permanent, and not provisional; it is not produced around the bone, but between its extremities. The treatment and apparatus are the same, only greater care must be taken, and the dressing oftener repeated, for a

wound exists, and if it was not dressed daily and even twice a day the suppuration would become changed, burrow, and lead to untoward results.

The dressing of wounds from fire-arms consists of many details which it is important to appreciate. Exclusion from the atmosphere is of the first consequence; this is to be done as soon as circumstances will admit. Fine linen pierced with many holes and spread with cerate is best for the purpose; upon this is placed a pledged of lint, thick in proportion to the amount of suppuration. Bandages are injurious, because in order to apply them the limbs must be raised, and their position changed. It is better to employ compresses somewhat long, which cross each other and are secured with pins. Much importance is attached to the removal of the first application, which formerly was done at the end of twenty-four hours. At this epoch, the wound was dry, the blood upon its surface adhered closely, the lint which covered it was glued to it, and much suffering was produced by endeavoring to remove the adherent dressings. But at the present time, surgery has undergone great change; a wound is not undressed until the coverings are detached and can be removed without suffering. Five, six, or seven days are necessary for this to take place; the injured surface then commences to suppurate, the lint is moistened and comes away without difficulty. Up to this moment the exterior layers should be removed and renewed; at the same time those remaining may be bedewed with some mild aromatic liquor. The dressing being intended to maintain the fragments, to facilitate the expulsion of pus, and to bring together the parietes of the wound, fillets of linen, which are preferable to permanent bandages or graduated compresses of lint, and sponges are to be used, according to circumstances; at each dressing the wound may be cleansed by means of injections, varying in properties according to the stage of the disease. These consist of solutions of nitric acid, of mercurial salts, and the chlorides when putrefaction is present; camphorated spirits when there is fetor; and vinomel\* when the wound is indolent. The chlorides, said M. Dupuytren, are much vaunted as remedies against hospital gangrene, and contagious affections; we have often employed them unsuccessfully; in 1830 they were valueless in many cases. We attacked the disease with lotions of nitrate of mercury dissolved in an excess of nitric acid, put on with a camel's hair pencil, and the experiment was most happy.

The position of the limb and of the patient merits special attention. The horizontal posture is an obstacle to the evacuation of urine, and a cause of its retention. This retention is increased gradually; at first a small quantity is retained, then a larger, and finally it is continually voided guttatim. This is a sure sign that retention exists, although there is an apparent discrepancy between its occurrence and the continual dribbling of urine; it is because the bladder being full and distended beyond its capacity, discharges the extra accumulation. The catheter must under these circumstances be frequently used or left in the organ; continuance in bed if fracture exist is not less inconvenient. The same position preserved sixty or eighty days is productive of pain in the hip and leg, inflammation and excoriation, sloughs of the sacrum, spinous processes, spine of the scapula and of the trochanter. To guard against these the couch is to be changed, and the transfer managed with care, &c. Cold damp sheets bring on chills and internal inflammation. If it is

\* A stimulating application composed of wine and honey.

not practicable to change the bed, the eschars are to be prevented by resolute strengthening lotions, such as solutions of lead, eau de vie &c., by pads of fine lint and by plasters of cerate, &c.

You already know, says M. Dupuytren, what are the methods employed to apply ligatures when hemorrhage occurs from injury to vessels. It is a subject of daily remark. At the present we shall confine our observations to arterioso venous aneurism. What are the modes of treating this species of aneurism? Compression? It is very difficult to practise, very inconvenient in general, and according to the situation produces intolerable pain and dangerous tumefaction. If for instance there exists a varicose aneurism between the artery and an axillary vein, compression would be applied at the same time upon these two vessels, and upon the plexus of nerves around the artery. Besides compression is useless over an old opening, conical in shape, and organized like the internal membrane of the artery and vein; circumstances in which the ligature itself applied according to the method of Hunter fails frequently.

Two methods are adopted of applying the ligature; one of placing it upon the artery above the disease as practised by Hunter, the other of applying ligatures above and below according to the ancient method, or with the modifications I have introduced. The first, which is very often successful in recent varicose aneurisms, fails completely where they have been of some standing. In these last cases, it is necessary to have recourse to the ligature on both ends, either with or without incision of the tumor.

*Stupor* is one of the most serious occurrences attendant upon wounds from fire-arms; it renders mortal nearly all the cases which it complicates; but the more alarming it may be, by so much the more must the treatment be energetic to combat its development and consequences. *Stupor* presents two stages, one of prostration, the other of reaction; in the first, stimulants are necessary to sustain the vital forces; and in the second, antispasmodics and antiphlogistics to prevent their running into excess. Thus at first the wound is to be bathed with spirits wine, &c. Cordial drinks are administered internally, without forgetting at the same time that reaction must supervene, and that its energy may be increased. When reaction has come on, we should merely look on as long as its symptoms are regular, for it is the method which nature takes to remove the stupor; but if it is carried to so high a degree as to threaten life, antispasmodics are to be used, as valerian, camphor, &c.; if these are not proper, leeches to the wound, emollient fomentations and poultices are to be employed. If there is sinking, mild stimulants may be administered. Should high fever be present with frequent full pulse, bleeding is our remedy; if delirium occurs, leeches to the head; if jaundice, cataplasms to the hypochondriac region; if vomiting, Sedleitz water or the potion of Revierus. In all cases, every thing irritating is to be guarded against in the treatment of the wounded. They must be removed from the seat of war, from the noise of arms, from the cries of victory or defeat. If the dangers of stupor and reaction have been obviated, it must not be forgotten that they are more exposed to ataxic affections than other cases.

The treatment of concussion, far from being the same in all stages of the affection, must vary according to the intensity and presence of sinking, reaction or irritation; the treatment of such symptoms should consist successively of stimulants, evacuates, and even antiphlogistics more or less energetic.

Such is the importance of this distinction, that if these different remedies were indiscriminately employed at all stages of the affection, in place of assuaging the symptoms, an untoward event would be in all probability hastened. Thus if bleeding is too early practised, life may be jeopardized, or if stimulants are continued when reaction has come on, inflammatory action may be dangerously increased. The plan to be pursued is this; in the first instance give mild stimulating cordial drinks, and wet the skin with spirit or ammoniacal preparations, &c. When reaction has come on these must be no longer used; if stasis of blood in the vessels exists, local sanguine evacuations, either by leeches or cups, are proper; if there is fever, general bleeding. But when the malady continues a long period, without symptoms of stasis or inflammatory reaction the best treatment consists in the employment of revulsive stimulants, such as mustard foot baths, purgative enemata, laxative draughts, &c. But of all these applications, large blisters to the posterior part of the neck and allowed to remain there, sometimes are the most effectual.

I could cite many examples of cases cured by such treatment. Its efficacy is so prompt, that often in a few hours there is a notable amelioration, and this not in cases likely to improve, but in those where the affection remained stationary, or threatened to terminate fatally.

Tetanus is also among the number of those diseases the treatment of which is confined to no fixed and settled method. A host of remedies have been brought in array against it, both internal and external. Thus general and local bleedings, abundant and reiterated warm baths of all temperatures, alkaline baths, dashing of cold water, vapor baths, mercurial frictions carried to salivation, electricity, blisters to the wounds to produce suppuration, or on other parts of the body, moxas to establish revulsion, excisions, enlargement, cauterization of wounds, removal of the wounded limb when practicable, &c. &c., have all in their turn been vaunted and employed as external means. An immense number of internal medicines have been relied on as cures for *tetanus*, such as opium, belladonna, aconitum, stramonium, camphor, castor, musk, æther, valerian, digitalis, purpurea, arnica, mercury; sudorifics, as aqua ammonia, acetate of ammonia, carbonate of potassa, acetate of lead, tartar emetic, purgatives, spts. of turpentine, poison of the viper, &c. &c. The apparent fertility of these resources is a proof of the penury of their efficacious qualities. They all have been lauded by their advocates; but their pretended merits vanish before the light of analysis and experience. As tetanus may admit of, and in fact does depend upon a multitude of causes; and as practitioners for the most part treat it empirically, it is not astonishing that the therapeutics of the complaint have advanced so little. It is easily understood that if vermifuges are prescribed for an individual attacked with tetanus, in consequence of suppressed perspiration, sudorifics for one laboring under the same, from a violent moral affection, opium for a vigorous and sanguineous man, warm or vapor baths for one whose head is violently congested, failure will be the inevitable consequence. The treatment then must be based upon causation, and if in time to come we flatter ourselves a cure will be discovered for this cruel disease, it can only be accomplished by the methodical employment of means whose influence is directed against the exciting causes.

Local treatment will consist, according to the case, in dilating the wound

when constricted, extracting foreign bodies, projectiles, portions of clothing, wood, stones and other contained matters in getting rid of the scales, in reducing and maintaining in situ the ends of fractures, and in cutting off and removing irritating projections into the soft parts. If this last is not performed in opposition to all internal treatment most skilfully directed the termination almost invariably will be unfortunate. Such an occurrence fell under my observation in the case of a young man wounded by a violent cut from a whip; the knot, detached from the leash, remained imbedded in the cubital nerve. Nerves divided partially ought to be cut throughout their diameter. If suppuration is suppressed, it must be restored; caustics are proper either to destroy the remainder of the divided nerve, or to change the irritation; emollients and narcotics to relax the parts and remove pain; and finally leeches to relieve tension and inflammation.

One of the best remedies for tetanus is the copious abstraction of blood, generally and locally, by means of leeches to the neck, ears and spine, especially in sanguine subjects, they relax and pave the way for other remedies. The patients are to be placed in a dark chamber, remote from noise and company; an elevated temperature is to be maintained, the air made moist by evaporation of water. In aid of these, flannel or wool are to compose the coverings, and baths rendered medicinal by means of poppy heads, carbonate of potassa, &c. &c. freely employed and persevered in for several hours. These remedies are relaxing to the muscular system, and promote perspiration. Next are to be used remedies of a calming soothing nature, and which will diminish the sensibility of the patient. Quieting measures are beyond contradiction the very best that can be used for *tetanus*; but it must be confessed that hitherto they have been of little avail, even when carried to large doses. *Stupefiers*, that is to say narcotics, which tend not solely to diminish sensibility but to annihilate it, are indicated. In administering them care is to be taken not to overshoot the mark; but at the same time it must not be forgotten that the sensibility is exalted, and ordinary doses will not act, hence they are to be greatly increased. I have at times administered as much as half an ounce of opium during three or four days, without changing the progress of the disease or hindering its fatal termination.

If it is concluded from what has been said that tetanus requires calming remedies, it is at the same time obvious that the one which can be used with infallible success has not as yet been discovered. Shall we attain, some day or other, this desirable result? This is what we are unable to decide; we are however to search for it in all possible ways. But during this state of suspense those which hold out the greatest prospect of relief are to be employed. Opium, for example, is at first to be administered in large doses, and then to be followed up by smaller until relief is obtained, &c. Rigidity of the jaws, the impossibility of swallowing drink and consequently solid articles, frequently preclude the use of medicines by the mouth, and render necessary some other medium; injections into the rectum are therefore brought in aid, using the least possible quantity of vehicle.

This substitute, which I among the first brought forward and rendered public, is of greater usefulness than by means of the mouth. This is easily acknowledged; for the rectum, not having the power of altering and digesting substances thrown into its cavity, their action is prompt and energetic;

hence, doses employed by the rectum should be less by half than those given by the mouth and taken into the stomach.

If by chance the mouth or rectum are not available in the administration of medicines, the endermic method conceived by M. Lember is to be brought in to our assistance. In this case, after having removed the skin over a surface proportionate to the effect we wish to produce, either by means of a blister or ammoniacal pomatum, upon the mucous body of the cutis are sprinkled one, two or more grains of acetate, sulphate, or hydrochlorate of morphia, after which the part is covered with a plaster of simple cerate.

It now remains for us to speak of amputation, considered and proposed by many surgeons, as an effectual mean of combating tetanus at the moment of its appearance. It has been some time since experience has removed from my mind every illusion with regard to the efficacy of this operation in cases of this kind. But do not the repeated assertions of so many authors, supported by such celebrated names, undermine the firmest convictions, especially when the severity of the evil and the extent of danger leave no choice of measures? It was then through deference for such respectable opinions, that led us to practice this operation some time since in a case of extreme severity, after having fulfilled all the indications and exhausted all the resources of our art. But the history of this fact will still more demonstrate how vain are the hopes that are based upon this measure. We received into our wards, towards the end of June, a young man who had fractured his leg the evening of his admission. The fragments were jagged, especially the inferior fragment of the tibia; many scales were imbedded in the fleshy parts, and there existed a wound through which the extremities of the fractured bones projected externally. Whether the patient had caught cold, or deviation from his natural diet, or finally the nature of the accident operated as the exciting cause I cannot determine. Pain and convulsive movements were experienced in the limbs, the jaw became rigid, deglutition was impossible, and soon the patient lost the power of articulating sounds. Such was the rapidity with which these symptoms came on that they presented themselves at the very onset of the disease, and the whole body was agitated by intermittent convulsive paroxysms. Amputation was judged necessary and carried into effect in opposition to the resistance of the patient; many vessels were tied. The day passed by happily; in the evening he was comfortable, but the next morning tetanus reappeared; a draught given by teaspoonfuls could not be swallowed. Three injections, four hours apart, with three grains acetate of morphia, were substituted, but death occurred the same day. Autopsy: We searched in vain throughout the brain, spinal marrow, principal nerves, and the viscera of the chest and abdomen, but nowhere found organic lesions sufficient to explain the occurrence of tetanus.

Called in consultation with M. Larrey to inspect a similar case; amputation likewise frustrated our hopes. The wife of one of our general officers, four months pregnant, fell from her couch and fractured her leg. Tetanus came on. We determined upon amputation, and it was as speedily performed as the circumstances would allow. Tetanus however continued, and carried off the patient.

By what rule then are we to be guided? Amputate in the first instance and run no risk. Military surgeons have been accused of being too hasty in

performing amputation ; I have repeated it often, and I again, for the last time, declare, that from the facts I witnessed in 1814, 1815, and 1830, my opinion upon this point is unchangeable. In complicated fractures, particularly those from fire-arms, by rejecting amputation more lives are lost than limbs saved. Tetanus is one of those diseases which renders null the axiom, "*sublata causa, tollitur effectus.*" It would be as vain to hope to cure *rabies* by amputating the bitten finger, constitutional cancer or syphilis by removing the local disease, as to expect to cure tetanus after it had set in by removing the limb.

Furthermore, the symptoms and autopsy conspire to prove that tetanus is an essential affection of a nervous nature, without appreciable organic lesion.

The course to be pursued during *convalescence* is as important to the physician as to the patient. Many wounded individuals, believing themselves restored to health, commit errors, which lead to relapses and death. Relapses after wounds cannot bring back again the original affection, as in cases of internal disease, but they engender diarrhoeas, adynamic fevers, &c. which frequently are fatal. Too early exercise and motion where there has been fracture occasion often new solution of continuity. Indulgence of the passions, exposure to the atmosphere, improper diet, are frequent causes of untoward results. It is easily comprehended how a patient, after having remained two or three months in a close atmosphere confined to his bed, will be attacked with rheumatism, pleurisy, &c., the consequences of exposure and imprudence. But the most prolific cause of relapses is error in diet, or the too sudden change from a severe and rigid regimen to one nourishing and stimulant. In the convalescent department at St. Cloud in 1830, when general interest was taken in the wounded, and all sought to regale them, indigestion, vomiting and diarrhoea, &c. were common. Such occurrences increased to so great an extent that the patients themselves entered into the plan of an organized system of discipline. They chose from among their number sergeants whom they obeyed without murmur, and who confined the next day all guilty of any excess the evening before.

It is then by gradually augmenting the diet and increasing almost insensibly its nourishing character, that we are enabled to avoid, by means of hygienic measures, the fatal results of relapses.

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