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[William Sharpey].**

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A

PROBATIONARY ESSAY,
ON THE
PATHOLOGY AND TREATMENT
OF
FALSE JOINTS,

SUBMITTED,
BY AUTHORITY OF THE PRESIDENT AND HIS COUNCIL,
TO THE EXAMINATION OF THE
Royal College of Surgeons of Edinburgh,
WHEN CANDIDATE
FOR ADMISSION INTO THEIR BODY,
IN CONFORMITY TO THEIR REGULATIONS RESPECTING THE
ADMISSION OF ORDINARY FELLOWS.

BY
WILLIAM SHARPEY, M.D.

OCTOBER 1830.

EDINBURGH:
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MDCCCXXX.

PROBATIONARY ESSAY

PATHOLOGY AND TREATMENT

FALSE JOINT

BY WILLIAM SHARPE, M.D.

OF THE COLLEGE OF PHYSICIANS AND SURGEONS IN LONDON

AND OF THE HOSPITAL FOR CONSUMPTION

IN THE COLLEGE OF PHYSICIANS AND SURGEONS IN LONDON

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PATHOLOGY AND TREATMENT

TO


JAMES SYME, ESQ. SURGEON,

THIS ESSAY

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ON THE
PATHOLOGY AND TREATMENT
OF
FALSE JOINTS.

WHEN the fragments of a broken bone, instead of uniting by a hard unyielding substance or callus, continue after the usual period of consolidation to be capable of more or less motion, the fracture is said to be *ununited*, and the solution of continuity is denominated a *false* or *artificial joint*, (*Articulatio Spuria, Analoga, &c.*) The same terms are used also to denote those new joints which are sometimes formed in cases of unreduced dislocations, when the displaced bone becomes attached to the surrounding parts, in such a way as to admit of more or less extensive motion.

In the following pages, I purpose to enter briefly upon the consideration of the first variety of false joints, or those which are the result of fractures; and I have made choice of this subject, not so much

on account of its possessing great importance, but because it presents one or two points on which a difference of opinion still exists among surgeons of reputation. I am indeed aware, that to do justice to a topic of this sort would require extensive opportunities of examining preparations of the structures in question, and of instituting experiments on living animals, which advantages I cannot claim. It has, nevertheless, appeared to me not a useless task to give a brief but connected account of the most material facts that have been ascertained, and the leading opinions on this branch of surgery. With this view, I propose to consider, *first*, the condition of the fractured part when a false joint occurs; *secondly*, the circumstances which give rise to false joints in fractured limbs; and, *lastly*, to notice briefly the different means which have been employed for their cure.

I.—THE STATE OF THE FRACTURED PART WHEN A FALSE JOINT HAS BEEN FORMED.

In fractures in which bony union has not taken place, the broken ends of the bone are sometimes found without any connecting medium. This is often the case in fracture of the neck of the thigh-bone, within the capsular ligament of the hip-joint, and in fractures within other joints. But when a false joint is the consequence of a fracture that has not been confined to an articular cavity, the fractured ends of the bone

are usually united more or less closely together by means of soft parts, which are formed subsequently to the injury. Respecting the mode of this connexion, however, surgeons of eminence still entertain different opinions. Some believe that the ends of the bones are covered with smooth cartilage, and connected together by a capsular ligament and synovial membrane, as in a natural articulation, while others maintain that the bones are in every instance connected merely by a fibrous or ligamentous substance, without any trace of an articular cavity. There are others again who hold that sometimes the one and sometimes the other of these modes of connexion occurs, and this opinion, with some slight modification, will, I believe, be found most consistent with the facts on record.

Let us now, therefore, examine these two varieties of false joints more particularly.

1. *Union by a Fibrous substance.*—This, I believe, is by far the more frequent of the two. Boyer, whose opportunities of observation, it will readily be admitted, must have been very extensive, never saw any other; his words are: “Je n’ai jamais rien vu dans leur disposition qui pût être comparé à une articulation: ni ligament orbiculaire, ni surfaces lisses et cartilagineuses. J’ai toujours trouvé au contraire, dans les articulations contre nature du femur et de

l'humerus que j'ai eu occasion de disséquer, une substance fibreuse et comme ligamenteuse qui s'étendait d'un fragment à l'autre ; et il est très probable qu'il en est de même, à quelques modifications près, de tous les autres cas que je n'ai point vus."* Other surgical writers express themselves nearly to the same effect.

The connecting substance is variously described ; it is commonly said to resemble ligament ; sometimes it is described as being of a cartilaginous or ligamento-cartilaginous nature, with particles of bone imbedded in it. In the preparations which I have examined, it was of a fibrous texture, very like ligament, and consisted of numerous fasciculi of fibres or bands, which passed from one fragment of the bone to the other. The fibres proceeded not merely from the fractured surfaces, but from the parts of the bones in the vicinity of the fracture. In some instances these fibrous bands were deficient at various points of the surface of the bone, and vacancies or cavities were thus left in the interior of the ligamentous connexion, between its fasciculi, which were consequently separated to a greater or less distance from each other. When a vacancy of this sort exists to a considerable extent, while at the same time the ligamentous bands are united together so as to form a continuous membrane on the outside, the state of the parts may be said in some measure to form a

* *Traité des Maladies Chirurgicales*, Tome iii. p. 103.

transition between a simple fibrous union and the structure of a natural joint. I am much disposed to believe, that not a few of the cases of ununited fracture in which a structure resembling a natural articulation has been said to exist, have in reality been nothing more than instances of fibrous union, with hollow spaces of the kind just described. There is a preparation of a fractured thigh in the possession of my friend, Mr Syme, which affords a good illustration of this mode of union, and which, as it presents some remarkable peculiarities, I shall here describe. The fracture is situated about the middle of the thigh bone, it is directed from the inside obliquely downwards and outwards, so that the upper fragment is placed outside the lower. The fragments, which overlap each other to a great extent, are connected together by a soft substance for the space of about four inches, and at the upper and lower part of this space, a considerable quantity of callus has been deposited on the upper fragment, forming two protuberances on its surface. Between these protuberances the union consists simply of fibrous bands, somewhat shining and opalescent, which pass from one bone to the other. Opposite to the protuberances the union consists also of fibrous bands, but most of these are collected together so as to form a firm, dense, and close exterior membrane, with a cavity in the inside, which is traversed by separate fasciculi of fibres passing from

one fragment of the bone to the other. Comparatively little callus has been deposited on the lower fragment, but between it and each of the protuberances of the upper, there is a moveable portion of bone imbedded in the substance of the ligament. The surface of the bone in the two cavities is covered, except at the points of attachment of the traversing bands, with fibrous excrescences of various sizes and shapes; but there is no true cartilage, and no synovial membrane capable of being detached from any part of the surface. A case resembling this in several respects will be found in a memoir on false joints by a M. Kuhnholz, in the third volume of the *Journal Complementary des Sciences Medicales*, page 293.

The extremities of the bones are sometimes little altered; but more frequently their irregularities are smoothed off, and callus is deposited in greater or less quantity on the surfaces of the fracture and the adjacent parts of the bone.

The degree of mobility of a false joint of this sort must necessarily vary according to the nature and extent of the fracture. When a fracture is transverse, the mobility will be much greater than when it is oblique, because in the latter case the uniting medium will most likely occupy several points in the length of the bone, more or less distant from each other, which will tend greatly to limit angular motion.

It is probable that the bones become connected by a fibrous substance when a joint has been removed by excision, and the capability of motion is re-established. This was the mode of union in one instance at least which, through the kindness of Mr Syme, I had myself an opportunity of examining. In the case to which I allude, the heads of the bones composing the elbow-joint had been cut out, and the patient had recovered nearly the full use of her arm. In consequence, however, of the wrist becoming diseased, and requiring to be removed, Mr Syme thought it right to amputate the arm above the new joint, and an opportunity was thus afforded of inspecting the state of it about a year after excision had been performed. The ends of the bones were found to be connected together by a ligamentous substance, consisting of numerous bands, or bundles of fibres, which passed from the humerus to the ulna and radius. At one part, a little way below the joint, the surfaces of the radius and ulna were covered with a smooth fibrous coating, and here they had evidently played on each other in the motions of pronation and supination. A small process or spicula of bone had grown from the extremity of the ulna at the margin of the cut surface. *

2. *Connexion by a Capsular Ligament with*

* Mr Syme has given an engraving of the preparation in the *Edinburgh Medical Journal* for October 1830.

an Articular Cavity.—This mode of connexion is much less frequent than the former. Boyer, as has already been stated, never saw an instance of it, though he does not deny that it may exist. Other surgical writers go farther ; Delpech, in treating of this subject, expresses himself as follows : “ Du reste il n'est pas exacte de dire que ces articulations contre nature aient quelque chose d'analogue à la structure articulaire naturelle.” * But though this opinion, as we shall soon find, cannot be received without considerable qualification, it is certainly much nearer the truth than what we find stated in many books on surgery, viz. that false joints are provided with a capsular ligament, cartilages, and a synovial membrane, precisely resembling in these respects a natural diarthrodial articulation. In fact, on inquiring into the cases which have been supposed to afford a proof of the latter doctrine, it will be found, that in those at least in which the appearances have been described with any degree of precision, the alleged resemblance is very seldom borne out by the description. At the same time there can be no doubt that false joints are sometimes met with, which approach very nearly in structure to natural articulations. In these cases the surfaces of the fracture are usually adapted to each other by absorption, so that

* *Traité des Maladies réputées Chirurgicales*, Tom. i. page 208.

the prominences of the one bone are received into corresponding depressions of the other. The fractured surfaces are sometimes also described as being completely incrustated with cartilage ; more commonly, however, this covering is only partial, the cartilage being deposited in separate patches. At other times, and I am inclined to think most commonly, the coating is not cartilaginous, but consists of a fibrous substance resembling ligament. At the points where the bones are destitute of covering, they are frequently worn quite smooth, while their texture is rendered much denser than natural, so as in some degree to resemble enamel. The inner surface of the capsular ligament is commonly represented as smooth and glistening, and the cavity is for the most part filled with a glairy fluid like synovia, in which loose cartilaginous bodies have sometimes been found, of the same kind as those which are occasionally met with in synovial capsules in other situations.

I have not seen any preparation in which the structure approached nearer to that of a natural joint than the fractured thigh of which I have already endeavoured to give a description ; but cases are described in books in which the resemblance is much more complete. I shall adduce the following examples, which are related by writers of unexceptionable authority.

Cruveilhier, who, however, is one of those who believe that a capsular ligament constantly exists in

false joints, * describes the state of the parts in a non-consolidated fracture of the humerus in the following words : “ Un des bras étoit difforme ; je reconnus une fausse articulation à la reunion du cinquième supérieur de l’humerus avec les quatre cinquièmes inférieurs ; une capsule fibreuse très résistante unissoit les deux surfaces articulaires, planes, polies, couvertes d’une couche mince de cartilage, lubrifiées par un liquide onctueux ; ” “ le grand pectoral et le grand dorsal, près de leur insertion à l’humerus étoient convertis en un tissu dense, fibreux, très résistant.” † Mr Alanson, in the Medical Observations and Inquiries, ‡ refers to a case of fracture of the tibia which had not united, and in which, “ on dissecting the limb after amputation, there was no appearance of any interposed part. The extremities of the fracture were incrustated over with a truly cartilaginous substance ; hence a kind of articulation was formed which allowed of considerable motion.” Perhaps the best and most complete description of a false joint of the kind in question is that given by Sir Everard Home in the Transactions of a Society for the Improvement of Medical and Chirurgical Knowledge. § In the case related by him the fracture was of the os humeri, and had existed about four years. “ The arm was carefully dissected to examine the state of

* Essai sur l’Anatomie Pathologique, Tome i. p. 373.

† Op. Cit. p. 374.

‡ Vol. iv. p. 413.

§ Vol. i. p. 233.

the fractured parts, between which there was no cal-
 lus but a large bag filled with a glairy fluid, resemb-
 ling synovia. The internal surface of the bag was
 smooth, like a capsular ligament, and its attachment
 to the bones was of the same kind ; it adhered firm-
 ly to the surrounding parts, which were thickened
 and consolidated, rendering it very strong." After
 minutely describing the way in which the surfaces
 of the bones were adapted to each other by absorp-
 tion, Sir Everard proceeds : " The surfaces of the
 bones fitted for motion were not completely covered
 with cartilage, but studded over with it, and the bone
 was exposed in the interstices ; a number of project-
 ing parts, covered with cartilage, grew out from the
 surfaces, some exceedingly small, others large. From
 the edges of the bones and the capsular ligaments,
 these excrescences were larger, extremely irregular
 in their shape, broader in their attachments, softer
 in their texture, and serrated upon the external edge.
 Thirty or forty small substances, similar to those
 above-mentioned, were found loose in the cavity," &c.
 —" Their hardness varied considerably, some of them
 being as soft as cartilage, others so solid as not to be
 pierced by a needle. Those bodies must have been
 originally attached, and broken off by the friction of
 the parts on one another. The preternatural cavity
 which I have described was in its nature and use si-
 milar to the naturally formed joints of the body ;
 these excrescences and loose bodies were its princi-

pal peculiarities, the formation of which appears to have been the result of the violence committed on the parts previously to the formation of the joint."

Breschet, who made numerous experiments on dogs in his investigations respecting the reunion of fractures,* states, that of nine cases of false joints which occurred in the course of his experiments, there were six which presented an articular cavity inclosed by a ligamentous substance, which arose from the circumference of the fractured surfaces. In the other three there was no cavity; but a substance of a ligamentous nature stretched from one bone to the other. In the cases in which a cavity existed, he found it always to contain before the 27th day, a small quantity of a thick, ropy, viscid liquid resembling synovia. The parietes of the cavity were so much the smoother the longer the period that had elapsed from the date of the fracture. The substance which surrounded the cavity appeared red in its interior when the fracture was recent, but whitish on the outside, where it had the appearance of fibro-cartilage, and at some parts even of true cartilage. It was attached also to the deposits of bony matter, which had been effused round the extremities of the fragments; "whence it appears that its mode of connexion resembled in some measure that of the capsular ligaments of joints." He adds,

* *Recherches sur la Formation du Cal.* p. 35.

“ this comparison will appear still more appropriate, when it is considered that the surfaces of the fracture become at length of an opaque white, that they present in every part the smoothness and lubricity of synovial membranes, and are evidently incrustated with a cartilaginous substance similar to the cartilages of diarthrodial articulations. Eighty-five days after the date of a fracture are sufficient, in dogs, to bring about this condition of the parts.”

Cartilage, or at least a substance strongly resembling it, is said to have been reproduced in some experiments of Chaussier, in which he produced an artificial joint by cutting out the head of the femur in dogs, and displacing the bone from its natural situation.*

II.—OF THE CIRCUMSTANCES IN WHICH A FRACTURE IS USUALLY CONVERTED INTO A FALSE JOINT.

There are both constitutional and local causes of false joints. Many facts could be adduced to prove that some peculiar states of the constitution, which do not amount to disease, have an influence in retarding or preventing the union of fractured bones. Sir Everard Home's patient, whose case has already been partly detailed, was an example of this. Some time after the false joint had formed in his arm, this individual suffered a fracture of the thigh, which took an unusually long time to become consolidated;

* See an account of his experiments in the *Bulletin des Sciences*, par la Société Philomathique, An 8, p. 97.

yet there was no mark of disease, “nor any thing in the man’s general health to account for this backwardness in the parts to unite.” Ruysch and Van Swieten have observed facts of the same kind.*

Perhaps the most remarkable of those general conditions of the body which interrupt or retard the consolidation of fractures, is the state of pregnancy. It is true this can scarcely be said to give rise to false joints, since the want of union of the bones occasioned by it is not permanent ; at the same time it must be regarded as one of those general causes which tend to prevent the formation of bony callus ; and its peculiar influence in this respect requires to be noticed. Some have imagined that a fracture will never unite during pregnancy,—a doctrine which every practical surgeon knows to be erroneous ; but it is not the less true that pregnancy has a tendency to prevent union. Cases are recorded on the best authority, of fractures in pregnant women, in which the bones could not be united during the continuance of pregnancy, but which became consolidated within a moderate period after delivery. Two in-

* Sed præterea forte in quibusdam hominibus latet talis dispositio, per quam non ita facile ossa fracta consolidantur, licet cæteroquin nulla notabilis cacochoymia vel aliud vitium occurrat. Celeberrimus Ruyschius se tales casus vidisse asserit, licet omnia ex artis regulis ad curationem adhibita fuissent.”—“ Vidi mulierem cui humeri os fractum fuit, et postea tota vita in loco fracturæ flexile manebat brachium, neque tamen adeo multum incommodi inde sentiebat.” Van Swieten, Comm. in Boerh. Aphor. Vol. i. p. 572.

stances of this sort are given in the collection of Fabricius Hildanus,* and there are more modern authorities to the same effect. Mr Alanson relates a very instructive case in the Medical Observations and Inquiries.† The patient, a woman of twenty-two years of age, had fractured the leg in the second month of her pregnancy, and the bones did not unite till nine weeks after she was delivered of her child. Mr Alanson remarks, “ It did not appear probable that the want of union could be owing to constitution, as she had, only three months before impregnation, been very happily and speedily cured of a fractured femur by another surgeon ; and this appeared the more improbable, as she was a sober, temperate woman.” Mr Wilson, in his Lectures on the Bones,‡ mentions that he had met with two cases of fracture in pregnant women, in which no union took place till delivery.

Various chronic diseases, such as syphilis, cancer, and scurvy, have been said to prevent the union of fractures, and even to cause destruction of the callus in fractures already united. The influence of scurvy in this respect is particularly mentioned in the interesting account which is given of that disease, as it prevailed among the crew of Lord Anson's ship.§

* Cent. v. Obs. 87, vi. Obs. 68. † Vol. iv. p. 410.

‡ P 214. § See the Rev. Mr Walter's Account of the Voyage.

Insufficient or unwholesome food, impure water, and a noxious atmosphere, are also assigned as causes which prevent the union of fractures. Baron Larrey * ascribes the frequent occurrence of false joints, which he had observed in Syria, partly to causes of this kind, viz. unwholesome food and brackish water, and the injurious qualities of the atmosphere in that country, which was loaded with noxious exhalations from the marshy districts ; and though, as he himself admits, much must have been owing to circumstances more immediately affecting the fractured parts, yet the greater difficulty he experienced in bringing fractures to unite in that country than in other places, may be fairly attributed to the above-mentioned general causes.

Erysipelas, particularly when it attacks the fractured limb, often prevents the deposition of callus, or causes it to be absorbed when already formed. This fact, which is mentioned by various authors, is established on the most satisfactory evidence. The case of a sailor is related by Mr Wardrop, † where the bone was united and disunited three times before the recovery was complete, in consequence of repeated attacks of erysipelas. Continued fevers ‡ are said to have sometimes produced similar effects.

* Relation de l'Expedition de l'Armée d'Orient, p. 277.

† Medico-Chirurgical Transactions, Vol. v. p. 378

‡ Langenbeck, Von der Bildung widernatürlicher Gelenke nach Knochenbrüchen, in his Neue Bibliothek für die Chirurgie, &c. Vol. i. p. 90.

But whatever degree of influence we may be inclined to ascribe to general causes, there can be no doubt, that by far the greater proportion of false joints are the effect of circumstances which operate directly on the fractured bones. These causes, which we have next to consider, are chiefly two, viz. want of contact between the fragments, and disturbance of the repose necessary for their consolidation.

The powerful effect of want of contact of the bones in preventing their union by an osseous medium, is sufficiently proved both by cases which occur in the human subject, and by experiments on animals. It is well known that those fractures in which the bones, being retracted by the muscles, are not kept in contact, rarely or never unite by callus. This is the case with transverse fractures of the patella and olecranon ; and that the non-union depends on the want of contact, is proved by comparative experiments on animals, the results of which show, that, when the surfaces of the fragments remain in apposition, as in perpendicular fractures of the same bones, an osseous union takes place. When a portion is removed from the continuity of a bone, and the remaining parts are kept asunder, the interval is usually filled up by a ligamentous substance, very seldom by new bone. This is what happens when a piece is taken out of one of the bones of the fore-arm or leg, while the other remains entire. Yet when both bones are broken, so as to permit the parts to approach each other, large portions may be ex-

tracted, and bony union still take place. A case is related by Mr Smith, * in which nearly four inches of the tibia were removed by excision, the fibula remaining entire ; and, in consequence of the patient dying about six weeks after the operation, an opportunity was afforded of inspecting the parts, the state of which is thus described :—" The edges of the bone left by the saw were absorbed, and rounded at both extremities, and on the inferior portion a bony callosus was formed, about three-fourths of an inch in extent. No earthy matter was discoverable through the greater part of the space originally occupied by the diseased bone, but a tough ligamentous band extended from the superior to the inferior portion of the tibia." Sir A. Cooper † " sawed seven-eighths of an inch of the radius from a rabbit, and the ends of the bones were not united to each other, but only to the ulna." He also sawed off the extremity of the os calcis, and suffered it to be drawn up by the action of the gastrocnemius muscle, and it united only by ligament. Similar experiments were made by Scarpa, with the same result ; ‡ and cases of the same kind as that of which the history is given by Mr Smith, are related by various authors. §

* Medical Records and Researches, p. 55.

† Treatise on Fractures and Dislocations, 5th Edit. p. 116.

‡ De Anatomia et Pathologia Ossium Commentarii, p. 114, 115.

§ See in particular a case by Larrey with a figure, in the

Contact of the fragments, even by a single point, has a powerful influence in promoting union. The callus thus meets from the opposite surfaces, and collects round the point of contact ; whereas, though it may be effused in considerable quantity round the extremities of the fragments, yet, if these be removed even a small distance from each other, it may never produce consolidation.* It is known also, that more callus is deposited at the points where bones press against each other than at other parts,—a fact which, whatever may be its more immediate cause, is an instance of the admirable adaptation of means to the end, so conspicuous in the processes followed by nature in repairing injuries. Hence, by preventing the possibility of pressure, want of contact of the

Journal Complementary des Sciences Medicales, Vol. viii. p. 98.

* Scarpa believed that the intermediate fibrous substance is incapable of becoming ossified, because it is produced by the surrounding soft parts, while the ossific juice, as he terms it, is, in his opinion, furnished only by the ends of the bones. “ Sed quoniam hæc ossea massa novissime genita ad utrumque cylindrici male habiti ossis extremum non attingit, intervallum illud replet substantia quædam ligamentosa, aut ligamento similis, cujus origo est a lymphæ *plastica* secreta a molli textu celluloso, vigente circum exsecti aut attriti ossis sedem inflammationis adhæsivæ studio. Quod phenomenon præter cætera id genus documento est, a textu celluloso, a membranis generatim, nunquam succi plastici ossifici elaborationem, et secretionem esse attendendam, quæ functio omnino propria et peculiaris est osseæ texture.” l. c.

fractured bones must further tend materially to hinder them from uniting.

Frequent or undue motion of the fragments.—It is easily conceivable how the frequent motion of the fractured bones against each other should prevent them from becoming firmly united ; and I believe that, of all the causes of the non-union of fractures, this is perhaps the most common. A large proportion of false joints occur in the upper part of the humerus, which circumstance is probably in part owing to the greater difficulty of keeping the fragments steady in that situation. The constant motion of the ribs in respiration is said occasionally to prevent their reunion when they have been fractured. The same thing is in many cases owing to the patient trying to use his limb before the callus has acquired sufficient consistency. In a case of fractured thigh, of which the history is given by Mr Wardrop,* the non-union was evidently occasioned by the frequent disturbance to which the fragments were exposed, in consequence of a harassing diarrhœa, which came on during the usual period of consolidation ; and Boyer† informs us of a case that came under his observation, in which an artificial joint, then truly deserving the name, was made by a charlatan, who thought proper to move the bones every day, in order, as he said, to ascertain whether they had begun to unite. The

* Med. Chir. Trans. Vol. v. † Op. Cit. Vol. iii. p. 101.

effect of motion in preventing union is also illustrated by the means employed by surgeons to prevent ankylosis, in diseases of the joints, or when a joint has been removed by excision.

To the causes of non-union already mentioned, may be added the want of a due supply of nourishment to one of the fragments. The influence of this circumstance in preventing union of the neck of the thigh-bone, when broken within the capsular ligament of the hip-joint, is now generally admitted ; it has been treated of at great length, in the numerous discussions of which the union of that fracture has so long been the subject.

III.—OF THE TREATMENT OF FALSE JOINTS.

If the want of union is presumed to be owing to any of the general causes above-mentioned, the surgeon will of course employ such means as he judges best calculated to obviate them. When, however, a false joint has been once completely established, its cure will almost always require the use of means applied directly to the part itself. A perseverance in the use of such measures as are fitted to keep the fractured bones in apposition, has sometimes been successful, even in cases of long standing. In proof of this, Boyer adduces two cases which occurred in his own practice. One of them was a fracture of the thigh, which had remained

without union four months, and was considered so inveterate, that some surgeons had proposed to saw off the ends of the bones ; a proper apparatus, however, being applied, and its use persevered in for three months, a complete cure was at length brought about, without recourse being had to any operation.

The effect of pressure of the fragments against each other in promoting the deposition of callus has been already spoken of. Accordingly, by combining pressure with the means just mentioned, the chance of procuring bony union is greatly increased. Mr White of Manchester effected a cure in this way in a case of fractured thigh, and the practice has repeatedly proved successful in other hands ; in proof of which, I may refer, amongst others, to three cases related by Dr Inglis, in a valuable paper on the Treatment of Unnatural Articulations, in the first volume of the Edinburgh Medical and Surgical Journal. Pressure may be applied either while the patient is kept in a state of rest, or, when the fracture is of the lower extremity, by making him walk, and bear his weight on the broken ends of the bone, while they are kept in apposition by means of a proper bandage. Which ever way may be preferred, a suitable contrivance for securing the bones, and directing the pressure, will readily suggest itself to the practical surgeon.

A severer method of treatment, which has been

often recommended, is that of rubbing violently the ends of the bones against each other, by which it is intended, in the *first* place, to destroy any intermediate soft substance which may be thought an obstacle to union, and *secondly*, to excite inflammation in the parts, and dispose the bones to throw out callus. This practice was followed by the ancients, and a passage of Celsus, describing the manner of proceeding, is quoted in most systems of surgery. At the same time, the degree of violence requisite to attain the object in view must, in old fractures at least, be always attended with a risk of causing serious injury to the adjacent soft parts; and I am not aware of any case in which it has been practised with undoubted success.

When the above means prove unavailing, two other plans have been proposed for the cure of an artificial joint, viz. excision of the ends of the bones, and passing a seton through the fracture.

Excision of the ends of the bones, as a cure for ununited fractures, was first proposed by Mr White, of Manchester, and, at his recommendation, successfully put in practice in the year 1760, in a case of ununited fracture of the humerus, of which the history is published in the Philosophical Transactions. A method of proceeding very nearly resembling it, however, seems to have been occasionally followed by surgeons at an early period. This method consisted in cutting down on the ends of the bones and scraping

them, but it seems to have been an operation attended with very little success. Excision of the ends of the bones, admitting that it were always to prove an effectual remedy for a false joint, is an operation of considerable difficulty, and by no means exempt from danger, especially if performed on fractures of the thigh ; hence we find that it has been practised by few surgeons since the time of Mr White. Boyer gives a decidedly unfavourable opinion of it ; he performed it once himself ; but the patient died the sixth day after, and the operation has proved equally unsuccessful with other surgeons. On the other hand, besides some additional cases in which it succeeded with Mr White himself, it has been practised by several surgeons since his time with results which seem more or less satisfactory. In one case the operation was even performed on a false joint of the thigh ; but though it ultimately proved successful, it was attended with such difficulties that the operator, Mr Rowlands of Chester, hesitates in recommending it to be undertaken by others. Dr Inglis, in his paper already referred to, mentions two instances in which excision was successful ; one of these was a false joint in the fore-arm, a case in which Boyer even condemns the operation as impracticable. Langenbeck would seem to advise the operation of excision as a means of cure to be generally followed. He gives an account of a false joint in the humerus, for which he performed it successfully.

The bone, he says, was united in twenty-two days after the operation. *

The method of treatment by seton is unquestionably attended with less danger than that by excision. The operation consists in passing a seton through the limb, between the ends of the fragments, and thus exciting such a degree of inflammation as may bring about union of the fracture. It was first put in practice by Dr Physick, of Philadelphia, in the year 1802, though it appears that M. Percy, the eminent French military surgeon, employed it soon after without being aware that Dr Physick had anticipated him. In both these instances the operation was successful. In Mr Percy's case the fracture was of the thigh ; in Dr Physick's it was of the humerus, and had remained ununited more than a year and a-half. The seton was kept in four months before it produced any favourable change, after which time, however, consolidation proceeded rapidly, and in five months from the first introduction of the seton, the patient was completely cured.

There are at least two cases on record in which the seton has been successfully employed in this country ; one by Mr Brodie, the other by Mr Stansfield of Leeds. More instances, however, are to be found in which this mode of treatment has either totally or partially failed, and which sufficiently show that it has by no means

* See his paper above referred to.

realized the expectations which were formed of it on its being introduced into practice.

In conclusion, I may remark, what at first sight may indeed appear superfluous, that no severe operation should be undertaken for the cure of an artificial joint till the surgeon has carefully considered both the degree of usefulness of the limb in its actual condition, and the probability of bettering it by an operation. As I have already hinted, the usefulness of a limb in which there is a false joint, is very different in different cases. Though the solution of continuity of the bone must always make the limb more or less unsteady, it by no means follows that it should render it entirely useless. By means of the muscles we can fix immoveably a natural joint, and in some cases in which the mode of connexion of the bones is favourable, the same may be done with an artificial one. Boyer remarks, "*lorsque cette articulation a lieu au bras ou à l'avant bras, surtout vers leur partie inferieure, elle n'empêche pas absolument les mouvemens, et le membre est encore d'une grande utilité.*" In proof of this opinion he quotes a case from the *Nouvelles de la Republique des Lettres*, (Juillet 1685, p. 718.) In this instance the false joint was situated in the fore-arm. The ends of the bones were adapted to each other in such a way as permitted of a moderate degree of flexion, but greatly limited extension, nearly in the same manner as in the elbow-joint; and

we are informed that the false joint occasioned the individual very little inconvenience. I have heard of a nail-maker who had an ununited fracture of the humerus, and who was nevertheless able to follow his employment nearly as well as before he received the injury; and as an additional confirmation of what I have advanced, I may mention a remarkable fact, related by my friend Mr Marshall, deputy inspector of hospitals. * A man who had a disunited fracture of the fore-arm was actually passed as a recruit, after being made to go through all the evolutions usual on such an occasion, by a military surgeon of the greatest skill and experience in inspecting recruits, who did not discover the disability.

These considerations, as I said before, should make us cautious in undertaking a serious operation for the cure of a false joint, unless it occasions such inconvenience that the patient, on being informed of the chances of success by operation, is determined to run the risk of dangerous consequences with which it must often be attended. † Guy de Chauliac, in speaking of a certain philosopher who

* Hints to Medical Officers, &c. By Henry Marshall. Lond. 1828, p. 76.

† For some interesting matter relating to the fatal consequences which sometimes follow even trivial operations performed on persons in health, see the *Medico-Chirurgical Review* for September 1830.

was said to have died in consequence of an operation of this sort, says, he thinks the philosopher "would have displayed more philosophy in living quietly with his lame leg, than in having his callus scraped, and then dying in the greatest torture, merely because he could not make up his mind to live a cripple." *

* Boyer, Op. Cit. Tome iii. p. 107.

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