Researches in pathological anatomy and clinical surgery / by Joseph Sampson Gamgee.

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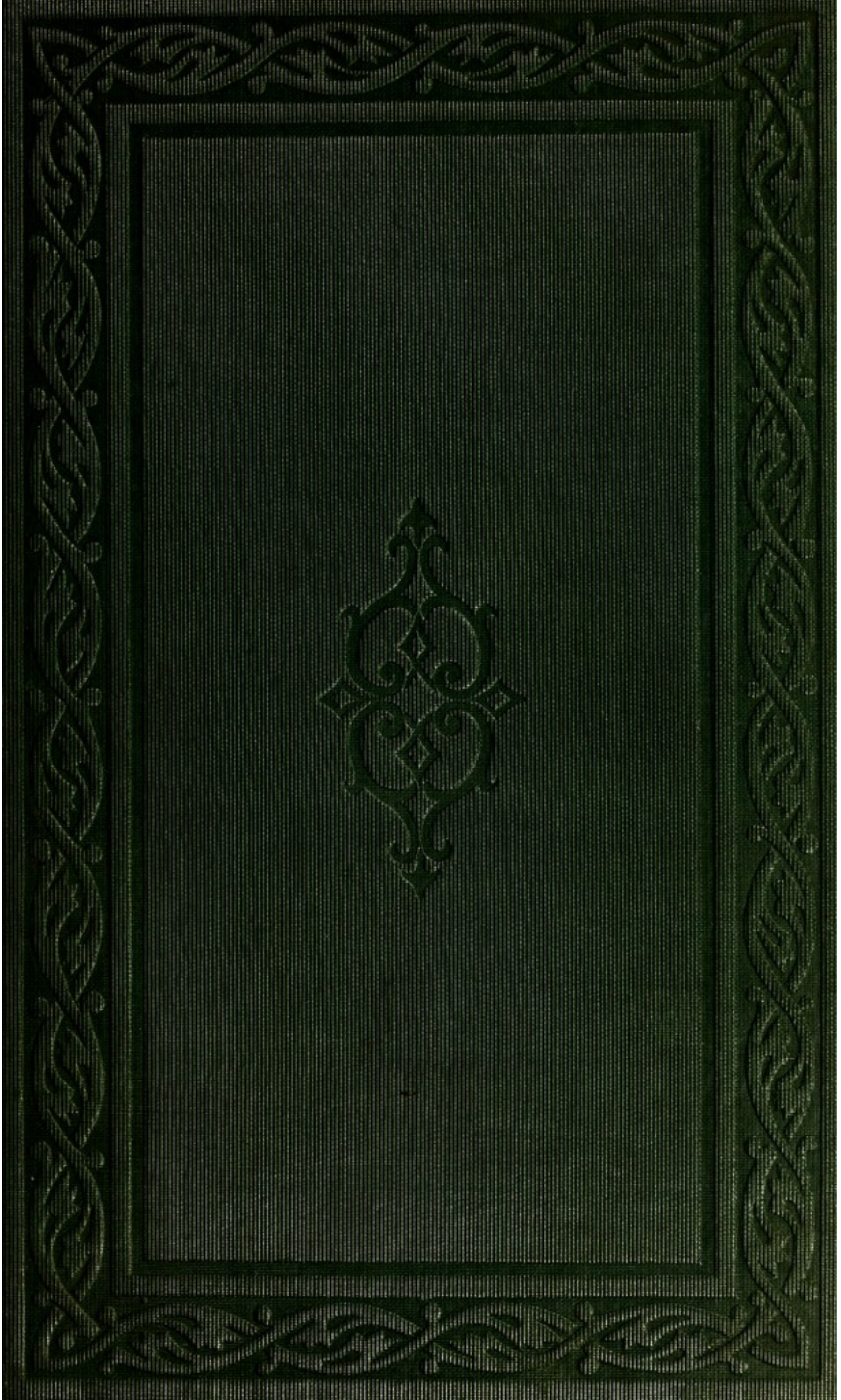

Harold. Wilthurs
30 Welbeck St.
London. W.
Feb. 4th 1913.

RESEARCHES IN PATHOLOGICAL ANATOMY AND CLINICAL SURGERY.

1111

By the same Author.

I.

ON THE

ADVANTAGES OF THE STARCHED APPARATUS

IN THE

Treatment of Fractures and Diseases of Joints.

Opinions of the Press on this Treatise,

TO WHICH THE COUNCIL OF UNIVERSITY COLLEGE AWARDED THE LISTON GOLD MEDAL FOR CLINICAL SURGERY IN 1853.

—o—

"Mr. Gamgee is the pioneer in this country of an important improvement in surgical appliances."—*Dublin Quarterly Journal of Medical Science.*

"We recommend Mr. Gamgee's volume to the perusal of those who are interested in this department of surgery. He appears to have stated his case most fairly; and we agree with him regarding the use of the starched apparatus in the great majority of cases."—*Association Medical Journal.*

"This is an excellent work; practical, well written, and will prove useful."—*Brit. and For. Med.-Chir. Review.*

"This work may be studied with great advantage by any surgeon who does not treat fractures by the starched apparatus."—*Medical Times and Gazette.*

II.

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AND ON

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III.

PENSIERI

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"L'introito di quest' opuscolo, in numero di 1000 exemplari, è destinato alla sottoscrizione dei cento cannoni per Alessandria, le spese della stampa acarico dell' autore."

IV.

In an advanced state for the Press,

A TREATISE ON PYÆMIA,

PATHOLOGICAL AND THERAPEUTICAL, HUMAN AND COMPARATIVE.

WITH COLOURED PLATES FROM NATURE BY PROFESSOR JOHN GAMGEE.

Joseph Lister Esq.
from his friend
the author

RESEARCHES

IN

PATHOLOGICAL ANATOMY

AND

CLINICAL SURGERY.

BY

JOSEPH SAMPSON GAMGEE,

STAFF-SURGEON OF THE FIRST CLASS: PRINCIPAL MEDICAL OFFICER OF THE BRITISH-ITALIAN LEGION DURING THE LATE WAR; ONE OF THE SURGICAL STAFF OF THE ROYAL FREE HOSPITAL; LATE PRESIDENT OF THE MEDICAL SOCIETY OF UNIVERSITY COLLEGE AND HOUSE-SURGEON TO UNIVERSITY COLLEGE HOSPITAL; FELLOW OF THE PATHOLOGICAL SOCIETY AND OF THE LONDON MEDICAL SOCIETY OF OBSERVATION.

"On ne trouve le repos que dans la recherche sincère de la vérité."—PASCAL.

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1856.

"For it is truth alone I seek, and that will always be welcome to me, when or whencesoever it comes."—JOHN LOCKE, *On the Human Understanding.*

TO

GEORGE JAMES GUTHRIE, ESQ., F.R.S.,

THE SURGICAL GLORY OF THE PENINSULAR WAR,

AND TO

ANDREW SMITH, ESQ., M.D.,

DIRECTOR-GENERAL OF THE ARMY AND ORDNANCE MEDICAL DEPARTMENT,

IN TESTIMONY OF

REVERENCE FOR THEIR PUBLIC WORTH,

OF

GRATITUDE AS MY BENEFACTORS.

J. S. G.

ANALYTICAL TABLE OF CONTENTS.

ADVERTISEMENT.

The ninth sheet of this work had been printed, and the tenth composed, though not revised, when I received peremptory orders, in August 1855, to leave England for General Percy's head-quarters in Piedmont. The printing of the remaining MSS. has been impossible before this.

The dedication and introduction were also in type before my departure. The former might in part seem no longer to apply, as Mr. Guthrie is of the past. But he is still present as the surgical glory of the Peninsular War, and will never cease to be my benefactor.

J. S. GAMGEE.

16, Upper Woburn Place, Russell Square.
10th October, 1856.

INTRODUCTION.

My anxiety in submitting these researches to the judgment of the profession, would be relieved, if I could assure myself that they will be deemed interesting and useful in proportion to the conscientious labour devoted to their preparation. I have endeavoured to neglect no means in the search after truth. The bedside and the dead house, experiments upon living animals, and the works of men of various ages and countries, have been diligently appealed to. This system of research has led to more important results than are embodied in these memoirs; but the time for publishing them has not arrived.

A most pleasing duty remains to be accomplished: the acknowledgement of how much I am indebted to my friends in the preparation of these materials.

Mr. Paget has favoured me with a beautiful specimen of calcified testicle; Mr. Prescott Hewitt

with permission to have drawings taken of ruptured hearts in St. George's Hospital; Mr. Sydney Jones has furnished me with notes of the preparations relating to calcification of the testicle and appendages, which are contained in the Museums of Guy's and St. Thomas's Hospitals; my researches into that subject have also been assisted by Mr. Fitzgerald, Mr. Henry Lee, and Mr. Quekett. Dr. Reid, of the Army Medical Department, has afforded me opportunity of examining the happy results of his exertions in adding to the efficiency of all kinds of surgical apparatus, that employed in the treatment of fracture in particular; Mr. Benjamin Hunt has given me permission to avail myself of his valuable papers on the treatment of fractures.

My brother John has supplied me with several original facts on the subjects of rupture of the heart and calcification of the testicle. Almost all the drawings which illustrate this work have been executed by him from nature, and on stone. He has materially aided me in bibliographical research, and whoever forms a generous estimate of the results of my exertions, must bear in mind that they would have been less fruitful, but for him.

J. S. G.

EXPLANATION OF PLATES.

PLATE I.—(After Ludwig in *Adversaria Medico-Practica*, I. 134). The Heart of a young man who received a kick on his chest from a horse, fell, got up, put on his hat, walked several steps, and fell dead. The pericardium was intact. The Plate represents the right cavities of the heart opened from the back. (Case 3 of Table at p. 22.)

PLATE II.—Representation of a Heart, in the Museum of St. George's Hospital, which belonged to a lad killed by falling into an area from the top of a house. In Fig. 1 the large rent in the left side of the septum is visible. Fig. 2 shows the small rounded aperture on the right septal aspect. (Case 12 of Table at p. 25).

PLATE III.—Fig. 1. A wire apparatus padded inside, for broken leg.

Fig. 2. Pirogoff's Field Splint, suited to gunshot fractures. See p. 155 of this work.

Fig. 3. A simple swinging apparatus, after Mayor's plan.

PLATE IV.—Fig. 1 and 2 represent the process of calcification, in an early stage, in the testicles of a goat. At Fig. 1, *t*, the tubes are converted into hard wiry vessels. The testicle, represented at Fig. 2, is greatly wasted. In its inferior half is a hard earthy substance, of a straw colour, and granular structure.

Fig. 3. The calcified testicle of a ram.

Fig. 4. A small portion of the surface of the testicle viewed with an inch lens; at *v*, are seen the bendings of the calcified tubes.

Fig. 5. Another portion of the surface, examined with the same glass as the above; the tubes are rendered indistinct by an intermediate calcareous deposit.

Fig. 6. A transverse section of the testicle examined with the microscope by reflected light. The cut tubes *d*, magnified 100 diameters, are seen filled with a white calcareous deposit. They are of various shape, and their boundaries are darker in colour than the interior. At *i* is the intermediate substance, of a dirty yellow colour, studded with small holes.

PLATE V.—Fig. 1. Calcified testicle of a horse, which was retained in the abdominal cavity, and arrested in development.

Fig. 2. (*a*) A deposit of earthy matter in the epididymis. Sir Astley Cooper, from whom this figure is taken, ascribes the product to chronic inflammation; more probably it was due to cretefaction of tubercle.

Fig. 3. Sir Astley Cooper, from whose work on the testis this figure was copied, annotates it thus: "ossific body growing between the tunica vaginalis and tunica albuginea;" more probably it was merely a patch of *calcified* lymph.

Fig. 4. A section of the same ossifying cartilage as Fig. 5 seen with a lower power; it has a mapped appearance, in consequence of the grouped arrangement of the corpuscles, and the irregularly shaped masses of granules pervading the matrix. Magnified 150 diameters.

Fig. 5. A section of cartilage in process of transformation into bone. The specimen was obtained from an enchondromatous tumour attached to the testicle of a horse, within the tunica virginalis. The cartilage cells are seen arranged in groups, and masses of granules to pervade the matrix. At *b*, the cartilage is impregnated with earthy matter, which at *a*, is seen advancing around a cartilage corpuscle. Magnified 300 diameters.

PLATE VI.—Fig. 1. A calcified testicle found in the abdomen of a horse. The epididymis is in great measure indurated, and the body of the testicle is destroyed, but a bony case remains covered by dry tunica vaginalis. On one side is an opening, and in the interior are bony and membranous laminæ, intercepting and partially filling up the cavity. It appears that the seminiferous tubes have been mostly absorbed and some indurated, whilst the specimen is principally made up of the calcified fibrous structures, interstitially disposed and covering the testicle.

Figs. 2, 3, 4, represent a front and back view, and a longitudinal section of a piece of bone discovered in a cavity filled with melted fat-like fluid in a horse's testicle by Signor Paolucci.

ERRATUM.

Page 127, line 2, for *Key*, read *Skey*.

RESEARCHES IN PATHOLOGICAL ANATOMY

AND

CLINICAL SURGERY.

RUPTURE OF THE HEART BY EXTERNAL VIOLENCE.

CONTENTS.

Nature of the lesion under investigation.—History and bibliography of the subject.—Case.—Analytical study of twenty-eight similar cases under the following heads : age, sex, cause, duration of life, co-existing lesions, condition of the pericardium and heart, precise seat of the cardiac lesions.—Semeiological and therapeutical considerations.—Mechanism of the rupture.—Experiments to explain it by Chaussier and John Davy.—John Gamgee's comparative observations, and physiological explanation.—In conclusion, a twofold explanation given of the mechanism.—Appendix of cases.—Summary.—Tables of the twenty-eight cases on which this memoir is based.

I PURPOSE studying under this title those ruptures of the heart by external violence, which are independent of penetrating wound ; and the result of such causes as a fall on the head, or the passage of a cart over the chest, without any external wound ; of a kick from a horse, or the discharge of a gun, without penetration of the bullet or the fragments of the ribs through the pericardium.

The systematic works now current in schools

of surgery are for the most part silent on this subject; which has, however, engaged the attention of some didactic writers.

"Le plus haut degré de l'action des corps contondants sur le cœur est celui où son tissu se trouverait déchiré." Besides the conditional mood of the expression, the illustrious Baron* adduces no cases in support. More positive is the actual President of the Royal College of Surgeons.† "Lacerations and ruptures of the heart have frequently taken place from blows or other serious contusions." Moreover, he quotes cases from Borellus, Vater, and Rust.‡

For its juridical bearings, this subject has attracted the attention of medico-legal writers. From Dr. Taylor we learn§ that, "when the heart is ruptured by accident it generally gives way towards the base, and through one of the cavities of the right side..... As a medico-legal subject it is worthy of note that when this alarming accident (rupture of the heart) proceeds from blows or falls, it is not always accompanied by marks of external violence, or any fracture or injury to the exterior of the chest."

Amongst writers who have especially studied

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* Dupuytren, *Leçons Orales*, vol. vi, p. 310.

† Guthrie, *Commentaries on the Surgery of the War*, London, 1853, 5th edition, p. 492.

‡ Injuries of Chest, 1848, p. 50-60.

§ Med. Jurisprudence, 4th ed., 1852, p. 304.

diseases of the heart, Sénac, Bouillaud, Walshe, and Stokes recognise the occurrence of the lesions under consideration. The two first quote cases, as will presently appear; the last* merely mentions that there are various instances on record of rupture of the heart from external violence; while Dr. Walshe† defines the ordinary seat of the lesion according to the experience of Ollivier, and expresses his belief that in all probability the heart's texture in these cases is never perfectly sound. In the tabulated summary of cases of rupture of the heart given by Gluge,‡ external violence only appears incidentally as a possible cause.

Ollivier§ and Dezeimeris‖ deserve special mention for their memoirs on this subject; whilst among contributors of original facts Prescott Hewett¶ and Ferdinando Zannetti** stand pre-eminent.

Having access to more copious and valuable materials in point than any of my predecessors in this study, I am about to methodize the results of my researches, in the hope that they may further

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* The Diseases of the Heart and Aorta, 1854, p. 465.

† Practical Treatise on the Diseases of the Heart and Lungs, p. 522-3.

‡ Atlas der Pathologische Anatomie, Jena, 1850, *art.* "Zerreissung des Herzens."

§ Art. Cœur (Ruptures), Dictionnaire de Méd. 2nd ed., 1834.

‖ Arch. Gén. de Méd., 1834.

¶ Transactions of Pathological Society of London, vol. i, p. 81; vol. v, p. 101.

** Studii sopra i ferimenti del cuore. Firenze, 1854.

the knowledge of an interesting pathological fact, and illustrate its practical bearings, particularly in connexion with medical jurisprudence.

On the 28th November, 1852, I received an order from the coroner to examine the body of Thomas Millett, which had been carried into University College Hospital the previous evening, lifeless, with the statement of those who accompanied it, that a few minutes previously the man had been thrown out backwards, from a cart in rapid motion. He was about 38 years of age, and robust.

Surface. On examination of the whole exterior, front and back, head, trunk, and limbs, I could perceive no evidence of violence with the exception of a fracture of the right clavicle, and of a decided though slight ecchymosis of the skin, covering the extreme outer point of the right acromion.

Head. A very slight ecchymosis seen on dissecting back the scalp in the cellular tissue over the occipital protuberance. The brain and its membranes perfectly healthy. Base of skull freed of dura mater, unmistakeably sound.

Injured shoulder. The right clavicle is the seat of comminuted fracture, but the integument is healthy with exception of the very slight bruise already alluded to just over acromion. Very little ecchymosis in the cellular tissue around the seat of fracture.

Abdomen. About a pint and a half of blood in the peritoneal cavity; its origin has been an exten-

sive rupture of the right lobe of the liver; in it are several deep fissures extending side by side from before backwards, and from the upper to the under surface, so much so that at some points, only slight bridges of hepatic tissue prevent the great slices falling loose into the abdominal cavity. The other viscera of this cavity are healthy.

Chest. Parietes sound. About a pint and a half of blood in pericardium, which presents a ragged aperture at its upper part; where adherent to diaphragm, it is uninjured. At the anterior edge of the left auricle is an aperture capable of admitting a large goose quill, with uneven and ragged edges.

The outward aspect of the heart's structure is that of health, and it is confirmed such, by microscopic examination. Lungs healthy, with the exception of slight congestion at their bases.*

My researches having led to the discovery of other 27 cases of ruptured heart, bearing close analogy to the preceding, I have summed up their chief facts in the appended table(*vide* p. 22), and now purpose studying the clinical history of these lesions.

The *ages* of the 28 subjects were very various; thus 2 infants, 7 below 21 years, 4 between 21 and 30, 12 adults not precisely recorded, 3 at 53, 60, and 70 years respectively. These facts confirm the very natural supposition that, provided the exter-

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* I feel much pleasure in acknowledging the assistance I received from my friend Mr. St. John Edwards in making this examination.

nal violence were sufficiently active, the heart of the mature man or of the decrepit adult would no more effectually resist it than that of the tender infant.

Sex, as is well known, materially affects the proportion of surgical injuries, women being much less exposed to them than men; the rule is borne out in the present instance; for of the 28 cases, 20 were males, and 5 females: of the other 3 no mention is made about sex.

The causes which produced the lesions under consideration may be thus classified. Falls from a height, or from a carriage in motion, 9. Passage of a wheel over chest or other forcible compression of it not accurately defined, 10. Kick from a horse, 4. Bullets fired against the chest from gun or pistol, 4. Blows of unknown kind, 1.

The duration of life after the accident is not mentioned in 9 out of the 28 cases. In 11 of the remaining 20, death was instantaneous; of the other 8, one got up, ran a few steps, and fell dead; 1 lived half an hour; 2 lived two hours; 1 three hours; 2 four hours; and 1 fourteen hours. Of these cases, the first and last deserve special mention. Of the first (No. 3 of table), the heart is figured in plate I. After receiving a kick on the chest from a horse, the man got up, put on his hat, walked several steps towards a stable, and fell dead. Upon examination, the pericardium was

found uninjured, but the heart presented three ruptures. It is worthy of notice, that the integument presented no sign of the blow, though the sternum was broken across in the middle.

It was an infant who survived the marvellous period of fourteen hours with a rupture nine lines in length at the posterior surface of the right auricle. It had been occasioned by the passage of a cart wheel over the chest, whereby also several ribs were broken, though no mark of contusion was impressed on the surface of the body. The circumstantial manner in which this extraordinary case (27 in the table) is related in Rust's *Magazin für die Gesammte Heilkunde* (vol. 16, p. 92), leaves no doubt whatever as to its authenticity. The wonder it excites is somewhat lessened by the reflection, that possibly the rupture was limited at first, and only acquired the mentioned extent, as the heart's fibres separated during its action.

Co-existing lesions. No mention is made of the condition of other parts of the body in five of the 28 cases. In two, the recorder alludes generally to other injuries, but does not specially mention any; in the remaining twenty-one cases the co-existing lesions admit of the following classification:—1st. Abdomen. Its condition is not alluded to in ten. In five, it is expressly said to be healthy. In three, the liver, and in other three the spleen, was the seat of laceration. 2ndly. Head. In thirteen out of the twenty-one cases its condition is not

alluded to; in four, it is said to have been healthy. In one, there was a slight bruise over the occipital protuberance. In one, depressed and comminuted fracture of the frontal bone and laceration of the cerebral lobes. In one, general contusion of the brain and fracture of the middle fossa at the base of the skull. In one, the scalp was torn and the parietal fractured. 3dly. PARIETES OF THE THORAX. In one of the twenty-one cases now under consideration, the condition of the chest-wall is not mentioned, but it may fairly be presumed to have been healthy, as Bérard was the recorder. The man fell from a scaffold, and there were lesions of the cranium and abdomen, besides the heart rupture. In six cases it is particularly mentioned that there was no bruise of the chest-wall. In three, that the bruise was but slight. In one, there was sensible depression of the chest-wall. There were fractures of the ribs or sternum, or of both, in eleven out of the twenty-one cases. In two of the eleven cases it is particularly mentioned that there was no displacement of the fragments; in a great majority of the others, the extent of the rupture, the nature of the cause, or the integrity of the pericardium, exclude all possibility of the heart rupture having been occasioned by penetration of one of the bony fragments.

Condition of the pericardium and heart. The state of the pericardium is not alluded to in two of the twenty-eight cases; in twelve it is expressly said to have been intact; in six torn; in eight filled with

blood, without allusion to its integrity. No mention is made of the condition of the heart's texture in twenty of the cases. In one the organ was enlarged, its walls thin and flaccid; it is recorded by Mr. Prescott Hewett; the seat of the lesion was the right ventricle, its subject a man, aged fifty-three, who had been thrown back several feet by a kick from a horse. In another case the left ventricle was hypertrophied. This case is recorded by the same gentleman; it occurred in a middle-aged man, who was thrown from a cart, and partly run over by it. The left auricle and pulmonary artery were ruptured. In the six remaining cases, the heart *appeared* healthy; of these, three were recorded by Dr. John Davy, Zannetti, and Prescott Hewett: hence the presumption that the appearance was real; it is stated to have been positively so in the other three, one of which, my own, was examined microscopically, two recorded by Mr. Prescott Hewett.

The twenty-eight cases now require analysis to determine the precise seat of the cardiac lesion. It affected the right ventricle alone eight times, the left ventricle alone three, the right auricle alone one, the right auricle and other parts three; viz., in one right auricle and septum Botallii, in a second right auricle, septum and apex, in a third right auricle and vena cava; the left auricle alone three, the left auricle and other parts four times; viz.,with pulmonary veins two, with pulmonary artery one,

with aortic arch one; the apex two, the septum two, both ventricles, auricles, and septum one. Excluding six cases, in one of which the heart was literally smashed, in another the precise seat of whose lesion is unknown, two of rupture of the septum, and two of the apex, the tabulated cases exhibit the following proportion between rupture of the two sides of the heart:—

	Right	Left
Auricles	4	7
Ventricles	8	3

Twelve ruptures of the right to ten of the left side; but the disproportion between them is much greater, 8—3 when ventricles alone are considered. This is a fact worthy of notice, as in spontaneous ruptures of the heart the reverse is the case, the left ventricle being much more frequently the seat of the lesion than any other part of the organ.

Instantly fatal as these lesions commonly are, there is little occasion for comment with reference to diagnosis. When the individuals have survived, they have exhibited all the signs of severe shock which generally accompany the most severe lesions of vital organs. Only one instance is recorded of the supervention of partial reaction, which is Rust's extraordinary case (No. 27 of table). It is extremely improbable that persons with ruptured hearts will ever survive long enough to give opportunity for semeiological study; but even if they do so, no treatment can be adopted beyond husbanding the

vital powers by keeping the body warm, and in a horizontal position of perfect quiet.

The Mechanism of these traumatic heart ruptures deserves consideration. With a view to explain it, Dr. John Davy instituted a series of seventeen experiments (Op. cit. p. 452-3) on the dead bodies of men and animals, by tying the various great vessels in the neighbourhood of the heart, and forcibly injecting fluid into it. He summed up: "The results of these experiments, in the way of illustration, as applied to the case with a view to which they were instituted, are in no wise clear and satisfactory. Considering them generally, they are perhaps less uniform than might have been expected, and hardly favourable to any general conclusion being deduced from them, excepting indeed the following: 1stly. That the power of resistance possessed by the heart and large vessels, independent of any vital properties of endurance peculiar to them, is enormous; and, 2dly. That there is much variation in point of strength in the same parts in different instances." Not much more conclusive, though certainly free from the objection which always attaches to experiments upon dead animals performed with a view to illustrate occurrences in living ones, were the experiments of Chaussier (Portal's *Memoria* cit.). He found that when the trunk of the aorta is ligatured in an animal, the left auricle and ventricle burst; but if the ligature be applied to the trunk of the

pulmonary artery, the right ventricle and auricle dilate considerably, the contractions of the heart redouble, but its walls do not rupture." Admitting the fact, its bearing is doubtful, if any. The causes which commonly produce traumatic ruptures of the heart, cannot operate so as to occlude the great arterial trunks, particularly the aortic ; and if they did, rupture of the heart should more frequently be noted in the left side, whereas the reverse is in fact the case.

More to the point is a very interesting observation by my brother John. While prosecuting his investigations in comparative pathology in the slaughter houses of Ferrara, in the spring of last year, his attention was particularly attracted by several cases of rupture of the vena azygos, which he associated with the manner in which the animals were killed—division of the spinal cord by thrusting a knife into the interspace between the first and second cervical vertebræ. He first observed, as the thorax was opened, circumscribed clots, between the pleura and vertebræ, covering the azygos vein ; the blood sometimes trickling down beneath the serous membrane. On dissection, jagged ruptures of the bloodvessel were discovered. His friends, Professors Maffei and Balboni, having sought from him an explanation of the fact, he suggested (to my judgment very plausibly), that the instant the animals are pithed, the walls and contents of the thorax are paralyzed, the heart becomes an inert

bag filled with fluid, the jerk of which, as the animal falls, causes rupture of the containing vessel at its weakest part; and this is, in truth, the vena azygos, whose walls are thin, and only protected externally by the pleura. At my brother's suggestion, Professor Maffei instituted a series of observations to determine the frequency of the lesion under consideration; and with his customary courtesy and exactness thus communicated the result: "From the first of June 1854, to this date (28th May, 1855) 3095 oxen and cows were killed in our public slaughter-houses; I have met with the rupture of the azygos in fifty-seven of these animals; these ruptures occur in various parts of the said vein; at times where the intercostals join it, and at others where the vein curves round to empty itself into the anterior vena cava. Such lacerations seem to occur about the same number of times in either of these situations: they bear the character of regular tears, inducing an effusion of blood between the laminæ of the mediastinum, or beneath the parietal pleura. Sometimes the vital fluid flows into the thorax itself."

Taking these facts into consideration in connexion with those recorded in the appended tabular exposition of cases, the mechanism of these lesions seems to admit of twofold explanation. 1stly. In the case of a person falling from a height on to his head or feet, it is presumable that the heart, losing for the moment its tonicity, may be preter-

naturally disposed to rupture at its weakest part, in consequence of the jerk of the contained fluid. This seems a fair explanation of the manner in which the anterior edge of the left auricle gave way in my case of Thomas Millett, who fell on to the back of his head from a cart in rapid motion. Even to Dr. John Davy's case (No. 24 in table), this explanation is not inapplicable: not so, however, in one of Mr. Prescott Hewett's cases (No. 12 in table, and plate 11). A lad fell from the top of a house. The autopsy revealed rupture of upper part of intra-ventricular septum, and bruise on the corresponding anterior surface of the heart. The ecchymosis was a good sign of the mechanical violence exerted on the organ: and it is possible that when once it had occasioned a solution of continuity, this may have been augmented by the active contraction of the cardiac tissue. 2ndly. We have to consider the ruptures which are occasioned by the application of direct violence to the chest wall (*e. g.* case 13 of table). A girl was suddenly killed by the passage of a cart-wheel over her body. The heart was literally smashed, as the liver so commonly is in the crush of a man between the buffers of two railway carriages. It is particularly worthy of notice, though readily explicable on account of the elasticity of the tissues composing the chest wall, that they had scarcely suffered any injury. There can be no doubt that, in a minor degree, some blows on the chest may produce rupture of the heart by a me-

chanism similar to the preceding. Ollivier (*Mem.*, cit.) believes that the passage of a wheel over the chest may sometimes occasion rupture of the heart by compressing the pulmonary artery, and opposing an obstacle to the flow of blood, to overcome which the heart acts with redoubled vigour, and consequently cracks.

Appendix of cases.—Since this memoir was set in type, I have met with other cases of rupture of the heart from external violence without wound. They in no way necessitate modifications of the conclusions arrived at from the study of the twenty-eight cases.

In last year's bulletin of the Parisian Anatomical Society (p. 238) I read that "M. Provent presented parts he had removed from a two years' old child that had fallen from a window. They consisted of a fractured femur, and of the heart, on the anterior surface of which was an ecchymotic patch, measuring about two-thirds of an inch on its surface, and extending through half the thickness of the walls. M. Charcot felt disposed to regard the lesion as the prelude to rupture of the heart, particularly as the soundness of the thoracic walls was ascertained by accurate observation." There can be no question as to the correctness of this suggestion. The case is clearly allied to the one recorded by Mr. Prescott Hewett (No. 10 of my table). It is to be regretted that the accuracy of his examination and descrip-

tion was not fully imitated by the French observer: so as to leave no room for the slightest doubt as to whether the bruise was really the only lesion of the heart.

A good example of the cardiac lesions under consideration has been placed upon record by Dr. Giacomo Maffei.* A robust young man, struck by the trunk of a great tree, which he was engaged in rolling down a steep descent, remained senseless for a few minutes, and died. Only slight excoriations were perceptible externally. The bones and investing soft parts were healthy. The mediastinum and right pleura were filled with blood; the pericardium ruptured, as was also the right auricle in two places. The heart was perfectly healthy in consistence, texture, and size.

In a valuable essay on wounds of the heart, by Dr. Purple,† to which Mr. Chatto kindly directed my attention, the following passage occurs: "A curious circumstance attendant upon gun-shot wounds of the heart is that in which the ball causing the wound has penetrated the walls of the chest, and produces a perforation in one or both ventricles, but there is no corresponding wound in

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* I quote from Schmidt's *Jahrbücher der Medizin*, vol. 74, p. 80, where the original is quoted as *Gazzetta Medica Italiana Federativa Lombarda*, 1851, No. 7.

† Statistical Observations on Wounds of the Heart, and on their Relations to Forensic Medicine; with a Table of forty-two recorded Cases. By Dr. S. S. Purple. In *New York Journal of Medicine*, May 1855.

the pericardium. A case of this character is reported by Professor Holmes,* of Montreal. The patient, a young man, lived but a short time after the receipt of the injury. On dissection, the anterior wall of the right ventricle contained a transverse linear opening, sufficiently large to admit the finger. Corresponding to this opening in the heart was observed a bloody ecchymosed condition of the cellular substance lying on the pericardium, which led to the inference that the pericardium had been driven before the ball and into the heart, while this organ was in the act of contraction, its fibres being hard and rigid from their muscular contraction. The ball was found loose in the cavity of the pleura."

But for a reference in Dr. Purple's memoir, I should have continued ignorant of another able essay on wounds of the heart, by Mr. Cathcart Lees,† who divides them into punctured and contused; to the latter he only makes incidental allusion, the value of which is however rendered very considerable by the annexed remarks, that "in the last siege of Antwerp by the French, some remarkable cases occurred in which the heart was severely contused and ruptured without any external appearance of injury either to the integuments or ribs, in which the death, in some cases instantaneous, was

* British Amer. Journ. of Medical and Physical Science, vol. i, p. 227.

† Dublin Journal of Medical Science, vol. xi, 1837.

supposed to have been caused by the wind of the bullet. In some of the cases mentioned, a violent acute pneumonia supervened; in others death followed from an effusion of blood into the cavity of the pleura."

Extensive research in the records of veterinary medicine and surgery, for cases in animals similar to those above recorded in man, has resulted in the discovery of only one, which fell under the notice of Mr. Parker of Birmingham.* "My attendance," he says, "was requested to a pony which, running away with a gig down hill, had, with his right shoulder, struck violently against the wheel of a cart. He reared up and then fell, from this position he could not move, neither could he stand when lifted on to his legs. I found him lying on left side, apparently free from pain, presenting the following symptoms: respiration very quick, but not laborious; pulse 55, and weak; visible mucous membranes pallid, especially the buccal. Presently expression of eye became haggard, breathing rather laborious, pulse more frequent and feeble. He was killed about an hour after the accident, at the entreaty of an officer of the Animals' Friend Society. P.m., abdominal viscera healthy; peri-

* Veterinarian, May 1855, p. 268-9. My quotation is not literal, but a condensation of Mr. Parker's report, with some additional information in point, which this gentleman has kindly communicated to me in reply to inquiries addressed to him, at my suggestion, by Professor Simmonds.

cardium ruptured on right side, contained a quantity of coagulated blood; a clot of blood affixed to base of right auricle, which was here separated from the ventricle; the muscular structure was evidently ruptured to the extent of almost an inch. Ribs and investing muscles uninjured."

Summary. The following conclusions are deducible from the facts of this memoir.

a. Ruptures of the heart by external violence, independently of penetrating wound, are notably more frequent than is generally supposed.

b. They occur irrespectively of age and sex, provided the requisite cause come into operation; but of the cases recorded, the majority are in adult males; in accordance with the known fact, that they are most frequently the subjects of injuries from being much more exposed to them.

c. The common causes are falls from heights, and the application of severe violence to the chest.

d. Death is usually sudden. Cases are on record, however, in which persons have been capable of momentary but severe exertion after the accident, such as rising from the ground and running. The

survival of fourteen hours renders Rust's case unique.

e. The most frequent co-existing lesions are ruptures of the liver and spleen, injuries to the head, and fractures of the bony chest wall, but without penetration of the fragments. In 9 of the 28 cases analyzed, there was either no bruise of the thoracic parietes, or a very slight one.

f. The pericardium is intact in at least one half of the cases. The observations relating to the condition of the heart's texture are few; but they demonstrate that even perfectly healthy hearts are liable to the accident under consideration. Analysis of 22 cases, with a view to determine precise seat of lesion, gives the following result: 12 ruptures of the right to 10 of the left side; but the disproportion between them is much greater, 8 to 3, when ventricles alone are considered. It is curious that the left auricle is more frequently the seat of rupture than the right, in proportion of 7 to 4.

g. In the few cases which have survived, the symptoms have been those of severe shock. No other therapeutic indications occur than husbanding the vital powers by keeping the body warm, and in a horizontal position of perfect quiet.

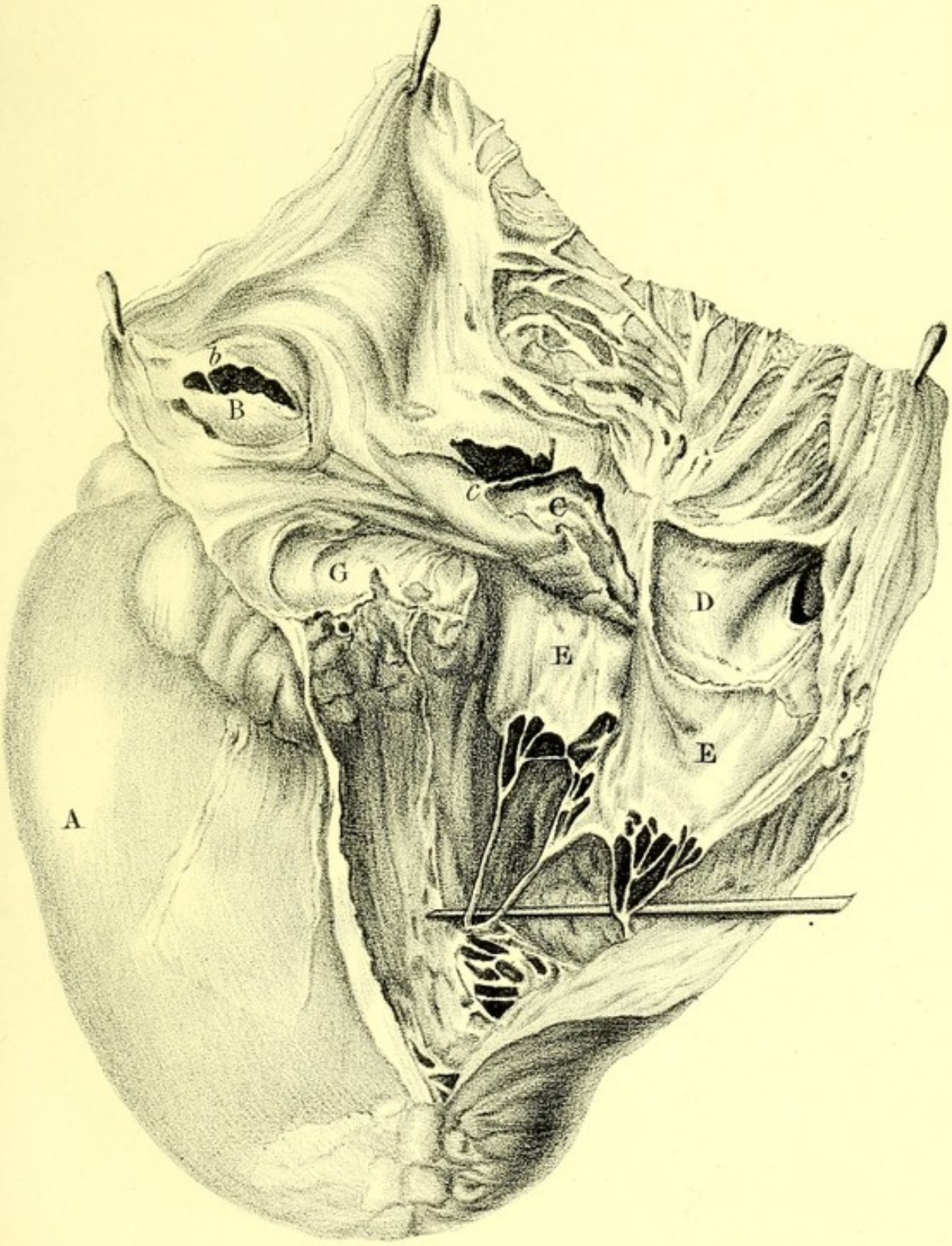
h. The mechanism of these ruptures is twofold: 1stly, by jerk of the blood contained in the heart;

2ndly, by direct compression, which may extend from a mere bruise on the front wall of the heart, to its complete disorganization. In both these modes of operation it is very probable that the extent and kind, if not the origin, of the rupture, are sometimes regulated by contraction of the heart's fibres.

TABLE.

Serial No.	Age and Sex.	Nature of Cause.	Reference.	Duration of life after accident.	Condition of Heart and Pericardium.	Co-existing lesions of Chest-wall and other parts.	Observations.
1	An adult woman.	Crushed by a cart.	*Valérius* in *Senac*, Traité du Cœur, 1749, vol. ii, p. 376.	Three hours.	Right ventricle torn open.		After commenting upon wounds of the heart, Senac remarks (loc. cit.): "Les plaies qui suivent les contusions du cœur ne sont pas moins dangereuses." He then succinctly relates the two cases, and adds: "Nous ne rapportons l'histoire de ces blessures que pour en faire voir la bizarrerie."
2	An adult man.	Discharge of a gun shot against chest.	*Borel.* in *Senac*, ut sup., and Zodiac, Med. Gall., Ann., ii, p. 156.		Right ventricle opened; pericardium entire, containing considerable quantity of blood.		
3	Stout man, 21.	Thrown back several feet by a horse's kick in chest.	*Mummsen*, De Corde Rupto, Leipz. 1764, and *Ludwig*, Adver. Med., prat 1, 134.	After kick, he got up, put on his hat, walked several steps, & fell dead	Pericardium intact, but filled with serum and coagulated blood. In anterior part of right auricle, a rupture to half an inch; also an incomplete rupture around auric. ventric. orifices; and a third fissure in septum, closing foramen Botallii same side.	Integument presented no sign of the blow; sternum broken across in middle; only slight ecchymosis in mediastinum; no effusion into the pleural cavities.	The heart of this case is represented in Plate I.
4	Adult.	A leaden bullet.	*Mummsen*, in Diss. Inaug. Med., de Ruptura Cordis, Christ. *Pohlii*, Lipsiæ, 1808, p. 23.		Pericardium intact; rupture of right ventricle.		

Plate I .



John Ganges. lith.

Day & Son, Lith.rs to The Queen

5	Lad, 13.	Crushed by carriage wheel.	*Worbe* in *Bouillaud*, Traité Clinique des Maladies du Cœur, i. 2, p. 504.		Pericardium filled with blood; a rupture in anterior wall of left ventricle, near septum, extending from base to apex.	Sternum, ribs, and their cartilages, healthy.	Bouillaud remarks: "La rupture des parois du cœur par suite de violences analogues à celle dont il est question dans ce cas, ne constitue pas un accident très-rare. Nous avons vue une rupture de l'oreillette droite chez un homme qui s'était jété par une croisée, pendant les angoisses d'une dyspnée des plus violentes." I have not tabulated this case, because the very incomplete account of it admits of doubt as to whether the rupture of the heart was not spontaneous during the attack of dyspnœa, and the cause rather than the effect, of the man falling out of window.
6	Boy, 10 years.	Kick by a horse in chest.	Salucci in Filiatre Sebezio, 1834, fasc. 34.	Sudden death.	Laceration into right ventricle posteriorly, five lines in extent.	Slight contusion of sternal region; lungs, abdominal and cranial organs uninjured.	
7	Young bricklayer.	Fall from a scaffold, head foremost.	Bérard, Obs. d'Anat., Pathol., etc., Arch. Gén. de Med., t. x, p. 370.	Two hours and a half.	Pericardium filled with partially coagulated blood. In appendix of left auricle, a round aperture with slightly fringed edges, capable of containing a very large goose quill.	Comminuted fracture, with depression of frontal bones; cerebral lobes smashed; upper surface of liver also extensively lacerated.	The patient was carried to the Hôpital de la Pitié senseless, with stertorous breathing and imperceptible pulse.
8	Man, 29.	Fall from a ladder.	Prescott Hewett, Trans. Path. Soc. London, vol. i, p. 81 et seq.	Two hours.	Pericardium distended with partially coagulated blood. In anterior surface of left auricle, and passing up into pulm. vein, a laceration $1\frac{1}{2}$ inch long, $\frac{1}{8}$ wide. Structure of heart and valves healthy.	No external marks of injury; a small quantity of blood in peritonæum; in the upper surface of right lobe of liver, two lacerations, $2\frac{1}{2}$ inches long, two lines deep.	When admitted to S. George's Hospital, he was extremely collapsed; blue face, cold hands, no pulse. Soon congest. of face disappeared; small, irregular pulse discernible at wrist. He complained of much pain in the chest, and died in 2 hours.

Serial No.	Age and Sex.	Nature of Cause.	Reference.	Duration of life after accident.	Condition of Heart and Pericardium.	Co-existing lesions of Chest-wall and other parts.	Observations.
9	Man, 53.	Thrown back several feet by kick from a horse.	Prescott Hewett, as above.	Sudden death.	Pericardium filled with blood, torn on left side; heart enlarged, with thin and flaccid walls; a laceration capable of admitting tip of index finger into cavity of right ventricle, extended transversely from septum along margin of pulmonary artery.	No mark of external violence; some blood in subcutaneous cellular tissue; transverse fracture of sternum without displacement; on left side, 2d, 3d, 4th, 5th, & 6th ribs broken; on right side, 2nd and fourth; lungs not injured; other viscera not examined.	
10	Boy, 5.	Heavy cart passed over chest.	As above.	Half an hour.	No blood in pericardium, except two ecchymotic spots on surface of heart, which appeared quite healthy. One spot anterior, the other posterior, corresponding to middle of septum. On making an incision through serous membrane covering posterior spot, and removing extravasated blood, a slight laceration observed in muscular structure of heart, through which a probe was easily passed, in an oblique direction, into the cavity of the left ventricle; and on laying open this ventricle, an extensive rupture was found in the septum. This rupture, which was situated at the union of the lower to the two upper thirds of the septum, occupied the greater part of the septum, in an antero-posterior direction, producing an abnormal communication between the two ventricles capable of admitting tip of little finger. Heart well formed, and its structure apparently healthy.	Numerous bruises upon arms, chest, legs, and abdomen; fracture of several ribs; lungs collapsed and ecchymosed; no rupture of abd. organs, but fracture in left side of sacrum.	When admitted into St. George's, the boy was in a state of collapse, from which he never rallied.

11	Middle aged man.	Thrown from a cart, and partially run over by it.	Prescott, Hewett, as above.	Nearly four hours.	Pericardium torn, and distended with blood. In the front part of the left auricle, and passing transversely above the appendix, was a laceration, about an inch in length, and half an inch in width. In the front of the pulmonary artery, and just before its bifurcation, there was another laceration, equally extensive. The heart itself presented marked hypertrophy of left ventricle, but otherwise appeared healthy.	Much blood in subcutaneous cellular tissue and among muscles of chest, also in pericardium, in the mediastina, and at root of lungs; sternum fractured just above heart, eight ribs fractured on right side and two on left; abdomen filled with blood, which proceeded from extensive laceration of spleen.	
12	Boy, 12.	Fall from top of house into an area.	Prescott Hewett, Trans. of Pathol. Soc. of London, vol. 5, p. 101.	About four hours.	No blood in pericardium. On anterior surface of heart, corresponding to upper part of septum, was a bruised appearance, size of a shilling, under serous membrane, which was not torn through. The bruised spot corresponded to laceration of muscular structure of heart, extending through the upper part of the septum in its whole thickness, and bringing about a communication between the two ventricles, through which a probe was readily passed from one cavity into the other. The laceration in the right side measured about half an inch in depth in the antero-posterior direction; but on the left side there was merely a hole sufficient to allow of passing of probe. In one or two other points, how-	No trace of injury about external parts of the chest; the brain presented general contusion of its surface with fracture of the middle tissues on the left side of the skull. There was also laceration of the spleen, with a compound fracture of the lower jaw and compound comminuted fractures of both thighs.	The boy was admitted into St. George's Hospital in a state of perfect insensibility, and never rallied. The heart of this case is represented in Plate II.

Serial No.	Age and Sex.	Nature of Cause.	Reference.	Duration of life after accident.	Condition of Heart and Pericardium.	Co-existing lesions of Chest-wall and other parts.	Observations.
					ever, where there was also a bruised appearance of this part of the septum, the lining membrane of the left ventricle separated from the muscular structure, was the only portion of the septum remaining. One or two of the fleshy columns on the left side of the septum were also slightly torn; but the rupture did not extend deeply into the substance. Also a slight laceration extending through muscular structure of anterior wall of right ventricle. Cavities of heart of natural size and thickness; muscular structure throughout quite healthy.		
13	Girl, 10.	Passage of cart-wheel over body.	Edinb. Med. Chir. Trans., 1824, vol. i, p. 662; recorded by Dr. John Gairdner.	Sudden death.	Extensive laceration of the heart, laying open both ventricles and auricles, and tearing septum to shreds. About one half of the substance of the heart had burst a way for itself through the pericardium into the right cavity of the thorax, where it was found immersed in a very large quantity of grumous blood, and still attached to the other part by means of a small portion near the apex, where the rent had stopped.	There was scarcely any trace of the impression of the wheel externally, and no subcutaneous extravasation, except a very slight one under left nipple; abdomen perfectly natural. The only other injury was a slight bruise of each ankle.	This case is also quoted in Watson's Medico-Legal Treatise on Homicide by External Violence; Edinb. 1837, p. 96. He adds: "In his lectures Dr. Christison mentioned two cases of rupture of the heart from violence. In one it had been caused by a fall; in the other, from a blow." In the absence of further detail, I cannot make use of these cases for this table.
14	Girl, 5.	Dragged round in a mill-wheel.	Studii sopra i ferimenti del Cuore del Dottr. Ferd. Zannetti, Firenze, 1854, p. 160-61.	Sudden death.	The pericardium distended with blood. On opening the sac, an extensive laceration of the left ventricle became manifest.	The author says in general terms, that there were other lesions, referable to contusion and compression; but he does not specify them.	

15	Fœtus at full period.	Forcible compression of chest.	Zannetti, ut supra.	Sudden death.	The pericardium presented two apertures, and the apex of the heart was also lacerated, more especially in the right than in the left ventricle. The heart was contracted and empty; the right pleura contained blood.	The thoracic wall was sensibly depressed; the scalp was torn, and the right parietal bone the seat of a lineal fracture.	Dr. Zannetti's clinical treatise on wounds of the heart, from which cases 14, 15, 16, and 17, are quoted, is an invaluable contribution to medical jurisprudence.
16	Woman, 70.	Body found in a rivulet.	Zannetti, ut supra.	—	Pericardium lacerated, and apex of heart torn off and carried into right pleural cavity.	General mention only, is made of many other traumatic lesions, and of signs of the thorax having been subject to very powerful compression.	
17	Coachman, 25.	Jumping off carriage in rapid motion on to heap of stones.	Zannetti, ut supra.	Instant death.	Pericardium intact, filled with partially coagulated blood; heart contracted and empty. Its structure appeared healthy; but the anterior wall of the left ventricle presented a stellate laceration.		
18	Man, 27.	Crushed against wall by receding cart.	Bennett, in Lond. Med. Gaz., 1832, vol. i, p. 582.	Almost instant death.	The pericardium was found entire; but on laying it open, and examining the heart, a rupture of the left auricle was discovered, as well as of one of the pulmonary veins.	Several ribs, and sternum (near its middle) fractured; intercostal muscles torn, and a quantity of blood extravasated into all the integuments, and into the cavity of the chest; lungs free from injury.	Mr. Bennett remarks, that the countenance of the unfortunate man was pallid, resembling that of a person who has died from hemorrhage.

Serial No.	Age and Sex.	Nature of Cause.	Reference.	Duration of life after accident.	Condition of Heart and Pericardium.	Co-existing lesions of Chest-wall and other parts.	Observations.
19	Stout man, 60.	Fall from a cart, and passage of wheel over chest.	Thurnam, in Lond. Med. Gaz., 1837-8, vol. i, p. 815.	Instant death.	Pericardium intact, contained several ounces of coagulated blood and serum; rupture of right auricle more than two inches in length, just above attachment of tricuspid valve, extending from the appendage of the auricle almost to the inferior cava. Slight superficial rupture of intra-ventricular septum at its highest point; also a rupture of apex of heart, which externally was about an inch in length, and extended into the substance of the septum, but admitted only of the passage of a bougie.	The only external marks of violence were two or three abrasions of the skin on the left side of the front of the chest; fracture of 6th, 7th, and 8th ribs; also of sternum, but without displacement; serum on both sides of chest; ecchymosis of left pleura and diaphragm; lungs uninjured; spleen extensively lacerated and bruised, had given rise to hemorrhage in the peritoneal cavity.	
20	Adult female.	Thrown out of a carriage.	Christ. Vater. in Miscell. Acad. Nat. Cur., ann. 9 and 10, Obs. 164.	—	Pericardium intact, but filled with blood; rupture of the right ventricle at the apex and near the septum.	Fracture of the clavicle and of several ribs without inward displacement of the fragments.	
21	Adult male.	Kick on chest by a horse.	Graefe und Walther, Journ. der Chir., t. v, p. 669	—	Pericardium filled with blood; rupture of the right ventricle two lines in extent.	Fracture of the sternum.	

22	Adult male.	Fall from a horse, dragged along.	Nebel, Miscell. Acad. Nat. Cur., ann.3,Ob.82.	Instant death.	Pericardium filled with blood; rupture of the vena cava near its insertion into the heart; and another of the right auricle.	Exterior of the chest presented no contusion; ribs not fractured.	
23	Adult man.	Pistol bullet.	Journal der Arzneikunde, F. M. Hufeland, vol. 14, 1802, p. 200, 201.	Sudden death.	Pericardium filled with blood; heart ruptured.	No wound to be seen on the whole body, but only a contusion over the middle of the sternum, which bone was fractured opposite the said spot.	It is to be regretted that Hufeland did not bequeath more full particulars of this case. He states that the sternum was not pierced, but only bruised, and that the pistol bullet was found somewhat flattened in the man's shirt. From the fact of the condition of pericardium not being mentioned, the heart rupture not described, and the sternum said to have been smashed (*zerschmettert*), it might be supposed that the heart was wounded by portions of its fragments. But there is nothing impossible in the heart's being ruptured by a mere shock, and it is fair to believe Hufeland would have described the penetration by pieces of bone had there been need. The case is regarded as a *bonâ fide* one of rupture of heart by external violence, by Voigtel (Handbuch des Pathologische Anatomie, Erste Band; Halle, 1804, p. 406) and by Zucchinelli (Memoria sulle Rotture del Cuore, Annali dell' Omodei, 1826, vol. xxxvii, p. 215-21.)
24	Male, 24.	Fall down an almost perpendicular precipice 60 feet deep.	Dr. John Davy, Researches Physiological and Anatomical, London, 1839, vol. i, p. 437.	—	An ounce of blood in pericardium; six pints in left pleura. Ventricles contracted and empty. Left auricle ruptured in two places, and capable of admitting finger. Aorta ruptured almost completely across, just above mouths of coronary arteries; and again through rather more than half its circumference, a few lines beyond the origin of the left subclavian. Structure of heart and aorta appeared healthy.	Externally no mark of violence or appearance of contusion; oblique extra capsular fracture of right femur; brain healthy; no ribs fractured; lungs healthy; abdominal viscera uninjured.	Dr. Davy remarks that, taking all the circumstances of the case into consideration, it seems most probable that the soldier lost his way in a lonely night-walk, and coming to the brink of the precipice, stepped over, and fell on his feet, or rather perhaps on the one, the neck of the thigh-bone of which was fractured.

Serial No.	Age and Sex.	Nature of Cause.	Reference.	Duration of life after accident.	Condition of Heart and Pericardium.	Co-existing lesions of Chest-wall and other parts.	Observations.
25	Adult.	Gun-shot.	*Fine,* in Réc. des Actes de la Soc. de Santé de Lyon, 178, p. 200; Dezeimeris' Mém. sur Rupt. du Cœur.	Instant death.	Pericardium intact; right ventricle ruptured.		
26	A vigorous young man.	Passage of wheel of heavily laden cart obliquely across left side of chest.	Chaussier, in Portal's Obs. sur des Morts subites, occasionnées par la rupt. du vent. gauche du Cœur, Mém. de l'Acad. Roy. de Med 1784, p. 61	—	Pericardium filled with coagulated blood. Near the base of the left auricle, a laceration capable of admitting two fingers.	The integuments presented no sign of contusion; not a drop of blood was infiltrated into the areolar tissue; lungs and pleuræ healthy; fracture of all the ribs on left side.	Chaussier believed that this rupture had been occasioned by pressure on the arch of the aorta.
27	Male child, 18 mos.	Run over by a waggon.	Rust's Magazin für gesammte Heilkunde, 16 B., Berlin, 1824, p. 92.	Fourteen hours.	Pericardium intact, greatly distended with blood, which had not coagulated; heart collapsed and flaccid. At posterior surface of right auricle, a laceration nine lines in length. The blood effused in pericardium was found to weigh four ounces.	Contents of cranial and abdominal cavities healthy; fracture of several ribs; no contusions visible on surface of body.	Soon after accident, child repeatedly vomited mucosity, had insatiable thirst, and features bore signs of great anxiety; the pulse, rapid & full after accident, became slow and small, and at last imperceptible; the extremities were cold; the body bedewed with cold sweat; and the child died after fourteen hours.

Plate II.

Fig. 1.

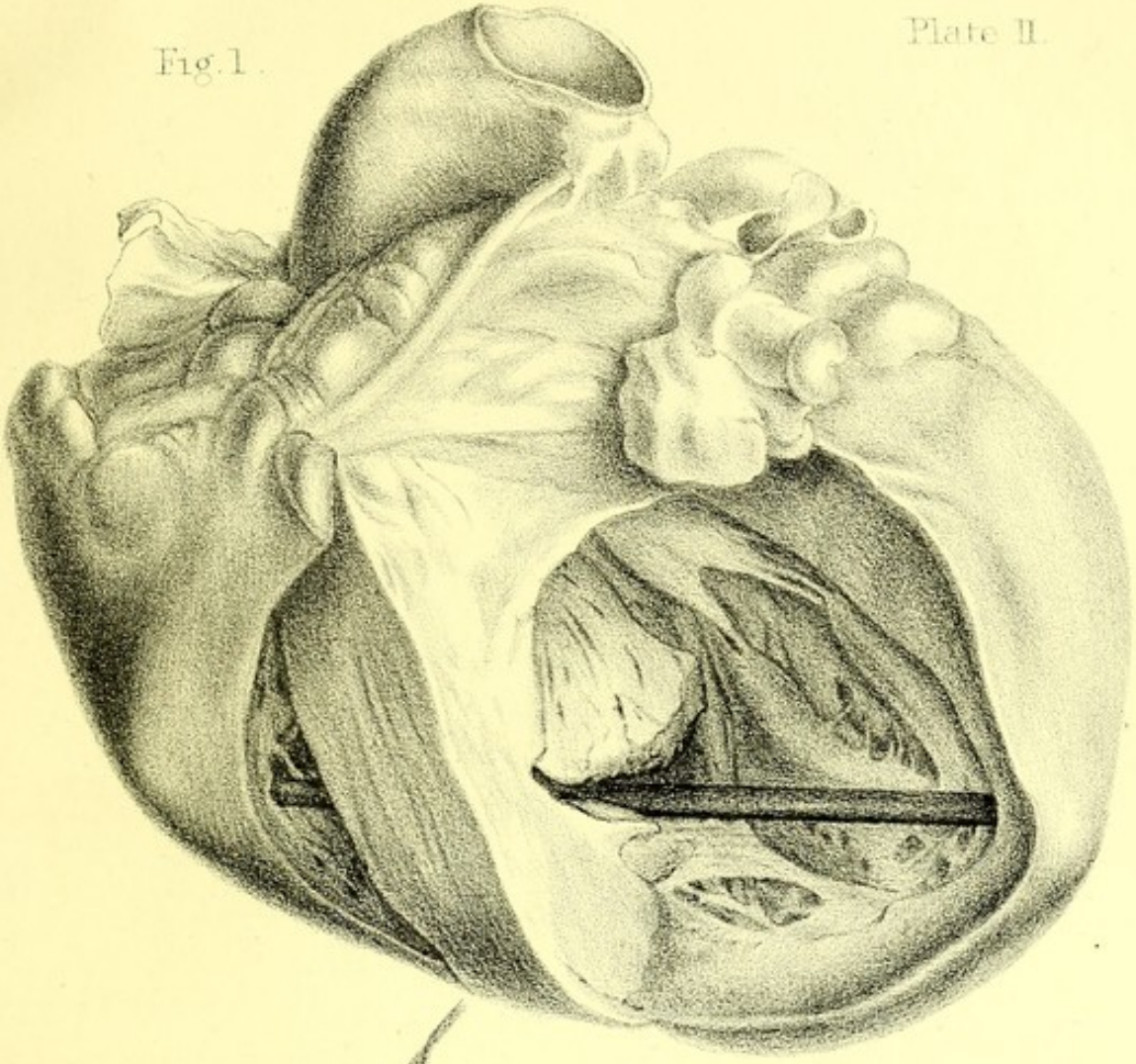
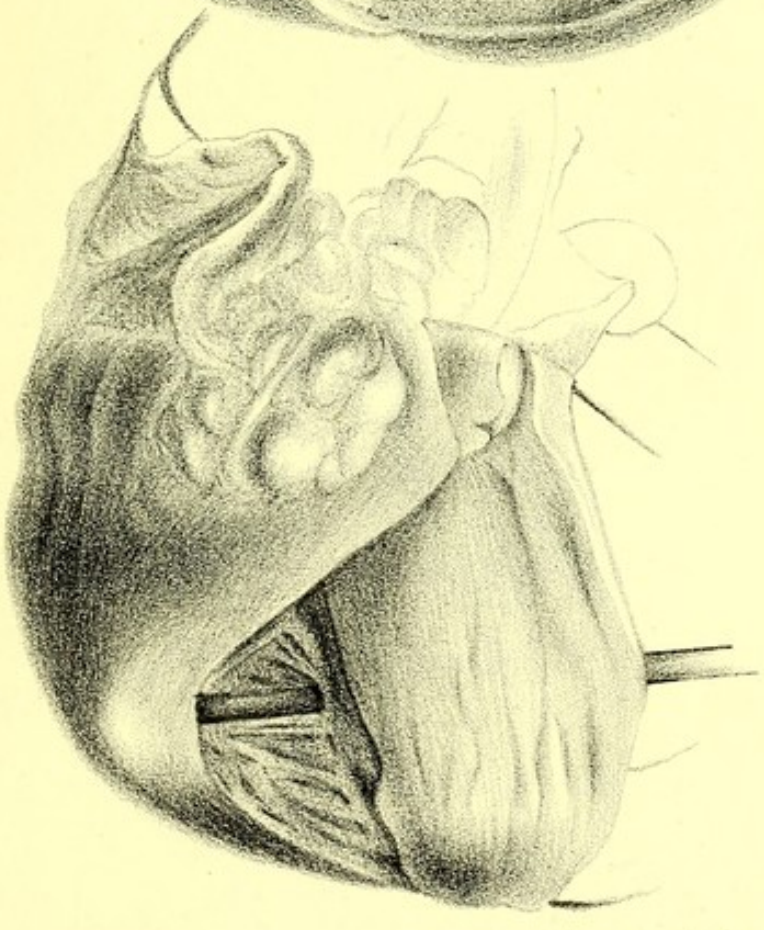


Fig. 2.



John Gamgee, del. et lith.

Day & Son Lith.rs to The Queen

FACTS CONTRIBUTED TO THE PATHOLOGY OF DRY GANGRENE:

WITH OBSERVATIONS ON ITS TREATMENT.

CONTENTS.

MUCH as this disease has been studied by surgical pathologists, since Mr. Percival Pott attracted prominent notice to it by the publication of his *Observations on the Mortification of the Toes and*

Feet,* "professional opinion is still unsettled as to its cause".†

Baron Dupuytren referred it to arteritis.‡ His opinions and observations were characterised as *inconclusive and defective* by Sir Robert Carswell, who maintained§ that calcification of the arterial coats and occlusion of the vessels is the cause of the disease, and that there was no evidence of idiopathic inflammation of the large arteries giving rise to it. His criticism has the assent of Sir B. Brodie, who is certain that " M. Dupuytren is mistaken on this point."‖ And of Mr. Liston,¶ in whose opinion the Baron's attempt to connect mortification with an inflamed state of the arterial coats, is not confirmed by experience. More recently Dr. Crisp has re-echoed the opinion of this distinguished French pathologist.** Professor Linoli†† held a

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* Works, vol. iii, p. 331 et seq.

† Mr. Syme, Contributions to the Pathology and Practice of Surgery: Edinburgh, 1848, p. 9.

‡ Leçons Orales de Clinique Chirurgicale. 2nd edit., t. iii, p. 268.

§ Illustrations of the Elementary Forms of Disease, *article*, "Mortification."

‖ Lectures illustrative of Various Subjects in Pathology and Surgery: 1846, p. 355.

¶ Elements of Surgery. By Robert Liston. 2nd ed., p. 42.

** A Treatise on the Structure, Diseases, and Injuries of the Blood-Vessels. London, 1847, p. 66.

†† Caso di Gangrena Secca con Autopsia Cadaverica del Prof. Linoli, negli Annali Universali di Medicina, compilati da Annibale Omodei; t. lxxiv, p. 469.

medium view; that arterial ossification is the remote, and inflammation the proximate cause. Professor Velpeau* expresses himself dissatisfied with the state of knowledge on this disease, and cites several cases of it in which he was unable to discover any anatomical change whatever to account for the phenomena. Many other instances of dissenting opinions might be quoted, not only with reference to the pathology, but also to the treatment of the disease; but enough has, I think, been adduced to demonstrate the desirability of adding facts which are calculated to exercise an influence in the solution of the question.

Case I. Gaspera Innocenti, aged 62, was admitted into the female clinical ward of Santa Maria Nuova, Florence, under Professor Ranzi, on the 30th of September 1851, when the following notes were taken by me. She is a peasant from the Appennines, accustomed to live on bread, beans, chesnuts, and weak wine; only eats meat twice or three times in the year. About sixteen days ago, she experienced severe burning pain in the whole of the left hand, from the wrist to the ends of the fingers; the latter acquired a black colour in the course of four or five days, and the gangrene has ever since gradually extended.

The pulse is very visible in both carotids, 120 in

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* Leçons Orales de Clinique Chirurgicale publiées, par Pavillon et Jeanselme. Ed. Bruxelles: pp. 690-91.

the minute. Pulsation is distinct in the outer side of the right subclavian, not so in the left. The arteries of the right arm and forearm pulsate well. Those on the left side cannot be felt. The left posterior tibial artery pulsates indistinctly, the right one does not do so at all. The same remark applies to the dorsal arteries of the feet. Both lower limbs as far up as the knees are œdematous.

The fingers of the left hand are semi-flexed, cold, motionless, senseless, black, and somewhat shrivelled; this condition involves the whole hand as far as the wrist.

The following temperatures are ascertained with the centigrade thermometer, care being taken that all the parts are similarly circumstanced as to covering:—

Ward		18½	degrees.
Inside of cheeks		24	,,
Both arm-pits		24	,,
Bend of elbow	left	21	,,
	right	23	,,
Palm of hand	left	20	,,
	right	23	,,
Dorsum of foot	left	22	,,
	right	20	,,

Strength gradually diminished; the gangrene extended a little up the forearm, but did not appear in any other part of the body; death occurred at 7 P.M. on the 7th October. Treatment adopted was bark and opium, with tolerably good diet.

Examination forty hours after death. The abdomen

contains about two pints of turbid greenish fluid, with flocculi of lymph floating in it. The viscera of this cavity are healthy.

About one pint and a half of limpid serosity in the chest; lungs healthy; heart small and flaccid; orifices healthy; with the exception of some calcareous deposit at the insertion of the aortic semilunar valves.

Atheromatous degeneration manifest in the arch and descending portion of the aorta, especially around the orifices of the intercostal arteries. There is one patch of calcareous degeneration near the origin of the subclavian artery, and another above the origin of the cœliac axis. Firmly adhering to the last one, is the lower half of a blood clot measuring two inches and three-quarters in length, half an inch in breadth, and a little more than a line in thickness; the upper half of the clot is loose, of dark red colour and rather soft; but the lower half is adherent, of reddish yellow colour, and firm.

The right common and external iliac arteries are almost completely obliterated by a blood clot, the upper half of which is of darkened colour, more uniform shape, and softer consistence than the lower half. The middle portion of the clot, including some of the dark red and soft, and some of the light red and consistent, is firmly adherent to the arterial coats, which appear healthy. A fine clot is continued into the right external iliac for rather more than an inch.

The left subclavian artery is decidedly redder than are the other great vessels springing from the aortic arch: on careful examination, the redness is seen to be due to capillary injection; this is most marked along the concavity of the artery. This injection extends to five inches beyond the origin of the superior intercostal; as far as this point the colour of the arterial coats is deep red; beyond it, they are of normal colour, but very much contracted. On comparing the brachial radial and ulnar arteries of the two sides, those on the left prove to be decidedly the smallest.

On slitting open the left subclavian artery from its commencement onwards, an obliterating clot seven inches in length is exposed. At its proximate extremity, the clot is of dark red colour, smooth on the surface, non-adherent, of moderate consistence; a little further on, it is softer, especially near the surface.

Towards its distal extremity, it regains consistence, acquires a lighter colour, and is so firmly adherent to the artery, that on attempting to detach it, it breaks up. Just beyond the coagulum, the artery contains a whitish, rather dry, grumous substance, which adheres to, but admits of being detached from, the artery. Under the microscope it is found to consist of imperfect granular and pus corpuscles.

It is to be regretted that I did not take more copious notes of negative characters, especially as to the

absence of calcific degeneration in particular vessels. I distinctly remember, however, that there was no notable calcification in the arteries of the affected upper limbs, in accordance with the well-known fact, that, frequent as this change is in the aorta and its inferior ramifications, it is uncommon in the subclavian and brachial arteries and their divisions. The anatomical characters observed on dissection of the left upper limb, prove that inflammation, and consequent occlusion of its arteries by plastic deposit, was the cause of the mortification in this case.

Facts similar to those above recorded have been once observed in the upper limb by M. Chassaignac,* and thus the occasional sequential relation of arteritis and dry gangrene no longer admits of doubt.† It must, however, be admitted, that in

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* Recherches sur la Gangrène Spontanée, appelée Gangrène sénile, par M. Chassaignac. Mém. de la Soc. Chir. de Paris, vii, pp. 254-273. M. Chassaignac's case was one of only partially dry gangrene of right hand and forearm. The subject was fifty-seven years old, and there can be no doubt that his ailment was senile gangrene, somewhat moister than usual. The evidences of arteritis were very well marked.

† The compilers of M. Dupuytren's *Leçons Orales de Clinique Chirurgicale* have shown themselves rather careless of his fame in recording his opinions relatively to "La Gangrène Symptomatique par suite d'artérite." In two of the cases (I and III), calcification was the distinctive anatomical change in the arterial coats. Case II is one of sloughing of the scrotum and penis without known reason; and certainly no mention is made of arteritis. Even the other facts and arguments they have collected are far from proving that arteritis is the cause of dry gangrene.

the majority of instances of dry gangrene in which the arterial system has been dissected, no inflammation has been discovered, but the arteries have been found obliterated in consequence of atheromatous and calcific degeneration of their coats.

The rarity of calcification in the arteries of the upper limb, the very small number of well attested cases of dry gangrene following arteritis, and the fact that in my case, and in the one recorded by M. Chassaignac, of gangrene symptomatic of arteritis, the disease affected the upper limb, are facts which simultaneously strike one as bearing relation to each other. What the nature or degree of intimacy of this relation may be, future observations must determine.

Case II. Marianna Cerchi, aged 85, admitted under Professor Regnoli, into No. 269 in the female clinical ward of Santa Maria Nuova, Florence, on the 10th February, 1852. Her mental faculties being somewhat impaired, she is unable to give a detailed history of her disease; but is positive that the gangrenous foot has never been black, but has on the contrary preserved its natural colour.

On admission, the right foot was of dirty white colour, shrivelled up and hard, almost completely separated from the leg at the ankle-joint by the effort of nature.

18th February. The foot was removed on the 10th by cutting through a piece of skin at the

anterior part of the ankle, it being the only remaining bond of union with the leg. The stump, which then looked red, has now a grey aspect. The tips of all the toes of the left foot are black and horny. They may have been so several days, but no complaint having been made, attention has not been directed to the part. Since admission, the old woman has gradually grown weak, and is to-day moribund.

I made the *post mortem* examination on the 20th February, death having occurred on the 18th, an hour after taking the foregoing report.

No rigor mortis; a good deal of tympanitis; considerable œdema of right thigh and leg; none of left lower limb, or of upper ones.

The aorta slit throughout its whole extent is found to be extensively atheromatous, the deposit being comparatively limited to the neighbourhood of the mouths of vessels which branch from the trunk. The aortic coats have undergone the calcific degeneration at three different spots; each in the vicinity of the point where the left subclavian, cœliac axis, and inferior mesenteric are given off.

Innominate and common carotids with their branches on both sides notably atheromatous, but only one small point of calcification on each side; on the right it is situated at the bifurcation of the innominata, and on the left at the bifurcation of the common carotid.

Atheroma, but no calcification, in subclavian

axillary and brachial arteries on both sides. In the last named, it diminishes with the increase of distance from the heart. Both radial and ulnar arteries perfectly healthy.

Atheroma and calcification in both common iliacs; the former, but not the latter, degeneration exists in both external and in the left internal iliacs. Right internal iliac healthy.

In dissecting the femoral vessels on the left side, nothing peculiar is seen externally. A good deal of atheromatous degeneration is discovered on laying open the left common femoral, and also a small calcareous patch an inch above the origin of the profunda, which on being slit up proves to be perfectly healthy. There is slight atheromatous degeneration in the upper inch and a half of the left superficial femoral, but none in the remainder of its extent. On laying open the left popliteal artery, numerous calcareous patches discovered in different parts of it.

The upper portion of the artery is obliterated by a red blood clot, but lower down by a firm white clot which extends down into the upper two-thirds of the posterior tibial; the remainder of this vessel is pervious. The corresponding anterior tibial pervious and healthy. The peroneal and plantars not examined.

Right lower limb. *Arteries.* Unusual difficulty is experienced in dissecting the femoral vessels, owing to adhesions between them and the adjacent tissues.

There is a marked vascular network in the cellular coat covering the common and superficial femorals in their whole extent. Its meshes are not very close, but of bright red colour. On removing the cellular coat, the artery remains pale. This red network contrasts strongly with the external pallor of the left femoral. On slitting open the common femoral artery, no atheroma, but just above the origin of the profunda it presents a rectangular calcareous patch measuring a quarter by half an inch. In the superficial femoral is a little atheroma just below the origin of the profunda, and a small patch of it on the posterior wall of the vessel just about its middle. Deep femoral artery healthy.

Right popliteal artery contains numerous calcareous patches in its coats; at about its middle the whole circumference of the vessel is calcified. Corresponding to this spot, the artery is partially occluded by a firm adherent whitish clot. In dissecting this artery, I have found it decidedly more adherent than usual to the surrounding tissues. On its exterior, which looks white, are more vasa vasorum than usual.

Anterior tibial artery healthy. It is pervious except in its last inch, where it is occluded by white adherent clots (this is the side from which the foot separated). Peroneal artery healthy. Posterior tibial looks normal externally, but on cutting it open it contains a whitish firm cord. On cutting this cord across, it proves to be hollow. On slitting

it open longitudinally, its interior is found lined by the inner coat of the artery. On examining the exterior of the cord, atheroma (proved microscopically to consist of fat and cholesterine) is seen in it. This examination, carefully conducted, proved to me that the cord was due to longitudinal splitting up of the middle coat of the artery, contraction of the inner part of the said coat, including the lining membrane, so as to form a cylinder which appeared in the cavity of the artery; but what was at first taken to be the whole artery, proved to be nothing more than the outer coat with a part of the middle coat lining it.

Venous system of the right lower limb. The common and internal iliac veins are perfectly healthy. On slitting up the external iliac vein, its coats are of normal colour and consistence; in its interior is a conically shaped non-adherent but consistent clot, extending from half an inch below the origin of the internal iliac down into the femoral vein.

On laying open the common and superficial femoral veins, which have a slate colour externally, with a fine net-work of very small vessels ramifying on them, I find their coats decidedly thickened throughout, but especially so the upper inch of the common femoral, where the tunics feel and cut almost like cartilage, and are very closely adherent to a firm reddish clot in the interior of the vein. This clot effectually closes the terminal orifice of the saphena. From the entrance of this

vein downwards, the superficial femoral vein contains a clot which becomes irregularly smaller and less adherent as it descends. It ceases completely about its middle. Whereas, above the orifice of the saphena, the clot is quite dry, below it, it is bathed by a fluid, in colour and consistency very much like chocolate and milk. Below the part where the clot ends, the vein is filled with a fluid of this kind. Opposite the termination of the said clot the femoral is joined by a venous branch, on tracing which into the triceps extensor, its first part is found to contain more of the chocolate-like fluid, but further on it contains a fluid like good pus. On sponging this away the lining membrane remains rough, in consequence of white matter remaining adherent to it. On removing the fluid from the superficial femoral, its lining membrane presents a similar appearance. Both these veins are preternaturally red where the white pus-like matter does not adhere to their inner coat.

The deep femoral vein at its upper part is occluded by an adherent clot, which becomes softer and acquires more the character of a healthy venous clot as it descends.

The muscles of the thigh are healthy.

The external and internal saphenous veins in the right leg are perfectly healthy; their orifices on the face of the stump are closed by adhesive matter. The popliteal vein is of a purplish colour, with very close vascular network on its exterior,

and is quite round and feels solid. On slitting it open, it is found completely occluded in its whole length by a firm adherent clot.

The anterior and posterior tibial veins are healthy. One of the peroneal veins is healthy. The other is occluded by a tolerably firm and slightly adherent clot.

Clinical Remarks. This case is replete with pathological interest.

A few days before death, small dry gangrenous patches were noticed at the extreme parts of the left toes; on cadaveric inspection we found the corresponding popliteal artery extensively calcified and obliterated by a firm and in part white clot, extending into the upper two-thirds of the posterior tibial. The anterior tibial was pervious.

No arterial inflammation was met with in this limb, but atheromatous and calcific degeneration were characteristically developed. It is curious that the extent of arterial obliteration was out of proportion greater than the amount of dead tissue would have led one to anticipate. This disproportion has been noticed by others, but only Cruveilhier appears to have recognised its true pathological significance; we shall presently have to recur to this matter.

On dissecting the femoral and popliteal vessels of the right side, unusual difficulty was experienced owing to their preternatural adhesion to the tissues immediately adjoining; that this was due to in-

flammatory plastic effusion, appears evident, when the marked development of the vasa vasorum noticed on the femoral vessels is taken into account.

That inflammation was not of arterial but of venous origin results from the following considerations:—*a*, the network of the vasa vasorum was more evident; its meshes were closer over the veins than on the arteries; *b*, the proper arterial tunics did not exhibit any signs of inflammation, nor was there any plastic effusion within them; *c*, the characters of phlebitis were typically well developed, so much so, that the disease was evidently of several days duration,—an interesting fact when it is borne in mind that in spite of it the process of disjunctive absorption between the leg and dead foot proceeded actively, and at its consummation the stump looked red and tolerably healthy for nearly two days. In which set of vessels did disease first commence? Were the arteries first closed by simple blood clots, or the veins by inflammatory deposits and their consequences, or *vice versa?* The dry and shrivelled appearance of the foot dispels all doubt in this regard; the arterial mischief must have had the priority; it is well known that just as œdema is one of the characteristic signs of venous, diminished size is of arterial obstruction.

The right popliteal artery was very much calcified, and a small firm clot occupied the greater part of its bore, but did not completely obliterate it. Moreover, the anterior tibial and peroneal

arteries were healthy: hence, though much impeded, the course of blood to the foot was not completely suspended; yet the whole foot died, singularly contrasting with the state of things in the opposite limb, where the foot gave very slight signs of suffering, though the main artery of the limb, the popliteal, was completely occluded by old firm white adherent clot. "Lisez les observations publiées sur la gangrène sénile," says Cruveilhier,* "vous n'en trouvez pas deux qui se ressemblent sous le rapport de l'étendue de l'obliteration des grosses artères. Ainsi, dans un cas présenté à la Société Anatomique par M. Maisonneuve, la fin de l'aorte, les deux artères iliaques primitives, iliaques internes et externes, poplitée, tibiale, et peronière, étaient complètement obliterées, et pourtant la gangrène était limitée à quelques orteils. Dans la deuxième observation que j'ai rapporté (xvii livraison, *Anat. Patholog. du Corps Humain*), l'obliteration était bornée aux artères tibiales postérieure et péronière; la tibiale antérieure était libre, et pourtant la gangrène avait envahi les quatre derniers orteils et la côté externe de la jambe: comment se fait-il que l'artère tibiale antérieure étant libre, la circulation ne se soit pas rétablie dans les artères tibiale postérieure et péronière? Par une raison toute simple: c'est que les voies de communication entre ces deux ordres de vaisseaux

* Traité d'Anat. Path. génér., t. ii, 1852, p. 303.

étaient interceptées par l'obliteration des collatérales." This is, I think, the only possible explanation; but be it remembered that it is matter of inference, not the result of direct observation. The condition of the smaller vessels has been singularly neglected by those who have studied this disease; and it remains to future pathologists to determine how often, and by what process, the small arterial ramifications are implicated. While admitting Cruveilhier's explanation of the disproportion between the extent of arterial disease and of gangrene, as the only possible one, I cannot subscribe to his generalisation, that "obliteration of the small arteries is the fundamental fact, as cause of spontaneous gangrene."* The facts to prove it are not at hand.

In addition to the reasons above adduced, what renders it about certain that the main cause of gangrene in the right foot of Marianna Cerchi was obliteration of the ultimate arterial ramification, is the fact that the foot retained its normal colour. This would appear referrible to the complete exclusion of blood from the part, an exclusion so complete, that it can only be supposed possible as a result of closure of the smaller arteries; for, however completely the trunks might be obliterated—but they were not so in this case—some blood would reach the part through collateral channels, and by its change impart the dark colour.†

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* Op. cit., p. 302.

† In the *Med. Chir. Trans.*, vol. xiii, is "a case of injury to

The condition in which I found the right posterior tibial artery merits attention. On slitting it open, it was found to contain a whitish firm cord, which, on transverse section, proved to be hollow; and, when slit up longitudinally, its interior was found lined by the inner coat of the artery, and atheroma was deposited in its outer surface. Careful examination proved that the cord was formed by longitudinal splitting up of the middle coat of the artery, and contraction of the inner part of the said coat, including the lining membrane, into a cylinder; and that it was not a solid body contained in the artery, as at first appeared, but in a shell formed by the outer coat, and most external layers of the middle one, which had preserved the original size and shape of the artery.*

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the bloodvessels of the lower extremity, producing pale, dry gangrene in the foot, by T. W. Chevallier, Esq." At page 24, I find: "In conclusion, I may mention an observation of my father's, which I find confirmed in the writings of others, that the pale, or white, dry gangrene takes place only where the veins of the parts affected are not obliterated." In one case, however, the pale, dry gangrene of the foot was associated with extensive obliteration of the veins of the same limb.

* These facts were noted several months before I became acquainted with the existence of M. Chassaignac's *Researches on Spontaneous Gangrene*, published in the second volume of the *Memoirs of the Parisian Society of Surgery*, pp. 254-273. He therein describes, in all essential particulars, appearances similar to those noted above; but he appears to refer them to dissection, whereas there can be no doubt that the splitting up of the

The whitish firm cord had often been noticed by Carswell; but he did not examine its structure, and consequently misunderstood its nature. "In every case of gangrena senilis which I have examined after death (Carswell, *op. cit.*), the arteries of the limb were obliterated to such an extent as to interrupt the circulation of the blood. The obstructing cause consisted in five or six cases of a *fibrous tissue formed either in the walls or cavities of the arteries*, and which had converted these vessels into nearly solid cords of ligamentous consistence." Carswell then recognised these cords as one of the

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middle coat occurred during life. In speaking of the arteries of the leg in a case of dry gangrene, he states they were obliterated "par des concrétions cretacées dures et sèches comme de la pierre et qui forment des cylindres paraissant tamponner en quelque sorte la lumière du vaisseau. Ainsi en incisant de l'extérieur à l'intérieur, on semble ouvrir l'artère, dont on écarte les parois. En les renversant, et au centre de l'artère ainsi épanouie, on voit le cylindre ossiforme, qui est parfaitement arrondi. Toutefois ce premier aspect est trompeur; ce n'est pas dans la cavité même du vaisseau que ce trouve le cylindre, et la disposition que nous venons de signaler, n'est en quelque sorte que le résultat même de la dissection. En effet, ce cylindre ossiforme, fendu suivant sa longueur, présente dans son axe une cavité évidemment tapissée par la membrane interne de l'artère. Il est donc évident que par la première incision faite sur le vaisseau on a divisé la tunique celluleuse et les couches les plus externes de la tunique moyenne, tandis que les couches les plus internes, converties en une lame osseuse, maintiennent la forme d'un cylindre engainé dans les membranes divisées, et qui au premier aspect paraît fondu dans la cavité même de l'artère."

most frequent causes of dry gangrene, acting as passive obstacles to the flow of arterial blood; but the discovery of their structure suggests future investigation, to determine whether they be not active agents. It is easy to conceive how, in the diseased condition (atheromatous degeneration) of the middle coat, its layers may split up, and the inner ones, by virtue of their elasticity, contract upon the lining membrane, and, while forming a cord-like substance, effectually impede the access of blood.

Both the patients whose histories I have related were very poor women: one an inhabitant of a secluded village in the Apennines, whose life was certainly not devoted to the pleasures of the table, for milk and flour of chesnuts were her staple articles of nourishment, and meat a luxury only about thrice a year indulged in. I have seen other three cases of this disease in persons of this class; and there seems good reason to suspect, contrary to the prevalent opinion, first sustained by Mr. Pott,* that this disease is scarcely, if at all, more frequent among the wealthy than the poorer classes.

Observations on treatment. From the recorders of Baron Dupuytren's clinical teaching, we learn† that he had resort to repeated bloodlettings in the management of cases of dry gangrene,—two-thirds, and even three-fourths of which, he thereby cured.

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* Chirurgical Works, ed. 1783, vol. iii, p. 333.

† Leçons Orales, vol. iii, p. 282.

Such a result is contrary to what sound doctrine would lead us to predicate. It is impossible, *à priori*, to conceive how 75 per cent. of the poor old people whose limbs shrivel up, blacken, and die with this affection, can be cured by subtraction of the pabulum of life. It is rare for the results of experience to be in direct opposition to the anticipations of sound reasoning. The Baron's practice in this disease appears a great exception: not so, however, when contrasted with the experience of the great majority; and it must, indeed, remain matter for astonishment that the judgment of so distinguished a man should be so signally warped by fallacious theoretical preoccupation, such as his referring dry gangrene invariably to arterial inflammation; but certain it is that the great majority of surgeons are agreed that, instead of repeated blood-letting ministering to the salvation of 75 per cent. of dry gangrene patients, it tends materially to lessen the little group which nature might possibly save by her own unaided efforts.

The further therapeutical observations I have to make, may be conveniently classed under the heads *constitutional* and *local*.

The advantages accruing to the constitution from the exhibition of opium, after the example of Mr. Pott, are generally acknowledged. The pain, often very severe, blunting appetite and forbidding sleep, tends powerfully to impair the powers of life: their economy, attendant upon its alleviation, is

attended with much good. Repeated clinical observation has convinced me that this end is always enhanced by the free exhibition of opium; so much so, that it must be regarded as the most powerful therapeutic agent available in this malady.

On the question of regimen, opinions are divided. Mr. Syme* is for *strictly farinaceous* diet; Sir Benjamin Brodie,† for *animal food and stimulants, such as ale, wine, or brandy.* In the absence of facts to reconcile such discrepancy between authorities so eminent, the solution, by accurate and impartial observation, is much to be desired: meanwhile it seems prudent to guide practice without exclusive adherence to either precept, and to suit the regimen to the requirement of individual cases. It is fairly presumable, that as the disease may occur in the most abstemious as in the most free livers, the former may require a nourishing diet ill suited to the latter. But apart from these special considerations, general surgical experience would induce the belief that the practice of the above quoted authorities, is more exclusive than is consistent with the very various conditions of individuals subject to the disease in question.

Locally. Though no great objection can be urged against a light poultice, yet the enveloping in carded wool is preferable, as being most conducive

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* Contributions to the Pathology and Practice of Surgery, pp. 10-12.

† Lectures on Path. and Surgery, p. 367.

to the patient's comfort. The question is, should the part once dead be removed by the knife, or be left until severed from the living by nature's effort. The latter alternative had been almost universally assented to, when it was once more, and that very recently, called in question in the great surgical societies of London and Paris. M. Chassaignac* concludes a commentary on a case of the kind, in which he amputated while the gangrene was spreading, by laying down as a rule, "that, when amputation is performed for senile gangrene, the knife should only be applied where the arterial pulsations are unmistakably felt." This precautionary rule may in some measure be a guarantee that the stump will be supplied with blood, and not subject to mortification; but it will not lessen the chances, always considerable, of gangrene occurring in other parts.

In a discussion which took place about the same time in our own Medico-Chirurgical Society,† cases of successful amputation in this disease were mentioned; and it was sought to infer therefrom arguments in favour of a more extended application of the practice. It is curious that the case which provoked the discussion was by no means one of the ordinary cases of dry gangrene, with reference to which alone the amputation question can be debated. An individual became the subject of dry gangrene of the foot in May. Two abscesses

* Mém. de la Soc. de Chir. de Paris, loc. cit.

† Lancet, 1853, p. 315-17.

formed in the leg, discharged, and healed. Pus accumulated in the knee-joint, and was spontaneously evacuated. The patient's health improved, and amputation was performed, on 30th of Sept., with good result.

The history of this case is obviously exceptional, not only on account of the slow progress of the disease, but of the constitutional vigour betokened by the purulent depositions, by the granulation of their residual chasms, and by the improvement of the general health in spite of the local malady. There can be no doubt that the surgeon, Mr. Garlake, very correctly interpreted the constitutional state, and aided nature's effort by the removal of the dead parts. But the case has no bearing upon the question of amputation in dry gangrene, when (which is the rule) the tissues successively die with scarcely any manifestation of systemic vigour.

What *à priori* therapeutic argumentation, does ascertained pathological fact warrant? The disease results from arterial mischief, which commonly affects the system extensively. Removal of the dead part by the knife does not, therefore, ward off the cause, which may give rise to similar mortification in the stump or other parts, while the dangers of amputation are superseded: these, be it noted, are very considerable in old persons with diseased arteries. Moreover, the dead part is dry, and not inconvenient beyond the production of some fetor and pain, which admit of counteraction by sedatives and disinfectants.

What does experience say? I am aware, as was proved at the already quoted discussion in the Medico-Chirurgical Society, that other cases of successful amputation in dry gangrene are on record; but they are only to be regarded as exceptions. Of nineteen cases of spontaneous gangrene, eight were treated by amputation, and five died; whereas ten survived out of eleven, in which nature was left to herself.* These statistics are incomplete in particulars; for it may be urged that the eight amputated cases were the worst, and that the three survivors owed their lives to the knife. But the experience of the great majority of surgeons accords with the doctrinal predication, in discountenancing amputation, as a rule, until the line of separation is very far advanced. The bones, or a bridge of soft tissue, may be severed, to save time. Exceptional cases like Mr. Garlake's, recurring, must be met as his was, by suitable application of means to special indications.

Summary. The principal facts and reflections embodied in this memoir may be summed up in the following propositions.

a. The conflicting state of opinion as to the pathology of dry gangrene, renders desirable further investigation in point. Certain it is that calcifica-

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* Bérard et Dénonvilliers, *Compendium de Chir. Pratique;* 1845, vol. i, p. 251. Sixteen of the cases they have analyzed are from Victor François' *Essai sur les Gangrènes Spontanées;* Paris, 1832.

tion and consequent obstruction to the blood's flow is the most common cause; equally certain that the obstruction is sometimes, though rarely, independent of atheromatous and calcific degeneration of the arterial coats, and due to their inflammation, and to the consequent deposition of plastic material in the vessel's bore. Both pathological states—calcification and inflammation—occasionally operate simultaneously in the same or different parts of one individual.

b. A part affected with the ordinary dry gangrene of the aged, though commonly black, sometimes preserves its natural colour, and it may do so—contrary to the opinion of Chevallier—even though the veins of the limb may be obliterated in addition to the arteries.

c. The extent of a part affected with dry gangrene does not bear relation to the extent of obliteration in the large arteries; sometimes an inverse ratio is observable. The degree in which obstruction of the capillaries and small arteries contributes to the disease, is a point requiring investigation, which promises to be fertile in results interesting to the scientific pathologist.

d. The supervention of phlebitis, an occasional though not very common occurrence, does not prevent, nor apparently even materially retard, the separation of a dry gangrenous part by the natural process—disjunctive absorption.

e. The white firm cord described by Carswell and others as occurring in the arteries of limbs affected with dry gangrene is sometimes made up of the lining membrane and inner layers of the middle coat, consequent upon longitudinal splitting up of the latter. It would be interesting to determine how often this change occurs, and what is its causal or sequential relation to the morbid phenomena.

f. In the treatment of dry gangrene, antiphlogistics are as a rule deprecable. Regimen must be suited to special indications; sometimes strictly farinaceous, at others generous and even stimulating diet may be necessary. The exclusive advocacy of the former by Mr. Syme, of the latter by Sir Benjamin Brodie, offers material for clinical inquiry into the relative merits of the two systems in particular cases. The internal administration of opium is of great value. Enveloping the part in carded wool is preferable to poultices. Traditional experience and statistics proscribe the amputating knife, but exceptional cases are on record in which it has been successfully employed; and it may be advisable to resort to it rather than wait for their separation when the progress of the disease is very slow, and special signs indicate more than common vitality in the adjoining textures and in the system generally.

CLINICAL REMARKS ON CYSTIC SARCOMA AND CANCER OF THE FEMALE BREAST.

CONTENTS.

Slow as must always be the march of knowledge, it is somewhat depressing to reflect that, in the science of medicine, which more closely than any other affects the welfare of men, there are special reasons which obstruct progress, in addition to those operating in other departments of knowledge. Such is the complexity of the animal organization, so numerous and difficult are the laws which govern

it in health and in disease, that even when to its study can be brought the aid of physical instruments, the task is one of uncommon labour, beset with extraordinary fallacies, as even the most sceptic may satisfy himself, who reflects upon the history of the innovation and introduction into practice of the stethoscope and microscope. The former has achieved its victories, the battle of the latter is being fought. Though there be ample proof that, but for the microscope, a large number of pathological facts of clinical value, now known, would never have been discovered; though there be good reason to hope that we have barely tasted its fruits; many surgeons in high stations treat it lightly, while others openly deny its practical utility. Cancer is the field on which its value to surgeons will in great measure have to be decided; and this will be immense, if, after ascertaining by microscopic investigation the anatomical characters of morbid growths, and classifying these accordingly, it can be determined that the anatomical characters of cancer are as peculiar as their clinical history; that a tumour not presenting the anatomical character of cancer does not entail upon its possessor any of the evils of this disease; and consequently, that in prognosis at least, immense aid will be afforded by the results of microscopic observation.

It seemed as if this great boon had resulted from the application of the microscope; but there are facts on record in the writings of Mr. Erichsen,

Mr. Birkett, and Mr. Paget, which throw a great doubt upon the reality of the discovery, if they do not altogether prove that a benignant tumour, though completely removed by the knife, may be succeeded by an affection in anatomical characters and effects inseparable from secondary cancer. I do not assent to the validity of the proof, because impressed with the belief that not only has not sufficient care been taken for excluding fallacy from the observation of the facts upon which it is founded, but that their impartial and rigorous study leads to conclusions, opposed to those which the above named distinguished authorities have inferred from them.

I shall first relate the case which has given rise to the discussion.

Case I. Catharine Edwardes,* aged 42, was admitted into University College Hospital, 9th June 1851. She was married, and the mother of two children. She had always enjoyed good health and regular catamenia.

History of the present Affection. Three years ago, she felt a small lump about the size of a nut, very hard and readily moveable, beneath the integument situate in the right mamma just above the nipple,

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* It is but just to state that no such correct account as the above has been published of the history of this case. The report in the *Lancet* of 31st Jan. 1852, from which alone Messrs. Birkett and Paget could judge, is defective, both from lack of information, and incorrectness of the scanty amount it supplies.

not at all painful. She could not account for it in any way. From the time she first noticed the tumour it gradually increased in size, till it became as large as an egg. It remained for some time of this size, and it was perfectly moveable beneath the skin, and painless, till three months ago, when it rapidly enlarged and became the seat of a *sharp, shooting* pain, which she compares *to the sensation of a dog gnawing a bone;* this pain was most severe at night. She had grown much thinner during the last three months, but no weaker, her appetite remaining good.

State on Admission. She was robust and healthy looking. The tumour in the right mamma was nearly hemispherical, about four inches in the maximum diameter. The skin, of natural colour, did not appear connected with it in the slightest degree, with the exception of slight retraction of the nipple. The tumour was very firm and solid, but one or two points could be detected on careful examination, somewhat softer than the rest of the surface. When touched, it was only painful at a point on the right side. It was, however, very painful at night. She said it got larger and more painful every day. A group of indurated lymphatic glands was felt in the right axilla.

On the 18th June, the mamma as well as the axillary glands were removed by the knife. The progress of the case was exceedingly favourable; and on the 3rd July the patient was discharged in

very good health with the wound nearly healed; but before the end of August, while I was acting as house-surgeon, she returned to the hospital with an affection of the cicatrix, presenting all the characters of secondary cancer. Before operation, there was some doubt as to the nature of the tumour; the softish points detected on palpating its surface were regarded as cysts, and notwithstanding the patient's age, the severe gnawing nocturnal pain, retraction of the nipple and enlargement of the lymphatic glands, the cystic formations were regarded as indications of the benignancy of the tumour, and it was diagnosed for cystic sarcoma. No cancer-cells appearing upon its being submitted to careful microscopic examination, the diagnosis of benignancy was held to be indisputably confirmed, and accordingly a favourable prognosis was pronounced. No notes were taken of the microscopic examination, but I perfectly remember observing at the time that all the specimens which I placed in the field contained a large number of compound granulated corpuscles; that they were the most beautiful ones I had ever seen; and it was only then that I was convinced that the delicate objects depicted under that name in Lebert's *Atlas de Physiologie Pathologique*, really exist in nature. It is not irrelevant to state that I was in no degree prepared to discover histological evidence of benignancy myself; for before the operation I had tenaciously held to the opinion I had formed

on first seeing the case, as to its being a *bonâ fide* cancer.

This case having been reported in the *Lancet* of 31st January, 1852, under the head of "Recurrence of a Cystic Sarcoma of the Breast," Mr. Birkett in the subsequent number of that journal called attention to the subject, for the reason of its being so "important in a practical as well as pathological point of view". After adducing reasons why the case must be regarded as one of carcinoma succeeding cystic sarcoma, rather than as a recurrence of the latter disease, Mr. Birkett remarks, "the development of carcinoma subsequent to cysto-sarcoma is happily very rare, and this case is a valuable contribution to our imperfect knowledge of the natural history of this form of mammary disease. A case of this kind is reported by Dr. Bruck (*die Diagnose der bösartigen Geschwülste*, case ix, s. 95), which was observed in the clinique of Professor Chelius. The heads of the case are as follows. A cyst containing fluid and intra-cystic growths was removed from the right mamma. The patient continued to enjoy good health for twelve years. A tumour was then developed in the same breast, which with some axillary glands were removed. This tumour is described by the name of carcinoma reticulare. The disease returned, infiltrated the skin around the cicatrix and the muscles of the mammary region, and the woman at last died. The necropsy revealed the

existence of several carcinomatous growths in various regions of the body." In the following number of the *Lancet* (14th February), Mr. Erichsen concurred with Mr. Birkett that this case must be regarded as one of the very rare examples of scirrhus appearing in the cicatrix after the removal of the breast for cysto-sarcoma. Mr. Erichsen adds, "a second case of the kind has, however, very recently occurred to me in private practice, which is not only interesting as affording another instance of this peculiar sequence of pathological conditions, but also as bearing upon a point adverted to by Mr. Paget in his recent lectures on tumours: that this appearance of a malignant growth upon the removal of a non-malignant tumour is especially apt to occur in those in whom there is an hereditary tendency to cancer. Last March, I removed a tumour the size of an orange from the breast of an unmarried lady about forty years of age, which had existed for four years, during which period it had at one time almost entirely disappeared under treatment, returning again about two years after its removal. This tumour was perfectly moveable, loosely attached by a broad pedicle to the mammary gland and had in no way implicated any of the neighbouring structures. After removal it presented the appearance of a chronic mammary tumour, with small cysts scattered through its substance; in fact, one form of cystic sarcoma, in illustration of which I used it in my lectures.

Neither to the naked eye nor to the microscope did it offer any appearance of malignancy. About three months after its removal, hard nodulated masses appeared in the cicatrix. These rapidly increased in size, and were speedily followed by considerable enlargement of the axillary glands, which had not previously existed. There was now no doubt in my own mind, nor in that of three or four other surgeons who saw this patient in consultation with me, that the secondary disease was well-marked scirrhus. Death occurred five months after the re-appearance of the disease, from erysipelas and general exhaustion. I have since learned that three of this lady's aunts had been the subjects of cancer." Again, in his work on *The Science and Art of Surgery* (p. 717), Mr. Erichsen alludes to these two cases as evidence that a recurrence of cancer will occasionally take place in the cicatrix, after the removal of cystic sarcomatous growths.

Mr. Paget has thus commented upon this subject in his lectures on *Surgical Pathology* (vol. ii, p. 259). "It has sometimes happened that a glandular tumour has been removed from a breast, and within a short time the same breast has become the seat of cancer. (See such a case by Mr. Erichsen in the *Lancet*, 14th January, 1852; and the history of a series of preparations in the catalogue of the museum of St. Bartholomew's, vol. i, p. 446)."

From these facts, then, it appears that a disease

possessing the anatomical and clinical characters of secondary cancer may occur without any antecedent malignant affection, merely as a sequel of the benignant growth known as cystic sarcoma. The evidence upon which this proposition rests I shall examine under four heads. 1. The case of Catherine Edwardes; 2. The case quoted by Mr. Birkett from Bruck; 3. The second case reported by Mr. Erichsen; 4. Mr. Paget's cases.

1. As to the case of Catherine Edwardes. Her narrative was one of the most common among women labouring under cancer of the breast. The general feel of the tumour, the slight retraction of the nipple, the group of indurated lymphatic glands in the axilla, were confirmatory of the judgment to which the anamnesis pointed,—a mammary scirrhus. The doubt of cancerous nature, and the diagnosis of cystic sarcoma rested exclusively on the feeling one or two soft points—supposed cysts—upon the surface. "When a cyst is formed on a basis of schirrus," says Dr. Walshe (*On Cancer*, page 481), "an uncommon combination in the female breast, great difficulty of diagnosis arises, and is only to be overcome by a careful estimate of the whole progress of the case." The case under consideration was precisely one in which very great importance could not be attached to the cysts; they were few and very small, and the patient's history, no less than the chief facts ascertained upon her examination, coincided accurately

with what we know of the progress of scirrhus. When, however, compound granular corpuscles, instead of cancer-cells, appeared upon microscopic examination, benignancy was no longer questioned, and the case was a theme of rejoicing, as affording evidence of the microscope's extraordinary value, just as some months afterwards it was ironically dwelt upon, in proof of the microscope's deceptiveness. But were those who used the microscope infallible? They were myself and two other gentlemen habituated to microscopic investigation. We all agreed upon what we saw; compound granular corpuscles; we all believed that these only occur (as the predominant histological elements) in benignant growths, and that the cell characteristic of cancer was not present in this case. Apparently the basis of our opinion was solid, but very little will suffice to demonstrate its singular frailness. We observed and reasoned, assuming two things, neither of which was at that time proved: 1. That the so-called granular corpuscles—Gluge's compound inflammatory globules—only occur in benignant growths; 2. That cancerous growths always contain a peculiar cell, in the absence of which cancer cannot be said to exist. Our error was common to the great majority of those who have discussed the diagnostic value of the cancer-cell. We reasoned before the fact; having verified the statement that a peculiar cell is usually met with in cancer, we assumed it to be

an invariable characteristic histological element, and that consequently, in its absence, cancer could not be said to exist. This was begging the question wholesale. Several thousand tumours, including all varieties, should have been examined and classified according to anatomical characters before a judgment was pronounced as to the diagnostic value to be attached to the presence or absence of certain histological elements. In the then state of knowledge, considering the history of the cases, all that we were warranted in, upon discovering the granular corpuscles, was to suspend judgment as to the cancer diagnosis; when, however, after the removal of the primary tumour the cicatrix became the seat of a disease presenting the typical characters of secondary cancer, the only logical, and therefore the only practical conclusion was, that this was a case in which the so-called cancer-cell had not been discoverable in a tumour, though the antecedent and subsequent history of the patient decidedly conformed to the progress of cancer as clinically observed. Repeated and progressively more enlightened microscopic inquiry has inspired me with the belief that the tumour of Catherine Edwardes probably did contain cancer-cells, but that from their being stuffed with fat molecules we mistook them for compound granular corpuscles. Of the case which first inspired me with this belief, record is preserved in my microscopic sketch-book. To the drawing of a large

cell with delicate outline and large coarsely granular nucleus is appended the following note. "This cell is from a cancerous nodule in the liver of a spinster, aged 70, whose autopsy was made in University College Hospital by Mr. John Marshall, on the 10th September, 1852. The left mamma was the seat of primary disease, not operated upon. My motive for drawing this cell is that in two large fields (one-fourth of an inch) it is the only one I have seen so distinctly, all the others being clouded by an immense number of fat granules, many of which are free, studding the cells and nuclei, so as to give the appearance of finely granular corpuscles. On adding ether, only oil-globules remain visible; cells, nuclei, and molecules having apparently been alike completely destroyed. In those cells in which the cell wall is visible, it is very faint; the nucleus, where not completely hidden from view by surrounding granules, is very large. Was it such a fat granular condition of cells as this that gave rise to the appearance of compound granular corpuscles in Catherine Edwardes?"

I think it quite possible that, with the aid of recent experience and more careful investigation, the so-called cancer-cells might now be found even in such a tumour as was removed from Catherine Edwardes. This surmise aside, the facts I have related, and the observations appended to them, are, I conceive, such that the case can no longer

be regarded as an example of malignant disease affecting a cicatrix after the removal of a benignant tumour.

2. The facts of the case which Mr. Birkett has cited from Bruck as a parallel to that of Catherine Edwardes, call for analytical study. The heads of Dr. Bruck's case are as follows:—"A cyst, containing fluid and intra-cystic growths, was removed from the right mamma. The patient continued to enjoy good health for twelve years. A tumour was then developed in the same breast, which, with some axillary glands, was removed. This tumour is described by the name of carcinoma reticulare. The disease returned, infiltrated the skin around the cicatrix and the muscles of the mammary region, and the woman at last died. The necropsy revealed the existence of several carcinomatous growths in various regions of the body." From these facts I infer that the woman in question was the subject of a benignant cystic tumour of the right mamma, and was successfully relieved of it by the knife; that, twelve years afterwards, the same breast became the seat of a primary cancerous tumour, the removal of which by the knife did not prevent the recurrence of fatal cancerous disease, between which and the cystic growth of so many years previously, known facts do not justify me in acknowledging any sequential relation. My right may be questioned to call the first cystic tumour benignant; I am induced to think it very probably

was such, by the history of the case, and by the fact that nothing is said of its being cancerous; whereas the cancerous nature of the subsequent formations is specifically mentioned. It is of course easy to understand that a mamma which has been the seat of a benignant tumour is subsequently at least quite as liable as a healthy gland to become the seat of primary cancer. Though granting that Mr. Birkett had not opportunity for judging fully the facts of Edwardes's case, I must confess myself unable to see the grounds upon which he established a parallel between it and the case of Dr. Bruck.

3. Mr. Erichsen has published in support of Edwardes's, a case quoted in the early part of this communication, which, though *prima vista* unimpeachable, does not warrant the conclusion argued from it, if, indeed, it do not point to a totally different one. Admitting that microscopic examination demonstrated no signs of malignancy, the case in question is in a great measure liable to the criticism I have made upon Edwardes's, besides furnishing an additional very powerful argument—cancerous affection of three of the lady's aunts—in favour of the belief that the tumour was malignant *ab origine.*

Had Mr. Paget had the opportunity of weighing the whole facts connected with Edwardes's case, it may be presumed he would not have cited it in evidence of the occasional occurrence of cancer in

the breast after the removal of a glandulous tumour. Neither do I think this proposition derives much support from the other cases quoted by that learned pathologist from the Museum Catalogue of St. Bartholomew's (p. 446). Their facts are not related with sufficient detail,—particularly in the absence of microscopic notes,—to constitute them valid evidence in the settlement of so nice a question; yet so interesting are they, that I do not apologize for their transferrence to these pages.

"A large tumour with the surrounding skin, removed from the front of the chest of a middle aged lady. Re-section of the tumour shows that it is composed of a soft but compact, pure white, brain-like medullary substance, with blood diffused through its lower half.

"In the course of eleven years preceding the removal of this tumour, three similar operations had been performed on the same lady. At the first operation, the part removed appeared to be a simply hypertrophied mammary gland. At the second, a large tumour was removed from the opposite breast. At the third, a large tumour, removed from the seat of one of the former operations, appeared to be partly fibrous and partly medullary. At the fourth, the tumour above described was removed from the front of the sternum, between the cicatrices of the other operations. The effusion of blood into the lower part of this tumour was the consequence of its being punctured. Profuse hæmorrhage occurred

at the same time, and a large portion of the tumour, as the preparation shows, protruded through the wound.

"Sections of a tumour, with the surrounding skin, removed from the same patient as the tumour last described, and from the cicatrices of the previous operation. The sections display the same medullary character as the preceding tumour presents, but the morbid substance is softer and more uniformly coloured with effused blood. During her recovery from this, the fifth operation, the patient died suddenly. A mass of fibrine mixed with cancerous matter was found in the pulmonary artery."

I think the probability is—in consideration of the patient's age, the physical characters of the tumours on section, their frequent recurrence, and the eventual apparition of the disease in other organs,—that this case, though in some particulars exceptional, was from the commencement anatomically cancerous and clinically malignant.

It is a conviction that the march of knowledge suffers more from the introduction of errors due to imperfect observation and precipitate generalisation, than from the slowness of progress dependent upon the difficulty of investigation, which has made me thus analytically and critically examine evidence tending to invalidate some of the most important propositions deduced from careful and prolonged study. If those propositions be not sound,

the sooner they are proved false the better; but the evidence adduced against them must at least be as valid as that upon which they are based.

It may not be inappropriate to append from my clinical note-books the histories of other two cases, in which, from the existence of cysts on scirrhous bases, the diagnosis was difficult, but in which the microscope cleared up the doubt.

Case II. K. G., aged 59, had never been a strong woman, but always healthy. Catamenia appeared first at 15, last at 47 years. She had had nine children and six miscarriages. She had never heard of cancer or tumours of breast in any of her family. Five years ago, a little tumour, about as large as the end of the little finger, appeared just under the skin above the left nipple. She could move it easily. It was of about present hardness, not painful, nor had it ever been so, with the exception of the last month, when she had occasionally, while wringing clothes, felt a little pain on its inner side for a few minutes. She spontaneously described the pain as the pricking occasioned by a needle, but it had been very trifling. For about a year the tumour did not grow, but it had since gradually enlarged. She thought it had grown most rapidly in the last twelve months; during the same period, the skin covering it had become discoloured.

The tumour occupied the left breast, was about as large as a good sized apple, irregularly spheroidal, and inseparably connected with the gland.

Its base, especially on the outer side, was very hard; but at the anterior and upper part, over a surface one inch square, the tumour was made up of tolerably distinct, softish, elastic nodules, apparently cysts containing liquid. Among these elastic nodules was a very hard one. This part of the tumour was decidedly more prominent than any other, and was, moreover, peculiar for the livid discolouration of the superjacent skin, and for being more adherent to it than was the substance of the tumour to the integuments in other parts. There was no adhesion to pectoral muscles. The nipple was slightly retracted. Just within the anterior fold of the left axilla was a very hard lymphatic gland, perfectly smooth, not at all tender, about as large as a filbert.

The diagnosis would have been easy but for the cystic complication. The surgeon under whose treatment K. G. was placed, diagnosed her tumour as a cystic sarcoma, and non-cancerous, for the following reasons:—1. The tumour was not adherent to the pectoral muscles. 2. There was no dimple in the skin. 3. Scarcely any pain was complained of. 4. Well developed cysts were present. My opinion having been requested, I diagnosed the tumour as scirrhous associated with cysts. The absence of adhesions to the pectoral muscles, and of dimpling of the skin, the almost painlessness of the tumour, were not serious objections: scirrhous tumours are often met with in those conditions.

The patient's age, the very marked hardness of the tumour's base, the slight retraction of the nipple, the enlarged and indurated axillary glands, were signs of cancer. Cysts, though rarely, are occasionally developed on a scirrhous base.

The affected mamma having been excised on the 12th of January 1853, my diagnosis was proved correct by examination of the tumour, of which the following notes were taken at the time:—The elastic nodules at its upper and anterior part proved to be cysts filled with turbid serosity. There were three or four of them, each capable of containing a cherry-stone. The substance of the tumour was firm on section, but it did not grate under the knife. The cut surface presented numerous little yellow spots, about the size of pins' heads, studding a whitish, uniform, and somewhat cartilaginous-looking tissue. At several parts were little masses of yellow, soft substance, which, under the microscope, were found to consist of oil-globules in large numbers, and of large cells, some of which were so stuffed with granules as to be quite black; others, less granular, showed a large nucleus, and nucleolus in their interior. On pressing the tumour, milky-white fluid escaped in drops from the surface. In this fluid, as well as in scrapings from the tumour, were seen histological elements unmistakably cancerous.

I had been greatly aided in the diagnosis of the foregoing case, by having a short time previously

had one, in many respects similar to it, under observation in the great Florence hospital.

Case III. Faustina Franchi, admitted to No. 154 of Professor Regnoli's Clinique on the 18th of January 1852, the mother of fourteen children, always enjoyed excellent health. No trace of hereditary predisposition to cancer.

The left nipple was slightly but decidedly retracted. In the upper part of the corresponding mamma, and inseparably connected with it, was an irregularly square-shaped tumour, almost as large as a small orange, non-adherent to the skin or subjacent tissues, finely nodulated, and very hard, except at its supero-anterior part, where a cyst, about as large as a walnut, rose from the hard base, so as to form a notable prominence on the surface. There was an indurated lymphatic gland, about three times its normal size, in the left axilla. The mammary tumour had occasionally been the seat of a dragging sensation, but never of pricking or stabbing pain. Handling it produced no inconvenience.

Interrogated as to the history of the tumour, the patient stated that, after her first and second confinements, abscesses formed in the left mamma, and for the time prevented her suckling with it. She had ever since been able to suckle with both breasts; but the left one had diminished somewhat in size, was generally harder, especially at the upper and inner parts, and yielded somewhat less

milk. She stated positively, that, when last confined (eleven months before admission into the clinique), the only difference between the two mammæ consisted in the smaller size and greater hardness of the left one, especially at its upper and inner part. She suckled even her last infant with both breasts: they both contained a good deal of milk when I first examined her, on admission. It was not until seven months after her last confinement, and four months before entrance into hospital, that she became aware of the existence of the tumour. Its size had since then rapidly increased.

The history of this case was obscure; and though the very hard base of the tumour, retraction of the nipple, and enlarged axillary glands, indicated its scirrhous nature, I was only positive of it after the operation, which was performed by Professor Regnoli on the 13th of February. On section, the cyst at the upper and anterior part proved to be filled with a limpid, serous fluid. The cut surface of the tumour typically presented the appearance of scirrhus, and microscopic examination unmistakably confirmed the judgment based on the naked eye characters of the section.

The comprehensive study of the cases recorded in this memoir, in conjunction with others of a similar character dispersed through the annals of surgery, suggests a variety of reflections, which admit of succinct grouping under two heads: 1stly,

the import of the term "cystic sarcoma", and the anatomical nature of the growths to which it is applied; and 2ndly, the value to be attached to the microscope in the diagnosis of these and other abnormal deposits.

Though preeminently unphilosophical, if, indeed, not barbarous, be medical nosology, in many of its applications, in none, perhaps, is it so much so as in the definition of a *sarcoma*. This unhappy term, the heritage of ignorance, was once applied to a very great variety of affections presenting some few physical characters in common, and which though clinically very various, were not distinguishable anatomically, for lack of investigating instruments. As these have come to hand, order has begun to pervade the jumble of our ancestors, and several distinct diseases are known to have been erroneously grouped under one head. But the nomenclature has not progressed *pari passu*, and we now find ourselves more confused in its applicatiou, relatively to the amount of knowledge possessed, than could be the pathological writers of by-gone days. The experience is cheering; for we know that the free development of differences by enlightened inquiry, is the safest method of arriving at truth.

There can be no question that Mr. Paget has done good service by introducing the term "glandular tumour";* to which may, no doubt, be refer-

* Lectures on Pathology, vol. ii, p. 248 et seq. Velpeau has, apparently independently, suggested for the same tumours the

red the chronic mammary tumour of Sir Astley Cooper,* "the partial hypertrophy of the mammary gland" of Lebert,† "the imperfect hypertrophy of the mammary gland" of Birkett.‡ Thus a clearly significant name has been given to solid tumours of the breasts, structurally consisting of hypertrophy of the normal constituent of the gland, and clinically benignant. But the cystic complication is a source of serious confusion. We are not yet in a position to determine, according to anatomical characters and pathological tendencies, the precise nature of the "tumor mammæ hydatidis" of Sir Astley Cooper,§ of Brodie's sero-cystic tumour of the female breast,‖ of Müller's three varieties of cysto-sarcoma—simplex, proliferum, and phyllodes.¶ The introduction of the term "cystic carcinoma" by Rokitansky,** has been of service in distinguishing those cases of scirrhus which are associated with cysts. To avoid the confusion

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"non-adipoid": thus happily the two greatest authorities on the subject in England and France, are agreed. (*Traité des Maladies du Sein*, 1854, p. 350.)

* On Diseases of the Breast, p. 54.

† Physiologie Path., t. ii, p. 201. Traité Pratique des Maladies Cancereuses, etc., 1851, p. 367.

‡ On the Diseases of the Breast, p. 124.

§ On Diseases of the Breast, p. 54.

‖ Lectures on Pathology and Surgery, p. 137.

¶ On Cancer, etc., p. 168 et seq.

** Lehrbuch der Pathologischen Anatomie. Dritte Auflage. Wien, 1855, p. 293.

attendant upon the designation "cystic sarcoma", I would suggest the sacrificing the apparent convenience of the name, on the score of conciseness, to explicitness and the avoidance of error. This may be done by slight periphrasis. Thus, when cysts implicate a glandular tumour, or a scirrhus, the plain statement of the fact, as glandular tumour with cysts, or scirrhus with cysts, would be preferable, because less liable to confuse, to cystic sarcoma and cystic carcinoma. My suggestion, it will be observed, is based upon the principle of adopting the most constant and prominent feature of the growth as the basis of its nomenclature: that is, no doubt, the solid part. In the cases under consideration, cysts are accidental formations, of secondary importance, and they cannot be adopted as the nosological basis without incurring the risk of hopeless confusion.

I have next to offer a few observations upon the importance to be attached to the results of microscopic inquiry in determining the character, and prognosticating the clinical history of abnormal deposits. Some of the facts recorded in this memoir would, no doubt, serve the purpose of those who feign to contemn the microscope, because fallible and not omnipotent. There can be no question that, in this discussion, zealous enthusiasts have tended, no less than retrograde prejudice, to vitiate the conclusion. Impartial consideration of recorded facts must convince any one that, as all

the circumstances of a case require to be taken into account for the formation of a correct diagnosis, the structure of disease must hold a foremost rank in the inquiry. In determining it, the microscope is of great service: hence its title to be regarded as a first-class auxiliary. It is very probable that errors will be committed with it, even after much more accurate study; but this will in no way affect the truth of the proposition, that the liability to err is greatly diminished by the light with which it guides the clinical student. Truly, as the microscope, in the majority of cases, only comes into play after the intervention of the knife, it is not a material aid to surgical treatment; it is so, nevertheless, in the relief of moral suffering; for I can conceive no greater felicity to all concerned, than the being able to prognosticate with almost perfect certainty the benignancy of an excised growth, about the malignant nature of which doubts would very often be entertained but for the microscope's aid. But let any one still disposed to question the microscope's worth to the practical surgeon, cast a glance back half a century, to John Abernethy's attempt to classify tumours; let him endeavour to discover the causes of the great progress which has been made in this important department of pathology: if impartial, he will find it impossible to refuse a lion's share in the good work to microscopic inquiries.

To many, these reflections must seem super-

fluous. I confess that the principal motive in penning them has been a feeling of surprise at the exclusive and partial manner in which this question was discussed, a few months since, by many of the most distinguished French academicians.*

Summary. The following propositions are intended to represent the principal truths inculcated in this memoir:

a. Complication with cysts sometimes renders the diagnosis between a benign and malignant tumour of the female breast, matter of considerable difficulty. In determining it, the whole history of the individual, and of the local disease, as well as its external physical characters, must be taken into consideration. Notwithstanding great experience and caution, it may, in rare instances, be impossible to determine the nature of the abnormal growth before removal.

b. In doubtful cases, care must be taken not to be deceived by the granular appearance of cancerous cells consequent upon fatty degeneration of

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* Vid. *Bulletin de l'Académie Impériale de Médecine,* t. xx, etc., and Prof. Velpeau's pamphlet, *Du Diagnostic et de la Curabilité du Cancer,* Paris, 1855, p. 44.

their contents. While holding a subordinate position, in point of practical importance, to the comprehensive study of all the clinical phenomena of the case, the value of the microscope in these inquiries is very considerable; and it is fair to pronounce that it will augment with experience, by enlightened, unprejudiced, and persevering observation.

c. So far as the cases analyzed in this memoir are concerned, there is no evidence of what, theoretically, is very improbable, though it has been experimentally maintained, that secondary cancers may occur in a part on the removal of a benignant tumour. I am disposed to believe that such sequence never occurs.

d. As no precise meaning can be attached to the term "cystic sarcoma", and its employment consequently leads to confusion and much practical inconvenience, it is suggested to abandon it, and also its congener, "cystic carcinoma", for the expressions, "a glandular or benignant tumour with cysts", "a scirrhus or encephaloid with cysts".

THE TREATMENT OF CANCER BY CHLORIDE OF BROMIUM, OR LANDOLFI'S PASTE.

CONTENTS.

HAVING learned from Dr. Combe's work, *La Médecine en France et en Italie*, that a particular method of treating cancer was pursued by Dr. Landolfi, a professor at the Ospedale della Trinità in Naples, I was anxious, on visiting that city for the purpose of inquiring into the state of its surgery, to ascertain the merits of the plan in question; but to my regret Landolfi was absent, he having been called into Germany, for the treatment of a noble personage, subject to the disease in question. On

reaching this country,* I had no need to make inquiries after the Neapolitan professor. He has here been alternately honoured and abased by sovereigns,† by the mob, by academies, journalists, and medical practitioners, so that the "Landolfische methode" is the great question, and its author the hero, of the day. Such is one of the effects of passionate opposition.

Even to one less anxious than myself to search to the bottom of every surgical question, the honour and abuse poured upon Landolfi for professing to cure cancer, would have invested him with unusual interest, and stimulated an inquiry into the merits of his practice. Opposed upon principle to the despotism which constituted opinion strives to exercise upon new ideas struggling for a *locus standi;* convinced that, in so far as regards the treatment

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* This memoir is printed, with very few verbal alterations, from a MS. which I prepared while writing in the Allgemeine Krankenhaus at Vienna last summer.

† "Berlin, 21 Février, 1854.

"Voici la lettre que j'ai adressé à votre excellent roi, et dans laquelle je prie S. M. de vous permettre de porter les insignes de mon ordre de l'aigle rouge. Je vous souhaite, mon cher Landolfi, un heureux voyage et surtout un heureux et prompt retour. Que Dieu vous bénisse pour continuer le soulagement et la guérison de cette classe de malades, qui, avant vous, était irrévocablement perdue. Adieu.

"Frédéric Guillaume."

"Landolfi, und seine neue heilmethode, etc., nach Dr. Frankenburg. Dessau, 1854. P. 13.

of cancer, the surgical profession is bound to examine carefully all evidence tendered in support of any new method; considering that Dr. Landolfi makes no secret whatever of his plan, I accepted his invitation to witness his practice. The result of my inquiry is the basis of this communication.

The treatment consists in the destruction of the cancerous product by the application of a paste prepared by adding *q. s.* of flour or powdered liquorice to a compound of equal parts of the chlorides of bromium, zinc, gold and antimony. Frequently, only the first of these substances is employed. The proper method of applying the paste is on a piece of linen cut to the size of the part to be destroyed. At the end of twenty-four hours the rag is removed, and in the course of three or four days it becomes manifest that the part is dead, and in process of limitation by an ulcerative line; as the slough separates, the sore is occasionally dressed with charpie soaked in a solution of from ten to twenty grains of the chloride of bromium in twelve ounces of water; with this exception it is treated as a common wound, and the patient is ordered to take, morning and evening, a pill containing one-tenth of a grain of the same chloride.*

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* In consequence of the very intensely irritating power of the fumes emitted from the chloride of bromium, care must be observed in dealing with it. Thus the paste should be prepared in the open air, with the mouth covered; and during, and for a short time after, its application, the patient should sit near an open window.

To use Professor Landolfi's words: "Having for thirty years been at the head of a special clinique for cancerous cases in Naples, I have had ample opportunities for testing all the prescribed methods of treatment. The result has been my conviction of their inefficiency; and I have been thus led to the application of the chloride of bromium. Having observed that chlorine preparations exercise a powerful influence in the treatment of gangrene, I bethought myself of trying their effect in cancer. Failure attended the experiments. Having learned that bromium had been extolled for its power of promoting the absorption of some deposits on which iodine was powerless, I tried bromium in cancer, but with no better result. Then it occurred to me to try a combination of the two agents, and ever since I have employed the chloride of bromium, my success in the treatment of cancer has been miraculous. My paste having destroyed the malignant growth, leaves a benignant surface, which readily heals, and, by an action which I cannot explain, the chloride of bromium so modifies the constitution as to arrest the progress of the disease. That I am not able to explain the *modus operandi* of the remedy is of course no reason for discarding it, any more than it would be reasonable to discard quinine, when we have to deal with cases of intermittent fever, which it most certainly cures, though we do not know how. With equal certainty in a large number of cases does chlo-

ride of bromium cure cancer, as the immense number of facts I have collected prove ; to these facts I invite your attention, because it is upon facts alone that you can form a judgment in this matter."

Acquainted with the strange history of many discoveries, and with the fact that to empiricism are we indebted for many of the most valued facts in therapeutics, I did not suffer myself to be prejudiced by the just quoted narrative, though a strange one. At the same time I knew too well, to be blinded by allusion to numerous facts, that *facts* are the favourite material of which weak men, fanciful fabricators of doctrine, and adventurous speculators, no less than philosophers, profess that the indestructible pedestals are constructed, on which the monuments of their genii are raised. No number of facts persuades me, unless I have the opportunity of testing their correctness individually, or the ability no less than honesty of the observer is circumstantially proved to me. Honesty alone is not enough ; for, in spite of the very best intentions, its exercise in medicine is impossible without wisdom. It must ever be remembered that in medical observation the effects of ignorance and dishonesty bear a very close resemblance to each other, so close, indeed, that they are often indistinguishable; a truth which, while it sharpens my appetite for evidence, induces me to judge charitably, all those who err either from lack or fallacy of proof. This anachronism will not be useless, if it tend to prove that in me

Professor Landolfi had a patient and unprejudiced, yet accurate and severe observer.

It is simply just to acknowledge that the Neapolitan professor's anxiety to give me every opportunity of judging fairly the results of his practice seemed to have no bounds. He introduced me to his private patients; and such was their enthusiasm and hope in the new remedy, that, regardless of station in life, they courted inquiries, which they strove to satisfy with alacrity. The cases I witnessed, appeared satisfactory proof that the caustic paste employed by Professor Landolfi is capable of eradicating a cancerous tumour, even when situated in the substance of the mammary gland; that such deep action is not prejudicial to the surrounding textures; and that it is followed by granulations which speedily fill up the chasms and contribute to the formation of a good cicatrix.

Of four of the agents employed, three are well-known; the chloride of antimony is one of the oldest caustic applications to cancerous ulcers; the chloride of zinc has been extensively employed since it became generally known as the active ingredient of Canquoin's paste; and the chloride of gold was the favourite caustic of Récamier, in whose hands, Dr. Walshe informs us,* it is alleged to have produced very remarkable effects.

Chloride of bromium, so far as I am aware, has not

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* Treatise on Cancer, p. 219.

been employed prior to Landolfi, and to it he attributes the specific power,—when externally applied and internally administered,—of *curing* cancer in the great majority of cases. With it alone he treats many cases, as he considers the other three ingredients of his paste not absolutely essential. In the rapidity of granulation and cicatrisation, and in the improvement of the constitution which follows this mode of treatment, I see nothing surprising or different from what we are in the habit of witnessing after the extirpation of cancer by other agencies. It is one of the characteristic properties of caustics, that the destruction of tissue which they produce is very speedily compensated by the granulating process; and this whether the part destroyed be the walls of a syphilitic bubo, the surface of a phagedenic sore, or a cancerous product. In this respect nitric acid, the Vienna and Canquoin's paste, caustic potash, and acid nitrate of mercury, do not yield to chloride of gold or of bromium. Neither is there anything peculiar in the improvement of the constitution, which, according to the Neapolitan professor, occurs in the great majority of cases speedily after the operation of his caustic appliance. So great is the moral depression of most women aware of being the subjects of cancer, so notable the disturbance of appetite and sleep from such depression, and the frequently attending pain, that even before the manifestation of the cancerous cachexia, floridity of aspect and flesh are lost. In proof that

the only cause of such deterioration is the inconvenience produced by the local disease, every one who has watched cases of cancer, can adduce many facts. By whatever method the disease is extirpated, a moral and physical improvement takes place,—often in a very marked manner. Unhappily the same experience teaches, that this auspicious change affords no ground for abating the dread of recurrence, and the cases are not rare in which the surgeon's suspicion is aroused by a peculiar feel or appearance of the cicatrix, while the patient's excellent health is the cause of general hope that the disease has been radically cured. Sometimes, indeed, the constitutional amelioration progresses, from the moment the primary disease is extirpated, in spite of the manifestation of secondary disease.*

While reflecting on the facts which Professor

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* A remarkable case of this kind came under my notice in the Florence hospital in 1851. Not deterred by great emaciation, pallor of countenance, enlarged axillary glands, and cutaneous ulceration of a scirrhus in the left mamma, of Caterina Lori, Prof. Ranzi removed it by the knife. A few weeks afterwards the woman left with the wound healed, and her general health much improved. About three months later, while walking through one of the wards, I was surprised on being addressed by a strange-looking patient, a plump, rosy-cheeked little woman, who announced herself as the identical Caterina, again affected with cancer. The bare touch of the cicatrix sufficed to convince, that secondary cancer was present in a very marked degree. This only rendered greater my surprise at the marked improvement in the patient's aspect in so few weeks.

Landolfi submitted to my notice, two questions occurred to me as demanding solution. Firstly. Is the caustic which he employs superior to those in general use as a means of extirpating the local disease? I am disposed to reply in the affirmative. Experience must decide. That, with great power, the chloride of bromium paste conjoins the advantage of being very easily manageable, and restricted within the required limits of action, appears to me proved; consequently I shall feel warranted in giving it a trial, in preference to the chloride of zinc and the other well-known caustics. The second and capital question is, does the chloride of bromium, externally and internally employed, prevent the manifestation of secondary cancer, that is to say, does it cure any more cancer cases than does the knife, and the long chapter of caustics? This is the only serious question at issue, and as Professor Landolfi has only been in Germany a year, the surgeons of this country have not had the opportunity of solving it; but they seem to have vicariously showered down abuse and flattery without considering it.

"In three thousand out of four thousand cases which I have treated by this method, the patients had no recurrence of cancer,"—was Landolfi's astonishing reply to my inquiry. The evenness almost as much as the magnitude of the number acted unfavourably upon me. I must repeat,—what I then expressed, urgent entreaty that the extraordi-

nary statistical account be published,—I am quite at a loss to understand how Professor Landolfi can have been so careless of world-wide renown,—to say nothing of the lives of thousands in all countries,—as to be in possession of that extraordinary series of facts without making it publicly known. There can be no doubt that if he be in a position to PROVE that he has radically cured three thousand out of four thousand cases of cancer, a place will be accorded to him among the benefactors of mankind not second to that of Jenner. While reserving my judgment until the requisite materials for forming it accurately are submitted to me, I must remark that all recorded experience being against the possibility of curing cancer in the majority of cases, it is incumbent upon Professor Landolfi so to state his numerous facts as to place beyond question the correctness with which they have been observed, and give to every one the opportunity of forming an independent judgment. He need have no fear that the tribunal to which I invite him to appeal, will convert him into a Galileo before granting him a hearing. This will be most patiently accorded him by all who have at heart the advancement of knowledge for the relief of suffering, that is to say, by all whose opinion can be precious to him. Until the evidence I ask for be supplied, it must be held that Professor Landolfi has added to the long list of caustics a useful one, but that he has not proved his ability to CURE a single case of cancer.

I cannot close this communication without expressing disapprobation of the manner in which this subject has been dealt with by many medical journalists and practitioners of Germany. Landolfi came amongst them as a professor, ready to communicate to everybody all the details of his mode of treatment. The ordinary pharmacists in the towns he has visited have compounded his prescriptions, and numerous medical men have regularly attended his practice. Thus, even though he might be in error, which I believe he is to a considerable extent, he is exempt from the reputation of a quack so liberally heaped upon him. His most eager friends have not benefited him so much as his opponents, whose vehemently passionate and abusive criticism has invested him with the interest attaching to all martyrs, and called down upon them the calm but heavy censure of such men as the eminent Moriz von Stubenrauch.* I firmly believe that, if on Landolfi's first appearance in Germany, the question had been placed on the basis established in this communication, much wrangling would have been spared, to the great economy of patients' suffering and of professional decorum. On Landolfi rests the *onus probandi;* on the surgical profession the *onus audiendi.* Vague assertions and wholesale denials will eventually benefit neither party; precise statements, patient observation, and severe reasoning, must soon solve the problem.

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* Die Presse, Wien, 1 August, 1854.

The MS. from which the foregoing memoir has been printed, was written in Vienna last summer, a few days after my visit to Dr. Landolfi's patients. Since that epoch his method of treatment has been experimented in the Allgemeine Krankenhaus of the Austrian capital, and in the Salpétrière of Paris. The results obtained confirm the opinion I formed of the value of the chloride of bromium as a manageable powerful caustic,—an opinion in which I also received confirmation in a conversation which I had, on my return from Germany, with Professor Velpeau. As yet, however, no evidence has been adduced to prove that chloride of bromium has any more power than other caustics, or the knife, in curing cancer: that is to say, in preventing the recurrence of the secondary disease.

This being a subject likely to engage much attention, I subjoin a note of the publications specially dedicated to its consideration. I omit the many periodicals in which merely superficial notices of the plan are to be found.

Bibliography.—Dr. Landolfi's Methode der Krebs und die Krebsartigen Krankheiten zu heilen, von Dr. v. Brunn. Göthen. 1854.—Dr. Landolfi und seine neue heilmethode gegen den Krebs und die Krebsartigen Krankheiten von Dr. Siegmund Frankenberg. Dessau, 1854.—Die Behandlung des Krebses und des Krebsähnlichen Krankheiten nach Prof. Landolfi's neue Aetsmethode, von Dr. R. Weinberger. Wien, 1855.—Landolfi's Aetzverfahren zur Beseitigung der Pseudoplasmen, in Zeitschrift des K. K. gesellschaft der Aerzte zu Wien, 1855.—Du Traitement du Cancer, par la Méthode de Landolfi, par le Dr. Lasègue, in Arch. Gén. de Médecine. May 1855, p. 609 et seq.

REFLECTIONS UPON THE SANITARY AND MORAL EFFECTS OF SYPHILISATION AND THE CONTROL OF PROSTITUTION.

CONTENTS.

Claims of syphilisation to the attention of observers.—Clinical observations upon it in the Turin Syphilicome.—Proof of the doctrine afforded by the progressively decreasing susceptibility of the system to the action of the syphilitic virus, with its repeated inoculation.—Sperino's summary of cases, proving, in his opinion, the curative and prophylactic power of syphilisation.—Seventy of these observations not sufficient to exclude all sources of fallacy, yet ample, with the results obtained, to warrant further inquiry.—Boeck's opinion in support.—The immorality of syphilisation considered.—The necessity of exerting all legitimate means, not only for curing, but for preventing, syphilis. How far is the control of prostitution efficient in promoting these ends? Incompatibility of the system with English habits and laws.—Dr. Holland's able defence of it examined.—Conclusion.

WHATEVER be the judgment which experience will eventually pronounce upon the merits of syphilisation, there can be no question as to its present claims upon the attention of every one who is interested in lessening the evils of one of the greatest scourges of the human race. Though only a few years have elapsed since the fundamental fact was

announced on which the doctrine and practice under consideration are based, it has been repeatedly debated in the medical academies of the Continent. Though these have for the most part condemned it, Auzias Turenne in Paris, Sperino in Turin, Boeck in Christiana, Retzius in Stockholm, and Siegmund in Vienna, persist in its advocacy: though it has been sweepingly condemned as chimerical and immoral, numerous well-established facts connected with it, await solution; and it has yet to be proved that efforts to lessen the evils of syphilis are contrary to morality. The opportunity which I have recently enjoyed, of frequent interviews with Prof. Sperino, privately, and in the Turin Syphilicome, at the head of which he is placed, will, I trust, be deemed a sufficient apology for this communication.

The cases I observed were of old date, the Professor having, for reasons presently to be noticed, suspended his experimental inoculations for the present. In all of them the gradual diminution of the cicatrices from the size of three-penny pieces to pins' points was a striking phenomenon, confirming the doctrine, that in repeated inoculations the system becomes less susceptible of the specific action of the syphilitic virus; or, in other words, the latter gradually loses its power to produce a chancre. Whatever be the clinical value of this fact, I am quite certain it has not yet been accurately determined: its strangeness cannot be exag-

gerated, particularly when it is considered that, in many cases at any rate, the repeated inoculations exert no injurious influence upon the system; that in some cases, certainly, the disappearance of secondary symptoms proceeds, *pari passu*, with the inoculation of chancrous pus; and that, in the majority of cases, if not in all, the opinion which one would, *à priori*, be disposed to defend, that the frequency and intensity of the secondary symptoms bear intimate relation to the number, degree, and duration of the primary sores, is demonstratively refuted.

As illustrative of the fact that individuals once syphilised are incapable of contracting the syphilitic virus, Professor Sperino brought under my notice a prostitute, who had, notwithstanding uninterrupted assiduity in her vocation, continued free from disease since she was syphilised three years since. Granting that she has probably been exposed on several occasions to the actual danger of infection, her immunity will justly be held to prove little in support of the preventative efficacy of syphilisation, by all who reflect upon the not unfrequent histories of dissolute characters of both sexes, who, in a long career of vicious indulgence, have scarcely been interrupted by even a light clap, or a simple excoriated chancre. A large number of cases observed for several years can alone prove the point. According to Professor Sperino, some such evidence is at hand. He thus sums up the cases, proving the curative and prophylactic power of syphilisa-

tion:* "Excluding all the cases of incomplete syphilisation, those in whom lesions characteristic of constitutional syphilis supervened, and all those in whom, during the two past and in the present year, recourse was had to mercurials; and collecting together only those cases in which there was not manifestation or reproduction of constitutional syphilis, let us see if the body of all these facts be not worthy the attention of those who love the progress of science.

"The individuals already affected with primary syphilis, and as yet free from constitutional syphilis, excluding (to be liberal) all doubtful cases, are 44 in number.

"The individuals already affected with constitutional syphilis, cured with syphilisation alone, in whom the disease has not hitherto reappeared, are 28.

"The individuals cured of constitutional syphilis with syphilisation and iodide of potassium, in whom the disease has not as yet returned, are 4 in number.

"Uniting these 4 to the 28 preceding, we have 32 cases in which constitutional syphilis disappeared without the aid of mercury, and has not yet reappeared, and which have been syphilised at the following periods:

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* Esame critico del rapporto della commissione incaricata dalla R. Acc. Med. Chir. di Torino di studiare la sifilizzazione e stato attuale della questione, per C. Sperino. Torino, 1854, p. 126.

1	since	27	months.	1	since	13½	months.
2	,,	26	,,	1	,,	11	,,
5	,,	25	,,	1	,,	10	,,
3	,,	24	,,	1	,,	9	,,
1	,,	23	,,	1	,,	7	,,
1	,,	22	,,	3	,,	6	,,
2	,,	21	,,	1	,,	5	,,
2	,,	18	,,	3	,,	4	,,
1	,,	16	,,	—			
2	,,	15	,,	32			

"It is not necessary that I should call the attention of the academy to the immense importance of these facts, because they are of themselves sufficient to demonstrate that there is ground for regarding the therapeutic power of syphilisation as radical.

"Being, in the next place, desirous of studying the prophylactic power of syphilisation, I shall only group the cases of completed or partially accomplished syphilisation practised on prostitutes, they being at every moment exposed to infection.

"There are sixty-five prostitutes who have not hitherto contracted any new symptom of primary syphilis.

"In other twelve prostitutes, a symptom was observed which left doubts of primary syphilis.

"As every one sees, it is still with the support of facts which I have observed, that I persist in believing that syphilisation is worthy of being studied."

The professor not regarding the above imposing facts as conclusive, but merely as warranting further study, possesses unimpeachable claim to the support

of all, the main springs of whose actions are love of truth and the relief of human suffering.

Granting to the case of the prostitute, above related, some weight on the positive side of the prophylaxis balance, much greater was that on the negative afforded by two other women, who, since they were syphilised, had contracted sores at the vulva, for which they were under Prof. Sperino's treatment during my visit. He denied the sores being chancres, and maintained they were simple excoriations or abrasions from excessive coition. He based this opinion upon the appearance of the sores, and his experience of the incapability of the discharge from sores similar to these, to produce chancres when inoculated. Deeming this opinion too solid to need further experimental evidence, he had dispensed with inoculation in the two cases under consideration. I grant that the sores had not the characters of Hunterian chancres, that they had the appearance of simple sores, and were healing without mercury. But who can positively determine the difference between some venereal and simple sores from appearance alone? It is well known that a considerable number of primary venereal sores have not the Hunterian characters, but present the appearance of simple excoriations, and heal without specific remedies, or without any treatment at all. It must, moreover, be borne in mind that the presumption is in favour of the venereal nature of the sores in question, the origin of

which one is, *à posteriori*, indisposed to explain in a prostitute, as the effect of abrasion from excessive coition. As the onus of proof rests on Professor Sperino, no leniency in the shape of a *petitio questionis* can be allowed him. He is bound to establish the diagnosis in every case by direct observation, and exclusion of fallacy, so as to remove all doubt. Every suspected sore met with in the prosecution of his studies on syphilisation, should be inoculated at different periods of its existence; but even then, if no effect were produced, would it be warrantable absolutely to deny the venereal character of the sore? It would be so in the very great majority of instances: indeed, the exceptions are so rare,* that I am disposed to regard the ino-

* I have practised inoculation in syphilis to a very considerable extent, and have only known it to fail in reproducing chancres, twice. As both these exceptional cases possess special interest, I shall briefly relate them. The first was that of a young man, the subject of chronic phthisis: he had had a chancre at the frænum for about three weeks, and it had destroyed a considerable portion of the glans when I first saw him. Three inoculations with pus from the surface of the sore failed, though its own specific action was only destroyed by two energetic cauterizations with nitric acid. Any doubt as to its true syphilitic character was removed by the youth becoming the subject of very severe ecthymatous syphilide about a fortnight afterwards. I was myself the accidental object of the next experiment. In February 1853 a little sore appeared under the edge of my left thumb-nail. It was very painful. Absorbents of forearm became corded; change of air and diet failed to do good. Remembering that I had examined a patient with urethral chancre a few days

culation test in syphilis, as second to none of the means available throughout the whole range of medicine in forming a correct diagnosis; yet, as even this test may fail, the whole history of the disease must be taken into consideration, and very great caution observed before a judgment is formed in direct opposition to what general experience indicates as its probable nature. Whoever reflects how much the progress of knowledge is arrested by the lack of sufficient severity in the observation of individual facts, will see the necessity of exhausting every resource for the exclusion of fallacy, in the experimental study of a matter so fraught with difculty as is the whole subject of venereal disease.

While Professor's Sperino's candour, kindness, scientific enthusiasm, and marvellous powers of application, excited my highest admiration and gratitude, I should have been additionally pleased

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previously, I suspected my little sore might be specific; and as it occasioned great suffering, I begged my friend Joseph Lister to destroy it with nitric acid, after having inoculated the corresponding arm. This he did in two places; but the spots did not even redden. I rested tranquilly, in hopes of being exempt; but another month brought out papular syphilide of scalp and body, ulcerated throat, and threatening, big bubo in axilla. A more full account of my case will be found in the *Association Medical Journal*, December 16, 1853, p. 1108. Can it be that in both the cases just quoted, the inoculations failed because the systems were so impregnated with syphilitic virus as to be insusceptible of producing chancres by the introduction of fresh poison,—that, in fact, syphilisation had occurred?

to see him even more than ordinarily severe in his method of clinical study; nevertheless, the undoubted facts he brought under my notice in his wards, and in his published works, abundantly satisfied me that those who have so speedily condemned syphilisation as not only useless but pernicious, have judged prematurely. When it is borne in mind how unjustifiably, bitterly, and vehemently Professor Sperino has been assailed at home and abroad, it is not altogether surprising that he has refused to identify himself with those salamanders who, to use the words of Bishop Hall, are only happy in the fire of contention, and has for the present suspended his experiments: yet, when I consider the vast resources at his disposal, the warranty with which his numerous facts supply him as to the justifiableness of his proceedings, the support he has received from such men as Siegmund, Retzius, Seutin, and Boeck, I cannot but regret that he should have retracted one step before the fiery declamations of the highly talented and eloquent, but—be it remembered, in every question of scientific discovery and merit—jealously disposed Parisians, instead of adopting for his motto the famous lines of the Venusian lyric—

"Si fractus illabatur orbis
Impavidum me ferient ruinæ"—

as every one should do who has sufficient confidence in the purity of his intentions and the justifiableness of his means, for obtaining an object con-

ducive to the welfare of men, however numerous and poignant be the arms with which he is assailed, by those who either lack the will or the ability to judge him fairly. Believing as he does that "none of the questions in syphilisation can, in the actual state of science, be definitely solved, and that therefore the new phenomenon is still worthy of accurate study,"* I trust Professor Sperino will continue to give to precept the all-important and powerful succour of example.

In support of my anxiety for further information on this subject, I shall quote the authority of Dr. Boeck, the Professor of Clinical Surgery in the University of Christiana. In a memoir which he published simultaneously in Swedish and French, he remarks: "I believe with M. Ricord that it is very doubtful whether constitutional syphilis can be expelled the system when once it has invaded it. Patients have too often been seen, apparently cured, relapse after several years without having exposed themselves to new contagion, or their children come into the world with syphilis; and, as it must be agreed that in mercury we have but an uncertain and deceptive remedy, I have thought it my duty not to hesitate to give trial to a plan which might possibly open to us a new road in the treatment of this disease. The trials which I have made have been conducted without pre-occupa-

* Esame Critico, cit. p. 141.

tion; my only object was to ascertain the merits of syphilisation; therefore I took note of every fact as correctly as my time permitted; and the trials took place under the eyes of students and many of my senior colleagues. To place beyond doubt that I had to deal with syphilitic affections, I caused portraits to be taken of the patients before commencing the treatment; and, in order not to interfere with it, I employed no other remedy, provided this name be not given to simple unguentum cerati and a poultice."

In reply to a question from Sperino, as to whether, from "his practical studies of syphilisation, he could conclude that it is worthy of being studied," Professor Boeck thus wrote on the 6th of November ult:* "I can answer by a very positive *yes* to your question as to whether my practical studies in syphilisation have convinced me that it is worthy of being studied. The first series of my experiments, comprising six persons affected with constitutional syphilis, was attended with such happy results, that I have commenced a second one, consisting of seven individuals similarly affected with constitutional syphilis. As to the conclusions deduced from my first experiments, I only consider three of them important, viz.—

"1. Repeated inoculations produce immunity. Neither friend nor foe can dispute this fact, the

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* Id., p. 133.

importance of which, in itself, is such, that it alone would suffice to insure for syphilisation an honourable position.

"2. Nutrition improves with the repeated inoculations.

"3. The syphilitic symptoms frequently have a tendency to disappear."

But it must not be overlooked that at least equally eminent authorities have not only condemned syphilisation as therapeutically useless, but as immoral; and on this twofold basis have discountenanced its further study. The question of the morality of syphilisation, so often mooted, and indignantly solved in the negative *even by the Parisians*, forcibly suggested itself to me as I was roaming about the crowded wards of the Turin Syphilicome, with the image fresh on my mind of the little alley near the Porta Capuana at Naples, thronged by three hundred prostitutes, than which a more revolting and melancholy sight can scarcely be conceived. I am amongst the last who would in the least aggravate the moral or material degradation of these unfortunate women; I am one of the most sanguine in believing that much may be accomplished to alleviate it; but, when I reflect on the enormous ravages of syphilis, on the truth that, in the study of syphilisation, facts have been observed which afford a prospect of those ravages being in part, at any rate, mitigated; that the experimental prosecution of this study does not appear to injure the health

of its subjects; that it is impossible to conceive how moral injury can result from endeavouring to cure syphilitic prostitutes by one method rather than by another,—I find no reason to check my appetite for further information on this most interesting subject. But it may be said, if, besides curing these prostitutes, you render them incapable of contracting syphilis; if, besides discovering a more potent remedy for this disease than you now possess, you discover a preventive, you will destroy one of the barriers providentially destined to check illegitimate sexual intercourse. Whilst I have yet to be informed of the evidence in support of this barrier's high mission, while I am quite persuaded it very inadequately fulfils it, and produces far more evil than it appears to do good, I see no sufficient reason against the prosecution of the study of syphilisation. It being admitted that we are bound to exert our utmost endeavours to cure the venereal, as well as all other diseases, I should like to know upon what principles we are, in the treatment of syphilis, to protest against the real philosophical end of therapeutics—the prevention of disease? Though no one can deny the moral benefits of syphilis are, in degree at any rate, questionable, that its material evils are numerous and certain, many may question the propriety of persisting in endeavours of problematical efficiency in lessening the latter, and of probable tendency to lessening the former. Let it be borne in mind that the chances

of moral evils from such endeavours are in the continental syphilicomes reduced to the minimum. Would any Englishman close Ricord's famous *Lettres sur la Syphilis* in disgust, because *trop outrées* for his nationally instinctive, no less than for his professionally acquired notions of literary decorum? or refuse to avail himself of the enormous advantages of the lying-in hospital of Vienna, because opposed not only to English usages, but to all notions of decency or propriety ?* Experience proves the negative. Much less do I see reason to abate the delight I experience on reflecting that the lowest class of prostitutes, in some of the crowded capitals of Europe, are being made the objects of observations which, however contrary to preconceived opinions, do not appear to injure them, while they afford a prospect of benefit to the whole family of mankind.

The preceding memoir has been reprinted, with a few comparatively unimportant alterations, from last year's *Association Medical Journal.* Since that period I have had the advantage of studying a

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* Upwards of 10,000 women are delivered in the Allgemeine Krankenhaus annually; and all in the same room. It is not unfrequent to see eight or ten labours going on simultaneously. The patient endurance of the women is marvellous. Within one hour sometimes as many as thirty or forty students make a vaginal examination. The poor creatures dare not resist!

vigorous and very able attack upon syphilisation, by my friend and colleague, Mr. De Méric,* and an impartial statement of its history and effects by my friend Mr. Henry Lee.† My opinion has remained unaltered. Certain it is, that in the study of syphilisation, facts have been brought to light which could not have been predicated apart from experience; pathologically their interest is great,—how great, how conducive to therapeutic advantage, experience alone can decide. With the greatest deference for the Ricord school, illustrious almost as much for the fame and number of its disciples, as for its founder's greatness, I cannot forbear stating a belief, that the attacks directed from it upon Auzias Turenne and Sperino have partaken too much of the character of party warfare, to command the respect only due to dispassionate and impartial consideration of facts, investigated by zealous and well-intentioned persons, for the cause of truth.

My inquiries into the prophylactic powers of syphilisation have caused me to turn attention to the more general question of the prophylaxis against syphilis. I had intended embodying the result of these researches, when I became acquainted with two elaborate articles on the sub-

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* On Curative and Prophylactic Syphilisation. By Victor de Méric, Esq. London, 1853.

† On Syphilisation applied to Man and Animals, pp. 194-232, in Mr. Henry Lee's "Pathological and Surgical Observations," London, 1854.

ject, published by Dr. T. S. Holland, under the head "The Control of Prostitution," in last year's first volume of the *British and Foreign Medico-Chirurgical Review.*

At the conclusion of an inquiry into the police regulations for the control of prostitutes in Berlin and other cities of the continent, Dr. Holland strongly advocates the extension of a similar system to our own shores; and he anticipates from it, not only a diminution of disease and crime, but the incalculable benefit of assisting in the reformation of prostitutes. As the institution of the system of registration and control would be altogether ineffectual, unless means were taken to ascertain the manifestation of syphilis at the earliest possible period, and to confine the affected women until completely recovered, Dr. Holland sees the unavoidable necessity for a legislative enactment, "to render the reception of money for sexual intercourse a criminal act, which places the woman under control." It is very doubtful whether our legislature would pass such a law, even upon very demonstrative evidence of the beneficial effects of similar enactments in other countries in a sanitary point of view. Dr. Holland believes that he has such evidence at command. But who will presume to say that any country can furnish accurate statistics of the prevalence of syphilis amongst its population, ever ready as the majority are to hide it? To say the least, all the statistical accounts on this sub-

ject furnished by continental states must be regarded as incomplete; while in our country it is impossible, in the absence of all data, to guess at the extent to which syphilis prevails, without incurring the risk of very grave error. Under these circumstances, I deem it impossible to place implicit reliance in the arguments inferred in support of the system of registering and controlling prostitutes, from the statistical data at hand. So far as general observation is concerned, I am led to regard the sanitary effects of the system under consideration with very little favour; for I have found syphilis everywhere prevailing in fearful extent; and this, not only in general hospitals and syphilicomes, but, according to the reports of professional brethren, in private practice among persons of very different stations.

In accordance with his very debateable assumption, that "man's weaknesses or faults cease to be seriously dangerous to society as soon as they are known," Dr. Holland, without, in my opinion, attaching sufficient importance to the evil operation of public scandal, derives an argument in support of the system he advocates, from the fact that he believes a public and officially regulated system of prostitution, to be less dangerous to society than private and clandestine prostitution, which he characterizes as a far more demoralizing evil. But granting assent to this comparative statement, it affords no guarantee in support of the "control sys-

tem," unless means be taken effectually to prevent clandestine prostitution. Such prevention, even approximately, would be altogether impracticable without the establishment of such an inquisitorial and despotic system of police, as it is pretty certain an English population would not tolerate, even if, —which I believe highly improbable,—legislative authorities were found to sanction it. But the fact is, that in the continental cities in which public prostitution is organized, the prevention of the clandestine vice, though energetically attempted, is found impracticable; and in Paris, for instance, instead of the controlled system being a substitute for that which prevails amongst us, it practically amounts to an additional evil; for I am disposed to believe, upon the authority of very reliable evidence, that even excluding the large family of *femmes entretenues*, the prostitutes unauthorized by the police, are relatively to population as numerous in Paris as in London. This result would be predicable, *à priori*, even by one not very deeply conversant with the failings of human nature. It is the forbidden fruit which is most eagerly sought after. Truly the act of copulation is the final aim of sexual appetite, but this is not satisfied in proportion as facilities for the former are afforded; and why? It is with the vices as with the virtues of men, they acquire vigour and power of reproduction in proportion as they are exercised; and the experience of individuals no less than of the masses

teaches the fallacy of the expedient of endeavouring to exhaust inordinate passion, by providing means for appeasing it, for these only prove the fuel which aliments the flame.

So numerous are the circumstances influencing the morality of different nations, that very little importance can be attached to the results of its comparative study; but of one fact this study has convinced me, that any one who dispassionately prosecutes it, will discover no valid reason for applying to England the laws which govern public morality in the various states of the European continent.

In the absence of PROOF of its beneficial sanitary operation, in consideration of the legal difficulties attending its organization, and of its possible, if not probable demoralizing influence, I must dissent from Dr. Holland's opinion as to the expediency of applying to England the system of registering and controlling prostitutes which prevails in some parts of the continent. I am not, however, insensible of the great public good which is likely to attend his philanthropic endeavours to bring the subject under consideration. Though I differ from him as to the means to be put into operation with a view to lessen the evils of prostitution, I perfectly concur that something must be done to alleviate them, and particularly the chief one, its so frequent attendant, venereal disease: that something ought, I think, to consist in making ample

provision for all those who seek to be cured,—provision which is ridiculously inadequate in the London hospitals: and this inadequacy not only affects the present, but the future generation; for, while it denies to the diseased the means of cure, it deprives students of the means of learning. It is a remarkable fact that, though for number, difficulty, and importance of study, the great family of venereal affections yields to none in the whole range of medicine, a system for clinically teaching them is a desideratum in every medical school in London. It is obvious that the propagation of the disease will be in inverse ratio to the means taken for its cure; and, that as these are efficiently organized and carried out, mankind will be proportionately relieved from one of its most terrible scourges.

In addition to its attendant disease, prostitution is productive of moral evils which are well deserving much more serious attention than has hitherto been directed to them, though I fear that, under the existing conditions of the social system, attempts to counteract this one of its most unfortunate effects would prove of little avail, even in spite of the most pure and liberal intentions, and of the most vigorous resolve to put them into operation.

OBSERVATIONS ON THE NEAPOLITAN OR MOREAU'S MODIFICATION OF LATERALIZED LITHOTOMY,

AND ON THE

RELATIVE MERITS OF LITHOTOMY AND LITHOTRITY.

CONTENTS.

I HAD learned the very fortunate issue of the cutting operation for stone in the hands of Neapolitan surgeons, from the records of a brief communication which the great Dupuytren addressed to the French Academy, on his return from Italy, whither he had repaired for rest, when labouring under the effects of his first apoplectic attack. But it was not until I visited the hospitals of Naples, in the spring of 1854, that I learned the precise measure of that success, and the mode by which it is attained.

From 5 to 10 per cent. is the maximum mortality

amongst lithotomized subjects in the great hospital of the Neapolitan capital; and be it noted that almost all patients with stone are cut there, lithotrity being in little repute, and only practised in a very few exceptionally promising cases. In 1853, forty-three patients were cut in that institution, with only one fatal result, and that not immediately connected with the operative procedure or its sequelæ.

One plan of cutting is invariably adhered to by the Neapolitan surgeons,—the lateral, with the modifications about to be described.*

An ordinary grooved staff having been passed, and the patient tied up, the operator grasps the handle of the instrument in the left hand, and inclines it to the right side, at the same time pressing down in the perinæum. By this manœuvre, the curve of the staff is readily felt beneath the integument, which is moreover made tense by it; and, in the majority of instances, the prostate gland can be felt in front of the anus, and even its anterior edge defined, so as to furnish a very valuable guide. The operator now makes the ordinary external incision of the lateral operation, and divides the tissues down to the staff, which is constantly pressed towards the wound; in its upper angle, and a very

* This description is taken from my notes written in Naples, the accuracy of which I ensure by consulting the *Istituzioni di Patologia Chirurgica di Felice de Rensis e Antonio Ciccone.* 3ª edizione. Vol. vii, p. 496 et seq. Napoli, 1852.

little below the surface, the right index finger detects the anterior edge of the prostate; the point of the knife* pierces the membranous urethra a little in front of that edge, and now the operator's two hands must co-operate; with the left one, the handle of the staff is carried upwards, towards the middle line, and backwards; thus the concavity of the staff becomes distant from the rectum as it approaches the pubis, and the point is pushed further on into the bladder. Simultaneously, the point of the knife having been from the first kept in contact with the staff, the right hand is raised and pushed forward, so that the back of the knife slides along the groove, and its point enters the bladder; the blade being narrow, it only notches the anterior edge of the prostate and its urethral surface in the passage onwards. It is not until the point has entered the bladder that the prostatic incision is completed; and this is done by fixing the back of the knife against the staff, and directing its point downwards and to the left, in the direction of the inferior oblique axis of the prostate, the one commonly divided; the knife is now withdrawn without cutting, in the same direction in which it was introduced. The maxim is, to make the prostatic incision as small as is consistent with the safe extraction of the calculus. It

* At this stage of the operation the Neapolitan surgeons commonly exchange the ordinary scalpel for one cutting only for an inch at its extremity.

is enjoined that the fibrous ring at the base of the prostate should be preserved intact.

The introduction of the forceps and removal of the stone complete the operation.

It is impossible to convey anything more than a comparatively faint notion of an operation by verbal description. The one I have given will enable any one to follow its steps; and, I suspect, whoever tries the experiment will be surprised, as I have been, with the great simplicity and efficiency of the plan. Its advantages seem to me to be, the guide afforded by the prominence of the staff's curve, and even of the prostate in the perinæum, the diminished risk of dividing the artery of the bulb, of wounding the rectum, or of missing the entrance into the bladder.

There can be no doubt, however, that the ordinary lateral operation for stone as practised in this country, is also very safe and efficient in competent hands; whether the modification above described deserves preference experience must decide.

Reflecting on the Neapolitan results of lithotomy, I have been led to consider the merits of this operation in relation to lithotrity, particularly as the comparison has of late been renewed by some of our most distinguished practical surgeons.*

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* "On Lithotomy and Lithotrity," by William Coulson, London, 1853. "On the Relative Merit of the Two Operations for Stone," two lectures delivered at the Royal College of Surgeons, May 1854, by Frederick C. Skey, F.R.S. Report of a paper read by Sir Benjamin Brodie before Med. Chir. Society, entitled

Observation of numerous cases has convinced me that lithotrity is by no means so harmless a procedure as might *à priori* be imagined, or as its ultra-advocates pretend to prove. The local and constitutional irritation which often follows, sometimes (though rarely) accompanies each sitting; the number of manœuvres required; the difficulty often experienced in the expulsion of the fragments; their liability to impaction; the frequent supervention of cystitis; the occasional though rare sequence of urinary infiltration and purulent infection; the liability to reconstruction of a calculus on a residual fragment;—are all detracting circumstances. Velpeau and Malgaigne have so invalidated Civiale's statistics of this operation, that they cannot be admitted as conclusive; and

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"Notes on Lithotomy, with an Account of the Results of the Operation in the Author's Practice," *Lancet*, March 24, 1855. "The author concludes his paper by stating that his experience had certainly led him to the conclusion that lithotrity, if prudently and carefully performed, with a due attention to minute circumstances, is liable to smaller objections than almost any other of the capital operations of surgery: the cases to which it is not applicable being very few indeed, and chiefly those in which, from the calculus having attained an unusual size, the danger and difficulty of lithotomy are so great, that no surgeons would willingly, nor otherwise than as a matter of duty, undertake it." A few weeks afterwards a very different judgment was asserted by Mr. Syme: "On the whole, I am of opinion that the wholesome, effectual, and, I will add also, safe method of excision, should in general be preferred to crushing." (Lecture on Lithotomy and Lithotrity, in *Lancet*, May 26, 1855.)

with the greatest deference for so eminent an authority as Sir Benjamin Brodie, the report of the 115 cases of lithotrity which he recently read at the Medico-Chirurgical Society, was not so full and circumstantial as to exclude all doubt respecting the conclusion, inferred from them, in favour of the applicability of lithotrity to almost all cases of stone, and of its very decided superiority to lithotomy.*

Without in any degree wishing to anticipate the decision which experience must eventually pronounce upon lithotrity as a general operation, I cannot but express a belief that it will only be accorded the merit, which most operators now agree belongs to it, of a useful auxiliary in the treatment of an aggregate of cases of vesical calculus; but that in the majority, removal of the stone by incision will be deemed preferable to crushing. I cannot but regard lithotrity as a much more serious operation than its eulogists represent it; while, on the other hand, experience proves lithotomy to be less dangerous than might be anticipated from abstract reflection on the presumable effects of fraying a passage by the knife into the bladder amidst the very

* My opinion on Sir Benjamin's communication is based upon personal recollection, from hearing it read and discussed, and upon a brief report of it in the *Lancet* (March 24, 1855). It is possible that careful study of the memoir so soon as published in the Society's transactions, may necessitate modification of the judgment advanced with reference to it.

important structures at and near the pelvic outlet.

Certain it is that we possess records of statistics of lithotomy far more satisfactory than are the most brilliant ones yielded by lithotrity. Subjoined is proof of this statement:

Operator.	Lithotomy Operations.	Deaths.
Frère Jacques*	171	3
Pouteau†	120	3
Cheselden‡	213	20
De Borsa§	100	1
James Earle‖	47	1
Martineau¶	84	2
Surgeons of St. Thomas's Hospital**	144	15
Dudley of Kentucky††	207	6
Crichton‡‡	200	14
	1286	65

From the preceding table I have purposely omitted the reported fabulous success of Rau, who is

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* Quoted in a letter from Souberbeille to Paris Academy of Medicine, 26th May 1835.

† Œuvres Posthumes, Paris, 1783. Vol. iii, p. 295.

‡ A short historical account of cutting for the stone, appended to the Anatomy of the Human Body, by W. Cheselden, London, 1778, p. 332.

§ Quoted in Allarton's Lithotomy Simplified, London, 1854.

‖ Practical Observations on the Operation for the Stone. London, 1796, 2nd edit., p. 95.

¶ Medico-Chir. Trans. of Lond. Vol. xi, p. 402, *et seq.*

** South's Chelius. Vol. ii, p. 635-42.

†† Trans. American Med. Asso. Vol. iv, p. 273, 1851.

‡‡ British and Foreign Medico-Chirurgical Review. Vol. xiv, p. 210.

represented as having cut 1,547 patients without losing one. There can be no doubt, notwithstanding the merit attaching to Rau professionally, that his love of truth was second to his anxiety for self-glorification.* Neither have I included in the above table any cases, the truth of which is not amply attested. The strict correctness of this statement requires proof in the case of Frère Jacques, who is said to have been obliged to leave Paris in disgrace on account of his disasters with lithotomy. Dionis† tells us that more than one half of the Frère's cut patients died; and Méry,‡ that of 60 patients whom he cut in the Hôtel Dieu and the Charité of Paris, in the spring of 1699, 25 died, and many of the survivors had fistulæ and incontinence. Admitting the correctness of this criticism, there is no reason to question the validity of the 171 cases. We

* Camper, whose ability and honesty are altogether beyond doubt, thus expresses himself: "Dubito etiam vehementer Rauo toties ex sententiâ successisse curam, quoties ipse gloriatus. Mille, quingentos, et quadraginta septem ægros se sanasse jactat: numerum concederemus, si de curatione vel de sanatione ageretur, silentio præterit quod mortia fuerint. Diarium igitur, quod jussu magistratus in Collegio Chirurgico de sectis à calculo servatur, adii, atque ex duobus supra viginti, quos Amstelædami secuit, quatuor mortuos fuisse comperi: *ex undecim igitur duos amisit*: plures adnotiones circa successum curationum ab eo institutarum, ad manus meas non pervenerunt."—Petri Camper Demonstrationum Anatomico-Pathologicarum, liber secundus, pag. 14.

† Cours d'Opérations de Chirurgie, 4e ed., Paris, 1751, p. 244.

‡ Obs. sur la manière de tailler pratiquée par le Frère Jacques. Paris, 1700, p. 74.

have it on the authority of Souberbeille (*loc. cit.*) that 60 of them were cut in Brussels without a death; 38 in the Charité Royale of Versailles, with equally auspicious result; 50 at Angers, with but two deaths; 23, with one death, at the Hôtel du Maréchal des Loges. These statistics are also admitted to be correct by Robert Alan in his treatise on the operation of lithotomy (1808, p. 25), who moreover adds that Frère Jacques cut for stone the extraordinary number of nearly 5,000 patients in the course of his life; but that it was only after he learned anatomy by dissection, under Du Verney, and laid aside the thick, curved, staff for the grooved one, that he became a successful operator.

A few remarks on some of the other statistics comprised in the above table. Pouteau expressly tells us he always cut patients for the stone whenever he saw the slightest chance of their recovery, believing with Celsus, "melius anceps remedium quam nullum". Pouteau's results are especially deserving of credit, from the publicity and freedom with which they were scrutinized in the dispute which raged between him and Frère Côme. Mr. Earle has recorded that the forty-seven cases included in the table are the only ones of stone of which he ever kept notes; but it is remarkable that the death which occurred in them was the only one he had had during his whole practice, private and public, in cutting for the stone. In proof of the very aggravated circumstances under

which he did not hesitate to perform lithotomy, Mr. Crichton cites several very remarkable cases.

We have, therefore, 1,286 operations of lithotomy with only 65 deaths: in round numbers, one death in twenty operations. But the result is even more favourable when the cases of children are examined. Thus, analysis of Mr. South's table shows that of fifty-eight children operated upon, between the ages of one and ten, only one died.

In estimating the value of these statistics, it must be borne in mind that, even if we had an equally large and favourable result from lithotrity, the result would be in favour of the cutting operation, because the numbers lithotomized would represent all, or very nearly all, the patients suffering with stone, who had presented themselves; while the number lithotritized would not give any account of those patients,—a considerable number, which, on account either of extreme age, or of enormous size of calculus, or diseased urinary organs, or extreme irritability, had been deemed unfit for the operation. I am assuming, it will be evident, that the comparison is made between exclusive lithotomists and lithotritists. I am well aware that this is not the philosophical process for arriving at the truth, but that the question to be solved should be, —is it possible, by adapting the operation to the indications of special cases, to reduce the average mortality of stone patients beyond what it would be if lithotomy alone were employed? As already

intimated, I am disposed to reply in the affirmative; but Mr. Key and Sir Benjamin Brodie having recently endeavoured to prove the general, indeed the almost universal, applicability of lithotrity, I have adduced the foregoing statistics of lithotomy. I apprehend it will never be possible to adduce a like number as the result of lithotrity, bearing in mind that the operations are to be performed on all individuals labouring with stone, irrespective of age, size of calculus, state of urinary organs, and any other influencing circumstances. As an exclusive and general method, I cannot understand how lithotrity can be relied upon with anything like the same degree of confidence as the cutting operation.

Historical considerations. My endeavours to ascertain the history of the Neapolitan modification of lateralized lithotomy, only resulted for a time in my being informed that it appears to have been the result of successive suggestions, and that no one in particular has exclusive claim to the merit of it. But since these sheets have been in the press, I have been surprised to find that, with the exception of respecting the integrity of the neck of the bladder,—an important point, I admit,—the operation now practised in Naples is identical with that of Moreau; so much so indeed, that it might be supposed I had translated it. My description was written long before I perused Moreau's.*

* In Deschamps' "Traité Dogmatique et Historique sur l'Opération de la Taille" (Paris, 1796, vol. ii, p. 131 et seq.), I find

I find that Ledrau and Aston Key performed a somewhat similar operation, the latter apparently not acquainted with the teaching of his French predecessor. Their accounts not being quoted in surgical books, I transfer them to these pages, as calculated to suggest profitable inquiry in connexion with the other facts adduced in this memoir.

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the following description of Moreau's operation: "Le malade situé un peu obliquement, le chirurgien introduit dans la vessie un cathéter très courbé, et donc le bec est allongé. Pour plus de sûreté il tient lui-même le cathéter avec la main gauche, il en incline le manche vers l'aine droite du malade, de manière que la partie courbe de l'instrument soit dirigée du côté gauche entre l'érecteur et l'accélerateur, et que suivant l'embonpoint du malade, il fasse plus ou moins saillie de ce côté; il saisit de sa main droite son lithotome envelopé d'une bandelette de linge, jusqu'à un pouce de sa pointe; avec cet instrument il incise les tégumens communs, suivant l'usage, à un travers de doigt de l'anus, vers la tuberosité de l'isection..... L'incision des intégumens et graisses faite, Moreau pointait son lithotome dans la rénure du cathéter; celui-ci soulevé, il conduisait son instrument dans toute l'étendue de la cannelure, jusque dans la vessie; où étant, il ne retirait point son lithotome, mais en appuyait le bord supérieure dans la rénure du cathéter, soutenait le manche, et en même temps en abaissait la pointe: par ce procédé il incisait la prostate sans changer la direction de l'instrument, il le retirait un peu pour étendre l'incision du col de la vessie: celui-ci incisé, il reportait la pointe du lithotome dans la cannelure du cathéter, le retirait sous le pubis, et en deça du muscle transverse; ensuite il quittait la cannelure, et ramenant horizontalement son lithotome de dedans en dehors, il achevait de couper les graisses, et en sortant, il agrandissait l'ouverture des tégumens; l'incision faite, il conduisait un gorgeret dans la vessie, retirait le cathéter, etc....."

Mr. Aston Key made use of a straight grooved staff, and of a bistoury, shaped like a common scalpel, but slightly larger in the blade, and rather convex in the back near the point, so as to run with more facility along the groove. He thus describes his operation:* "An assistant holding the director, with the handle somewhat inclined towards the operator, the external incision, of the usual extent, is made with the knife, until the groove is opened, and the point of the knife rests fairly in the director, which can be readily ascertained by the sensation communicated; the point being kept steadily against the groove, the operator with his left hand takes the handle of the director and lowers it, keeping his right hand fixed; then, with an easy simultaneous movement of both hands, the groove of the director and the edge of the knife are to be turned obliquely towards the patient's left side; the knife having the proper bearing, is now ready for the section of the prostate: at this time the operator should look to the exact line the director takes, in order to convey the knife safely and slowly along the groove; which may now be done without any risk of the point slipping out. The knife may then be either with-

* A Short Treatise on the Section of the Prostate Gland in Lithotomy, with an explanation of a safe and easy method of Conducting the Operation on the principles of Cheselden. Illustrated by engravings. By C. Aston Key, London, 1824, pp. 28-9.

drawn along the director, or the parts further dilated if necessary. Having delivered his knife to the assistant, the operator takes the staff in his right hand, and passing the fore finger of his left along the director through the opening in the prostate, withdraws the director, and exchanging it for the forceps, passes the latter upon his finger, into the cavity of the bladder. In extracting the calculus, should the aperture in the prostate prove too small, and a great degree of violence be required to make it pass through the opening, it is advisable always to dilate with the knife, rather than expose the patient to the inevitable danger consequent upon laceration. . . . The advantages of this mode of operating have been fully confirmed in respect to its quickness, facility, and event."

In the fifth edition of his *Operations in Surgery*, published in London in 1781, M. Ledran gives the following description of the method he had pursued in cutting for the stone, for some years previously, and which he had fixed upon preferably to any other, as it always proved successful even in the extraction of the largest stones.

The patient being tied up, "I (Ledran) introduce the staff into the bladder and feel for the stone. . . I then raise up the scrotum, and directing an assistant to support it, I place his two forefingers on each side of the part where the incision is to be made; one of the fingers being laid exactly along that branch of the ischium which rises

towards the pubis, and the other pressed upon the raphe, that the skin may be kept fixed and tight. Whilst I thus place the fingers of the assistant who supports the scrotum, I still keep hold of the handle of the staff, and direct it so as to form a right angle with the patient's body, at the same time taking care that the end of it is in the bladder. This position is the more essential, as all the other instruments are to be conducted along the groove of this. If the handle of the staff were kept inclining towards the belly, the end of it would come out of the bladder; and the gorget missing its guide, would slip between that and the rectum.

"The staff being rightly placed, I take the knife from the assistant who holds the instruments, and put it into my mouth; then pressing the back of the staff against the rectum, I feel the curvature of it through the perinæum. . . I begin the incision from the lower part of the os pubis, and terminate it an inch and a half below the point where the curvature of the staff is felt. I then pass the point of the knife into the groove of the staff, cutting from below upwards, without taking the point out of the groove. I open the anterior part of the urethra as far as the incision that is in the skin.

"The back of the staff, which was pressed upon the rectum, must now be raised and pressed against the os pubis. At the same time I turn the handle towards the right groin, that the groove which is

at the back of the staff may face the space between the anus and the tuberculum ischii on the left side; then carrying the point of the knife down the groove, I slide it along the back, turning the edge that it may face the space between the anus and the tuberculum. By this incision I exactly divide the bulb of the urethra, and by doing this on its side, we are sure to avoid wounding the intestine or rectum, which for want of this precaution has been often cut. This first incision being made, I again pass the point of the knife into the curvature of the staff to the part where it bears against the perinæum, and direct it to be held there by the assistant who supports the scrotum; this done, I take a large director, the end of which is made with a knob like that of a gorget, and conveying this back upon the blade of the knife into the groove of the staff, I draw the knife out. I then slide the back of this director along the groove of the staff into the bladder, and I withdraw the staff by turning the handle towards the patient's belly. I next feel for the stone with this director, and having found it, endeavour to distinguish its size and surface, in order to make choice of a proper pair of forceps; after which I turn the groove towards the space between the anus and the tuber ischii, and resting it there, convey along the groove a bistoury, with a knob half an inch round and about three quarters of an inch long. I continue the incision made by the knife in the urethra, and entirely di-

vide the prostate gland laterally, as also the orifice of the bladder. The bistoury being withdrawn, the groove of the director serves to guide the gorget into the bladder; I then introduce my forefinger along the gorget (which is now easily done, as the urethra and prostate, being divided, do not oppose its entrance), and with it I dilate the passage for the stone, in proportion to the size which I discover it to be. This dilatation being made, I withdraw my fingers, and use the proper forceps."

Whatever be thought of the other steps of his operation, I apprehend no surgeon will approve, much less repeat, Ledran's division of the entire prostate, even through the neck of the bladder, so as to divide its orifice.

ON THE RELATIVE MERITS OF THE DIFFERENT METHODS OF TREATING FRACTURES OF THE LOWER LIMBS.

CONTENTS.

Importance of, and discrepancy upon, the object of the present inquiry.—Critico-historical considerations.—Mr. Pott's plan.—Its merits examined under the twofold aspect of doctrine and practice.—Effects of Mr. Pott's original teaching on this department of surgery.—Numerous innovations to which it gave rise.—Double inclined plane apparatuses constructed upon its principle.—Fracture-beds.—The Macintyre.—Hyponarthesis, or the plan of suspending broken limbs.—Inefficiency of the new complicated swinging machines, compared with the original simple contrivances of Sauter and Mayor.—The theory of this mode of treatment and its practical effects.—Permanent extension, and contrivances for its maintenance.—Special consideration of the long splint.—The so-called immovable apparatuses.—Relative merits of starched bandages and pasteboard splints, and of plastered bandages, in their construction.—Arguments for and against this plan of treatment.—Mr. Hunt's cases illustrating its superior advantages.

"Perhaps there is no subject more interesting to the practical surgeon than this of fracture of the limbs....This is one of those subjects which has fallen into almost inextricable confusion: none, I believe, requires more to be historically explained.

....It is, I fear, but too certain, that, while more has been written on the subject of fractures than on hernia, lithotomy, amputation, or trepan, yet no two books correspond, no two authors agree, even on the general points of practice; and every surgeon, whether in the army or in the navy, in a village or in a city, sets a broken limb, as he writes his name, after a fashion of his own."*

With the forty years which have elapsed since John Bell uttered these remarks, they have gained rather than lost in justice. His own effort to reconcile the differences he so pointedly set forth, only added one to the list. Very little, if any, better lot has befallen the essayists who have succeeded him, in endeavouring to establish, on a sound basis, this department of practical surgery. At this moment even the question of immediate reduction is pending; its solution in the negative being supported by Mr. South.† With all deference to this eminent authority, I must consider the experience of the vast majority as supporting the illustrious surgeon of St. Bartholomew's, in the assertion that "it is demonstrably true that a broken limb cannot be too soon put to rights."‡ The propriety of early reduction and accurate coaptation settled, the question arises, by what means is this to be maintained,

* John Bell's Principles of Surgery, vol. i, pp. 490-91. London, 1815.

† Translation of Chelius, vol. i, p. 507.

‡ Chirurgical Works, 1783, vol. i, p. 394.

—displacement of the fragments and deformity to be prevented? This is the desideratum, to attain which, so many principles have been propounded, so many modes of practice continue in vogue: this is the question to which our attention must be directed.

When we reflect that the treatment of fractures has been the favourite theme of most great surgeons; that each has adduced experience in support of his particular tenets,—we almost lose hope of solving the dispute on the basis of facts, which, *primâ facie*, is the only legitimate solution in a subject so purely experimental. But the whole history of medicine teaches us not to attach too much value to precepts, merely because facts are adduced in their support. "Quant aux faits prenez garde! Rien de plus décevant, de plus fallacieux, de plus perfide que le fait médical." Such is the exclamation of Amadée Latour:* a severely cutting sarcasm, I admit; but that it is unhappily true, as facts have for the most part been observed and related, no one can deny. "For it must be acknowledged, that what are professionally called facts, are, for the most part, only those notions which a man insensibly adopts in the course of his practice, and which take a colour from his education and previous studies. It is this which makes the facts

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* Lettres sur la Syphilis, par Ph. Ricord; avec une Introduction par Amadée Latour, p. ix. Paris, 1851.

of one age differ from the facts of another age; and the opinions of men differently educated, to vary, on what they are inconsistent enough to call matters of fact."* The validity of facts has to be examined before conclusions professedly based upon them are assented to. Such is the course I have elected to pursue.

As we trace back to their origin the different methods of treating fractures, we are struck by the fact that they have multiplied with time, and that advance in this branch of surgery has been marked with a divergence from unanimity of opinion, which is generally held to be the representative of perfect knowledge. It is so, indeed, when it is the expression of a judgment arrived at after free discussion of particulars, after impartial, comprehensive, philosophical generalization. Such was not its cause in the present instance, but a servile veneration for authority, and a consequent enslaving of independent thought.

About the middle of the last century, two attempts were made to solve the then pending questions in surgery, the one by the Académie Royale de Chirurgie, who proposed a series of essays on such questions, to competition for prizes; the other by Samuel Sharpe, whose *Critical Inquiry into the Present State of Surgery* was given to the world in

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* Sir Charles Bell's "Observations on Injuries of the Spine and of the Thigh-Bone." London, 1824, p. 73.

1750. But in the five quarto volumes containing the *Récueil des Prix* of the former, no question relating to the treatment of fractures is even mooted; and the author of the latter work sets forth with the announcement (preface, *op. cit.*) that having only considered such doctrines as, though generally received, in his opinion, were ill-grounded, or such improvements as were yet but little known, he had not made any observations on the treatment of luxations and fractures, in the conviction that all eminent surgeons were agreed on the method of treating them.

True it is that, in the writings of Wiseman, Belloste, Moscati, Cheselden, and William Sharpe, instances are met with of slight deviation from the practice of the school of Cos, which for so many centuries had only suffered the slight and practically immaterial modification of Galen and of Celsus; but the sergeant-chirurgeon of Charles I distinctly recommends, in his *Chirurgicall Treatises* (London: 1676; book vii, p. 467), the method of Hippocrates for the "keeping the parts of a fracture joined together, and to defend them from inflammation". It was not until the year 1768 that a bold attempt was made by Percivall Pott to throw off the shackles of routine, in the *Few General Remarks on Fractures and Dislocations*, which gave evidence of as much power of independent thinking, as is perhaps to be found in any other essay of similar dimensions in the whole range

of practical surgery. So important are the "general remarks" in question, for their intrinsic merits, and for the influence which they exercised on the practice of surgery, that I do not apologize for quoting from them, such portions as contain Mr. Pott's particular views. "Neither extension nor counter-extension," he observes (Works, vol. i, p. 385), "can be necessary on account of the mere fracture, considered abstractly. The broken ends of the bone or bones are of themselves inactive, and, if not acted upon by other parts, they would always remain motionless. When any attempt is made to put them into motion, they of themselves can make no possible resistance; nor can any be made on their part, save an accidental one, arising from the points of the fracture being entangled with each other; and when they have been once, by the hand of the surgeon, placed properly and evenly with regard to each other, they would for ever remain so. What then is the reason why fractured bones always suffer a greater or a less degree of displacement? Why is a broken limb almost always shorter than its fellow? What creates the resistance which we always find in attempting to bring the fractured parts aptly together? Whence does it proceed that, when we have done all that is in our power (according to this mode of acting), the ends of the fracture will, in many cases, become again displaced, and lameness and deformity frequently ensue? In short, what

are the parts or powers which act on the bones, and which, by so acting on them, produce all these consequences? These parts are the muscles, the only moving powers in an animal body." He goes on to say (p. 388), that the putting the muscles in a state of tension is the cause of the resistance in setting a fracture, and that this resistance is best removed "by putting a limb in such position as shall relax the whole set of muscles belonging to or in connexion with the broken bone."..." What is the posture," he inquires (p. 391, *op. cit.*), "which almost every person, whose os femoris has been newly broken, puts himself into, in order to obtain ease, until he gets proper assistance? Do such people stretch out their limb, and place their leg and thigh straight, and resting on the calf and heel? I believe, seldom or never. On the contrary, do not such people almost always bend their knee, and lay the broken thigh on its outer side? and is not the reason why this must be the most easy posture obvious?" In accordance with this reasoning, Mr. Pott directed that patients with fracture of the thigh and leg should lie on the injured side, with the thigh bent on the abdomen, and the leg on the thigh. It is very important to note—a fact too often overlooked—that he called to his aid splints, which he tied loosely it is true, but which he rendered much more efficient by having of such length as to include both the joint above and the one below the seat of fracture, very

justly inveighing against splints which do not fulfil this condition.

In order to form a just estimate of this teaching of Mr. Pott, we must severally consider his reasoning, and the results of experience. Even in the present advanced position of the medical sciences, Mr. Pott's arguments in this matter must be characterized as ingenious and lucid throughout, much more did they merit this distinction at the time they were adduced; nevertheless they are vitiated by several important fallacies. Mr. Pott erred in only taking cognizance of the muscles as the cause of displacement; he seems completely to have lost sight of the physical laws which come into operation so soon as a bone is broken, at a greater or less distance from its extremities, at a more or less degree of obliquity. In the case, for instance, of an oblique fracture at the lower end of the tibia or femur, the fragments cannot maintain the position to which they are reduced, even after the removal of all muscular action; and this is owing to the displacing agency from gravitation of the lower part of the limb, as appears very obvious on observing such fractures in the dead subject: this brings me to the consideration of the next fallacy. Even apart from the displacing physical agency of the bony fragments themselves, Mr. Pott erred in assuming that it is possible so to place a limb as to render its muscles powerless; the position most propitious to the inactivity of one set,

is favourable to the action of another. It is practically impossible to lay a patient with broken thigh in such a manner as to prevent the fragments being acted upon and *pro tanto* displaced by the muscles. Mr. Pott's inference in defence of his doctrine from observation of the position naturally assumed by broken limbs, likewise tended to misguide him. The bent position of a recently broken thigh is not an instinctively assumed one, but one consequent upon the destruction of the solid support of the soft parts, and of the greater weight of the outer half of the latter. The flexed and curved position of a broken thigh is no more intentionally assumed than it is during sleep or after death, and it affords no legitimate grounds for therapeutic application.

Practical surgeons have, with rare and unimportant exceptions, long been agreed that Mr. Pott's plan of treating fractures of broken limbs is objectionable, on account of the very irksome position on the side, and of the difficulty of ascertaining the manner in which the broken bone is uniting by comparing it with its fellow in the sound limb. There can be no doubt, however, that the plan of treatment under consideration answers very fairly in a considerable number of cases. Here let me remark, once for all, that the above concession applies in greater or less measure to all the methods of treating fractures hitherto described; many fractures are so simple,

straight across the bone, without any injury to the soft parts, that, provided rest be enjoined, nature will reconsolidate the severed bony pieces. Forgetfulness of this truth, has been the most fruitful source of discussion in this as in many other therapeutical questions. The medical practitioner should never forget the proverb of the Italian peasant,—many roads lead to Rome. There can be no question, that in the aggregate the majority of cases of deviation from, would be restored to health by nature's unaided effort. It is equally certain, that very powerful agencies are often required to counteract this natural curative tendency. Lack of these reflections induces persons to think, who see cases recover under different modes of treatment, that to these are the cures assignable, whereas, frequently, the only legitimate conclusion is, that cases which otherwise would have recovered spontaneously, have done so in spite of the employment of particular agents. I have indulged in this digression, because it relieves me once for all from the necessity of reiterating the admission made. Many fractures will do well on Mr. Pott's as on most other plans; the question is to be settled upon the consideration of those cases which nature's unaided efforts are unable to cure. Even some of these do well upon Mr. Pott's method, but the great majority fail; this is particularly true of the oblique fractures just above the femoral condyles, of the oblique fracture of the tibia in its

lower third, of fracture of the lower end of the fibula, with dislocation of the foot outwards in consequence of rupture of the internal lateral ligament, with or without splintering of the internal malleolus: any one who trusts to position and the loose splints in these cases, is destined to signal disappointment.

But although appeal to experience has been far less fruitful in direct evidence of the soundness of Mr. Pott's teaching, than his contemporary admirers may have wished, it has signally contributed to the progress of this important department of the chirurgic art; for it shivered the shackles of antiquated authority, made men feel the truth so happily expressed by Mr. Liston, that "years are not the measure of experience"; and it set on foot an enlightened inquiry, which has been productive of the most auspicious results.

Only a few years elapsed after the promulgation of the new doctrine from St. Bartholomew's, when White of Manchester devised the double inclined plane, after the principle of which were constructed the fracture-beds of Harrold, of Earle, and of Amesbury, as well as a great variety of more or less complicated splints and fracture-boxes. By all these, the evils of the irksome position on the side are obviated, and the facilities for comparing the two limbs are increased. Nevertheless the physiological plan of treatment, according to simple position, has been found to possess so many prac-

tical disadvantages that its advocates have not been numerous. A different result has attended the experimental application of the physiological principle with some material modifications; to the two principal of which, I am about to allude.

1stly. The combined plan of position and extension, as exhibited in the Macintyre splint.

2ndly. The combined plan of position with suspension, as first suggested by Sauter,* and generalized by Mayor,† from whom it derived its name, *hyponarthesis.*

In the employment of Macintyre's splint, advantage is sought to be taken of the effects of the flexed position in relaxing the muscles; of extension and counter-extension in effecting reduction and maintaining co-aptation; the foot being the part upon which the extensile force is exerted, while the counter-extension is kept up by the weight of the body. In a very considerable number of broken legs, this apparatus is consistent with excellent results: its employment, however, confines the patient in an uncomfortable position, renders the use of the bed-pan, and indeed any movement in bed, difficult if not painful, and is not unfrequently productive of very considerable suffering at the heel and ankle; particularly when it is necessary

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* Sauter, Anweisung der Beinbrüche der Gliedmassen ohne Schienen sicher zu heilen. 1812.

† Mathias Mayor, La Chirurgie simplifiée. Bruxelles, 1842.

to bandage firmly for the maintenance of co-aptation. There are, moreover, some exceptionally difficult cases,— *e. g.*, fractures of the leg, with tendency of a flute-mouth shaped upper fragment of tibia to cock up, and of lower one to be dragged upwards and backwards,—in the management of which, the Macintyre is very inefficient; and this for two reasons:—it cannot relax all the muscles, and is mechanically inadequate to fixing the fragments. The necessity of suspending the foot in a stocking from the toe, with a view to relieve the heel of pressure, operates as an active cause of displacement, by depressing the upper end of the lower fragment; and even though the latter be withdrawn from the power of the muscles by the division of the tendo Achillis, observation has proved that sometimes co-aptation cannot be maintained with this splint, in spite of the nicest management. In fractures very near the ankle-joint, especially when compound, and in all fractures of the leg associated with bruises or other injury of the foot, the Macintyre fails—often altogether. In children it is always very inconvenient.

Much more generally applicable to fractures of the lower limb, and much more efficient, is the suspension plan, according to which the broken limb is placed upon a padded board, having a piece of rope from one to two feet long attached to each angle; the four cords secured above in a knot, may be suspended by a long rope from the ceiling, or

from any contrivance over the bed. (Fig. 3, pl. 3.) This simple apparatus is suited to any broken leg. Co-aptation having been effected, the knee and foot are fixed by means of bandage, or a folded half-square handkerchief, and any complication in the shape of bruise or wound befittingly treated. For a broken thigh, another piece of board is attached by hinge to the upper extremity of the one on which the leg rests, so that the knee and hip-joint may be more or less flexed: this thigh piece should reach to the trochanters, and be secured to the thigh and round the pelvis by bandage; but the suspension is effected, as in the leg, by a cord on each side of the foot and of the knee.

Observation of numerous cases of simple and compound fractures of the thigh and leg, which I instituted a few years since in the Lausanne hospital, famed as the scene of Mayor's brilliant exploits in this and other departments of surgery, convinced me of the very great comfort accruing to patients, while under this treatment with fractures of the lower limbs, and of the facility with which good results may be obtained with it, even in spite of great tendency to displacement in consequence of the obliquity of fractures and of the power of muscles.

A few words as to the *rationale* of the suspension plan. The flexed position of the leg upon the thigh, and of the latter upon the trunk, tends to muscular relaxation; but, what is more particularly worthy of notice, is the manner in which the

movements of the body, and the action of the muscles of the broken limb, are prevented displacing the fragments. This will best appear upon comparing a broken leg placed upon a Macintyre, and one, similarly injured, upon a swing. In the case of the Macintyre, the leg is fixed to the apparatus, and this to the bedstead through the block on which it rests. If the patient's body move, or the muscles of the thigh and calf otherwise act, their power is concentrated upon the weakest and most movable part—the seat of fracture—the apparatus and bed being immovable; *ergo*, liability to displacement. In the case of a swing, the motive power is almost completely expended in moving the apparatus, and with it the limb as a whole, and very little of the impetus is felt at the weak spot; *ergo*, the less liability to motion and displacement of fragments. In this comparison, it will be observed that I have assumed precisely similar fractures, and equal motive power; but difference in the apparati, so far as fixity;—the one an immovable block, the other an undulating sling. It follows theoretically, that to ensure the great desideratum, —the communication of the least possible impulse to the point of fracture,—the swing should be as movable as possible, so as to exhaust in its undulations the motive power communicated to the limb, and thereby render impossible a jerk in any part of its length. Experience is in accordance. I was much struck by the attention paid, in

the hospital of Lausanne, to the carrying out the principles just expounded, and by the great comfort thereby accruing to the patients. The swinging machines commonly made by London instrument makers, are so heavy, and the suspending medium (often a chain) so stiff and short, that, practically, there is scarcely any provision for undulation; the heel is almost a fixed point, and the movements of the trunk, or of the muscles inserted into the broken bones, are little less effectively and prejudicially communicated to the fragments, than if the limb were placed upon a Macintyre or long splint.

Mayer's motto was *simplex sigillum veri*,—a truth always to be borne in mind in surgical appliances, particularly so in the treatment of fractures. Theoretically, and practically, the principle of suspension is commendable, and it is so in proportion to the simplicity of the means employed. Complication in mechanism impairs the operation of that principle, and is commensurately inadvisable. Dr. Reid's suggestion of suspending broken legs by India-rubber bands from an iron cradle, appears a valuable one; certainly it is conceived in the right spirit and merits trial. It is to be borne in mind, that whatever apparatus is applied to a broken limb, it may be suspended by very simple contrivance, often with decided comfort to the patient.

It yet remains for experience to determine what is the precise measure of utility of suspension in this department of practical surgery. The principle

appears a good one *à priori;* experience has de monstrated it to be productive of some good results, and, in my opinion, as superior to the majority of contrivances by which fractures are commonly treated; further experimentation, to be conducted without prejudice, with attention to principles, with simplicity and exactness in appliances, will eventually pronounce a more full and true judgment.

Thus far we have followed out the working of Mr. Pott's doctrine. A totally opposite one, that of permanent extension, as advocated by his contemporary Desault, now invites attention. It would be mere matter of historical interest to dwell upon the arguments adduced for and against this plan, on the one hand, by that great surgeon of the Hôtel-Dieu, and by his zealous disciple and biographer, Bichât; on the other, by the adherents and converts to Mr. Pott's system, illustrious amongst whom must be recorded Dupuytren and Delpech.

As it is in the treatment of fractures of the thigh that the permanent extension plan has more general and advantageous application, and since the long splint of Mr. Liston is deemed the most simple and efficient contrivance for keeping it up, I shall consider the principle of action of this instrument, and its practical effects.*

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* My present experience of permanent extension apparatus for the thigh is confined to Desault's, Boyêr's, and Liston's splints.

The splint placed on the outer side of the limb is destined to act as the solid support of the soft parts while the bony lesion is being repaired;

I have never observed the effects of Mr. Syme's; but as its apparent simplicity and suitableness are supported by his great authority, I extract his instructions for applying it, from one of his recently published clinical lectures (*Lancet*, 1855, vol. i, p. 174): "In ordinary practice, the long splint is generally made not sufficiently broad. It ought to be equal in breadth to the diameter of the limb, or about four inches and a half for an adult; otherwise there is great difficulty in preventing eversion of the foot. The best means of fixing the limb to the splint is a sheet wrapped round the splint, till a part equal in breadth to the circumference of the thigh remains enrolled. The sheet is passed under the leg, and wrapped round it; after which its free margin is secured by strong pins to the part rolled round the splint, which serves also as a pad to the limb. It is also well to use a perineal band, and to produce extension so much as to act as an additional means of insuring the perfect rest of the limb: the foot being fixed to the lower end of the splint by a handkerchief passed round the ankle, just above the heel, and crossed over the dorsum of the foot, the ends being passed through the holes or notches in the splint, and tied upon its outer surface. A broad bandage carried round the chest and upper part of the splint completes the apparatus. The sheet is far simpler and more effectual than rollers applied from the foot to the groin. Two or three bandages, six yards in length, are required for that purpose; and though they look very neat when first applied, they soon require reapplication. The state of the limb can never be ascertained without either raising the thigh to take off the bandages, or cutting it up; and in the latter case the thigh must be raised in order to reapply the bandage, whereas, when the sheet is used, on taking out the pins, and throwing the sheet aside, the limb is exposed undisturbed for examination. This apparatus has also the great advantage, that

and it acts in effecting and maintaining reduction, by virtue of the extension power applied to the foot, and the counter-extension exerted above, through the perineal band. The circular bandaging from the foot to the upper part of the thigh, likewise exercises an influence in maintaining the fragments in proper apposition.

There can be no question that the long splint thus applied, is an efficient instrument in treating many fractures of the femur. It is objectionable, however, as confining the patient in bed in a fixed position, during the whole course of treatment,—confinement peculiarly objectionable in children and old people. The use of the bed-pan is inconvenient, and, in consequence of the bandages becoming loose, it is necessary to re-apply them, and renew extension almost every fortnight; to the patient's suffering, and, it is fairly presumable, to the retardation of bony consolidation. But in oblique fractures just below the trochanters, with tendency of the upper fragment to cocking forwards and outwards; and in oblique fractures of the lower end of the femur, with displacement of the lower fragment backwards and upwards, the long splint is almost always an unsatisfactory instrument, often altogether inadequate so to maintain co-aptation

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it can be obtained extemporaneously: there are few patients, rich or poor, whose houses do not contain a piece of wood that would answer for a long splint, and a sheet or tablecloth to wrap round it."

as to insure re-consolidation without very manifest deformity. I do not lay great stress on the pain at the ankle and chafing in the groin, which the long splint is apt to occasion, for they may commonly be averted; yet they are so liable to occur in some cases, even in spite of much care, that they must be regarded as special annoyances attending the use of that instrument.

We have finally arrived at the consideration of the plan of treating fractures by the so-called *immovable apparatus*, a term not literally correct, yet practically convenient for its distinctiveness.* Starch bandages and pasteboard splints have hitherto been the materials employed in the construction, but recently the "plaster of Paris bandages" have been introduced by Messrs. Mathijsen and Van de Loo, of Holland, and powerfully advocated† by Prof. Pirogoff, of St. Petersburg (the Surgeon-in-chief at Sebastopol), for their peculiar suitableness to army practice. The method of applying the starched apparatus having been sufficiently dwelt upon in my published essay,‡ it only remains to give a

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* My friend Hunt proposes the designation the *Modern Treatment of Fractures;* but this would occasion confusion between the suspensive and the immovable plan.

† Klinische Chirurgie, eine Sammlung von Monographien von Nicholas Pirogoff: Leipzig, 1854.—Zweites Heft. Der Gypskleberverband bei einfacher und complicirten Knochenbrüchen, etc.

‡ On the Advantages of the Starched Apparatus in the Treatment of Fractures and Diseases of Joints. By J. S. Gamgee, London, 1853.

description of the manner of preparing and using the plaster of Paris bandages.

The best material for making them is unglazed, open calico. It is spread on a table, and dry, powdered plaster of Paris rubbed into it for several minutes, until the meshes are well and evenly filled with the powder. The bandage thus prepared is rolled, and, just previously to application, sufficient water is dropped into the extremities of the roll to moisten the plaster, but not enough to soak through rapidly, and thereby wash it out. The surface of the limb having been previously protected by a common bandage or stocking, the moistened plaster bandage is carefully applied. In a few minutes a very firm and accurately-fitting casing is the result, rendering displacement of the fragments an impossibility, and allowing of the patient's movement, even to a considerable distance, without pain and inconvenience. This bandage being light, not brittle, and easily cut up, obviates the well-grounded objections to the plaster of Paris apparatus of Dieffenbach, as advocated by Muttray in his dissertation, *De cruribus fractis gypso liquefacto curandis.*"*

Personally, I have not sufficient experience of this application to add anything to the commendation it has received from distinguished surgeons of Belgium, Holland, Germany, and Russia. So far

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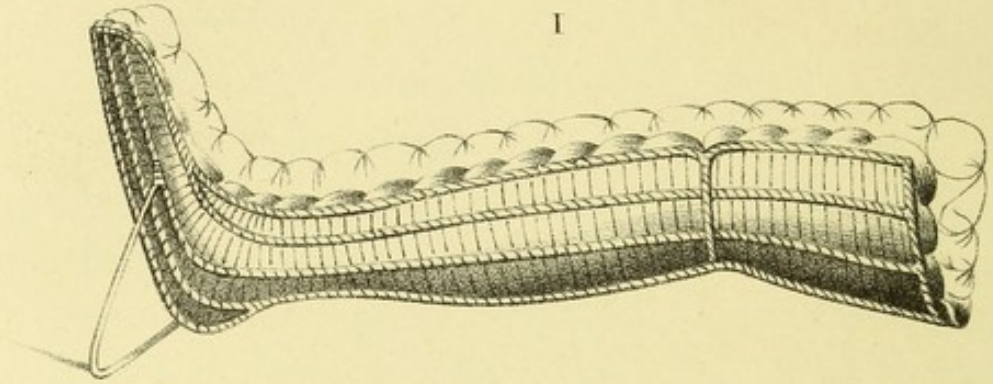
* The above description of the plaster of Paris bandages was published, with comments, in the *Associated Med. Journal,* Sept. 1853, after my return from the Continent, where I learned it.

I



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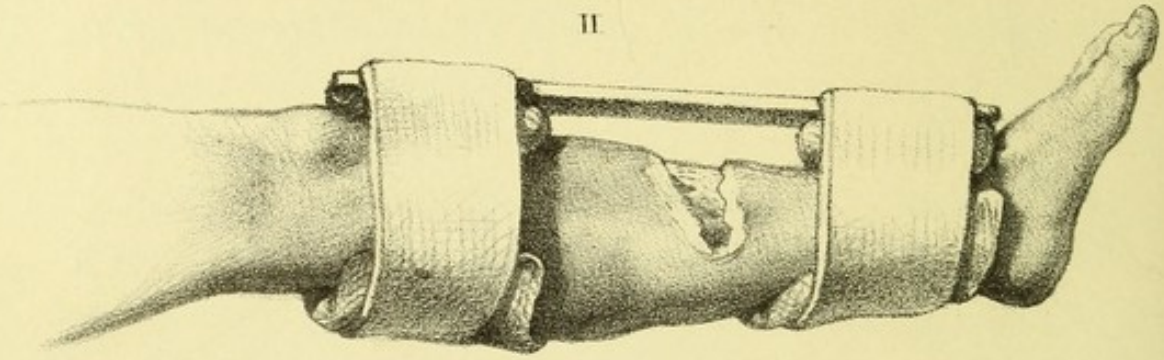

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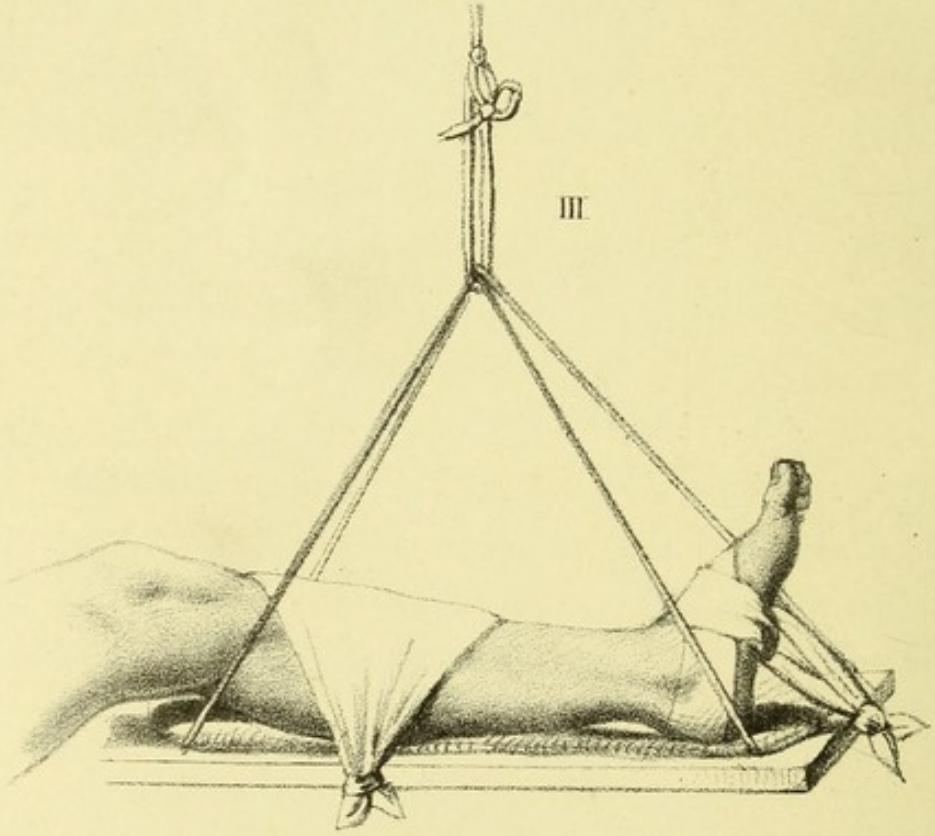


John Gamgee del. et lith.

Day & Son Lith.rs to The Queen.

as my observation has extended, it warrants me in regarding the plastered bandage as a very simple contrivance, calculated to be of great use in the hands of surgeons. On reference to fig. II, pl. III, will be seen a splint recommended for the treatment—at any rate, in its early stage—of a compound fracture of the leg. The pad at each end of the splint raises it off the seat of injury, while a few rolls of moistened plastered bandage so fix it as to construct what appears to be a simple and effective substitute for the broken limb. It would appear as if carrying the wounded man from the field with such a lesion would be greatly facilitated by that contrivance, while the materials and mode of its application are so simple as to leave no desideratum on that score.

Whatever material be employed in its construction, the *modus operandi* of an immovable apparatus is the same; we shall consider it under a twofold aspect;—its theory, and practical effects.

Theoretically considering the principle of action of an immovable apparatus, closely fitting as it does to the elevations and depressions of the limb, after the fragments have been brought into accurate apposition, it may be said to act the part of an outer skeleton, whilst the solution of continuity in the bone is being repaired, giving to the soft parts that support which the natural skeleton once afforded. The surgeon applying an apparatus of the kind, closely follows nature's example.

The soft parts of the animal frame are supported upon two principles,—by an outward shell, as in the crab; by an interior skeleton, as in man. When a part of the interior bony framework is broken, what more rational than, during its repair, to support the soft parts by nature's other scheme, an investing shell? This is precisely what the surgeon does in treating a broken leg or thigh with an immovable apparatus. Once applied, it effectually prevents displacement of the fragments and its consequent attendants, injury to the soft parts, pain, and deformity. But this may be said to be mere theoretical disquisition. What says experience? We shall reply by separately considering the advantages exhibited by this method of treatment, and the disadvantages alleged against it.

The cases recorded in the Liston Prize Essay for 1853, are, in my opinion, ample evidence of the advantages of the movable apparatus,—an opinion which has been all but unanimously shared by reviewers. Nevertheless the plan has gained but a small number of supporters. My own practice has afforded many more cases to confirm the previous experience, while no fact has come to my knowledge to invalidate it. I look forward to being able, in due course, to publish the results of this method in a large number of fractures of all kinds; meanwhile I shall limit myself to adducing the results of the experience of my friend Mr. Hunt, of Birmingham, as recorded in the *Association Medical*

Journal for 1855. At page 837 of that volume he has drawn up, in the following tabular form, the histories of thirty well authenticated cases of fracture, the reports of which were taken indiscriminately from amongst many others treated in like manner at the Queen's Hospital. (*See table at next page.*)

Mr. Hunt concludes his series of extremely valuable papers on this subject with the following remarks. "In the above table, it will be seen that the ages vary from early childhood to extreme old age; from which it may be inferred that the method is adapted for any age; indeed, I have applied the apparatus, in treating a broken thigh, to a child aged sixteen months, and for the same injury to a woman above 80.

"Under the head of Fracture, in the table, it will be seen that the femur was the seat of injury in eleven cases; the tibia and fibula together, in eight; the fibula only, in four; the malleoli, either singly or together, in four; the patella, in one; the olecranon, in one; and the radius and ulna, in one. The bones of the lower extremities sustained the injury in every case but two, which may be accounted for from my not taking notes of cases which did not require admission into the hospital; and fractures occurring to the bones of the upper extremity generally do not; yet I have employed the apparatus in treating fracture of the arm and forearm as often as of the leg and thigh, and can as strongly recommend it in the one as the other.

Tabular View of Cases of Fracture treated by the Starched Apparatus in Queen's Hospital, Birmingham, by Mr. Hunt.

Case	Name.	Age.	Fracture.	Date of accident.	Treatment commenced from time of accident.	Length of treatment.	Confinement to bed under treatment.	Result, etc.
1	Greenway	42	External & intrnl. malleoli	Feb. 28, 1853	March 4, 1853	Three weeks	Two days	Cured
2	Tustin	53	Compound comminuted of tibia and fibula	April 18, 1854	Immediately	Six weeks and 3 days	Three days	Cured
3	Ady	54	Oblique of the femur	Jan. 10, 1854	Seven hours	Eight weeks	Three days	Cured
4	Abel Cann	11	Transverse femur	April 11, 1854	Immediately	Six weeks	Four days	Cured
5	Tudor	35	Pott's fracture	April 13, 1854	Do.	Three weeks	Two days	Cured
6	McCarthy	19	Femur at lower third	Aug. 24, 1853	Do.	Six weeks	Three days	Cured
7	Coyle	56	Femur near neck	Nov. 2, 1853	Do.	Do.	One month	Cured, shortening ½ inch
8	Wilkinson	26	Compound of femur	Oct. 8, 1853	Do.	Two months	....	Amput., recovery
9	E. M.	77	Femur	Oct. 3, 1853	Do.	Six weeks	One week	Cured
10	M. A. Girling	7	Do.	Feb. 21, 1854	Do.	Three weeks & 5 days	....	Cured
11	Parsonage	3	Do.	Jan. 20, 1854	Do.	One month	....	Cured
12	Tyerbuck	6½	Do.	Aug. 6, 1853	Do.	Seven weeks	....	Cured
13	E. Wilson	6	Do.	April 27, 1854	Do.	Three weeks & 2 days	....	Cured
14	S. A. Field	5	Do.	May 5, 1854	Do.	Three weeks & 5 days	....	Cured
15	G. W.	44	Tibia and fibula	Dec. 27, 1853	Ten hours	Six weeks	Two days	Cured
16	H. Robins	34	Do.	Dec. 25, 1853	Immediately	Three weeks	Two days	Cured
17	Bell	59	Do.	April 17, 1853	Do.	Six weeks	One week	Cured
18	G. Clarke	14	Do.	Aug. 13, 1854	Do.	One month	One day	Cured
19	T. Dale	17	Do.	Sep. 30, 1853	Do.	Three weeks	Do.	Cured
20	Mrs. S.	50	Do.	March 14, 1854	Do.	Six weeks	Two days	Cured
21	T. W.	41	Patella	March 30, 1854	Do.	Eight weeks	Do.	Cured, union ligamentous
22	J. W.	31	Fibula	Oct. 10, 1853	24 hours	Three weeks	Do.	Cured
23	Sherriff	30	External malleolus	Jan. 9, 1854	Immediately	Do.	One day	Cured
24	E. Pattison	—	Inner malleolus	Dec. 29, 1853	Do.	Do.	Two days	Cured
25	G. Hunt	35	Pott's fracture	....	Do.	Do.	Do.	Cured
26	B. P.	51	External malleolus	May 1, 1854	Do.	Two weeks	Do.	Cured
27	N. P.	56	Fibula	Aug. 4, 1853	Do.	Three weeks	Do.	Cured
28	Allsopp	45	Compound radius & ulna	Jan. 25, 1853	Do.	One month	None	Cured
29	T. D.	45	Olecranon	May 17, 1854	Do.	Three weeks	None	Cured
30	H. R.	25	Comp. of tibia and fibula	Jan. 7th, 1853	Two months	Three months	Two days	Cured, 19 pieces of bone came away

"It will be observed that, in the majority of cases, the treatment was commenced immediately after the receipt of injury, which may be called the time of election; neither inflammation nor swelling have supervened, and rarely, if ever, take place after the apparatus has been applied. When, however, several hours or even days have elapsed since the accident, and the limb, in the absence of treatment, shall have become swollen and inflamed, the application of the apparatus is usually followed by the subsidence of both these conditions.

"Confinement to bed is perhaps the most irksome condition required of the patient under treatment for fracture of a bone of the lower extremity, not to mention the impairment of health it induces. Reference to the above table proves that this may be limited to two or three days, excepting while the fracture is complicated with injury to other parts of the body; and even then the patient may, in most cases, be placed upon a couch during the day.

"The results are almost uniformly successful, the bones having united without shortening, and without deformity, in all the cases but three. Of these, one was a very severe compound fracture of the thigh, occurring to a man of weak constitution which terminated in amputation of the limb; another was fracture of the femur close to the trochanter, and accompanied with severe contusions of the whole side of the body, in which case a cure

was effected with half an inch of shortening; in the third and last, the injury, a compound fracture of the leg, had existed ten weeks before the apparatus was applied; and by this time necrosis of the bone had taken place, and the limb was greatly deformed: the modern method was only adopted, therefore, to save the limb; and in this it succeeded.

"In concluding these remarks, I may observe, that every case of fracture which required mechanical aid during the time I was Resident Surgeon at the Queen's Hospital, a period of one year and nine months, was treated by the modern method here recommended, and with equally good results."

The reports of cases II and III, tabulated in the preceding form, are so instructive that I gladly avail myself of my friend's permission to reprint them.

"Case II. This is a case of fracture, of a compound and comminuted character, occurring to a bricklayer, aged 53 years, named Tustin; he was brought to the Queen's Hospital on the 18th of April 1854. While at work a short time previously, a plate of iron, four feet square and quite an inch in thickness, which was placed in an upright position, fell and jambed his left leg against a wall; it was with difficulty that he could be extricated from his painful position. I found his trowsers cut through in two places, exposing a wound

an inch and a half long with lacerated edges, and muscle protruding, three inches above the outer malleolus; another wound of equal size on the inner side, situated rather lower down, communicated with a comminuted fracture of the tibia. There was much swelling, with contusion of the soft parts, and rapid oozing of blood from both wounds; the preternatural mobility at the seat of fracture left no doubt that the fibula was also broken. Dry lint was placed over the wounds, and also a pad of the same material along the shin; the apparatus was then applied as above described, but made to extend to midway up the thigh, and no cotton wool used. There was oozing of blood during the following night, and some starting of the limb, but the man complained only of numbness. On the next day, the bleeding which came from the wound on the inner side of the leg ceased. On the second day, forty-eight hours after the case was put on, it was found sufficiently dry to admit of being opened; this was done by cutting it up on the anterior surface, taking the fold of lint over the shin as a guide; one side of the limb was examined by drawing outwards one half of the case and using the other as a support, keeping it applied to the leg with the hands of an assistant; and the examination of the other side was similarly conducted. The fragments were found to be *in situ*, and the swelling of the soft parts much diminished; the edges of the wound on the fibular side were

adherent, but the wound in the tibial region was inflamed and suppurating. A piece of the case was cut out opposite the wound, to form a kind of trap-door to facilitate inspection and the application of dressings, without disturbing the rest of the limb; folds of lint were inserted between the case and the leg as seemed requisite to keep up pressure after subsidence of swelling; and the edges of the apparatus having been adjusted, a starched bandage was applied, leaving uncovered only the part where an opening for the wound had been made. The treatment of this man was henceforth simple; the wound on the tibial aspect of the extremity was dressed daily, and healed up in three weeks; he sat up in bed on the third day, and when about to go to sleep, always turned upon his left side. The only discomfort his leg gave him was that he could not flex the limb, as the case included the knee-joint; in two or three days, with my permission but without solicitation, he left his bed to go about on crutches. He was discharged from the hospital on the 2nd of June, forty-five days after the accident occurred; the fragments were firmly united, and without any displacement; he could bear his weight on the limb when the apparatus was on, which latter was cut down so as to allow movement of the knee-joint. A fortnight afterwards, the apparatus was removed, and an elastic stocking worn instead, to prevent that œdema which comes on after injuries of this kind.

"Case III. Fracture of the femur, oblique to the long axis of the bone, with unusually powerful contraction of the muscles giving rise to great displacement of the fragments, is the next case to which I wish to draw your attention, as illustrating the efficiency of this method of treatment in keeping up permanent extension by means of controlling muscular action. John Ady, aged 54 years, by trade a painter and glazier, was admitted into the Queen's Hospital on the 10th of January 1854; about an hour previously, he had fallen down in the road, which was frozen and slippery, and had sustained an oblique fracture of the right thigh-bone at the junction of its middle and upper thirds. I saw him before 9 A.M.: there was then much deformity of the thigh with considerable shortening. The want of able assistants and the urgency of other business induced me to apply the long splint, but I was unable to reduce the fracture then completely. Upon visiting him at 4 P.M., he complained of severe pain at the heel, instep, and perinæum, although I had used every precaution, by padding these parts, to protect them from undue pressure. I prepared to apply the starch apparatus in the usual manner: the materials having been got in readiness, I carefully removed the wooden splint, extension of the limb being at the same time steadily kept up by assistants. Finding this, however, inadequate for the reduction of the displacement of the broken ends of the bone, because

of the powerful action of the surrounding muscles, I had recourse to the following expedient; a strong piece of calico three-quarters of a yard wide and six yards long, was split at one end for half its length; the broad undivided portion was passed obliquely under the patient's back, from the right hip to the left shoulder, while of the two ends made by splitting the calico, one was brought forward over the right trochanter and ilium, the other to the inner side of the thigh against the perinæum, which was protected by a fold of lint, and both carried obliquely across the abdomen and chest to meet the one behind at the left side of the neck. where the three were fastened together, and attached by one common band to a convenient part of the bedstead; thus counter extension was fully provided for, and a covering obtained for the right buttock, which is desirable when applying the apparatus for a fracture of the thigh. Extension was made from the foot by attaching it to a pole six or eight feet long, held vertically, one end of the pole being fixed in a groove in the floor, the other used as a handle to make leverage with; and as the foot was fastened to the pole so as to raise it several inches from the bed, the required extension could be made and kept up without interfering with the application of the apparatus. Care being taken to keep the limb in a proper position, it was next bandaged from the cleft of the toes to above the ilium, and then after a coating of starch, the mill-

board splints, prepared as before described, were adjusted; two for the leg, reaching from the sole of the foot to above the knee; and four for the thigh, the posterior and external reaching from below the knee to the crista ilii, the anterior from above the patella to the fold of the groin, and the inner from below the knee to the perinæum; thus, it will be observed, the inner and outer thigh splints overlapped at the knee-joint the lateral leg splints; these were retained by careful bandaging and starch, great attention being paid to cover the hip-joint as much as possible. The counter-extension band was cut off where it appeared from beneath the apparatus, both before and behind, and the band for extension at the foot was served in the same manner. The limb being now examined, was found to be of the right length; and it was also seen that the apparatus completely controlled muscular action so as to prevent displacement or shortening from recurring; the only thing which remained to be done was to apply two or three thigh splints, made of wood, until the case was dry, to prevent the limb from bending; care also being taken to prevent eversion, by watching the position of the knee and foot, and obviating any tendency, by cushions or pillows.

"My notes state that for three or four hours after the apparatus had been applied, much pain was felt; and that he could not sleep at night because of the starting of the limb. On the following

day, he was quite easy, and remained so afterwards. The apparatus was cut open from the toes to the groin, forty-eight hours after it was put on, and the thigh inspected without disturbing the limb; a few pieces of folded lint were inserted where it seemed requisite for keeping up an uniform pressure; and, the edges of the case having been brought together, a bandage was put on from the foot to the groin, and, having been smeared over with starch, rendered the apparatus as complete as before. I should have remarked, that the limb in every respect looked well; there was little or no swelling; and its symmetry perfect. From the third day, he got up daily, and went about the ward on crutches. At the eighth week, the apparatus was removed from the leg, and retained only on the thigh; so that he might use the limb in walking. It was not, however, until the expiration of three months, that he was able to throw aside his crutches altogether. He recovered perfect use of the limb, without any shortening or other deformity: I examined this man six months after the accident occurred, and no traces of the injury could be then discovered: he had been engaged at his work for several weeks; and suffered not the least inconvenience. I have selected this case from amongst many others equally successful, as showing how perfectly this apparatus may be made to keep up permanent extension, when opposed by the most powerful muscular contraction."

To epitomise these two cases: in the first one, a fracture of both bones of the leg from direct violence, with two large wounds, contusion of soft parts, protrusion of lacerated muscle, much swelling, and rapid oozing of blood, the starched apparatus was immediately applied, opened and adjusted when dry, and the man walked about on crutches within the first week; the forty-fifth day he was discharged from hospital, practically cured. In the second of the just quoted cases, with oblique fracture of the femur in an adult man, great displacement and shortening, a fruitless trial was made of the long splint; after a few hours, the starched apparatus was substituted for it. After the third day the man got up daily, and perfect union occurred in due time, without shortening or deformity.

This is conservative surgery.

What other mode of treatment would have given such results? And those cases are not exceptional. Mr. Hunt tells us he has selected them from amongst many others equally successful. They accord with the experience recorded in my little treatise on this subject; and the works of Seutin Burggraeve, Croq, Velpeau, and Salvagnoli Marchetti, record numerous cases no less remarkable and demonstratively conclusive.

With the greatest reverence for the old academy of surgery, which expressed its disapprobation of systems,—a dislike commonly well founded,—it is nevertheless true that the aim of every scientific

inquirer should be *generalization;* undue haste of course to be avoided, correct observation and severe reasoning to be adhered to. This branch of surgery offers greater opportunity than almost any other for reconciling contradictions and establishing rules, which must tend to the simplification of practice and the saving of pain ; and commensurately to the glory of scientific research and philosophic experimentation. While the multitude of fractures to which the bones of the human skeleton (those of the limbs particularly) are liable, present great variety in detail, they have fundamental characters in common, both anatomically and clinically: loss of solid support to the soft parts, preternatural mobility and deformity, and liability of the fragments to injure the surrounding soft tissues: hence the uniformity of therapeutic indications;—to effect and maintain reduction of the fracture, to prevent the occurrence of complications, such as swelling and wound, and to remedy those of coeval origin with the fracture itself. These objects are all fulfilled by the immovable apparatus, which mechanically keeps the fragments in position without injuring the soft parts, paralyzes the action of the muscles, prevents the occurrence of swelling, lessens it when it exists, and allows of one or more wounds being dressed with facility, without disturbing the fracture.

Additionally the immovable apparatus has the very great advantage of allowing the patient to leave

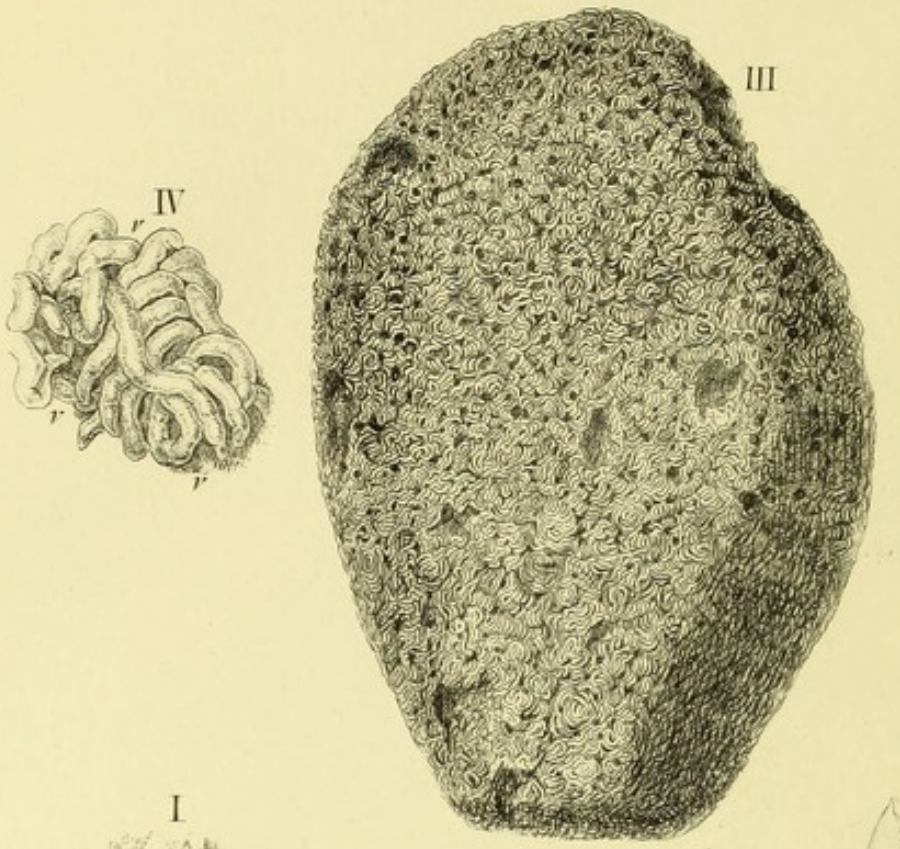
his bed, within a very few days after the accident, instead of being confined in it many weeks;—confinement always attended with great discomfort, occasionally with positive detriment to health.

It may be objected that I have begged the question of the advantages of this plan of treatment, by attributing to it precisely those merits which are called in question. But I have not predicated *à priori;* the cited experience is my warrant.

I am well aware, that not only has the starched apparatus been objected to theoretically, as tending to produce constriction and gangrene of a limb, but that cases have been adduced to prove the correct foundation for that objection. In the numerous difficult cases which I have treated myself and seen others treat by this method, I never saw one of the accidents in question; I do not believe their occurrence possible in the hands of a skilful surgeon, except as one of those extremely rare fortuitous occurrences which are apt to follow every operative procedure, and cannot be adduced as objections to a plan of treatment, provided a sufficiency of well established facts be adduced in its support.

The alleged insufficiency of the apparatus to maintain reduction, the condemnation of the principles on which it is constructed, particularly that of compression, were met by plain argument and eloquent facts in my former treatise; Mr. Hunt's experience now comes to my support, and I have

no hesitation in stating that by this method properly carried out, many limbs and lives may be saved, much pain alleviated, and deformity avoided. Operative methods must be compared on the twofold basis,—of the final results to which they lead,—and the pain they occasion or soothe during application. By this standard the palm must, I apprehend, eventually be awarded to the treatment of fractures by the method under consideration. I shall limit myself to concluding with the last paragraph of my treatise of 1853, simply remarking, that the experience accumulated since that date renders more weighty, on all who have opportunities, the duty of contributing to the solution of this interesting practical question. "That the system I advocate does possess real advantages in a large number of cases, can no longer be matter of doubt. Whether or not all my anticipations respecting it admit of realization, is a question well deserving further clinical observation for its solution."



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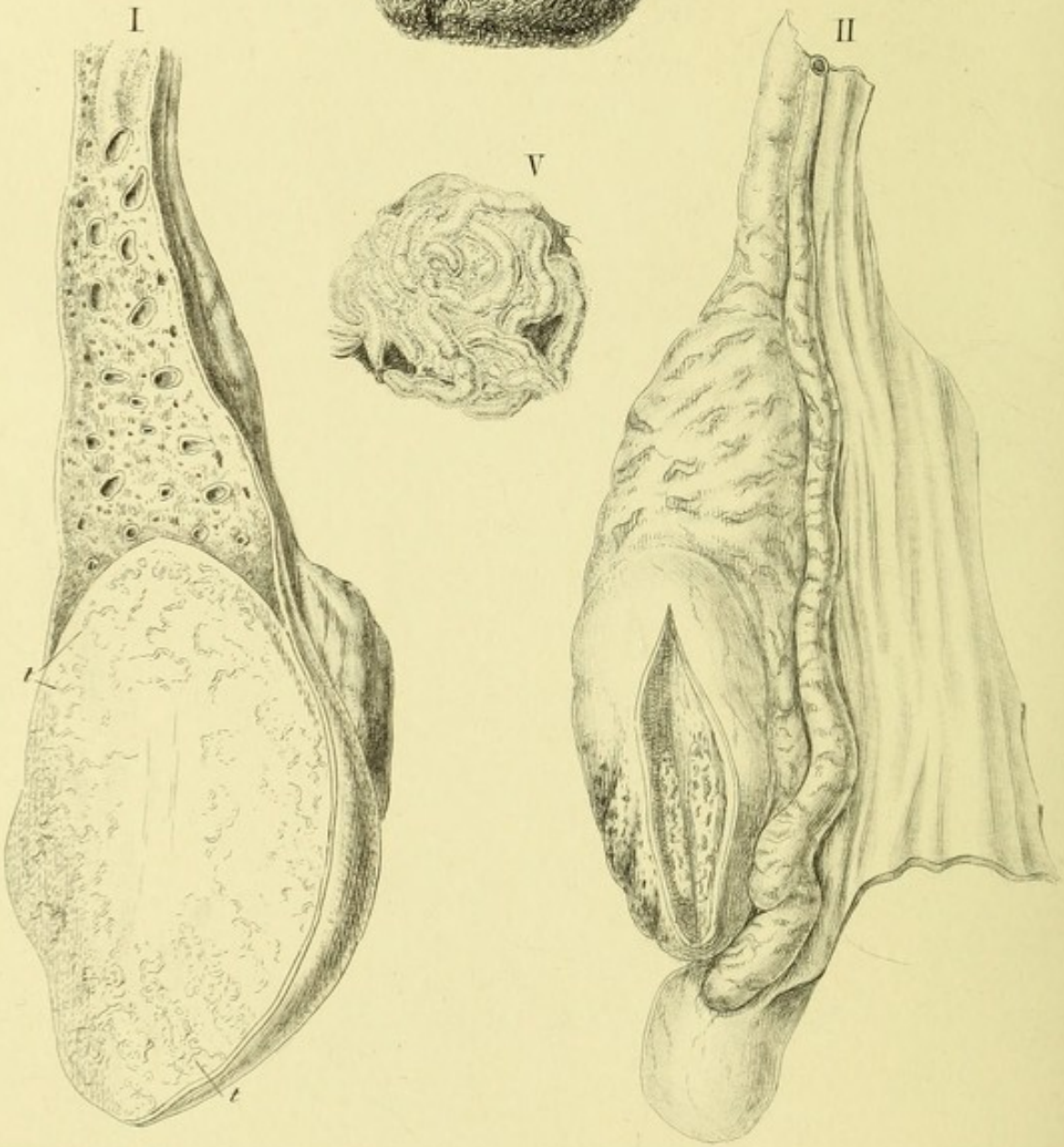

ON CALCIFICATION AND OSSIFICATION OF THE TESTICLE AND ITS APPENDAGES IN MAN AND ANIMALS;

AND INCIDENTALLY ON

THE DEVELOPMENT OF PORTIONS OF FŒTAL BONE, HAIR, AND TEETH, IN CONNEXION WITH THAT GLAND.

CONTENTS.

Seven years have almost elapsed since my attention was attracted to this subject, by the opportunity I enjoyed of examining a ram's testicle in a complete state of calcification; the diligent search which this remarkable pathological product led me to institute, brought three similar specimens under my notice, and I deemed the facts elicited in their joint study sufficiently important for publication;*

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* Veterinary Record, 1850, p. 241 et seq., with a coloured engraving.

the result proved that I had not overvalued them. On further inquiry I have met with other specimens of the same kind amongst animals, and a like result has attended the labours of my brother John.* Moreover, I have discovered analogous morbid conditions in the human testicle, and been further convinced, by search for information in point in the works of ancient and modern pathologists, that these morbid changes are considerably more frequent and present greater variety than is commonly supposed. The facts thus accumulated constitute the basis of the present memoir, which I shall further preface by brief extracts, to illustrate the amount and kind of knowledge possessed by previous writers on the subject.

In the third book of Felix Plater's Observations,† we read under head *Durities seu scirrhus in teste a calculo*, "Post mortem cum securetur calculus in eo fuit inventus quam asservo."

The following is an extract from the work entitled *Observationum Medicarum Rariorum*, Joannis Schenkii,‡ under the head, *Lapilli in testiculis geniti.*

"Tophi et in testiculo et in membrana erithroide

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* "Osservazioni sopra varj prodotti morbosi per servire alla storia dell' Anatomia Patologica comparata," a memoir read before the Medico-Chirurgical Society of Ferrara, by John Gamgee, 2nd June, 1854.

† Basileæ, 1641, p. 708.

‡ Libri VII. Lugduni, 1644. Vide Libro IV. De Testiculis, p. 511, Obs. VII.

occalescunt, renixu multo, duritie, et inæqualitate, a carnose ramice, et æquoso discreti. (Paulus Ægineta, lib. vi. p. 63.)

" Monspelii in cadaveris quibusdam dissectione testiculi lapellis pleni inventi sunt. (Gesnerus lib. de fossilib. cap. 11.)

" Lapillos in pulmonibus studiosi cujusdam, rotundos, albos, tophaceos, uti et in testibus sectione deprehend. (Cl. v. Felix Platerum in observ. suis.)

" Inter varia quæ de calculorum generatione scribuntur, etiam notandum videtur: quod cum anatomiam facerem, in sinistro testiculo, lapillum albicantem, et nonnihil gemmæ modo nitentem, lenticulæ fere figura, sed majorem esse generatum, invenerim. Quod cum clariss. D. D. Philipp. Mentzelius, collega meus observandum, tunc etiam præsens, vidisset: lapidem illum orchitem esse appellandum sciti dixit.

" Ubi et illum notandum, quod hoc in eodem corpora contigerit, in quo splen adeo magnus, fuit visus, id quo in splenis latere sinistro. (V. Cl. Cyriacus Lucius in observ. suis.)

" Anno Domini MDLXIX in dextro testiculo decollati cujusdam hominis, lapillum subalbidum, lentes magnitudine inveni; quem, ob rei raritatem, in hunc usque diem asservo. D. D. Johann. Knoblochius."

" Alii lapides," writes Nicholaus de Blegny,*

* Zodiaco Medico-Gallico, Annus Secundus. Genevæ, 1682, p. 122.

" item triangulares, pisi magnitudine inter testiculum et membranam ejus internam reperti."

" Riverius narrat," according to the text of Bonetus,* " de N. N. qui testiculos magnos admodum habebat à naturâ, ut multo intervallo reperarent magnitudinem testiculorum equi, ex quibus, ut reflet, postmodum deciderunt frusta lapides, quæ siliceam duritiam æmulabantur, et malleo contusa in multas partes dissiliebunt, ut cæteri lapides."

After alluding to a small stone found in the pineal gland, Stalpartius van der Wiel records,† " Alii lapilli etiam in vasis spermaticis visebantur."

In Morgagni's renowned pathological treasury I have met with two cases in point. The first one, that of a man aged 70, whose body was dissected, appears from the following account to have exhibited a varicose state of the cord, with partial ossific or calcific degeneration of the testicle: " Multiplices venæ, dilatatæ, et crassæ factæ totum undique testiculum amplectabuntur, cujus substantia ita erat compacta ut in canaliculos, quemadmodum alias proclive est facere; dissolvi non posset. Erat præterea infra testem corpusculum exiguum osseum. Hæc omnia vaginalis tunica compre-

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* Theophili Boneti, " Polyalthes, sive Thesaurus Medico-Practicus." Genevæ, 1694. Tomus secundus, p. 1152.

† Observationum Rariorum. Lugduni Batavorum, 1698, p. 53.

hendebat."* Of the testicle's condition in the second case (autopsy of an octogenarian), our author gives the appended description: "A dextris enim intra vaginalem tunicam, quæ non magis erat madida, quam secundum naturam, calculos deprehendimus duos, undique solutos, alterum majusculum, alterum minimum, utrumque durum. Sinistra autem vaginalis, inferior facta, nullum calculum, sed aquam continebat multam, colore lixivium referentem. Crassia quoque erat ex pars vasis semen deferentis, quæ intra aquam erat, ut etiam albuginea, quæ convestiebant epididymen, majori hic tractea ad testiculum arcte se annectentem, quam solet. Nec prope illius superiorem globum corpusculum deerat subrotundum, ex albuginea exstans, quale in hoc hydroceles genere invenire nos solitos esse, aliis literis scripsimus."†

The works of Dr. Matthew Baillie‡ contain interesting information in point. Under head *Loose Cartilages in the Tunica Vaginalis Testis*, we read: "Small cartilages are sometimes found loose in the cavity of the tunica vaginalis testis, similar to those met with in some of the joints, more especially the knee-joint. They do not, however, occur in the testicle so frequently as in joints. They must once

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* Jo. Bapt. Morgagni, "De Sedibus et Causis Morborum." Epist. vii, art. 11.

† Epist. lxiv, art. 7

‡ Edited by J. Wardrop, Esq. 2 vols. London, 1825, pp. 309-313.

have been attached to some part of the serous surface of the tunica vaginalis testis, by very small processes or peduncles, and by the motion of this tunic upon the testicle, they must have been separated. They afterwards continue to lie loose in the cavity of the tunica vaginalis testis, and are, I believe, attended with no inconvenience. An example of the kind has been seen by myself, and it has not unfrequently been observed by others." Under the title *the testicle bony*, Dr. Baillie states that " the testicle is sometimes converted into bone. A few instances only of this disease have fallen under my observation, and in them the bony process had not extended over the whole substance of the testicle, but had affected it partially.*"

In the *Observationes Anatomicæ Joannis Gottlieb Walteri*,† we find: " Nec testis nec penis virilis a concrementis terrestribus tuti sunt. In epididymo viri adulti concrementum terrestre figuræ et magnitudinis pisi deprehendi. Totius testiculum in viro 50 annorum dextrum in concrementum durum glutinoso-terreum mutatum operavi."

Christopher Conrad† taught that, " in scirrhous

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* It may be here remarked, that the envelope of the testicle, like other membranes, is occasionally ossified. I have seen the ossification both in the tunica vaginalis and in the albuginea. (Wardrop Ed.)

† Berolini, 1775, p. liii.

‡ Anatomia Patologica; traduzione dal Tedesco di Giovanni Pozzi, con aggiunte. 4to., parte 2ª. Milano, 1806, p. 120.—Sammlung für praktische Aerzte; t. v, pp. 525 and 526.

testicles, bones, cartilages, chalk matters, etc., have been found: that the testicle has been met with ossified, cartilaginous, and containing isolated pieces of bone."

The invaluable pathological repertory of Voigtel‡ is rich with information in point. We sometimes, he informs us, find little cartilaginous and even ossified bodies between the tunica vaginalis and the testicle, which are very similar to the little bodies occasionally met with in articular cavities. At first they are attached to the testicle or epididymis by thin bands, which appear gradually to grow finer, and eventually to be severed, so as to leave the little bodies loose in the vaginal sac.....Wagner describes a testicle which had become converted into a mass of cartilage; another, completely ossified; and a third, in which several pieces of bone were found. Voigtel further refers to cases of a similar kind in the writings of his predecessors and contemporaries.

In the Observations on the structure and diseases of the testis, published in 1830 by Sir Astley Cooper, are recorded a considerable number of interesting facts directly bearing upon the subject under consideration. Sir Astley was evidently acquainted with the earthy deposits which are occasionally met with on the visceral and parietal portion of the vaginal tunic. He refers the

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* Handbuch der Pathologischen Anatomie. Halle, 1805.—Dritter Band, p. 385 et seq.

earthy concretions sometimes formed in the globi of the epididymis to strumous inflammation; gives a very good description of the cartilaginous and ossific like bodies occasionally found loose in the vaginal sac, and compares their appearance and mode of formation to the loose bodies of joints. As already shown, Voigtel had made this comparison many years previously. Upon the calcific degenerations within the testicle itself, Sir Astley's observations are very scanty.*

"J'ai vu une fois," writes Andral,† "la portion de tunique vaginale recouvrant le testicule soulevée en un point de son étendue par une concrétion calculeuse, du volume d'une noisette, et qui n'intéressait en aucune façon la substance même du testicule, dont la séparait la tunique albuginée restée intacte."

"J'ai opéré par incision," says Vidal,‡ "un hydrocèle qui avait été vainement traité deux fois par l'injection. Le testicule était tout sablé comme le dessous des boîtes à allumettes chimiques dont on se sert aujourd'hui."

In Mr. Curling's monograph on the diseases of the testis,§ the contributions of the great surgeon

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* Op. cit., On the Ossific Inflammation of the Testicle, p. 111. —Of the Formation of Cartilaginous Bodies in the Tunica Vaginalis, p. 204.—Analysis of Ossific Matter from the Tunica Vaginalis, p. 245.

† Précis d'Anat. Path., tom. ii, 2e partie, p. 669.

‡ Traité de Path. Ext., t. v, p. 200.

§ Second edition, London, 1856, p. 336-343.

of Guy's are availed of, and the cretaceous masses of the epididymis are, with great probability of correctness, referred to cretefaction. Mr. Curling also alludes to the laminated calcareous matter sometimes met with in old cases of hydrocele—most probably owing to impregnation of lymph with earthy salts; he notes the small masses of bone which occasionally form in enchondromatous testicles, and he adds two cases, hereafter to be quoted.* Furthermore, his work contains brief chapters on *loose bodies in the tunica vaginalis*, and on *fœtal remains in the testicle and scrotum*, which are in advance of English surgical literature on the subjects to which they respectively refer.

There being, so far as I am aware, no connected exposition and systematisation of the facts relating to calcification and ossification of the testicle, I purpose dividing this memoir into two parts: 1stly. Documentary clinical evidence of the existence of these changes; 2ndly. An attempt to classify them according to pathological nature and seat.

1*stly*. *Documentary clinical evidence of the existence of calcification and ossification of the testicle and its appendanges.*

In the Descriptive Catalogue of the National

* I very much regret that my numerous occupations while engaged in the organisation of the medical staff of the British Italian Legion, prevented me writing this chapter from the materials I had on hand, for the second edition of Mr. Curling's work on the testes, in which he had generously promised me a place for it.

Museum of the Boston Society for Medical Improvement,* the following preparations are described.

Case I.† Prep. 687. A loose body from the cavity of the tunica vaginalis; it consists of a hard ossific mass, covered by a thin layer of cartilage, and is about the size of a pea. From a dissecting room subject. The testicle and serous membrane were healthy, except that from the last there hung off a slender mass of half-organised lymph, about a quarter of an inch in length.

Case II. 688. Several fragments of ossific matter from the testicle of an old negro, the organ being about three times its usual size.

Case III. 689. Ossific deposit, about an inch in length, in the substance of the testicle; organ otherwise healthy, although there is seen to have been an universal old adhesion of the tunica vaginalis. The testicle has been cut open. It was removed from a man who had had syphilis fifteen years before, had suffered from intense headache last ten years of life, and presented thickening of frontal bone, which was nearly half an inch thick and quite solid, the diploë being effaced; the bone was rough on the outside, corresponding to ulcerations which existed there, and still more so upon the inside, where the dura mater adhered.

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* Edited by J. B. S. Jackson, M.D. Boston, 1847. P. 217.

† The Roman numbers are intended to denote each case, as tending to constitute the basis of this memoir, and admitting of reference in its second or systematic part.

From Guy's Museum Catalogue, I extract the following:—

Case iv. 2363. Section of testis and epididymis; the latter is enlarged, and appears to have been the seat of an abscess or scrofulous deposit; its tunic is completely encased in bony deposit.

Case v. 2364. The corresponding section to the preceding, in turpentine.

Case vi. 2382. A particle of bony deposit from tunica vaginalis.

Case vii. 2383. Section of a bony deposit, forming a complete case to epididymis, in turpentine.

Case viii. 2351[25]. Testicles laid open, exhibiting ossific matters.

Case ix. 2351[37]. Earthy struma in testicles.

Case x. 2367[44]. Ossified vasa deferentia.

In the Catalogue of the Museum of John Heaviside, Esq., the following entries occur.

Case xi. 0.10. A stone found in the cellular substance of the spermatic cord of a man who died of strangulated hernia.

Case xii. 0.16. A testicle with a calculus formed in the epididymis.

Case xiii. 46. Ossification in the testis and spermatic cord.

In the Catalogue of the Museum and Library belonging to the Birmingham School of Medicine, 1832, p. 34, we read:—

Case xiv. A testis with calcareous matter in the epididymis.

Case XIV, Preparation 56, Series XXVIII, in Anatomical Museum of St. Bartholomew's Hospital, is thus described in its Catalogue.*

"Sections of a testicle, with the cavity of the tunica vaginalis obliterated by layers of false membrane, a third of an inch in thickness, and very tough and compact. At the posterior part, by the side of the epididymis, earthy matter has been deposited in the midst of the new tissue. The substance of the testicle is soft, but not otherwise diseased; it is of natural size, but the epididymis is enlarged and indurated. All the tissues around the tunica vaginalis appeared thickened, adherent, and hard; and, together with the thick layer of false membrane, gave the characters of a considerable enlargement of the testicle itself.

"The other testicle was similarly but less diseased."

The Museum of the Army Medical Department at Fort Pitt, Chatham, contains a series of highly interesting preparations, illustrating calcification of the tunica vaginalis, and particularly the mode of origin of the loose cartilaginous and ossific-like bodies which are sometimes met with in its cavity.

Case XV. 1910. Sac of a hydrocele, with a plate of ossific matter deposited in the tunica vaginalis, the interior of which is rough and irregular. This condition is no doubt due to calcification of the

* London, 1846, vol. i, p. 397.

lymph product of inflammation, as occurs not very rarely, sometimes to a very great extent, in pleural exudations. Preparation 1909 is evidently a minor degree of the foregoing. It is catalogued thus: tunica vaginalis thickened, and fibro-cartilaginous; the inner surface of the sac is rough and irregular from the effusion of lymph.

Case XVI. 1911. Partial ossification of the tunica albuginea testis and obliteration of the vaginal sac. From a man, æt. 98, in whom most of the arteries were ossified.

Case XVII. 1912. Portion of the tunica albuginea testis, with ossific matter deposited in it. From the same subject as Preparation 1911.

Case XVIII. 1919. A small pedunculated body of an ossific nature, attached to the vaginal tunic covering the globus minor. The pedicle is quite thready, and no doubt would have been severed before long, so as to leave the little body free in the serous cavity.

Case XIX. 1920. Two small bony concretions from the tunica vaginalis. These are evidently more advanced specimens of the change recorded just before (Case XVIII). A circumscribed deposition of lymph took place, became pedunculated, with time calcified, and finally fell loose. From 1913 to 1918, six Chatham preparations exhibit various pedunculated bodies hanging from the surface of the tunica vaginalis, and varying in consistence from flesh to cartilage.

Case xx. From Curling *On the Testis.* A soldier, about 70 years of age, whose left testicle was apparently converted into bone, and felt extremely firm and indurated, was an out-patient at the London Hospital, under Mr. Adams, for many weeks, on account of the organ becoming painful and inflamed. After some time it suppurated; and the pus, on being discharged, had the usual offensive smell of an abscess connected with dead bone. The earthy matter came away by degrees in small pieces, which amounted to nearly one hundred, and the patient ultimately recovered with an atrophied testicle.

Case xxi. Also from Curling. A man, aged 62, came under my care at the hospital on account of a painful swelling and fistulous sinus of the left testicle. He had been affected with acute orchitis twenty years previously, since which the organ had remained enlarged. Two similar attacks had since followed an injury of the part. The last occurred a few weeks before his admission, and ended in an abscess, which had burst, leaving an open sinus. Another abscess formed, which I punctured, and on passing a probe to the bottom of the sac, it struck against a hard substance like bone. Some weeks afterwards, I seized this body with the forceps, and endeavoured to detach it, but it was too firmly attached to come away. The part was not very sensitive, for the man himself endeavoured to remove the hard substance with the sharp end of

a common nail, but without success. The fistula continued to discharge thin pus for several weeks, and at length the man discontinued his attendance.

Case XXII. In relating a case of extraordinarily precocious development in a boy, 11 years of age, Fournier states:* "L'accroissement des testicules est excessif, et l'enfant ne peut marcher qu'en les relevant avec un suspensoir. Le testicule gauche a dix pouces une ligne de circonférence, il est environné d'une couche liquide qui n'empêche pas de distinguer un tissu ossifié; le droit est aussi gros, et parait cartilagineux dans la plupart des points de sa surface, et osseux dans les autres." It is to be regretted that no great value can be attached to this history, because the case was not followed up. Fournier relates it on the authority of Doctor Moreau, Bibliothécaire de l'Ecole de Médecine.

Case XXIII. Preparation No. 1486 of the anatomical Museum of George Langstaff, Esq., is thus catalogued.† "Testicle of a ram which had been converted into calcareous matter; the natural size and figure of this gland were not increased by the morbid change. The epididymis and spermatic cord were healthy. This, adds Mr. Langstaff, is the most remarkable specimen I ever saw."

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* Dictionnaire des Sciences Médicales. Paris, 1813. Article *Cas rares*.

† Catalogue of the Preparations of normal, abnormal, and morbid Structure, Human and Comparative, constituting the Anatomical Museum of George Langstaff. Lond., 1842, p. 375.

Case XXIV. 2429 *a*.* Two large portions of bone-like substance, of light and delicately filamentous texture, composed of granules of earthy matter imbedded in animal tissue, which were enclosed within a tumour connected with a testicle. They resemble portions of a light and fibrous looking osteoid tumour.

The following is part of the history sent with the specimen:

"W. W., aged seventy-two, applied on account of a prodigious swelling in the scrotum, which appeared to be one or both testicles in an enlarged and indurated state. The tumour had began about six or seven years before, and, as he thought, about the upper part of the testicle, and had gradually increased to its present size. It was of an incompressible hardness. Of the penis, the only appearance was a small concavity, like a navel, nearly in the middle and upper part of the tumour. The circumference of the tumour at its root, or neck, measured fifteen inches. The patient was obliged to keep it suspended with straps over his shoulders, and could not, without pain, bear it hanging down for any length of time. The other testicle could not be felt. The patient was stout for his age, and otherwise healthy, but had passed many nights without sleep before the operation of the removal

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* Catalogue of General Pathology, Museum of Royal College of Surgeons. London, vol. iv, p. 220.

of the diseased testicle was performed. . . . He was well in the course of three weeks.

"About two years afterwards he applied again on account of a tumour, about the size of a hen's egg, on the upper part of the cicatrix of the former wound. This also was removed, and healed; and he continued pretty well for two or three years, when he was seized with a violent cough, of which he died.

"On making an incision into the tumour, the scalpel struck on a hard body, about four inches long, two and a half broad, and about half an inch thick; which, when taken out and macerated in water, was evidently a deposition of bony substance. At the upper part of the lump one of the testicles was found in a flattened state, pale and flaccid, and bedded in the tumour.

"The appearance of the tumour throughout was exactly like that of scirrhus of the breast, when they are taken out before ulceration takes place. . . . The spermatic cord appeared pretty sound and free from knots."

Case XXV. 2435.* Portions of an osseous or earthy substance, said to be from a tumour in the tunica vaginalis. *From the Museum of Sir A. P. Cooper.*

Case XXVI. Prep. No. 587 of the Zootomic Museum, in the Royal Veterinary School of Berlin, is

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* Ut supra, p. 221.

thus described. "The testicle of a stallion, for the most part ossified.*

Case XXVII. The following passage occurs in the abstract of the proceedings of the Veterinary Medical Association, Session 1838-9.† "Mr. Bowles laid on the table a portion of the testicle of a horse, in which ossific matter had been deposited, and from which a considerable quantity of coarse long hair, similar to that on the mane or tail, had grown. The minutes of this case, as recorded by Mr. Bowles, late of Cambridge, stated, that on opening the scrotum, the hair was found attached to the testicle, the roots being imbedded in its substance, which on examination was ascertained to be partly ossified."

Case XXVIII. Tooth and hair structure in a horse's testicle.‡

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* Katalog von Gurlt in Magazin der Thierheilkunde, vol. iv, p. 213.

† These proceedings are bound up with the *Veterinarian* for the respective year. I now quote from p. 134.

‡ Gurlt's Magazin, vol. xvii, p. 99; and Wiener Vierteljahrschrift, 1851, p. 31.

Vallisnieri, in his *Opere Fisico Mediche*, fol., ed. in 3 vols., Venezia, 1733, at p. 127, vol. i, derisively alludes to a monster which, according to the narrative of Michiele Fehr, was discovered within the scrotum of a boy, in conjunction with several balls of hair; and in the same place he mentions in like tone the story spread in 1697 by Signor de Saint Donat, of a male fœtus discovered in the testicle of a gentleman. I grant that those cases are related in an exaggerated manner, but the great physicist forgot, that his plainly eloquent narrations

Case XXIX. Entitled *ossification of the testicles in a year old colt*, the following account is inserted in the *Veterinarian* for December 1855, by Mr. Andrew Cunningham, of Inverkeillor, N.B. "On the 17th April 1855, I was requested to go a considerable distance to see a valuable year old colt, of the farm breed, belonging to a gentleman, which was intended to be kept entire; but owing to an enlargement of one of the testicles having been observed to gradually take place, my opinion was asked concerning it. On examination of the part, I found both testicles increased in size to such an extent, that on standing behind the animal, the scrotum had the appearance of being as large as in a horse of four years old. Manipulation showed one of the testicles to be as hard as bone, and to have every indication of being adherent to the surrounding parts. The other felt quite loose, and not nearly so hard. I told the owner he would never do for an entire horse, and, as far as I was able to judge, both testicles were in a state of disease. On hearing this, he said that he would leave me to do as I thought proper; and at once I had the colt thrown for castration. On making an incision through the scrotum, I had to dissect completely around the testicle, to free it from its ad-

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of fact were exceptions to the scientific, and particularly to the pathological, jargon of his day. The facts recently ascertained render it extremely probable that the cases so severely handled by Vallisnieri were genuine, though overadorned in description.

hesion; which being done, the caustic clam was put on in the usual way. The other testicle I removed more easily, although it was far larger than is usually found in so young an animal. Two days after the operation, I removed the clams, and the colt continued well ever after. On cutting into the testicles after their removal, I found one of them to be nearly all composed of cartilaginous substance, and the other made up of bone, and so hard, that no scalpel could penetrate it. On removing its covering, all the rest of its substance seemed to be thoroughly ossified together, and in its present dry state it resembles nothing but a solid piece of bone as large as a hen's egg.

Case xxx. Calcification of the vasa deferentia testiculorum. The subject of this diseased condition was Louis Poirier, æt. 60, admitted into the Hôtel-Dieu of Paris, on the 3rd April, 1824, under Baron Dupuytren.* He died from sloughing of the integument of the scrotum and penis, the cause of which could not be ascertained. The vasa deferentia were remarkably thicker than usual, but were not peculiarly abnormal in their course to the inguinal canal. From this point they almost suddenly assumed an osseous calcified condition. This transformation affected them in the whole of their course to the prostate; here they resumed the ordinary structnre. This was the only case of the kind that had fallen under M. Dupuytren's notice.

* Leçons Orales, vol. iii, p. 272-273.

Case xxxi. The piece of bone, represented of natural size in fig. ii, iii, iv, p. vi, was met with in Professor Alessandrini's museum at Bologna by my brother John, to whom Signor Paolucci, of Bologna, communicated the following history respecting it. "Having been requested to castrate a rig horse, fourteen years old, belonging to the Pontifical chasseurs, on account of his awkwardness with mares, I removed the testicle by the common incision, and secured the cord with wooden clam. At first I observed nothing peculiar in the gland, and it even appeared healthy on first cutting into it, but towards the centre of the testicle the knife penetrated a cavity filled with what appeared to be melted fat; in this fluid substance I felt a bony substance, which was easily extracted because nowhere adherent. The little bone was of pyramidal shape, covered with membrane; one section presented an outer compact shell and an inner cancellous structure,—in fact, all the characters of true bone. The presence of this body could not be accounted for, the more so as the horse had never given signs of disease." I am disposed to believe that this bone was due to fœtal inclusion, like the next specimen; the reason for this opinion will be developed at a more advanced part of this memoir.

Case xxxii. In my clinical note books for 1853, the following passage occurs. "I have seen several small pieces of true bone, recently obtained from the human testicle, in the museum attached to the

Florence Hospital. For the following historical details, I am indebted to Dr. Palamidessi.

"An infant, in whom nothing peculiar was noticed at birth, became the subject of swelling of the right testicle about the eighth month. A surgeon pronounced the enlargement due to a collection of serous fluid in the vaginal tunic, and accordingly its size diminished somewhat by puncturing it. Still the testicle retained preternatural dimensions, and even grew larger. It had attained the size of a duck's egg when the child was about eighteen months old, and the parents consented to Professor Regnoli's advice to have it excised.

"On cutting into the gland, several small pieces of bone were discovered in it, their shape very irregular. To the naked eye, their true osseous structure appeared indubitable, and it was fully confirmed by microscopic examination.

"This is regarded by Dr. Palamidessi and others as a solitary instance of the formation of bone in the testicle as a diseased deposit; the main basis of their opinion is that nothing peculiar was noticed in the infant's scrotum until several months after birth. I am, however, disposed to regard this as another example of the inclusion of the products of the arrested development of a fœtus within the testicle.

"To the fact that nothing abnormal was noted in the scrotum until eight months after birth, much value cannot be attached; for very probably it was

only then, that the testicle descended. The rapidity with which the disease advanced (eighth to the eighteenth month), renders it extremely unlikely that several pieces of new bone of perfect structure were developed in that short period; such a supposition would be contrary to all we know of abnormal bone formations,—especially at such an early period of existence. Several cases are recorded, in which pieces of bone with hairs and teeth discovered in the testicle, were obviously due to the arrested development of a second ovum, included within a fœtus at an early period of intrauterine existence; and to this category I am disposed to refer the just quoted case.

Case XXXIII. In 1851, I examined in the Pathological Museum of the University of Pisa, the calcified cyst of a hydrocele of the human spermatic cord. The walls of the cyst, about one-eighth of an inch in thickness, were *bonâ fide* calcareous. The cyst itself was about the shape and size of a hen's egg.

Case XXXIV. Mr. Howship has described* as existing in his collection of specimens in pathological anatomy, "a small compact bony tumour, imbedded within the substance of an adventitious membrane, upon the surface of the testicle. The tumour, the size of a pea, has in its increase induced interstitial

* Practical Remarks on the Discrimination and Appearances of Surgical Disease, with an Appendix. By John Howship. London, 1840, p. 373.

absorption of the adjacent surface of the gland, into which it has sunk. The tunica vaginalis, partially separated by dissection, is otherwise seen closely adherent to the testicle."

Case xxxv. Dr. Giosuè Marcacci gives the following history of an individual, from whose testicle were removed a large number of calcareous fragments, preserved in the University of Pisa, where I examined them. "N., aged 75, became the subject of inflammation of the testicle, which suppurated, and through an opening of spontaneous formation discharged a large quantity of pus. The suppurative discharge was peculiarly fetid, and only ceased with the patient's existence, about six months after the commencement of the disease.

"The testicle was about three times its natural size. The external opening communicated with a cavity containing numerous little bony laminæ irregularly arranged, and bathed with dark-coloured and very fetid pus; the walls of the cavity were thick and hard, but the body of the testicle had not lost its normal structure." The latter part of this statement is certainly paradoxical; it is possible that a considerable portion of the gland was occupied by the cavity in question, and that the remainder was healthy.

I have examined the so-called bony laminæ, and find them to consist of about a drachm of calcareous material in irregularly shaped plates of vari-

able size; the largest are about one-third of an inch in breadth, the majority are not more than a couple of lines in thickness. One of their surfaces is smooth and shining, the other rough and irregular. It appears most probable that these little pieces have resulted from the fracture of a calcareous cyst, due to calcific impregnation of the plastic matter deposited on the walls of the abscess.

Case XXXVI. *Complete calcification of a ram's testicle.** The specimen weighed 14½ ounces, measuring 4½ inches in length, and 9 in circumference.

Mr. Tufnell, of the Birkbeck Laboratory, subjected a portion of the earthy substance to qualitative analysis, and kindly favoured me with the following result. "The principal constituents were, phosphate of lime combined with a small quantity of phosphate of magnesia; a little sulphate, and probably carbonate of lime; also some nitrogenized organic matter."

"Upon careful examination, the surface presented to the naked eye a multitude of small, yellowish white, crescent-shaped objects, closely packed and more distinctly visible in some parts than others. (Pl. IV, fig. III.) When examined with an inch lens, these shining crescent-shaped objects appeared to be the bendings of little hard cylindrical rods, emerging from the interior of the mass and there returning. (Fig. IV.) The suppo-

* This description is substantially the one I published in 1850, *loc. cit.*

sition that these little rods were the calcified tubes of the testicle was confirmed by examination of a portion of the surface, where pieces had been at various times accidentally broken off; here the little rods were seen to be very much twisted; many of them were broken across, while the bendings of others remained perfect. So closely did the appearance resemble the characteristic structure of the testicle, that when the specimen was shown to a distinguished anatomist (without any intimation as to its history), he at once suspected its true nature. Both in a transverse and longitudinal fracture, the interior of the tubes was found filled with a hard material, of whiter colour and less shining than the outer surface. The fragility of the substance having prevented the preparation of a section sufficiently thin to be seen with transmitted light, I examined the surface of a small piece sawn from the testicle in a transverse direction by the aid of a lens magnifying ten diameters. The tubes (fig. VI) were thus seen to be uniformly filled by earthy deposit of dead-white colour in the interior; somewhat darker at the margin. Their shape varied; some of them were perfectly circular, others oval or elliptical, and others much more elongated, and bent in the form of a crescent. This difference in shape doubtless depended upon the relative direction in which the tubes were divided; some being sawn directly across, others more obliquely, and a few lengthways. Many of

the tubes were in close apposition, while others were separated."*

Case XXXVII. *The testicle of a ram converted into calcareous matter.* Under this head the following entry occurs in the first volume of *Transactions* of the Pathological Society of London: "Weight, ten ounces and a half; length, five inches; circumference, eight and a half inches. The epididymis and spermatic cord were healthy. Exhibited by Mr. Crisp, 15th May, 1848." In 1850 I published (*mem. cit.*) the following account of this specimen, Dr. Crisp having afforded me full opportunity of examining it. "The calcified testicle is still invested by the dry and adherent portion of the tunica vaginalis, which is semi-transparent, having been dried and varnished. A small portion of the calcified surface left uncovered, is more nodulated than that of the specimen above recorded, and the convolutions of the tubes are less

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* In the article *Calcul*, Nouveau Dictionnaire Pratique de Méd., Chir. et Hyg. Vétérinaires, par Bouley et Reynal, M. Verheyen briefly alludes to the above case as one of *spermatic calculi*, a term inadequately expressing the pathological state. M. Verheyen adds: "Dans le catalogue du cabinet de Berlin, Gurlt mentionne en ces termes des calculs trouvés dans les glandes de Cowper d'un bélier âgé de huit ans: ce sont des calculs petits, sphériques, brillants, ayant une ressemblance parfaite avec les calculs urinaires; il est probable qu'ils ont pénétré accidentellement dans les conduits excréteurs des glandes, ou que de l'urine s'y est insinuée et leur a donné naissance."

distinct. The testicle being divided lengthways, is seen to be solid throughout, except in the centre, which is marked by a groove resembling in form the letter J, and measuring in length about one inch and a quarter, and one-sixth of an inch in breadth. The boundaries of this groove are compact, smooth, and glistening; it does not reach either extremity of the testicle. On the whole, the calcified material is less compact, and the specific gravity lighter, than in the testicle, case XXXVI of the present memoir. In the interior of Dr. Crisp's specimen, many of the hard and solid tubes are seen cut across, while the bendings of others remain perfect: the interior of the calcified tubes is whiter than the circumference, which, however, is not so dark and glistening as in the tubes of the last specimen described. A considerable amount of granular calcareous material is interspersed among the tubes. On the whole, the appearance of Dr. Crisp's specimen is not so much that of *bonâ fide* calcified testicle, as is that of case XXXVI, which may be considered the explanatory key.

CASE XXXVIII. In Dr. Carswell's collection of pathological drawings, in University College, is a drawing (from which fig. I, II, pl. IV, are taken), representing the process of calcification in the testicles of a goat, at a much earlier stage than the two cases just described. The following description is appended to Dr. Carswell's drawing.

"Fig. I represents the right testicle laid open

longitudinally. The bulk of the testicle appeared to be natural, as well as its colour and consistence. Scattered through it, however, were seen a great number of vessels of considerable size, filled with a straw-coloured substance, which made them so hard and stiff, that when the finger was passed over them, they felt like wires; they were most numerous at the inferior part of the organ, where they were coiled up into branches, resembling the spermatic organs of the worm. There was also a considerable number at the top of the testicle, and several could be seen scattered here and there in its body.

"Fig. II. The left testicle was greatly wasted; it was not more than a fourth of the bulk of the right, while the *vas deferens* and its branches appeared to have preserved their original size. The inferior half of the testicle was wrinkled, and felt hard, and, when cut, was found to be converted into a hard, earthy substance, of a straw-colour and granular structure. It adhered firmly to the substance of the testicle, which was firm and somewhat dry, and did not contain any of the vessels found in the other.

"The poor animal in whom this diseased state of the testicle was found, was confined in a state of solitude, in sight of his former female associates, with whom he had formerly been actively engaged in propagating his species."

Case XXXIX. *Deposition of calcareous matter in an*

early stage within the tubes of a bull's testicle. This specimen is preserved in the Museum of the Royal College of Surgeons, where Mr. Quekett afforded us opportunity of examining it last year. It corresponds to the condition described in Carswell's first case (fig. 1, pl. IV), the deposit in some of the tubes being still soft, whilst in others it has fully acquired calcareous hardness. While travelling in the Campagna di Roma some years since, I was informed by an individual accustomed to castrate bulls, that on one occasion he removed a testicle from one of these animals, which very closely resembled solid putty on being cut through. This was very probably a condition similar to the one under consideration,—calcification in an early stage.

Case XL. Labelled *ossified testicles*, a preparation exists in the Pathological Museum of Pisa. When I inspected it in the summer of 1850, I made the following note. "One of the testicles is about its average size, yellowish-white colour, and quite solid; the other gland has shrunk up, and in the centre of the dried tissue is visible a solid nucleus as large as a good sized pea. To each is attached a dried and varnished tunica vaginalis. The dried spermatic cords appear healthy. It is stated in the catalogue, on the authority of Professor Civinini, that these testicles were removed from a man eighty years of age." My impression at the time of making this note was, that the term

ossified had been improperly used, and that most probably the hardening of the two testicles depended upon calcareous impregnation of the seminal tubes, such as I had observed in the ram's testicles above described. But in 1853, Professor Filippo Pacini informed me that he had examined the microscopic structure of the old man's testicles, and found it to be in every respect bony, though the disposition of the histological elements was less regular than in normal osseous structure. This fact I verified myself later on examining a thin preparation of the same specimen in the possession of Dr. Magni.

This is, so far as I am aware, the only well-attested example of the conversion of the tissue of an organ into true bone. The not inconsiderable number of so-called ossified brains of oxen, the history of one of which I published in 1845, are nothing else but intra-cranial exostosis, which by pressure on the brain cause its absorption, and by growth within the cranial cavity acquire its shape. The specimen of this kind which is preserved in the Veterinary Museum of Milan, deceived the members of a large scientific congress—Tiedemann, amongst others— as to its nature; Professor Alessandrini always insisted it was nothing but an intra-cranial exostosis, an opinion confirmed by observation of other specimens in various stages of development.

Case xli. *Intra-cartilaginous ossification* in the

centre of a fibro-adipose tumour attached to the testicle of a horse. I here reprint, with insignificant verbal modifications, the account which I published of this specimen in 1850. The tumour occupied the posterior part of the testicle, and was invested by the tunica albuginea; its size about that of a small orange. On section, the bulk of it appeared made up of a mixture of fibrous tissue and fat,—appearance confirmed by the microscope. Two narrow crescent-shaped pieces of cartilage-looking tissue were seen in the middle of the cut surface, firmly adhering to the surrounding adipo-fibrous tissue; on grasping, with two fingers, the right half of the tumour, a hard mass was felt in its interior, and more particularly towards the outer surface, near the tunica albuginea, from which it was only separated by a small quantity of fibrous tissue: this being dissected off, a dirty white surface was exposed, which was of bony hardness in a considerable part of its extent, but at one part yielded to the knife. In this situation, a small piece of the apparently imperfect bone being removed, a cavity, capable of containing a large filbert, was exposed; its boundary was constituted by a thin layer of bone, resting on cartilage, and lined by a closely adherent white fibrous membrane. A thin perpendicular section of the cartilaginous-looking structure, with some of the adherent fibrous tissue, exhibited, under the microscope, true cartilage cells, disseminated in a

solid matrix. Those cells which were deeply seated, viz., at a distance from the free surface, were irregularly oval and spherical, and their outline indistinct, the nuclei having a well-defined margin, and being, for the most part, coarsely granular. On approaching the surface, which was in contact with the fibrous tissue, the cell walls were scarcely visible, and some of the nuclei presented an elliptical, others a fusiform and almost linear shape. In some parts the fibres could be seen extending, in a transverse direction, from the adjacent tissue for a short distance into the cartilage. A very large proportion of the fibres being rendered indistinct by acetic acid, the cartilage nuclei then came into view; but their shape was so altered (linear), that their real nature could only be inferred by tracing the gradual transition from the oval and spherical shape.

The intercorpuscular substance or matrix was, in some situations, homogeneous and transparent; in others, granular; and at wide intervals a few delicate fibres could be seen winding their course between the cells.

A transverse section of the bone exhibited, though somewhat imperfectly, the ordinary structure of osseous tissue. The Haversian canals were surrounded by lacunæ, which had a tendency to concentric arrangement, but were not so regularly disposed as in normal bone; and the canaliculi appeared as tortuous lines, branching out from the sides and extremities of the lacunæ.

With a view to ascertain if the bone owed its origin to the ordinary process of intra-cartilaginous ossification, a perpendicular section of the cartilage was made, including, at one extremity, a very small portion of the partially ossified structure. Under the microscope the walls of the cartilage corpuscles (fig. v) were observed to become very indistinct in proportion as the boundary of ossification was approached; they appeared, in fact, to have become confounded with the matrix, which had undergone a change from its original character; it was more opaque and coarsely granular than in specimens of the unaltered cartilage (fig. iv), and the tissue appeared mapped out into oval or irregularly-shaped figures, the boundaries of which were dark, while the interior was bright, and contained one or more nuclei, that were, for the most part, arranged in groups; were smaller, and more closely approached the circular form, than those at a greater distance from the seat of ossification. At the confines of the cartilage and bone the opaque earthy deposit was evidently encroaching upon the matrix of the cartilage, and surrounding the corpuscles; some of these were completely enclosed by an opaque material, arranged in concentric lines, within which the nucleus of the cartilage corpuscle was still visible. Some corpuscles, however, were not completely enclosed, but the earthy deposit was perceived advancing on each side of the cell, leaving it free at one part. In bringing a deeper and older portion

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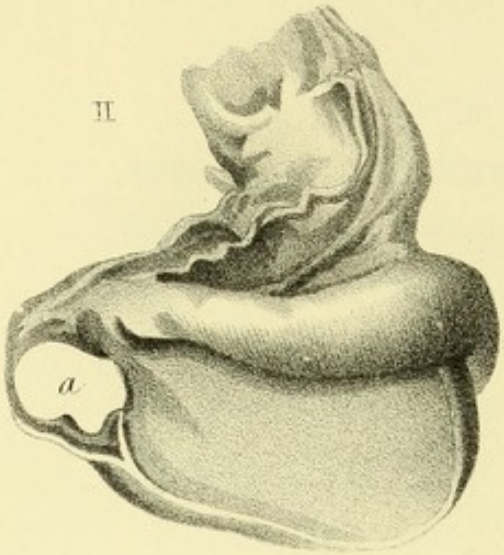

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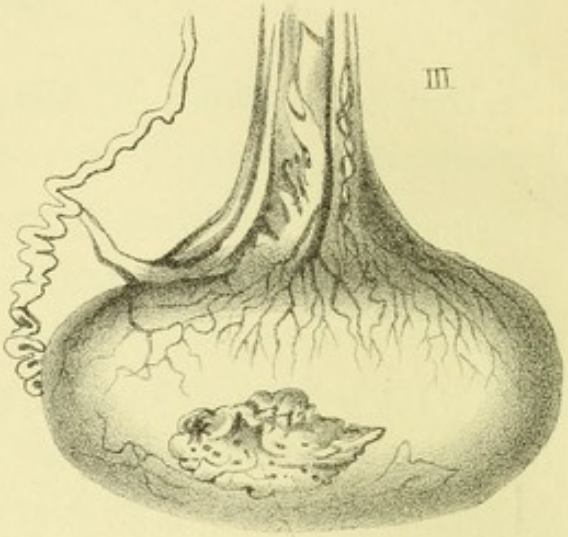

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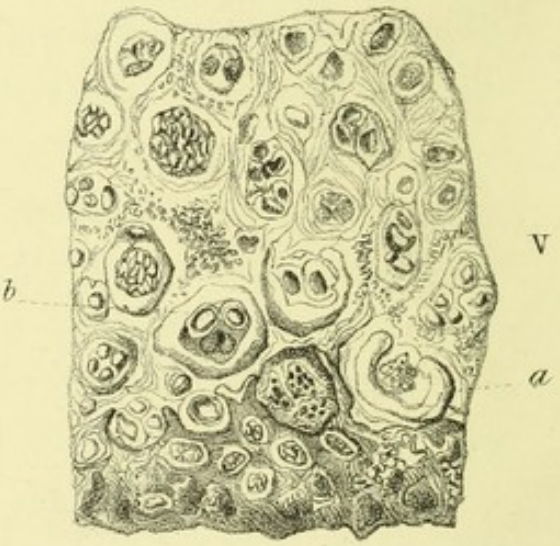

of the bone into view, little oval cavities with dark boundaries were observed; their appearance and arrangement were very similar to that of the lacunæ in the piece of bone already alluded to, but no canaliculi could be detected. The quantity of ossifying cartilage obtainable in a section being extremely small, and the transition being apparently very sudden in the structure of the osseous tissue, from mere cartilage, with earthy matter impregnating the matrix, to an imperfect appearance of Haversian canals and lacunæ, no sound inference could be deduced as to the mode of origin of the latter, or as to the mode of metamorphosis of the cartilage elements.*

Case XLII. Fig. I, pl. V, represents, of natural size, the calcified testicle of a horse, which had been retained in the abdominal cavity, and arrested in development. The little body was white, flat, smooth, and in every respect of chalky appearance. The cord attached to it was dried up but not calcified.

Case XLIII. Fig. I, pl. VI, represents a calcified testicle which had been retained in the abdomen of

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* Fig. XII, pl. VII, vol. i, Descriptive and Illustrated Catalogue of histological series of Royal College of Surgeons exhibits a vertical section of an enchondromatous tumour of the testicle, with cells containing a nucleus of bony matter." The figure resembles, but is less distinct than figure IV, pl. III of this work. I think it very probable that the histological process was alike in both cases.

a horse. My brother, who found the specimen in Romagna and took a drawing of it, has furnished the following description. "The epididymis is in great measure indurated, and the body of the testicle is destroyed, but a bony case remains, covered with dry tunica vaginalis. On one side is an opening, and in the interior are bony and membranous laminæ, intercepting and partially filling up the cavity. It appears that the seminiferous tubes have been mostly absorbed and some of them indurated, whilst the specimen is principally made up of the calcified fibrous structures, interstitially disposed and covering the testicle."*

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* While revising the proof of this sheet, Mr. Henry Lee has kindly sent me a specimen of bony looking matter which he removed from a man's testicle. It is in several fragments, the aggregate about the size of a bean; the little pieces are friable, and appear of calcareous nature. Mr. Lee gives me the following history of the case. "A man, above the middle age, of florid complexion, had long suffered from enlargement of the testicle, for which he had been subjected to a great variety of treatment. When I first saw him about two years ago, a sinus led into the testis and discharged a thin fluid. Upon introducing a probe into the sinus, a hard substance was immediately felt; a pair of fine forceps were then introduced through the same opening, and the accompanying calcareous matter without any difficulty extracted." It is quite possible that the hard substance owed its origin to cretefaction of tubercle, which we know occurs in small circumscribed masses in the testicle, and has a tendency to seek an outlet through fistulous aperture. Mr. Lee's case bears considerable resemblance to Mr. Curling's, No. XXI. of this memoir.

2ndly. An attempt to classify the processes of calcification and ossification of the testicle and its appendages, according to anatomico-pathological characters, with clinical and therapeutical considerations.

The facts adduced in the preceding parts of this memoir, place beyond doubt that the testicle and its appendages, both in man and animals, are subject to a process of calcific and ossific degeneration much more frequently than has hitherto been imagined, and it would appear considerably more frequently than other organs. On the basis of these facts, the following scheme is devised for the purpose of conveying a comprehensive idea of the pathological changes under consideration.

I. Spermatic Cord.

a. Calcification of the vasa deferentia.

b. *Ossification*, in connexion with the testicle.

c. Calcification of the walls of an encysted hydrocele of the cord.

d. Alleged formation of a stone in the cellular substance of the spermatic cord.

II. Tunica Vaginalis.

a. Calcification of pedunculated and loose bodies growing from the surface of the vaginal sac.

b. Fine sandy deposit on the surface of that membrane.

c. Formation of calcific patches and circumscribed masses.

d. Complete conversion of the vaginal tunic into a calcareous shell.

III. Testicle.

a. Calcification of the walls of abscesses formed in connexion with the testicle.

b. Calcareous bodies in the epididymis, the result of cretefaction of tubercle.

c. Deposition of calcareous material in the seminal tubes in various degrees, even to the extent of converting the entire testicle into a stone-like mass.

d. Ossific degeneration of one or both testicles.

e. Ossification of cartilage, developed within, or in immediate connexion with the testicle.

f. Osteoid of the testicle.

g. Development of bony and dental structure in the testicle, as the result of fœtal inclusion.

It is now proposed to consider the above changes separately, in the intent of illustrating them by the particular cases, and directing attention to any pathological interest they possess, both in its anatomical and therapeutical point of view.

I. Spermatic Cord.

a. Calcification of the vasa deferentia. Cases x and xx of the first part of this memoir illustrate this condition; the term *ossified*, used with reference to them in the Guy's Catalogue and in Baron Dupuytren's clinique, is almost certainly incorrect. From the fact that no mention is made of the testicles in either case, their healthy condition may be inferred. It is worthy of notice that in those cases of partial or complete calcification of the

body of the testicle which have come under my notice, the vas deferens was healthy. Clinically these two cases have no particular interest; Dupuytren's patient, it is true, died from sloughing of the penis and scrotum, but no connexion was established between this state and that of the vasa deferentia.

b. Ossification of the spermatic cord and testis is referred to in case XIII, but from complete lack of details no precise idea can be formed of the specimen.

c. Calcification of the walls of an encysted hydrocele of the cord, case XXXIII. This occurrence is, I apprehend, extremely rare; in case of its existence, the hard tumour could not of course be diagnosed whether solid or filled with serum, —a difficulty of no practical importance, as complete excision would be the only resource.

d. Case XI is so unsatisfactorily recorded in Mr. John Heaviside's catalogue, that we can form no idea of its nature, much less of the mode of formation of the stone alleged to have been found in the cellular substance of the spermatic cord.

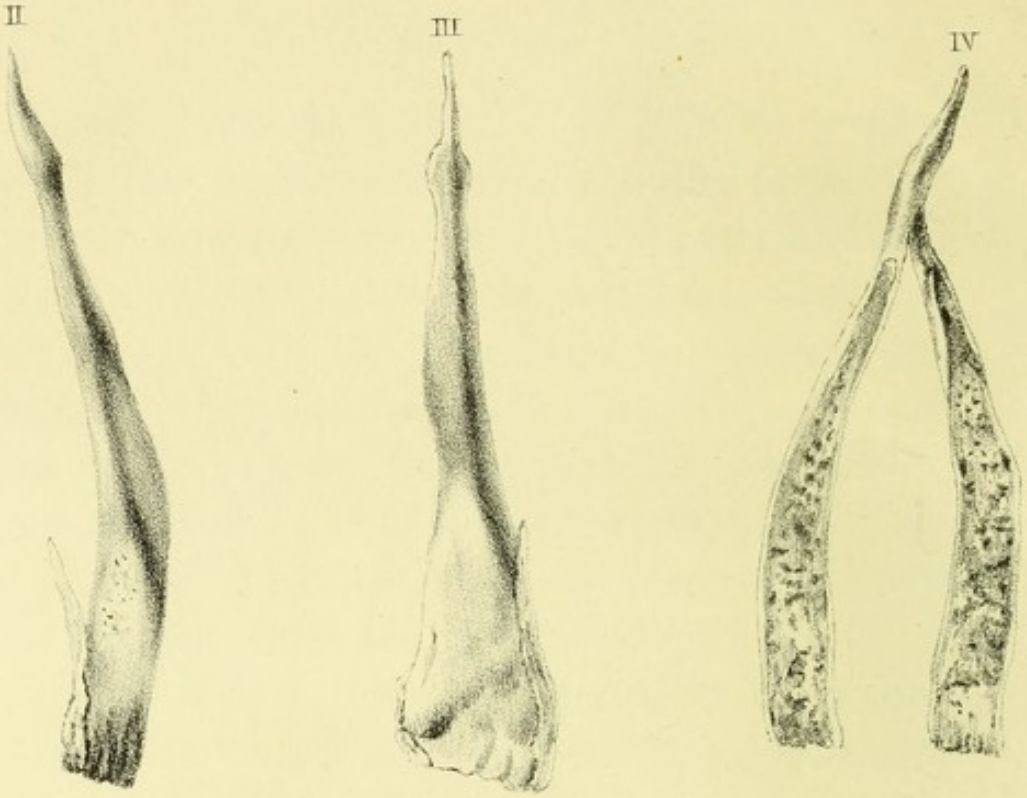
II. TUNICA VAGINALIS.

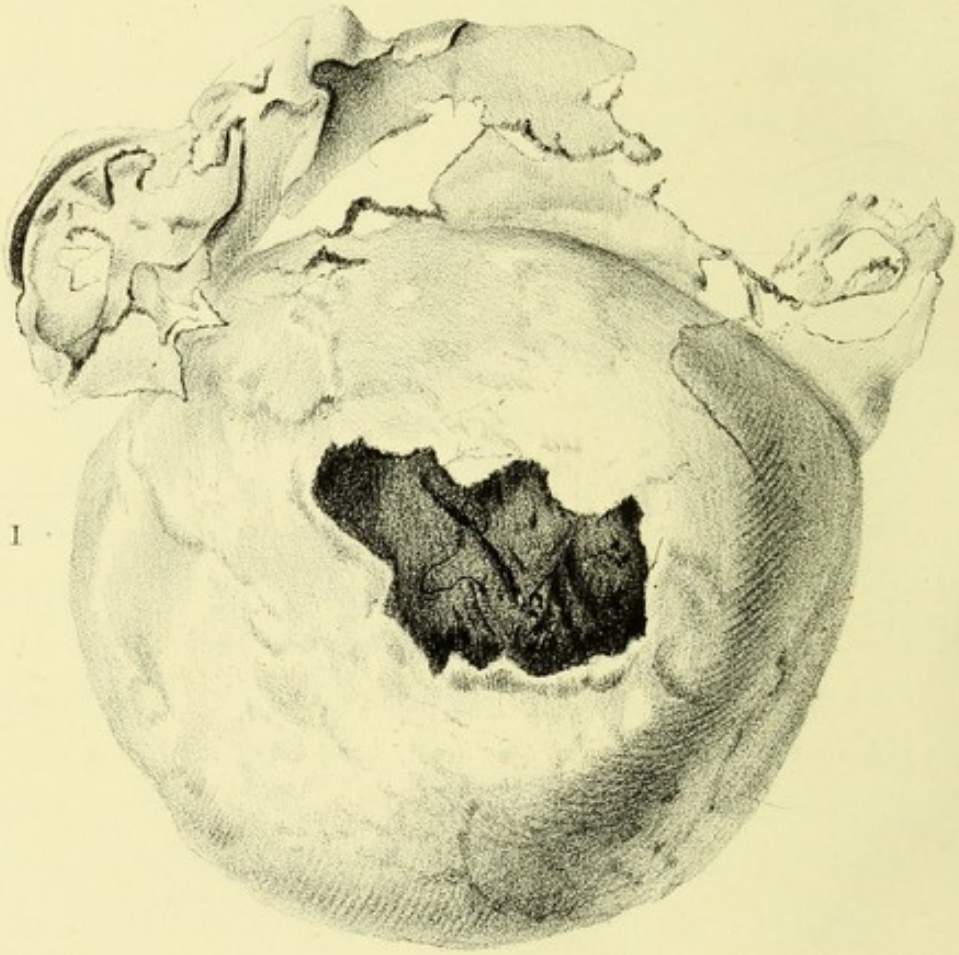
a. Loose bodies, as already observed in this memoir, are apt to form in the tunica vaginalis by the same process as in joints; lymph is deposited beneath the serous membrane, which is raised into a little tumour; as this projects, its bond of attachment becomes smaller, until at last even the fine

connecting pedicle is severed, and the body falls loose in the vaginal sac. These bodies appear invariably to grow from the visceral portion of the membrane; in process of development they are liable to a more or less complete calcification. Commonly they are single and small, and appear to give rise to no inconvenience beyond, occasionally, an extra secretion of fluid into the serous sac. One of these loose bodies, about the size of a hazel-nut, was excised from the vaginal sac by M. Chassaignac. This is the only instance to my knowledge in which the abnormal growths have necessitated operative procedure.

b. Fine sandy deposit on the surface of the tunica vaginalis. In Vidal's case of this kind (p. 178 of these researches), the case was one of old hydrocele, which it became necessary to treat by incision, in consequence of injection having twice failed. It would appear as if the fine sandy deposit and serous effusion were the result of old inflammation.

c. The tunica vaginalis, as often recorded in the first part of this memoir, is liable to be the seat of calcareous deposit in masses and circumscribed patches. Case XIV proves distinctly how such calcareous deposit may occur in the lymph product of inflammation of the vaginal tunic, just as it is liable to occur under similar circumstances in the pleura. The specimen, fig. III, pl. V, from the collection of Sir Astley Cooper, would appear to owe its origin to the above named process, though it is manifest that when the drawing was taken, all re-





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dundant lymph had been absorbed. In case XVI of this memoir (p. 183), it is impossible to assert definitely whether the partial ossification of the tunica albuginea testis owed its origin to the very advanced age of the subject (98 years), or to old standing inflammation. The latter would appear the most probable explanation, as the vaginal sac was obliterated. In these remarks I have been unable upon evidence to discard the term *ossification*, but I apprehend that it has been loosely employed, and that the pathological states in question simply owed their origin to impregnation with amorphous earthy salts. Fig. 1, pl. VI, exemplifies calcification of the investing tunic of the testicle.

III. TESTICLE.

a. Calcification of the walls of abscesses formed in connexion with the testicle. Cases XX, XXI, and XXXV, exemplify the formation of calcareous matter in connexion with suppurating cavities in the testicle. The ages of all these individuals were very advanced—62, 70, and 75 years respectively. In two of the cases, XX and XXXV, it is especially mentioned that the pus was very fetid; in the former, Mr. Curling records that the offensive smell resembled that of an abscess connected with dead bone; it is not possible to say whether the hard fragments removed were of really bony structure, I think it most probable they were simply calcareous. Those cases are too briefly recorded to warrant formation of judgment on the precise

nature of the pathological change. Having established the analogy between the vaginal and pleural membranes, in so far as regards the formation of calcareous patches in adhesive lymph deposited on their surfaces, I am disposed to believe that they also bear resemblance in the incrustation of their surfaces with earthy salts when pus is deposited within them. It is easy to understand how a calcareous patch, the result of adhesive inflammation, may, in the course of time acting like a foreign agent, set up inflammation and suppuration, and how a similar result may be produced by a mass of cretefied tubercle in the substance of the epididymis. These suppositions granted, it would follow that calcareous formations may exist in the testicle as causes and effects of suppurating cavities. More precise observations on these pathological states are a desideratum.

b. Calcareous bodies in the epididymis, the result of cretefaction of tubercle. The known fact, that in the testicle the epididymis is the seat of election of tubercular deposit, that cretefaction is the natural curative process of such pathological state, renders it very probable that the calcareous deposits, briefly mentioned in cases XII and XIV, as occurring in the epididymis, owe their origin to cretefaction of tuberculous matter. In case IV, the enlarged epididymis is said to have been the seat of an abscess or scrofulous deposit, the investing tunic of which was completely incased in bony deposit.

From its locality I am disposed to regard this also as a case of tuberculous deposit, with this difference from the above cases, that the tubercle found its way out by suppuration, as is usual in the testicle, leaving a suppurating cavity, the wall of which became encrusted with earthy matter, a condition resembling those dwelt upon in paragraph *a*, under the head *Testicle*.

c. Deposition of calcareous material in the seminal tubes in various degrees, even to the extent of converting the entire testicle into a stone-like mass. Cases XXXVI, XXXVII, XXXVIII, and XXXIX, of the present memoir, illustrate the process of deposition of calcareous matters within the seminiferous tubes, from the earliest to the most advanced stage, that of complete petrefaction of the gland. The change appears to have proceeded without any sign of acute disease, and without participation of the constituent elements of the spermatic cord. The animals from whom the specimens were obtained were all ruminants, viz., two rams, one he-goat, and a bull; herbivora, be it observed, being especially liable to abnormal depositions of calcareous and bony matter. The healthy condition of the tunica vaginalis in these cases, is further proof of the slowness and innocence of their development. I am acquainted with no examples of this morbid condition in carnivora.* Neither, to the

* Fig. 1, pl. v, exhibits a calcified atrophied horse's testicle, but there was no appearance of tubular structure.

best of my knowledge, have any such cases been met with in the human subject. It is easy, however, to understand that the seminal ducts of man may become calcified in consequence of cretefaction of the tubercular matter, of which they are occasionally the seat. (Curling, p. 282-3.)

d. True ossific degeneration of the testicle.—Case XXXIX is the only well authenticated example of this condition with which I am acquainted; the bony conversion appears referable to the very advanced age of the subject; it would be curious to know the morphological steps of such extraordinary osseous formations. Cases II, III, VIII, XIII, XXII, XXVI of this memoir also refer to ossification of the testicle, but they are regretably deficient in details wherefrom to infer their precise characters. Two of those cases, however, call for further remark. The subject of case III had suffered for several years from tertiary syphilis, and died with extensive analogous disease of the frontal bone; there was a universal old adhesion of the tunica vaginalis and an ossific deposit, about an inch in length, in the substance of the testicle. Fournier's case, No. XXII, is certainly very remarkable; but so unsatisfactorily recorded, as to possess no scientific interest beyond acting as a stimulus to further inquiry.

e. Ossification of cartilage developed within, or in immediate connexion with the testicle. It is a well-established fact, that cartilage may occur in

the testicle as a benignant formation or simple enchondroma, or as forming part or the whole of a diseased condition, having every resemblance in its clinical history to malignant affections. Ossification of such cartilaginous formations has, however, been but rarely noticed, though it is presumable that it would be a common occurrence if the tumour were allowed a sufficiently lengthy existence. Case XLI, described in this memoir, possesses histological interest on account of the microscopic examination (page 201, fig. iv, v, pl. v). Bearing on the subject of intra-cartilaginous ossification of the testicle, is case XXIX. Mr. Cunningham has recorded that, on cutting into the testicles of a yearling colt, he found one of them nearly all composed of cartilaginous substance, and the other so thoroughly ossified that no substance could penetrate it. It is matter of regret, that the histological examination of these remarkable specimens was not carried out to the fullest extent.

f. Osteoid of the testicle appears to have been the pathological state in case XXIV. The specimen preserved in the Hunterian Museum is certainly an extraordinary one; the malignant character of the disease is indicated by the recurrence of disease two years after its complete extirpation.

g. Development of bony and dental structure in the testicle as the result of fœtal inclusion. To this head I am disposed to refer cases XXVII, XXVIII, XXXI, and XXXII, of the present memoir, as most

closely according with what is known of the development of fœtal inclusions in the testicle and scrotum. Further observation must determine the soundness of this arrangement; interesting as they are however, these cases are not in themselves sufficient to enable me to add anything to Dr. Verneuil's original memoir " Sur l'Inclusion scrotale et testiculaire" (*Arch. Gén. de Méd.*, 1855-56), a memoir replete with important observations.

I shall conclude this memoir by observing that I regard rather it as instigation and help to future inquiry than as a positive addition to knowledge; the novelty of the subject and incompleteness of observations having obliged me to limit myself to facts and few reflections. The subjects of calcification and ossification are yet comparatively uncultivated, and promise a good return to the sedulous pathological inquirer.

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