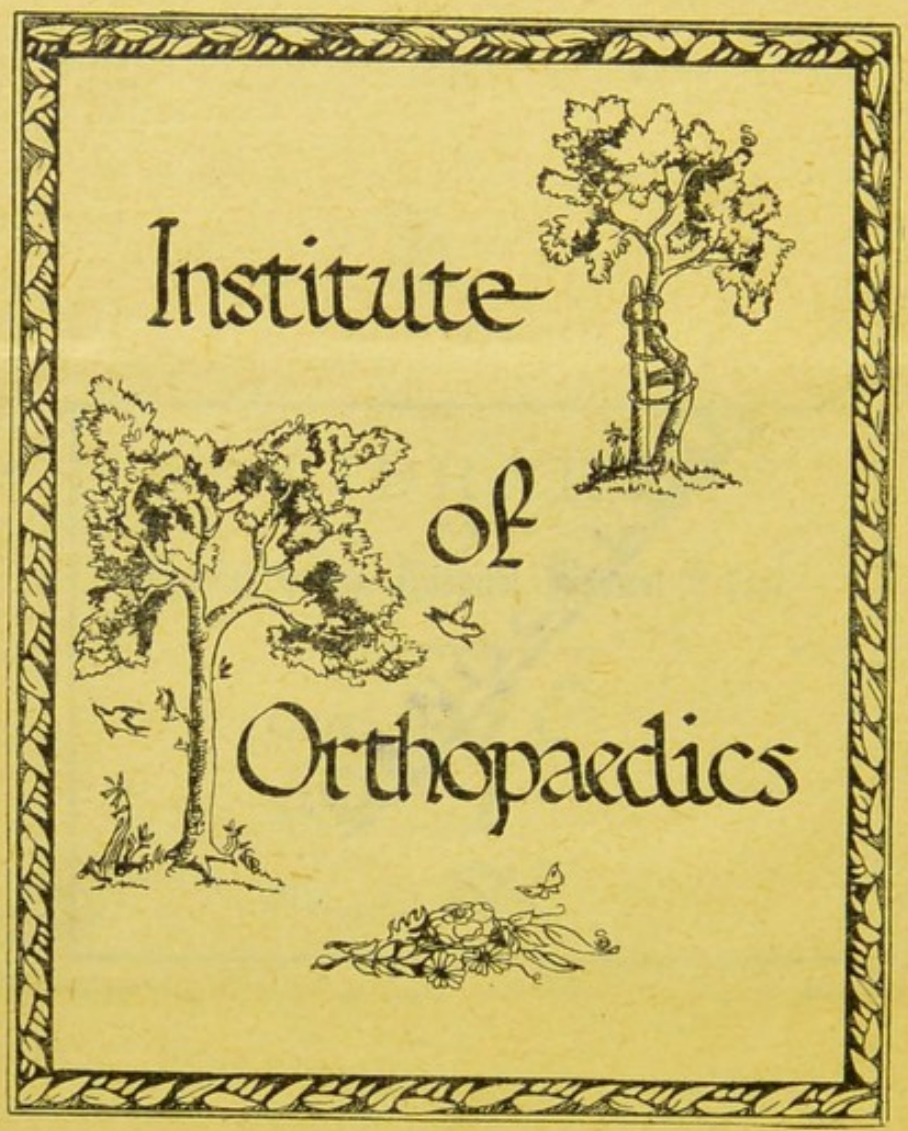
Practical observations on the diseases of the joints involving anchylosis : and on the treatment for the restoration of motion / by Bernard E. Brodhurst.



With the Authors Compliments

DISEASES OF THE JOINTS

INVOLVING

ANCHYLOSIS.

PRACTICAL OBSERVATIONS

ON THE

DISEASES OF THE JOINTS

INVOLVING

ANCHYLOSIS,

AND

ON THE TREATMENT FOR THE

RESTORATION OF MOTION,

BY

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TO

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THIS TREATISE IS DEDICATED,

IN TOKEN

OF AFFECTIONATE REGARD,

BY THE AUTHOR.

PREFACE.

My first observations on the diseases which are treated of in the following pages were recorded in the fortieth volume of the 'Medico-Chirurgical Transactions.' Further observations on the same subject were subsequently published in the 'Medical Times and Gazette.' And since that time, in the form of a separate treatise, they have passed through two editions.

In now offering this third edition to the public, I would ask for it as much favour as was shown to its predecessors. It has been re-written, and much new material has been added. The same views are inculcated as before, subsequent and greatly enlarged experience (embracing 114 cases) having confirmed my former statements.

Grosvenor Street, Grosvenor Square;
January, 1861.

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DISEASES OF THE JOINTS INVOLVING ANCHYLOSIS.

CHAPTER I.

PATHOLOGICAL OBSERVATIONS RELATIVE TO ANCHYLOSIS.

SECTION I.

Introductory Remarks—The Causes of True Anchylosis—The Causes of False Anchylosis.

ANCHYLOSIS* is that condition of a joint in which adhesions have formed, or new material has been deposited within or external to the synovial membrane, and through which motion is in part or wholly lost. This difference, namely, complete or partial loss of

* ἀγκύλωσις, incurvatio, from ἀγκύλος, uncus, curvus; whence is derived angulus; hence the English words, angle, angular. The etymology of this term, anchylosis, does not justify the sense in which it is at present employed. Formerly, it signified a contracted joint. Thus, Celsus says, "Contractos articulos, quas ἀγκύλας, Græci nominant." —Lib. v.

motion, has given rise to distinct terms, which imply more or less the conditions of the parts involved in the disease. Thus, anchylosis is said to be true or false: true anchylosis, or synostosis being bony union of the articular surfaces, the soft structures in the interior of the joint and the cartilaginous coverings of the extremities of the bones having been removed; while false anchylosis is occasioned by membranous or fibrous adhesions within or around a joint, and which interfere more or less with freedom of motion. Muscular contraction alone, resulting from fracture for instance, may occasion entire loss of motion. This is very rare, however, and quite exceptional; *vide* p. 26. Muscular contraction, impeding the motion of the joint, as it is ordinarily seen, and without adhesions, is not understood as anchylosis. True, complete, or bony anchylosis, or synostosis, then, signifies complete loss of motion in the affected joint; and false, partial, or fibrous anchylosis, implies that motion is impaired, but not wholly lost.

Further, anchylosis, whether true or false, may be straight or angular, and simple or compound, *i. e.* complicated with dislocation. This complication with partial or complete dislocation is not rare: it occurs especially after the formation of abscess. Some authors have included unreduced dislocations in their consi-

deration of compound anchylosis. This subject is, however, worthy of separate consideration; and, as it is but remotely allied to anchylosis, the result of disease, I shall reserve what I have to say with regard to it for another occasion.

Every articulation is capable of undergoing bony anchylosis. Some joints, however, are much more liable to this alteration than others; and, indeed, it may be looked upon as a natural change in certain parts of the skeleton in old age. Thus, it is not uncommon to find that, in advanced age, the ribs are firmly consolidated by osseous matter together with the vertebræ, and the vertebræ one to another; and, less frequently, the various bones of the carpus are found in the same manner united, as well as those of the tarsus; and, also, the sterno-clavicular, and some other articulations. This change may be considered as incident to old age; the diminished secretion of synovia probably giving rise to structural disease and removal of the articular cartilages, as has been suggested by Rokitansky. Also, anchylosis is observed in the aged, as the result of chronic rheumatism. And, wherever undue pressure has been long continued, as, for instance, in lateral curvature of the spine, deposits of bone (bridge-like formations and osteophytes), are formed at the margins of the bodies

of the vertebræ, and union of their surfaces takes place; in wry-neck, firm bony union may result between the atlas and the axis; and in club-foot (in advanced age), the same is occasionally, though rarely, observed between the various bones constituting the tarsus, and especially between the calcaneum, the cuboid and the fifth metatarsal bones. Whenever anchylosis takes place in the mixed form of articulations (amphiarthroses), it is bony union that occurs. In these articulations, the natural movements are so slight, that they would scarcely be diminished by false anchylosis.

In the moveable articulations (diarthroses), both forms of anchylosis—true and false, are observed; but, while true anchylosis is more frequently found in ginglymoid joints, it is much more rare in enarthrodial (ball and socket) articulations. Especially is it uncommon in the shoulder joint, and in that of the jaw. Any museum which contains one specimen of true simple anchylosis, of each of these ball and socket articulations, namely, the hip, the shoulder, and the jaw, may be considered to be well furnished in this particular. Of the great number of cases which I have examined, I have found only two instances of simple synostosis of the hip, and one of the shoulder. I have not met with one of the jaw. Dr. Little says, "I have witnessed, in the living subject, two

instances only of true anchylosis of the hip without luxation."*

Besides those causes already mentioned, there are many others which tend to produce anchylosis; such as inflammation of the structures within the joint, whether of a rheumatic, syphilitic, scrofulous or gouty character, traumatic inflammation, and that arising from sprains, contusions, or other mechanical injuries. Also, it may occur as a sequence of deep burns, of phlegmonous erysipelas, of gangrene, and of extensive ulceration. Fracture, also, into a joint or occurring in the immediate neighbourhood of a joint may determine complete loss of motion. Again, anchylosis is occasionally observed as a congenital affection. It is then, doubtless, the result of inflammation, equally as when it occurs after birth.

True anchylosis, or synostosis, then, may be induced by any of these causes.

Anchylosis of the moveable articulations is always the result of inflammation; consolidation—true anchylosis taking place or fibrous adhesions being formed.

The causes of false anchylosis are every variety of inflammation through which lymph is deposited within or external to the capsule, so as to form adhesions

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* 'On Ankylosis,' p. 36.

which shall interfere with the free motion of the joint. Adhesions within the capsule are termed "intra-capsular," and those which are formed external to the capsule are known as "extra-capsular."

Some forms of inflammation attack especially the structures external to the articulation, while others affect by preference those within the joint. Consequently, the character of the inflammation being known, it may be premised, with more or less certainty, what is the situation of the adhesions—whether they are intra- or extra-capsular.

In a large number of cases, the diagnosis may be made with sufficient accuracy, the form of the previous inflammation being considered, together with the alteration in the shape of the affected joint, and the character of the impediment itself. There are, however, numerous cases in which it is impossible to determine whether the adhesions are intra- or extra-capsular, until the patient is under the influence of chloroform, and force is being applied. Then, when they are being ruptured, it is not difficult to determine both the position and the extent of the adhesions.

Intra-capsular partial anchylosis results from synovitis,—acute, sub-acute, or chronic; whether of a rheumatic, syphilitic or strumous character; and

extra-capsular anchylosis depends rather on gonorrhœal rheumatism, phlegmonous erysipelas, strumous abscesses, and mechanical injuries. There are, however, numerous exceptions to this statement; but intra- or extra-capsular adhesions are usually formed as it is here stated. Extra-capsular adhesions, also, frequently exist together with those within the joint. When extra-capsular adhesions are alone referred to, it is to be understood that the synovial membrane is unaffected, and free from adhesions.

It is not my intention in this treatise to enter upon a detailed inquiry relative to the diseases of joints in their primary stages, but rather to limit my remarks to the results of such diseases, and to the treatment which is necessary for the removal of the impediments to free motion which have thus been produced. It will be necessary, however, to make some few preliminary observations.

Although no period of life is exempt from these affections of joints, the liability to suffer from their several varieties is not alike at all ages. Thus, we find, that childhood is especially obnoxious to strumous affections, but that primary synovial inflammations are comparatively rare at this period. And, in adults, inflammation of the synovial membranes may be said to constitute the rule, all other forms of inflam-

mation of joints being then comparatively rarely met with.

It will be understood that the commencement of disease is here referred to; for, as the synovial membrane may become implicated in disease which has had its origin in other textures, so inflammation, having commenced in the synovial membrane, may proceed to affect every portion of the articulation.

SECTION II.

INTRA-CAPSULAR PARTIAL ANCHYLOSIS.

Synovitis—acute, sub-acute, and chronic; rheumatic, syphilitic, and scrofulous.

Of intra-articular inflammations some are more prone to the formation of adhesions than are others—some are more or less limited, and terminate without involving or only partially involving adjacent structures, while others occasion thickening of the synovial membrane, softening of the ligaments, and displacement of the bones. I will, therefore, proceed to describe in detail the distinguishing points of these varieties of inflammation.

Synovitis is acute, sub-acute, or chronic in degree; it may arise from a local cause, as has been already

explained, and it may be modified, as frequently happens, by rheumatism, scrofula, and syphilis, according to diathesis. The inflammatory product is effused into the articulation, bands of lymph are formed between adjacent portions of synovial membrane which, becoming organised and contracting, act then, more or less, as impediments to motion.

These adhesions do not impede the motions of the joints in proportion to their extent, however, as might *à priori* be supposed; but, on the contrary, a very slender band may entirely prevent voluntary motion, while more extensive adhesions may permit of slight movements of the limb.

Acute synovitis commences with pain, which is soon followed by heat and swelling. The synovial membrane becomes congested, the natural secretion is poured out in excess, and distension of the capsule may become so great, that the sense of fluctuation, which was at first distinct, may be lost. Fluctuation will be distinguished most readily where the joint is the least covered; as, for instance, in the knee-joint, by the side of the extensor tendon and of the ligamentum patellæ, protruding, as it were, into the spaces between the tendons and ligaments. The membrane loses its glistening appearance, and it becomes thickened and softened. Now, flakes of fibrin are

found floating in the serous fluid, as well as adherent to the membrane itself; and these deposits, attaching adjacent portions of the synovial membrane, and becoming partially organised, constitute bands of adhesion.

Sub-acute synovitis is the most common form of inflammation of joints. It more rarely runs on to suppuration than the former variety, and it is less tedious in its course than chronic synovitis. Without prompt treatment it is apt to assume a chronic form. In this form of inflammation lymph is effused into the articulation, which becoming organised, constitutes membranous adhesions.

Chronic synovitis is very apt to occasion a form of anchylosis. The symptoms of this form of disease are equally well marked as those of acute synovitis, though they are less severe. The synovial secretion is poured out in increased quantity, and of a more aqueous quality than in health, causing great distension of the capsule and extension of the ligaments of the joint. This distension of the joint leaves, after re-absorption of the effused fluid, relaxation of the ligaments; so that the flexor muscles, as when the knee has been affected, may displace the articular extremity of the tibia backwards. These muscles are generally more powerful than the extensors, and for this reason they

overcome the action of the extensors in diseases of joints; and hence it is that a flexed position of the limb is that which is usually seen both during the continuance of disease, and after it has subsided. Again, the flexed position allows of the greatest distension of the joint, with the least amount of pain. The flexor tendons remain tense, their muscles being contracted.

Fibrinous deposit takes place within, and external to, the synovial membrane; and the membrane remains more or less thickened through interstitial deposit of lymph: the articulation is consequently found enlarged, and its motion becomes impaired.

No joint gives the surgeon more trouble than the knee when it becomes inflamed. It is less painful than the hip when inflamed, its capsule being less resisting; but, on account of its large and complicated synovial surface, it is more liable to inflammation than any other joint, and the effects of inflammation are very frequently disastrous.

Any of these forms of inflammation may be modified by rheumatism, syphilis or scrofula, which, affecting an articulation, then become local manifestations of a constitutional disorder.

Rheumatic synovitis is attended with pain of a severe character. Inflammation, commencing for the

most part in the structures external to the articulation, may rapidly involve the joint itself: effusion into the synovial sac takes place, and lymph is ultimately deposited on either or both surfaces of the synovial membrane. This form of inflammation not only usually commences external to the articulation, being confined to the ligamentous and other fibrous structures, but it does not generally invade the joint itself. The inflammatory product is poured out into the cellular tissue around the joint, giving rise to induration with thickening and consolidation of the soft structures into and about which it is effused. It is not uncommon to find that the cellular and fibrous tissues around the articulation alone have suffered from the inflammatory deposit, the synovial membrane remaining unaffected and clear, and the interior of the joint free from all effects of inflammation.

The knee more frequently suffers from this form of inflammation than any other joint, being more exposed to vicissitudes of temperature than any other large joint: it is less covered by muscle, and less protected artificially.

Rheumatic inflammation, when it assumes a chronic character, "chronic rheumatic arthritis," as it has been termed by Dr. Smith, of Dublin, may induce, by the

formation of ossific growths between and upon the articular surfaces, and by alteration in the shape of the articular surfaces themselves, more or less immobility. Slight increase of synovial secretion is followed in the later stages of the affection by exostotic growths, which, encroaching on the articulation, seriously impair its motion. As Dr. Robert Adams, of Dublin, has shewn in his valuable work,* true bony anchylosis is an exceedingly rare result of this disease; but articular rigidity, or false anchylosis, is not an unusual consequence.

Scrofulous synovitis is the result of a morbid condition of the system, occasioned by insufficient nourishment and exposure to cold, or by want of pure air and sunlight; or it is hereditary, or it results as a sequel of measles, smallpox, scarlet fever, or other exhausting malady. Such a condition of the system generally being developed, scrofulous synovitis may be set up by a kick or a sprain or a fall, or, apparently, without a local cause.

It is true, that, in children, scrofulous disease of the joints usually commences in the articular extremity of the bone, and thence invades the soft structures of the joint. Within the last year, however, I have seen

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* 'A Treatise on Rheumatic Gout,' 1857.

at least half-a-dozen cases, where, in scrofulous children, inflammation commenced in the synovial membrane. One of these is remarkable for the very early age at which the child was attacked, namely, when it was twenty-three months old. I am at present watching this case, together with Mr. De Berdt Hovell. In this instance, false anchylosis of the hip joint, without the formation of abscess, took place.

Scrofulous disease of the joints is a very common form of disease, and among children it is that affection which is usually met with. Morbid action commences, as has been said, in the cancellous structure of the articular extremity of the bone, and anchylosis may take place without the formation of abscess. Such a course, however, in this form of disease is rare. When the disease terminates without suppuration being established, motion may not unfrequently be restored; and even this has been known to take place when a portion of cartilage has been removed. Not uncommonly, the course of this affection is as follows:— Slight pain and swelling at first are experienced, which may or may not subside, leaving, however, more or less tenderness and weakness of the affected joint. At every attempt to use the limb, puffiness about the joint will be observed, and this, as well as the pain, will be sensibly increased by any unusual exertion.

Abscess will form and discharge itself; the ligaments will become softened and extended, and the limb will be flexed.

In this form of inflammation the synovial membrane becomes much altered in structure, being thickened and softened, with deposits of curdy lymph upon it. Displacement of the articular surfaces of the bones takes place, as has been already explained.

Syphilitic synovitis partakes of the characters of both of the former forms of inflammation—rheumatic and scrofulous—according to the period of development of the constitutioual disease itself. When it occurs in secondary syphilis, it assumes somewhat of a rheumatic character, the fibrous structures being at this period of the constitutional malady specially affected; while in tertiary syphilis inflammation assumes somewhat of a scrofulous character, the tendency of syphilis itself at this time being to resemble scrofula. This subject will be again alluded to.

SECTION III.

EXTRA-CAPSULAR PARTIAL ANCHYLOSIS.

Gonorrhœal Rheumatism—Syphilitic Synovitis—Strumous Abscess—Phlegmonous Erysipelas—Mechanical Injury.

Extra-articular anchylosis is the result of inflammation and the formation of adhesions external to the joint. It may be induced by gonorrhœal rheumatism, syphilitic synovitis, strumous abscesses, phlegmonous erysipelas, and mechanical injuries.

The fibrinous inflammatory exudation is deposited in the cellular tissue external to the joint, and becoming consolidated, it causes immobility of the parts around. And when it is poured out between muscles and tendons, it renders them immovable, and the articulation which they govern motionless.

Gonorrhœal Rheumatism. — Before I proceed to show what are the results of this form of inflammation, it will be well, perhaps, in some few words, to explain what is understood by the term. Sir Benjamin Brodie says—"I shall have occasion to notice hereafter some very remarkable cases of inflammation of the synovial membrane, preceded by purulent inflammation of the urethra and purulent oph-

thalmia, to which the name of gonorrhœal rheumatism is commonly applied; though it must be plain to any one who has watched their progress, that the relationship of the disease to rheumatism extends no further than a partial resemblance in the symptoms. There seems to be no doubt," adds Sir Benjamin, "that, while it occurs in most instances as a consequence of gonorrhœa, it may take place quite independently of gonorrhœal infection."*

The disease, then, is rheumatic synovitis of a peculiar character, which is preceded or accompanied by urethral inflammation or irritation. Such an affection will, doubtless, be recognised by every practical surgeon.

It is to be regretted that the term "gonorrhœal rheumatism" was ever used. This nomenclature was adopted in error; on the supposition, namely, that this affection of the joints was necessarily consequent on gonorrhœa virulenta.

It is true that this affection of the joints is usually preceded by gonorrhœa, but it is not absolutely necessary that the disease should be preceded or accompanied by urethral discharge. Sir Benjamin Brodie has shown that the use of the bougie may induce "gonorrhœal rheumatism." I will narrate a case,

* 'Pathological and Surgical Observations on the Diseases of the Joints,' pp. 28 and 43. Ed. 5, 1850.

the worst of its kind that I have seen, where the fourth attack of inflammation was not preceded by purulent discharge.

Usually, however, the course of the disease is as is stated above, namely, that urethral discharge precedes inflammation of the synovial membrane. And not only is it usual that there should be urethral discharge, but this is generally of a specific character. However, it is clear that this rheumatic affection of the joints may follow any form of urethral discharge.

"Gonorrhœal rheumatism" never occurs for the first time without urethral discharge, and this is generally of a specific character; but a second attack may occur without urethral discharge.

Such being the circumstances of the case, the term "gonorrhœal rheumatism" is incorrect, and leads to erroneous conclusions. I would therefore substitute for it the term "urethral rheumatism,"* as has been proposed by Dr. Elliotson.†

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* I may here mention, that there are some statements in Dr. Elliotson's communication with which I cannot entirely agree. I think, however, that the term "urethral rheumatism" presents more advantages than one over the term "gonorrhœal rheumatism." With one exception, however, the specific character of the urethral discharge has been acknowledged in every instance of "gonorrhœal rheumatism" that I have seen.

† *Vide* 'The Medical Times and Gazette,' June 30th, 1860, p. 642.

The pain attending this form of inflammation is of a most acute character, and the effusion about the joint is often very considerable; so much so, indeed, that great distension of the integument is frequently induced. Suppuration, however, never takes place. The fibrinous material is poured out into the cellular tissue around the joint, and, consolidating, fixes the articulation. Motion is impaired in proportion to the intensity of the inflammation, and the consequent deposit of lymph: it may be entirely obstructed, the limb perhaps being anchylosed in an extended position. I have seen a considerable number of anchylosed hip-joints from this form of disease; and in every instance, the limb has been perfectly extended. In two or three instances, there has not been appreciable motion, even under the influence of chloroform. In others, the smallest amount of motion—just appreciable motion—has remained. I have never seen a case where the hip was anchylosed, from this form of inflammation, in a flexed position—the position which is almost always assumed in other forms of inflammation of this articulation.

In other joints, a flexed position is that which is most commonly met with, a certain amount of motion, perhaps, remaining. For instance, the limb may be semi-flexed, and further flexion shall be perfect, but

extension impossible. I lately saw such a case with Dr. Gull; to which I allude, for it illustrates well a condition that is not unfrequently seen in this disease. On attempting to extend the limb, the obstruction was so complete that several surgeons who examined the case believed the exudation to be osseous, so suddenly and harshly was extension stopped; and operative proceedings were by them consequently discountenanced. It was determined, however, in consultation, to extend the limb, using a moderate amount of force, and that, this failing, the tendons should be divided. As much force was used as was justifiable, but without success; the tendons were then divided, and, with a very moderate amount of pressure, the adhesions instantly yielded entirely: thenceforth, the joint was perfectly free.

The following case is the most remarkable of its kind that I have seen. I introduce it here, for it illustrates several points of interest in this malady.

In October, 1859, a gentleman sent to me, requesting me to go to him; at the same time excusing himself, being, as he said, so great a cripple that he could not come to me. When I saw him, he related to me the following history.

In 1848, when he was twenty-five years of age

(eleven years before I saw him), he had intercourse of a doubtful character, which was followed in seven days by urethral discharge. Some few days later, synovitis of both knee-joints supervened, with considerable pain, followed by effusion. He was confined to the house during two or three weeks, and was then able again to walk about, before the swelling about the knees had entirely subsided. The urethral discharge continued for two months, and then ceased. Before three months had elapsed, he had entirely regained the use of his knees. At the expiration of three months, the act of intercourse was repeated, under similar circumstances as before.

The urethral discharge again appeared on the seventh day, and it continued for two months. It was followed, in the course of some few days, by synovitis of the left hip-joint, of both ankle-joints, and of the tarsal-joints (the soles of the feet were not affected). On this occasion the pain was more acute than the last time, and the swelling and stiffness also lasted longer: after ten months he was able to walk with the aid of sticks. Stiffness continued yet for many months, but at length he entirely regained the use of the affected joints.

In November, 1852, a similar series of events occurred as before, without any notable difference in their commencement. On this occasion, however,

both hip-joints became inflamed, as well as both ankles and one knee. This attack of inflammation was infinitely worse than the last.

On this occasion, perceiving the urethral discharge, he immediately consulted a gentleman, eminent as a surgeon, whose foible, however, it is to ignore gonorrhœal rheumatism. And he ignored it.

Notwithstanding, synovitis appeared at the same period as before. Pain was on this occasion excessive, and the effusion around the joints was much greater than on either previous occasion. He was long in recovering the use of his limbs ; yet he recovered, with this exception, that, having been seated for some hours, he was somewhat stiff, and had some difficulty in rising from his chair. This stiffness continued, and he never entirely lost it. On this occasion, also, he suffered from ophthalmia.

Here, then, were three distinct attacks of inflammation of the joints following close upon purulent urethral discharge. But the most extraordinary part of this history yet remains to be told.

In 1854, being in perfectly good health, he married. The consummation of marriage appeared to him to be impossible. He accused himself, however, and painful efforts were repeated. At length, it was discovered that malformation rendered the consummation im-

possible. Dr. Lever discovered that perfect occlusion of the vagina had taken place.

At this time, namely, immediately after marriage, the articular inflammation returned; now, however, with redoubled violence, and, apparently, to cease only with life itself, or when every articulation has been anchylosed. On this occasion there was no urethral discharge.

The same quality of inflammation of the articulations as before succeeded, and terminated in anchylosis.

I found that anchylosis had taken place of the atlas, together with the axis, and that all the cervical and most of the dorsal vertebræ were involved, as well as both hips. His condition was, in consequence, most distressing: his head was immovably fixed; and the hips being fixed, his knees were the only portions of his body which would bend "to shorten him," as he expressed it. But this was not all; anchylosis subsequently took place of the temporo-maxillary articulation, of the shoulder-joint, and of the knee. I never saw an object more truly pitiable — whether from his helplessness, or on account of the pain which he is still suffering; for the disease is still advancing.

Here, then, is an affection which is always preceded by urethral irritation, and for the most part by puru-

lent urethral discharge. The discharge is not an ordinary gonorrhœa, for it shows itself later than gonorrhœa virulenta usually appears, and it lasts longer. Further, when the disease has once been established, it may be reproduced without gonorrhœa.

Syphilitic synovitis commences with acute pain, the ligaments as well as the synovial membrane being affected. The joint is exquisitely tender to the touch, and it is moderately swollen. Effusion, for the most part, takes place into the cellular tissue external to the capsule.

Strumous abscess occurring in the neighbourhood of a joint, occasioned perhaps by the diseased shaft of a long bone, may burrow and surround the joint. Lymph is deposited in the cellular tissue, and thickening and adhesions result. The abscess having discharged its contents, cicatrices form, and contraction of the limb probably follows. More or less immobility of the articulation is thus produced, with, probably, some displacement of the articular ends of the bones.

Phlegmonous erysipelas, involving the cellular tissue, quickly proceeds to suppuration and sloughing. The purulent matter burrows in the course of the muscles, causing separation of these one from the other, with destruction of the inter-muscular tissue and fasciæ. And the joints themselves are not exempt, but may

equally undergo destructive inflammation. This form of inflammation usually, however, runs a rapid course, and terminates without affecting the interior of the joint; it occasions sloughing of the cellular tissue, and consequent contraction of the surrounding parts, with loss of mobility in the neighbouring joint. Also, diffuse cellular inflammation, consequent on dissection wounds, will equally induce anchylosis. Such was the case with a leading Russian physician, from St. Petersburg, who lately came under my notice. The middle joint of the ring-finger of his right hand was anchylosed (false anchylosis) at a right angle.

Mechanical injury causes perhaps more frequently true than false anchylosis. Inflammation may, however, be set up in the neighbourhood of a joint which shall terminate in false anchylosis, or it may give rise to muscular retraction through which motion shall be destroyed. I will cite two cases to show these results of mechanical injury.

C. M—, an officer in the Royal Engineers, was returning from the trenches before Sebastopol, on the 24th of November, 1854, with a friend, when he was wounded, by a bullet striking him in the median line of

the abdomen, immediately below the umbilicus. In this position, the ball struck on a button, and, glancing, it entered about three inches above the pubes. It passed into the groin, carrying with it portions of a match-box and fragments of other articles which were in the pocket of the friend, which it traversed before it reached its destination. The ball passed deeply into the upper part of the thigh, just below Poupart's ligament, displacing the femoral vessels outwards. Inflammation resulted, and an abscess formed, but the ball was not dislodged. Inflammation extended to the hip-joint, and confined my patient to bed, with scarcely any power of movement, until the following April. It was then discovered that the limb was fixed at an obtuse angle, and that the motion of the joint was lost. For the conclusion of this case, see p. 66.

W. C—, aged thirty-eight, a sailor, in July, 1857, while aloft, fell out of the rigging on to the deck of a man-of-war, a height of twenty feet. He was largely built, with powerful muscular development. The femur was fractured in its upper third by the fall. Reunion took place, with considerable displacement and angularity, so that the inferior

extremity of the bone was seen projecting on the outer side of the thigh. I saw him first in May, 1859. The leg was fully extended, and the limb was almost immovable at the knee: there was just perceptible motion, and it was smooth. On endeavouring with force (so much as could be used without danger of fracturing the patella—for it caused no pain) to overcome the resistance, the extensor muscles of the leg were made slightly more tense than before, and motion was stopped rigidly and completely, as though by a process of bone. Under chloroform, exactly the same state of matters existed. It was obvious that, whatever other impediment might exist, the extensor muscles of the leg acted powerfully to prevent flexion. It was, therefore, determined to divide the tendon of the quadriceps extensor cruris. The tendon was divided at two inches above the patella, so as to avoid the synovial bursa, and gradual flexion was afterwards instituted. At the expiration of two months, the knee could be bent at a right angle. The patient subsequently walked well and easily, and could even again go aloft.*

No adhesions existed: the shortened condition of the muscle being the sole cause of immobility.

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* *Vide* the 'Lancet,' August 27, 1859, p. 215.

SECTION IV.

OF DEGENERATION OF THE ARTICULAR CARTILAGES.

Fibrous degeneration of the articular cartilages.—As articular disease commences ordinarily in the bone or in the synovial membrane, the cartilages become implicated secondarily; and, when inflammation is arrested in the former structures, the cartilages do not undergo destruction. There are, however, changes incident to the cartilage itself, which commence and proceed independently of any morbid action either in the synovial membrane or in the bone. In old age, for example, atrophy of the articular cartilages always takes place: it advances gradually, until the whole cartilage may be entirely removed, or, as Mr. Toynbee says, "Articular cartilage during the whole of life gradually becomes thinner, by being converted into bone."* Whether it be atrophy of the cartilage simply, however, or whether this be converted into bone, a concomitant change in the articular surface of the bone is observed; namely, calcareous degene-

* 'Philosophical Transactions' for 1841.

ration. This change, however, is a condition incident to age, and not a state of disease.

There is another, and in its results, a somewhat similar affection, to which I would especially refer—a diseased condition however, and not a natural change —fibrous degeneration. This affection of the articular cartilages occurs for the most part in elderly people who have been subject to rheumatic pains in the joints. In the first instance, the cartilage loses its glistening appearance; fissures then form in it vertical to the surface, and gradually and slowly they pass through it to the calcareous surface of the bone, widening as they advance, until the cartilage is entirely removed. This change commences in the cartilage, and other structures are not necessarily involved. It is, therefore, painless; for the cartilage is not provided with vessels or with nerves, and is consequently devoid of sensation.

This destruction of the cartilages is, during life, altogether unsuspected; the process being without pain, and mobility not being disturbed. Simultaneously with this destruction of the articular cartilage, there occurs a change in the articular surface of the bone itself (similar to that result of age to which allusion has been above made)—porcellanous transformation, or eburnation. This, as Dr. Redfern remarks,

is the only repair which is observed when the whole thickness of the cartilage is thrown off, without the occurrence of disease in the neighbouring parts; or, in the words of Professor Pirrie—"Reproduction of cartilage never takes place, and the place of disintegrated cartilage may be occupied by an amorphous formation, technically called the porcellanous deposit. This substance fills up the cavity, and its smooth and polished surface compensates for the want of cartilage and of synovial membrane."*

Thus, it is shown, that disease being limited to the articular cartilages, the motion of the joint may remain unimpaired, and that, when mobility is destroyed, other textures besides the articular cartilages are affected.

NOTE.—It was stated in an early page of this chapter, that these pathological observations would be limited to the results of disease, and that the diseases themselves would not be considered in detail. It could not have been otherwise, unless this work had been enlarged far beyond its present dimensions.

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* 'The Principles and Practice of Surgery,' p. 414. 1852.

CHAPTER II.

THE DIAGNOSIS OF TRUE AND OF FALSE ANCHYLOSIS.

It is only within the last few months that we have had to deplore the death of one who especially elucidated this department of surgery—one who was an ornament to his profession and who was beloved by those around him—M. Bonnet. I regret to have to allude to him as of the past. M. Bonnet wrote, "We have not any certain signs by which we can recognise bony anchylosis." This sentence was written before anæsthetics were in general use in surgery. Now, it is easy to recognise bony anchylosis. But not only through the employment of anæsthetics may this be determined, for, except in very rare cases, an accurate diagnosis may be made even without their aid.

It may be impossible, however, so perfectly to grasp a bulky limb, with one hand above and the other below

the articulation, and thus to overcome the influence of its proper muscles, as that no doubt shall exist with regard to the condition of the articulation. Also, in the case of the temporo-maxillary articulation, the teeth of the upper and lower jaws may be so closely approximated, that it may not be possible to determine, except under the influence of chloroform, that one at least of these articulations is not ossified.

As a general rule, the sensation of solidity in bony anchylosis is unmistakable, on grasping the limb above and below the articulation. Bony consolidation in the moveable articulations is so rare, however, that an examination should always be instituted after the full effect of chloroform has been obtained, before an opinion favorable to synostosis is delivered.

False anchylosis is the rule; and it is so common, that adhesions should always be held to be fibrous until they are proved to be bony.

Immobility alone is not a sign of synostosis; it not unfrequently exists where the adhesions are fibrous. And even when chloroform has been administered, immobility may be as great as before.

Immobility will frequently exist until muscular action is entirely removed through anæsthetic influence: then, a certain, definite amount of motion may usually be obtained. Occasionally, however, the limb will

remain utterly motionless as before; but the sensation communicated to the hand will not be that of bony union.

I was lately called upon to examine a case of anchylosis of the hip, where, on the previous day, chloroform had been given, and attempts had been made to break through the adhesions. Considerable force had been exerted, and because no appreciable motion could be obtained, it was inferred that bony union had taken place; and the case was therefore abandoned as hopeless. On examination, and before chloroform was given, I did not detect the usual sensation of bony consolidation. Chloroform was, therefore, administered to its fullest extent; and, in the presence of those who had previously attempted it, I ruptured the adhesions with the application of very slight force—using one hand only. The joint was immediately free in all its motions. No pain whatever was excited by this operation. Indeed, the patient could not be convinced that it had been performed, until the splint was loosened and the joint was gently moved. Then, he was content to remain quiet in bed.

Whenever the muscles can be thrown into action, so as to render the tendons prominent, or tense about a joint, the adhesions are not bony; nor

are they bony when the slightest motion is found to exist.

Great gentleness and tact are necessary to distinguish exactly the condition of a joint. Rough handling is inadmissible in every case. It is more especially inadmissible, because it tends to mask the condition into which we desire to gain an insight. M. Sanson relates a case which shows this point well. He says, "I have seen an hospital surgeon raise by the thigh a child who was suffering from hip-joint disease, and because the pelvis did not move on the thigh, he concluded that anchylosis had taken place. A by-stander, however, by no means convinced, withdrew the child's attention, and the limb was then easily abducted or adducted. Thus, whilst the muscles spring into action to resist violence, the limb is readily moved with gentleness and when pain is not excited."*

Those who are not in the frequent habit of examining diseased joints not uncommonly commit the error to which allusion is now made. Within the present year, a child, five years of age, was sent over to me from Normandy, with a request that I would rupture the

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* 'Dictionnaire de Médecine et de Chirurgie Pratiques,' 1829. Art. "Ankylose."

adhesions, anchylosis of the hip-joint having taken place. On examination, I found hip-joint disease, with thickening of the synovial membrane. Adhesions, however, had not formed, and motion was permitted in every direction, *when the limb was handled gently.*

When a limb is handled very gently, so that the muscles are not thrown into action, it may almost always be determined whether anchylosis is true or false—solid bony union communicating the sensation as of a single bone, whereas fibrous anchylosis generally allows of a certain amount of yielding, if not of motion. After the full effect of chloroform has been obtained, doubt can no longer exist with regard to the nature of the adhesions.

But, although fibrous adhesions may be diagnosed, it is often extremely difficult to distinguish between intra- and extra-capsular adhesions. Frequently, it is impossible to make this distinction, except when force is being applied and the adhesions are being ruptured. Then, it may usually be stated with precision; and not only the positions of the adhesions, but also their extent. The consideration of the primary forms of inflammation will usually assist in this part of the diagnosis, as I have endeavoured to show in the previous chapter. And that the treatment may be

adequate to the case, it is essential that the primary form of inflammation should be considered in every case of false anchylosis; for, while some forms yield to gradual extension, others resist except when force is applied suddenly. This I will illustrate in a future chapter.

CHAPTER III.

THE TREATMENT OF TRUE ANCHYLOSIS.

THREE forms of operation have been proposed and practised for the removal of that immobility which results from consolidated bony union, namely,—first, the establishment of a false joint, after division of the bone; secondly, the excision of a wedge-shaped piece of bone; thirdly, the fracture of the consolidated anchylosis.

SECTION I.

The establishment of a false joint, after section of the bone, was proposed by Barton, of Philadelphia, U. S., and the operation was performed on the person of a sailor—John Coyle, aged twenty-one, who, having fallen down a ship's hold, sustained a fracture of the

thigh-bone. Angular union took place with great deformity, so that not only was the limb rendered useless, but the individual himself was incapacitated for labour, the thigh being flexed and the knee being carried across the opposite thigh.

Twenty months after the accident, Barton performed his operation for an artificial joint; for which he made a crucial incision over the great trochanter, seven inches in length and five in a horizontal direction. With a fine saw, he then divided the bone transversely between the two trochanters. The natural direction of the limb was immediately afterwards easily restored. At the expiration of two months, Coyle first put his foot to the ground; and after four months, not an untoward symptom having shown itself, he could walk a considerable distance; and he had gained so much power over the limb, and the artificial joint had become so fairly established, that he could carry the foot twenty-four inches forwards, twenty-six backwards, twenty laterally, and he could rotate it six inches inwards or outwards. There was shortening of the limb to the extent of half an inch only. Nine years afterwards, he died of phthisis pulmonalis, having abandoned himself to drunkenness and dissipation, and having entailed on himself, through his mode of living, an attack of inflammation in the new joint, through

which anchylosis took place two years before his death.*

This operation has been successfully repeated, by Gibson, Rodgers, Warren, and others.

When the direction of the limb deviates greatly from its normal position, so as to become a burden to the patient—as in a case which I lately saw, where, the head of the femur having become dislocated on to the os pubis, anchylosis had taken place with the limb so abducted as to describe nearly a right angle with the trunk—this operation is justifiable. And not only is it justifiable, but, in such a case as Barton's, it may be looked upon as a splendid effort of conservative surgery. It is an operation which, now-a-days, would be undertaken without irrational fear, and with the hope of success not less brilliant than was gained by the American surgeon. We need never despair in these cases of establishing such motion as shall justify the means which are employed.

The establishment of a false joint, by division of the bone above or below the anchylosed articulation, will

* "On the Treatment of Anchylosis, by the Formation of Artificial Joints," in 'The North American Medical and Surgical Journal,' 1827; with further remarks in 'The American Journal of the Medical Sciences,' vol. xxi.

usually be sufficient, without the removal of a wedge of bone, for the restoration of motion, when distortion is not superadded to anchylosis. It is necessary to expose the bone, to divide it with a small saw, and afterwards to prevent reunion by motion of the parts one upon the other. The two ends of the bone thus become fashioned to allow of motion, the moveable end being rounded, while that which is fixed becomes expanded and slightly hollowed out into somewhat of an excavation. A kind of capsular ligament surrounds and binds together the two portions, into which is secreted a fluid very much resembling synovia, and in the course of time the muscles accommodate themselves to the new articulation. It is important, as Dr. Barton has shown, to establish the new joint as near to the destroyed articulation as possible, that the muscles may more easily resume their functions.

John Hunter, speaking of false joints, says, "When two bones rub and press on one another, absorption of the external surface takes place, the adhesive ossific inflammation goes on around the edges, a fluid is secreted in the cavity, and thus we have the new joint." And again, "The surrounding parts thicken and form a kind of capsular ligament, and the extremities of the bone rub against each other at each motion of the limb, by which stimulus the broken

parts are absorbed, and the extremities become smooth, and in time are covered with something similar to cartilage, and at length the cavity between them becomes filled with a fluid very much resembling synovia."*

That this form of joint may be made available for motion is certain. Several cases are on record by Larrey, Sanson, Sue, Saltzmann, and others, where not only useful motion was obtained, but where it was available without artificial support. This operation entails far less danger on the patient than either amputation or resection.

SECTION II.

The excision of a wedge-shaped piece of bone was subsequently proposed by Barton for cases of anchylosis with great distortion, where a transverse section of the shaft of a long bone would not be sufficient to restore the normal direction of the limb; and it was performed by him on the person of a young physician, Dr. Seaman Deas, of Alabama, whose knee was anchylosed at an angle, somewhat less than a

* 'Lectures on the Principles of Surgery,' chap. xviii.

right angle. The wedge of bone was removed from the femur, immediately above the patella. The limb was gradually extended by means of a series of splints with varying angles, "until it had attained a position almost straight. It was then unchangeably continued in that line until the contact surfaces of the bone had united and securely fixed the limb in this the desired direction."*

SECTION III.

Fracture of the consolidated bony anchylosis has been resorted to. It has been observed by several authors, that the motion of an anchylosed limb has suddenly been restored by a fall. And, without sufficient knowledge to distinguish between true and false anchylosis, it has been supposed that both these forms might be treated in the same manner. Thus, Louvrier, having cognizance of an accident of this kind, proposed to himself to restore mobility to every stiff joint. The first five cases on which he operated were of false anchylosis, and in each instance he was successful. He then came to Paris, where his arrival was hailed with a flourish of trumpets. The 'Gazette

* 'The American Journal of the Medical Sciences,' vol. xxi, p. 335.

des Hôpitaux' announced him thus: "A young physician, M. Louvrier, has lately arrived in Paris, from the Department of Doubs. He has invented an apparatus, and has instituted a new method for the cure of anchylosis; and he has, in consequence, visited the metropolis, hoping to meet with as much success as at Besançon and elsewhere. If the results of his operations are as certain as he asserts, our most hearty acknowledgments will be due to him. The treatment of anchylosis, in whatever condition it may be (*à tel état qu'elle soit*), is simple and easy to him: in some few moments, the affection is radically cured; and, in the course of very few days, he is able to restore to the limb its full power and mobility."

Such a statement could only impose on one ignorant of pathology. It is wonderful that it was not treated as a joke, at the time, in Paris. M. Louvrier, however, was allowed to try his success in the hospitals of Paris; but, not having the requisite knowledge, he accepted all cases alike, not knowing what to refuse. His zeal soon led him into inextricable difficulties. M. Bérard was ordered to make a report on the subject to the Royal Academy of Medicine, and this being unfavorable, as, indeed, were the results of his operations almost without exception in Paris, M. Louvrier did not gain all those rewards

which he had fondly anticipated would fall to his share, on his arrival in the metropolis.

Louvrier applied sudden, forcible extension, by instrumental means, to all cases of anchylosis—whether firm bony consolidation had taken place, whether the patella was adherent to the femur, or whether false anchylosis alone existed. He was unable to form an accurate diagnosis—to distinguish between true and false anchylosis; and the result of his operations could, therefore, scarcely have been otherwise than it proved.

As Velpeau said, when bony consolidation has taken place, such an operation is "cruel and barbarous." But he went on to say, with that sarcasm which is his own, "M. Louvrier ne comprend pas comme nous l'histoire des ankyloses."

Some cases of ruptures of anchyloses through falls are recorded by old authors, as Meckren. Bartholin, also, relates a similar case. And Amussat communicated to the Royal Academy of Medicine, in 1831, a case where forcible extension had been performed, and in which the patella was adherent to the internal condyle of the femur. But one of the cases which brought this practice especially under the notice of Louvrier was the following, which was recorded by M. Cazenave, of Bordeaux, in the 'Journal des Connaissances Médico-Chirurgicales,' 1837.

"*Penetrating wound of the right tibio-femoral articulation, followed by complete anchylosis which was cured accidentally.*"

"M. Expert, of Cerons, fifty years of age, whilst at work in his vineyard, wounded his knee with a hatchet. He felt some slight pain at the time, and immediately returned home, walking a distance of a mile and a half. Having arrived at home, he raised his trousers to examine the wound; when he found that it was about an inch in length. It bled but little; but he observed that, from between the lips of the wound, a transparent, viscous fluid flowed in considerable quantity; especially it flowed when he moved the limb in flexion or in extension, as he did to assure himself of the perfect integrity of the joint-motions.

"The surgeon of the place was sent for. He recommended exercise, and, if it were necessary, force, that the joint might not become stiff; and also, that hot wine, with brandy, should be constantly applied.

"In a short time, fever was excited and horrible pain was felt in the limb. Notwithstanding, the surgeon desired his patient to walk during the whole day. This was rigorously performed; that is to say, M. Expert walked, limping and supporting himself with a stick, until the swelling and pain of the joint obliged

him to go to bed. On the following day," says M. Cazenave, " I was sent for. I found a small quantity of synovia escaping from the wound; the knee enormously swollen," &c. &c. " At length it became evident that anchylosis could not be prevented: all means that could be imagined were resorted to, but without any advantage being gained. In the following year, he went to Baréges and he returned in the same condition in which he went.

" Six weeks after his return from the Pyrenees, and towards the end of the vintage, being impatient, and unwilling to wait for his driver, he himself tackled the oxen to the waggon, mounted, and, standing, urged on the oxen. Presently, one of the wheels came into contact with a post, when he was violently thrown forward, and he fell on his anchylosed knee. M. Expert was uninjured by the fall, and he rose perfectly cured of his anchylosis."

M. Cazenave adds, " M. Expert is still living at Cerons, and the facts which I have related are known to my professional brethren in the neighbourhood," of whom he mentions the names of eight.

This, then, is one of the cases, and it is so original that I could not refrain from giving it, from which Louvrier got his idea of removing anchylosis, " *whatever its condition might be.*"

After what has been stated, we shall not be expected to acquiesce in the opinion of a late much-esteemed surgeon, who wrote, "Where a complete osseous consolidation has taken place, it may be set down not only as incurable, but as admitting of no improvement or alteration in the position of the limb; and whatever that may be, the patient must be content with it." *

When no inconvenience is felt, a careful surgeon would scarcely recommend operative proceedings for the removal of a stiff joint; but when life is rendered a burden, and prospects are destroyed, through the existence of true anchylosis, it must be gratifying to one so circumstanced to learn that measures may be adopted to remedy this evil, at least, in part.

It has occurred to me to fracture a slender band of bone, in operating on an anchylosed hip. It was perceptible that the adhesions were not ordinary fibrous adhesions, and yet there was a certain amount of elasticity, which differed widely from consolidated osseous union. With moderate force and the use of the hand alone, this band, as well as the fibrous adhesion, was

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* 'A Dictionary of Practical Surgery,' by Samuel Cooper. Seventh Edition. Art. "Anchylosis."

broken, and good motion was restored. These adhesions were, of course, extra-capsular.

I entirely agree, however, in the opinion expressed by M. Velpeau, that to rupture consolidated osseous anchylosis is cruel and barbarous; but I would further say, that such treatment is unwarrantable and never to be thought of, when the safety of the patient is a primary consideration.

CHAPTER IV.

THE TREATMENT OF FALSE ANCHYLOSIS.

Rupture of adhesions by forcible extension—Section of tendons, and subsequent separation of adhesions —Gradual extension.

It has already been shown that the causes of false anchylosis are various. It has also been shown that the results of inflammation differ in some measure as the causes. It will be reasonable, therefore, to expect that the treatment of these varied effects of inflammation shall differ, and that it will be advantageously adapted to each case, according to its peculiarities.

Thus, we will suppose five classes of cases of false anchylosis.

1st. Extra-capsular adhesions without alteration in the form of the articulation.

2dly. Extra-capsular adhesions with muscular retraction, or with cicatrices, but without alteration in the form of the articulation.

3dly. Slight intra-capsular adhesions.

4thly. Slight intra-capsular adhesions, with muscular retraction and cicatrices.

5thly. Intra-capsular adhesions, with alteration in the form of the articulation.

It will be seen at a glance that these several forms of false anchylosis differ materially. I will now endeavour to show that successful treatment requires that measures shall be adapted to each case according to its pathological conditions.

In some forms of anchylosis, the adhesions will alone yield to forcible extension; in others, they will yield to forcible extension after the sub-cutaneous division of tendons; while, again, in other cases, the adhesions will yield to gradual extension.

I have seen cases of false anchylosis treated by gradual extension for months and years, without the slightest benefit being derived. I have further seen cases of true anchylosis treated in the same manner as false anchylosis, when, by such means, any advantage was impossible. Such treatment is simply empiricism and cannot be defended.

With pathological knowledge and chloroform, an accurate diagnosis may be made. It is, therefore, to be hoped that a great change may be effected in the treatment of this important class of affections.

It is a great gain to exchange a position in which the limb is useless for another in which it is made available for some of its purposes; when, for instance, the thigh, having through neglect been allowed to become fixed at a right angle with the trunk, is brought into a slightly flexed position; or when the forearm, having been left fully extended, is bent at an acute angle, &c. How much greater is the gain, when, instead of a good position of the limb merely, motion can be restored. That this can be done—that motion can be obtained, without danger to the limb and without pain, in a large number of cases, and in many others with patient, painful perseverance, I will show.

In no instance in which I have been concerned has there been injury to the limb or to the health or to the life of the patient; but, on the contrary, the removal of so great a misfortune as anchylosis of a large joint has always been hailed with unbounded satisfaction. I have not known any cases in surgery which have caused so much delight as the restoration of motion to an anchylosed hip-joint, for instance. The freedom which is thus given can only be compared to the removal of the fetters from a prisoner. Some few cases of this description have impressed me deeply.

Occurring, as these cases very frequently do, in the young—in the hey-day of life, when action is a neces-

sity, it requires to be seen to be fully understood, how the advantages of restored motion are appreciated, when the hip-joint, for instance, has been for several months motionless. In three instances, the careers of young officers were supposed to be closed by misfortunes of this nature, which had befallen them. And in a fourth instance marriage was made dependent on the successful termination of the operation. I am proud to say that, in two of these cases, hip-joint motion was perfectly restored; and that, in the other two, motion was so perfect that it was sufficient for all the ordinary purposes of life. I may perhaps be excused in thus expressing myself, since it had been determined, in various consultations which had been held in reference to three of these cases, that the restoration of motion was impossible.

Palasciano followed the practice of Louvrier, but with more success than the latter; and having directed attention again to this operation, several of the leading surgeons of Europe, as Bonnet, Schuh, and others, but especially the Germans, followed in his steps—Berend, Buehring, Lorinser, and others.

Dieffenbach* was among the first to modify this forcible extension of an anchylosed limb, by the previous

* Durchschneidung der Sehnen und Muskeln.

section of tendons. He divided the tendons subcutaneously, and immediately afterwards he extended the limb forcibly; thus causing the wounds to gape, and frequently converting them into extensive lacerations. A crooked limb was thus made straight, but in no instance was the motion of the joint restored.

And, again, Langenbeck* taught (æther at this time coming into use in surgery) that the employment of anæsthetic agents caused perfect relaxation of the contracted muscles; so that, the patient being under their influence, it was unnecessary to divide tendons, but fasciæ only; for that the limb might then be extended without fear of rupturing the muscles.

That this statement involved an error was proved by his practice; for serious accidents, such as dislocations, not unfrequently attended these violent operations.

In the treatment of false anchylosis by forcible rupture of the adhesions, there are some conditions which I consider to be indispensable, and to which I will now refer.

1st. That the action of the voluntary muscles be entirely suspended, under the influence of chloroform.

* Commentatio de Contractura et Ancylosi Genu.

2d. That cicatrices, tense fasciæ, and tendons be previously subcutaneously divided, and that the punctures be allowed to heal, before forcible flexion or extension is applied. Extension of the limb should on no account be made, nor should adhesions be ruptured, until the punctures have healed. When this precaution is neglected, the punctures may be extended into gaping wounds; especially this is liable to occur in the neighbourhood of a large joint: the cellular tissue will be lacerated, inflammation will necessarily be established, and abscess will form. No train of circumstances can be more unfortunate, or more entirely or more certainly preclude the benefit which was intended by the operation than this.

3d. That moderate force alone be used, and with the hand only, and without instrumental aid.

When complete relaxation of the voluntary muscles has been obtained, only slight force is required to rupture membranous or fibrous adhesions; for then no power intervenes between the force employed and the resistance. And that the weight of the limb, the thigh, for instance, may not interfere materially with the exhibition of force, and that the amount of power which is being used may be accurately estimated, it is convenient to sling the limb, the pelvis having been firmly fixed.

4th. That adhesions should be ruptured in flexion of the limb.

It very rarely occurs that the adhesions are so placed that they cannot be ruptured in flexing the limb. In forcible flexion of the limb, injury cannot possibly accrue to vessels or muscles, or other structures.

After this operation, considerable pain is sometimes experienced. It is due to the bruising and laceration of the muscles, chloroform not having been exhibited to produce its full anæsthetic properties—temporarily to annihilate voluntary muscular power. When chloroform has been fully exhibited, this bruising and laceration are almost, if not quite, impossible; and therefore the subsequent pain is then generally slight, and very often it is entirely absent.

5th. That the adhesions should simply be ruptured, and that no attempt should at that time be made to restore the position of the limb; nor, indeed, should the condition of the joint be further investigated. This is a point to which I would especially direct attention. In many instances it may, no doubt, be disregarded, but in others it is conducive to success.

It is unnecessary to examine the state of the joint at this time. The operator may rest assured that

the joint is free when he has heard the snap, or when he has felt the limb suddenly yield. His whole aim then should be to prevent inflammation, which is most certainly effected by preventing any further motion of the limb.

Before chloroform is administered, a gutta-percha splint should be moulded to the limb; and it may be allowed to harden while the chloroform is taking effect. This splint is to be removed before extension is made, and it is to be replaced as soon as the adhesions have been ruptured: it may be worn until tenderness about the joint has ceased. When tenderness has entirely or nearly disappeared, the limb may be moved gently. This passive motion should be repeated at intervals, according to the nature of the case: perhaps it will be borne every day, or every second or third day; or once in the week may be sufficient to regain the entire motion of the joint. Probably, each time that motion is attempted it will excite less pain than on the previous occasion.

6th. Motion should not be commenced until the lapse of some days after the operation. Then, flexion and extension, to a slight extent, will probably be borne, if motion is imparted gently. It may, however, be necessary to exhibit chloroform when the limb is first moved. In some cases it is necessary

to produce anæsthesia on several occasions when the joint is being moved. I have known it to be necessary to inhale chloroform twenty-five or thirty different times before the full motion of the joint could be borne. The pain which is induced by motion is generally referrible to rigidity of the muscles, and not to the condition of the joint itself. The hot-air bath frequently acts like a charm in removing this muscular pain.

7th. Under the influence of chloroform, muscular rigidity may in a large number of instances be so far overcome, that the adhesions may be ruptured without previous subcutaneous division of soft structures. Often, however, it is necessary to divide tendons, cicatrices, and fasciæ, before it is possible to affect the adhesions. Hence, it becomes evident that, if force be applied to overcome great muscular contraction, and at the same time to rupture the fibrous adhesions, the soft structures, namely, the muscles, must yield before the deeper adhesions can be reached. But, having been long contracted, the muscles cannot yield to a suddenly extending force; and, therefore, there is danger of laceration should extension be continued without previous subcutaneous section of tendons and fasciæ.

When tendons have been divided, it will be neces-

sary, the punctures having healed, and the adhesions having been ruptured, to extend the limb gradually; that loss of power may not occur of those muscles whose tendons have been divided.

8th. In all cases of partial anchylosis some muscular rigidity exists. It has a twofold origin: it depends, in a large number of instances, on the primary inflammation, the inflammatory product being effused into the sheaths of the tendons and muscles, as well as between the muscles themselves; and, also, on the duration of the anchylosed condition of the limb. As the duration of anchylosis increases, so the difficulty generally also increases of restoring motion; pathological changes being induced, both within the articulation and of the muscular fibre itself, by non-use.

Rheumatic inflammation, and that form also which is accompanied by urethral discharge, is generally followed by great muscular rigidity — rigidity which is infinitely more difficult to dissipate than the anchylosis itself. In these forms of inflammation, the muscles themselves and their investing sheaths become implicated. Hence the difficulty which arises in the subsequent treatment of these cases.

Strumous inflammation and phlegmonous erysi-

pelas give rise to loss of substance, to matting together of tendons and fasciæ, and to cicatrices. Much subcutaneous division is frequently required in these cases, and the subsequent extending process is necessarily slow. With these forms of inflammation the same kind of muscular rigidity never occurs as is found to follow, and almost to characterise, those forms previously mentioned.

All impediments, then, having been removed, such as tense tendons and fasciæ and contracted cicatrices, and the punctures having healed, the full effect of chloroform, namely, the entire and complete relaxation of the voluntary muscles, is to be obtained, and the limb is to be brought into such a position as to render the adhesions tense. When this has been done, a slight jerk in the direction of flexion will generally rupture fibrous adhesions. A large number of cases are held to be incurable and bony, for want of this simple management.

Doubtless, in the majority of instances, adhesions may be ruptured when only a moderate effect of chloroform has been obtained, and without subcutaneous sections having been employed. A very large number of cases remain, however, where, if the adhesions are to be ruptured with security and without

injury to the bone of the limb, the foregoing precautions must be attended to.

I have known several cases where violent efforts to break through the adhesions have entirely failed, and which have been abandoned as hopeless, and regarded as cases of bony anchylosis, to yield to a very slight effort when the action of the muscles had been entirely removed, and the limb (the thigh, for instance) had been slung, so that its weight should offer no impediment to the operation.

Rupture of the adhesions is generally attended with an audible result, and with more or less sudden yielding. When the adhesions are rigid, they give way with a loud snap, like the fracture of bone; and when they are extensive, but less rigid, their rupture will be attended with a prolonged tearing sound; or they may be extremely slight, when they will yield without sound.

If one point is more worthy of attention than another, it is the management of the skin while the fibrous adhesions are being ruptured; for, where adherent cicatrices exist, laceration of the integument is easily induced. Adherent cicatrices and points of adhesion, therefore, should be previously subcutaneously divided, so that unequal pressure may, as far as is possible, be removed during the act of extension,

and especially from those weakest points, the neighbourhood of cicatrices. Should the continuity of the integument be endangered by the extension which may be necessary for the replacement of the articular surfaces, it is preferable to complete this replacement on a future occasion rather than to risk the smallest rent of the skin. As might *à priori* be expected, those cases are attended with the greatest success where the adhesions are ruptured on the application of slight force, and when they yield with a single snap; where the skin is in no measure endangered; where the adhesions are extra-capsular; and where the integrity of the joint is so far preserved that there is no tendency to dislocation.

When partial dislocation exists, or when extensive adhesions have been formed, it is necessary, in the first place, to restore the shape of the limb, or by gradual extension to place the limb in such a position that it may be available for motion. Long-continued manipulations under the influence of chloroform, together with friction and passive motion, and the use of the hot-air bath, will then often restore at least partial motion to a joint which has long been considered to be hopelessly stiff.

Anchylosis of the hip causes more inconvenience than of any other joint, except that of the maxilla.

When anchylosis has taken place in the extended position of the limb, the patient can only sit on one buttock, with the leg of the affected side thrown backwards. Continued pressure on the buttock soon becomes painful, and the leg of the affected side becomes cramped. Thus, the sitting posture is not only awkward, but, after a time, it is exceedingly painful. But the most painful position is on horseback. Not only is the seat most insecure, but much pain is occasioned, which is felt especially on dismounting. Three of the cases on which I have operated have been of mounted officers; and although in two of these only partial motion was restored, the relief was in both instances very great. One of these gentlemen, writing to me eight months after the operation, said, "I am in the saddle all day, and have no pain." The chief complaint of two others also, who were similarly affected, was that, in consequence of the pain which was occasioned, they were unable to sit on horseback. The relief which seems to be most appreciated is that arising from the ability to flex the thigh, and consequently to sit fairly and straight on a chair. This position, before the separation of the adhesions, was impossible; and it causes great satisfaction and pleasure to find that the power has been regained.

When the patella is adherent to the femur, through bony union, forcible rupture should not be attempted. The force employed would probably cause dislocation of the tibia backwards, and it is extremely improbable that even the slightest freedom could be restored to the patella. Should, however, the adhesions be membranous and slight, it would be justifiable to make an attempt to regain motion.*

When the patella becomes adherent, it is usually anchylosed to the outer condyle of the femur.

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* Occasionally a certain amount of motion of the joint may be restored, even though the patella remain anchylosed. Such was the result of a case that I lately attended with Dr. Jennings. Motion was obtained, which enabled the leg to be flexed to an angle of 40°. This will, of course, always depend on the position in which the patella is anchylosed. In this instance, subluxation of the tibia, together with anchylosis of the patella and contraction of the hamstring muscles and adhesions from enormous cicatrices, existed. This motion, which at first, perhaps, may be looked upon as a doubtful gain, may be made available by suitable apparatus. The patient, to whom I have just referred, can now, after nine months, walk without a stick and without limping, notwithstanding the fixed condition of the patella.

Although what is stated in the text is, in general, the prudent course to adopt; yet it is possible, not unfrequently, to separate adhesions of the patella, especially when they have been formed in a flexed position of the limb; so that, even though motion should not be obtained, the limb may be rendered useful. I would especially direct attention to Cases I and II in a report of "cases of forcible extension in contracted and ankylosed knee-joint," where Mr. Stanley operated. They are in the highest degree instructive. The sequel of Case II is thus recorded:—"She recovered the perfect use of the limb." 'British Medical Journal,' January 23, 1858, p. 62.

Mr. Wickham, of Winchester, in his excellent treatise, says, "It is a common expression of surgeons, 'I stiffened the joint;' implying both that there are circumstances which warrant its being done, as well as that there are means of producing the effect. By this hackneyed expression, and by my own observation, I am inclined to think, however," says Mr. Wickham, "that many joints are unnecessarily sacrificed to this act. Anchylosis is to be regarded as a complete annihilation of the functions of the diseased joint, therefore, in all cases a serious evil, and, if possible (consistently, that is, with security from greater evil), to be prevented. It seems to me, that attempts to accomplish this process are unjustifiable, so long as there exists a probability of a return of the functions of the part. *It is only, then, when we know that the natural textures of a joint are destroyed, that anchylosis may be hailed as a salutary termination of the disease. On the contrary, until such destruction can have been ascertained, every effort should be made use of to avert or remove it.*"*

I am happy to have the testimony of the leading surgeons of the day with regard to the efficacy of the

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* 'A Practical Treatise on Diseases of the Joints,' p. 118.

treatment which is here advocated, for the restoration of motion in false anchylosis. Since the attention of the profession was called to this operation by my paper in the Transactions of the Royal Medical and Chirurgical Society, numberless cases have been submitted to that test which alone can decide the merits of any operation—practical experience; and the results have been so favorable, that the operation must not only be considered as wholly innocuous, but as being of the greatest advantage where an anchylosed joint is in such a condition as to render the restoration of motion possible. As Bonnet says, "The immediate consequences of this operation are harmless, and the ultimate results are most satisfactory."*

There is no operation in surgery which is not capable of being abused. Some seem to think that the class of cases to which this operation is applicable is far more extended than I have proposed—that it is applicable where disease is still advancing; and again, that motion may be permanently re-established when the soft structures of the joint have been destroyed. Without further discussion at this time, I must refer my readers to the observations which have already been made in Chapter I.

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* 'Traité de Thérapeutique des Maladies Articulaires,' p. 307.

The following cases will illustrate the various positions which I have endeavoured to maintain in the previous pages. To those who desire more confirmation of these views, I would further refer them to the works of MM. Barrier,* Berne,† Bonnes,‡ and Philipeaux,§ all of which have been published during the current year; as well as to that of Mr. Bryant.‖

CASE I.

Traumatic inflammation of the hip-joint—Extra-articular anchylosis—Restoration of motion.

C. M—, an officer in the Royal Engineers, was returning from the trenches before Sebastopol, on the 24th of November, 1854, with a friend, when he was wounded by a bullet striking him in the median line

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* 'Observations et Remarques sur la rupture de l'ankylose de la hanche.'

† 'Observations et Remarques sur le redressement brusque ou immédiat de la hanche, dans le traitement des coxalgies aiguës ou chroniques, d'après la méthode du Professeur Bonnet.'

‡ 'Observations et Remarques sur la rupture de l'ankylose de la hanche, et sur le traitement de la coxalgie.'

§ 'Observations et Remarques sur la rupture de l'ankylose du genou et de la hanche.'

‖ 'On the Diseases and Injuries of the Joints,' chap. 8, "Anchylosis of Joints," 1859.

of the abdomen, immediately below the umbilicus. In this position the ball struck on a button, and glancing, it entered about three inches above the pubes. It passed into the groin, carrying with it portions of a match-box and fragments of other articles which were in his friend's pocket, and through which the ball passed to its destination. The ball lodged deeply in the upper part of the thigh, just below Poupart's ligament, displacing the femoral vessels outwards. Inflammation resulted, and an abscess formed, but the ball was not dislodged. Inflammation extended to the hip-joint, and confined the patient to bed, with scarcely any power of movement, until the following April. Then it was discovered that the limb was fixed at an obtuse angle, and that the motion of the joint was lost.

It would be tedious to follow my patient in his wanderings during the years 1855 and 1856. Suffice it to say, that he sought the advice of the most experienced surgeons in London and in Paris, and tried baths innumerable, in the south of France and elsewhere. The result of all this was, that his health was restored; but the limb remained as immovable as before.

When he placed himself under my care, in March,

1857, I found the thigh immovable at the hip-joint and flexed at an obtuse angle, so that when he stood upright, the sole of the foot was two inches from the ground.

He was tall, handsome, muscular, and healthy, and he felt very naturally that the loss of motion in the hip was a serious impediment to him in his career. He was willing to submit to any operation which offered a probability of the restoration of motion.

On the 30th of March, chloroform having been administered, by Dr. Snow, and its full effect having been obtained, the pelvis was firmly fixed, when, with the assistance of Dr. Gibb, I endeavoured to flex the thigh. After a considerable effort, a band of adhesions yielded; but the joint was not free. A renewed effort was made, and the remaining portion was ruptured with a loud snap. The last-mentioned portion was a narrow band of bone external to the capsule. The limb was immediately afterwards encased in a gutta-percha splint, which had been previously moulded to the thigh. Considerable pain was felt, both in the hip and in the knee, on recovering from the effects of the chloroform. This, however, soon subsided, and he slept well at night, without an opiate. After this time, pain was only felt on moving the limb. He left his bed on the seventh day, and

motion of the limb was commenced one week later. Passive motion of the limb occasioned great pain in the neighbourhood of the hip-joint; it was borne, however, heroically. This pain was attributable to the presence of the ball, which was most painfully felt whenever motion of the joint was attempted, rather than to the condition of the joint itself. Indeed, so much pain was caused by the position of the ball, that it became a serious question whether an attempt should not be made to remove it. Happily, however, in consequence of the increased amount of motion at the joint which was obtained, the ball became displaced from its former bed, and gradually it ceased to be felt.

At the end of the third week he could bear almost the entire weight of the body on that leg. Motion was slow in being acquired, and a powerful effort was necessary to overcome the largely developed muscles of the thigh, which became rigid on making the least attempt to move the limb. However, by great perseverance in the use of passive motion, the thigh could, at length, be flexed beyond a right angle, and it could be perfectly extended.

The adhesions in this instance were unusually firm, and superadded to the fibrous adhesions was a narrow

band of bone. Immediately after the operation the joint-motion was perfectly smooth. There was considerable thickening of the tissues around the joint, and the muscles were rigid and somewhat retracted.

CASE II.

Partial anchylosis of the elbow—Intra-capsular adhesions—Restoration of motion.

S. D—, when three years of age, was jerked up from the ground by his nurse, who held him by the forearm. Inflammation followed, and subsequently anchylosis took place.

Five years later he was brought to me, namely, in November, 1856.

I found the forearm nearly fully extended, and the hand in a semi-prone position. The limb was somewhat atrophied, and the elbow was motionless.

Chloroform having been administered, I endeavoured to flex the arm. In this, however, I did not immediately succeed, but the joint gradually yielded without imparting a distinct sensation of tearing, moderate force being continued until the arm could be fully flexed and extended. The radius, however, could not be rotated; and, although a prolonged

effort was made for this purpose, it was useless. The arm was therefore enveloped in a wet bandage, and placed in a splint, at the same angle as before the operation. An inconsiderable amount of pain was suffered after the separation of the adhesions. The patient slept well, and without an opiate, during the night; and on the following day the joint was not painful, except when pressure was made upon it.

On the following day the forearm was moved upon the arm slightly, without exciting pain; and these movements were continued on alternate days, for a week, when he was again placed under the influence of chloroform. Now the radius could be rotated perfectly, and with a very slight effort; the adhesions yielding immediately. Cold was again applied to relieve pain, and the arm was encased as before. No inflammation followed. After some few days, passive motion was recommenced, and in a very short time the arm could be perfectly flexed, and it could also be extended almost to a normal degree. Two months after the adhesions had been ruptured, there was considerable power of voluntary motion, which increased, until the forearm could be flexed beyond a right angle with the arm. There was also a limited power of pronation and of supination.

CASE III.

Urethral rheumatism—Anchylosis of the hip—Extra-articular adhesions—Restoration of motion.

F. C—, twenty-five years of age, an officer in the army, suffered, whilst he was stationed in Ceylon, from rheumatism, in 1855. He was confined to bed during many weeks, and suffered excruciating pain. Several joints were inflamed, as the shoulders, knee, hip, and ankle, but all recovered well except the hip. The effusion around the hip was more than about any other joint, and the swelling was so considerable, that it was feared suppuration would take place. However, it subsided, and at length it was discovered that the motion of the joint was lost. He returned to England some few months later, and consulted a surgeon of the highest eminence, with a view to regain motion of the joint. No hope was held out that motion could be restored, but, on the contrary, he was assured that he must take his stiff joint with him to the grave; and in consequence he abandoned all hope of accomplishing his object. He was unable to perform his military duties satisfactorily, and he therefore determined to leave the army. He expected to receive his captain's

commission from day to day, and he proposed then to sell out.

At Christmas, 1856, he heard of a case somewhat similar to his own, where I had ruptured the adhesions and restored the motion of the joint; and, by the advice of Dr. Wood, he in consequence came to me. I found both lower extremities of the same length; the head of the femur in its normal position; the buttock much flattened, and the limb slightly wasted. The thigh was fully extended, and there was no power of flexion, nor of motion, at the hip-joint, except a very slight (just perceptible) lateral motion. This motion, slight as it was, was sufficient indication that the adhesions were fibrous; and I gave an opinion in accordance with this view, and stated that the adhesions might be ruptured, and that motion might be restored. He was about to proceed with troops to Canton, and was anxious that the operation should be performed before he went on board ship. I wished to have the power of watching him for six weeks after the operation; but he was unable to promise this, as it was doubtful when he might receive orders to embark. With Dr. Wood's sanction, the operation was, therefore, deferred until his return from China. Ten days later he embarked, expecting to leave the port on the following day, when an order was received to detain the vessel for three weeks. He

immediately obtained leave of absence, and returned to London. The operation was done the day next but one following, namely, on the 24th of January, 1857, Drs. Wood and Partridge and Mr. William Pile being present, and kindly giving their assistance.

Chloroform was administered by Dr. Snow, and the full effect having been obtained, I fixed the pelvis with one hand, and with the other jerked the limb, using very slight force, two or three times, when the adhesions yielded and gave way gradually, allowing the thigh to be flexed to its full extent. A gutta-percha splint, which had been previously prepared, was then applied, and the limb was bandaged. On recovery from the effects of the chloroform, my patient could scarcely believe that the operation had been done. He had no pain. Slight tenderness was felt in the course of the evening, but he slept well at night without an opiate. He remained in bed during the four following days, at the end of which time the thigh was slightly flexed and again extended. After two more days the splint was discontinued. The limb was now moved every day, the joint being worked gently, and to a slight extent only at first; but soon more violent and extended movements could be borne, and for this purpose, ropes and pulleys were used. A stick was at first used for support in walking about

the house, but it was soon discontinued, for he could walk firmly and without lameness. Beyond the house, however, a stick was used for some weeks. Before three weeks had elapsed he had walked two miles from his lodgings. I was alarmed when I heard what had occurred, and feared for the result; but, happily, no harm was done. Some slight tenderness of the joint and rigidity of the limb followed; it passed away, however, rapidly, and after twenty-four hours the motion of the limb was as perfect as before. Six weeks after the operation the thigh could be flexed voluntarily beyond a right angle, and it could be abducted to within one inch of its normal range of motion. To show how sound the joint had become, I may mention that our patient could sit on his heels, each heel being equally in contact with the corresponding tuberosity of the ischium.

Exactly two months after the operation, this communication was read before the Royal Medical and Chirurgical Society, namely, on the 24th of March, and by his own desire this gentleman was present. Many then had an opportunity of seeing him walk, and some also were there who were well able to judge of the change which had been effected, having seen him previous to the operation. He walked without the slightest halt and without artificial support.

On the 24th of December, 1857, I received a letter from him, from which I quote the following sentences: "I walk occasionally twelve or thirteen miles a day. The buttock has filled out wonderfully."

He was then, and had been for some months, performing his military duties. He has gained his promotion, and has now no intention of leaving the army.

This was doubtless a favorable case for operation. The adhesions were tense, but they were extra-capsular. They yielded at once, on the application of slight force. There was no pain after the operation. The joint-motions were perfectly free and smooth. The only obstacle to contend with after the operation was the rigidity of the muscles, which is always found in this class of cases.

CASE IV.

Urethral rheumatism—Anchylosis of hips, knees, and jaw—Extra-capsular adhesions—Section of hamstring tendons—Restoration of motion.

W. E—, aged twenty-three, July, 1859. Four years ago, having exposed himself to the infection

of gonorrhœa, the urethral discharge appeared on the seventh day; and it was followed, in a fortnight by pain and swelling in the knee-joints. This inflammation about the knees lasted for two months, when it entirely ceased, and he appeared to be well. The gonorrhœa also had ceased, having yielded to cubebs in three weeks.

Two months after the articular inflammation had ceased, he was again attacked; this time, however, with tenfold violence.

On this occasion the right temporo-maxillary articulation first became inflamed, and later other joints in the order in which they are here mentioned; namely, the ankle, the knee, and the hip of the left side, the right hip, ankle, and knee, both thumbs, both elbows, and both shoulders.

The joints of the upper extremities recovered well, without any perceptible trace of inflammation being left; but the jaw became stiff, as well as both hips and both knees. During the continuance of the inflammation, the right hip and the left knee were more painful than the other joints; but the right knee was much more swollen than the left, and the right hip was more swollen, as well as more painful, than the left hip.

There was slight motion of the jaw, which allowed

the incisor teeth to be separated to about one eighth of an inch. And the left knee also could be slightly moved—just sufficient to alter the angle; but the leg could not be extended, the hamstring muscles being contracted. In the other affected joints there was no appreciable motion.

Such was his condition, when it was suggested by Dr. William Clarke that he should consult me.

I had the advantage of meeting Dr. Gull and Mr. Fergusson in consultation; when it was agreed that the forcible rupture of the adhesions offered the only means of restoring the motion of the joints. It was, therefore, resolved to try the effect of forcible rupture on the left hip-joint.

For this purpose we met on the 4th of August.

Having moulded a splint, and having fixed my patient in the recumbent position, in such a manner that motion of the pelvis was prevented, I secured the right thigh in an extended position on the bed, while the left was slung so as to remove the weight of the limb. Chloroform was administered by Mr. Clover, until the action of the voluntary muscles was entirely overcome, when the limb was raised by Dr. Gibb until the adhesions were made perfectly tense. The patient being thus placed, the limb was in a condition to be acted on.

I placed my right hand behind the lower end of the femur, and using very moderate force, and with one hand only, I made an effort to flex the limb. The adhesions yielded almost immediately, with a loud snap, almost like the fracture of bone, and the motion of the joint was forthwith free. The joint was perfectly smooth, and the limb could be flexed and extended, and rotated inwards and outwards.

There was no pain after the operation; so that our patient could not, for some time, be persuaded that anything had been done, and could only be convinced of it by being allowed to move the joint. This he did readily, and immediately flexed the limb considerably, and without assistance turned over on to his side; a feat which he had not been able to accomplish since his hips had been anchylosed.

Here, I may mention, that some few days before the operation was performed, an attempt had been made in this metropolis to effect the same purpose. It was not successful, and it was therefore concluded that consolidated bony union had taken place. I refer to this circumstance to show the importance of removing, through the influence of chloroform, the entire action of the voluntary muscles. This had not been done, and hence the failure which occurred.

Four days after the first operation, namely, on the

8th of August, there being no pain in the hip, the same gentlemen being present as on the previous occasion, we proceeded to separate the adhesions of the left knee also.

Our patient having inhaled chloroform, the adhesions were ruptured, almost without an effort, so easily was it accomplished. He had no sensation of pain in the knee at any time after the operation.

As the contraction of the hamstring muscles could not be overcome otherwise, Mr. Fergusson and Dr. Gull agreed with me, that the tendons of the biceps and of the semi-membranosus and semi-tendinosus muscles should be divided. On the 31st of October, this was accordingly done. Gradual extension was subsequently employed, commencing when the punctures had healed, to produce the required amount of extension.

The motion of this joint was, after two months, perfect.

Gradual extension was used for the jaw, pressure being made on the incisor teeth; the instrument with which it was made being a wedge with two blades; each blade being very accurately adjusted to the inclination of the teeth, so that, in separating the jaws the blades of the instrument still continued to act in the directions of inclination of the teeth.

The mouth was opened to the extent of one inch in the course of a fortnight. It was then opened fully under the influence of chloroform. There was great difficulty, however, in keeping the mouth open wider than one inch for longer than half an hour, the masseters and the temporal muscles becoming then very painful, and the flow of saliva being distressing; but with very moderate use of the instrument (only for half an hour in the day), the mouth could be freely opened at all times to at least one inch in extent.

This rigidity of the muscles constitutes the greatest and almost the whole difficulty in the restoration of motion in these cases. Friction and the hot-air bath relieve the pain induced by motion, as well as the rigidity of the muscles, more effectually than all other remedies, chloroform excepted. Chloroform liniments are useful; but the inhalation of chloroform enables these limbs to be moved with the greatest freedom. In these cases of rheumatism, and especially of gonorrhœal rheumatism, it is long before chloroform can be dispensed with; but the joint being free, the functions of the muscles may, with time and perseverance, be entirely restored.

CASE V.

Urethral rheumatism — Extra-capsular adhesions — Anchylosis of the finger—Section of flexor tendons—Restoration of motion.

S. M—, aged twenty-three, contracted gonorrhœa, which appeared on the eighth day after infection. Ten days later, he observed that the middle joint of the ring-finger of his left hand was stiff and swollen; but as it was not painful, he did not particularly attend to it for some days. He went to bed, the hand being perfectly well, and the joints flexible, and on waking in the morning he found the joint as I have stated. Dr. Gull saw him, and afterwards requested my opinion with regard to the restoration of motion.

I found the middle joint of the ring-finger flexed at a right angle: the finger could not be further extended, but it could be perfectly flexed into the palm of the hand. The flexor tendon was rigidly contracted. Motion was stopped so suddenly at a right angle, that more than one surgeon who saw the case, as well as an excellent and much-esteemed physician, recommended non-interference, since it was probable, as they thought, that osseous depositions prevented further motion. It is on account of this opinion that I relate the case here,

to show how guarded should be the judgment until chloroform has been exhibited.

I recommended forcible extension, with or without division of the tendon, as might appear to be necessary at the time.

Dr. Gull concurred in this view, and consequently we met to carry out this purpose on the 14th of May, 1860.

Chloroform having been fully inhaled, I endeavoured to extend the finger, and for this purpose used as much force as I deemed justifiable—much more indeed than is usually necessary ; but as it was not sufficient, I desisted, and divided the tendon, and again attempted to extend the finger. Now, the adhesions yielded readily, and to slight force. Little or no pain followed the operation. In a fortnight, passive motion was perfect. It required, however, longer time to gain the action of the flexor muscle.

In this instance I did not hesitate to extend immediately after dividing the tendon, inasmuch as there was not any loose cellular tissue in the neighbourhood of the puncture, and, consequently, there was no fear of inflammation and abscess.

This is one of the few cases in which I have not been able to separate the adhesions in flexion of the limb.

CASE VI.

Urethral rheumatism—Anchylosis of the shoulder—Extra-capsular adhesions—Restoration of motion.

J. H—, aged twenty-four, was infected with gonorrhœa six years ago, and a fortnight after suffered from rheumatic pain in the left knee and in the right shoulder. The pain in the shoulder, however, was extremely slight; so much so, that her attention would scarcely have been called to it, had not the joint gradually become stiff. For this stiffness of the shoulder she consulted Mr. Gerrans; and he kindly referred her to me.

I found the shoulder anchylosed in such a position, that the arm was immovably fixed by the side; that is to say, all motion at the joint was lost, and motion of the limb together with the scapula alone remained. The deltoid muscle was very much atrophied, and the pectoral muscle was retracted. The knee was perfectly flexible: it is yet, however, occasionally subject to pain and stiffness.

On the 15th of October, 1860, Mr. Gerrans and I administered chloroform and ruptured the adhesions. They were soft, and required scarcely more

force to separate them than was necessary to raise the arm. The motions of the joint were instantly free. The pain that followed this operation was most trivial. On the following day the bandage was discontinued.

Five days later, free motion was found. It will, however, require considerable time to re-develope the muscles of the arm.

This case presents no point of special interest except the fact of urethral rheumatism in the female. No such case is on record. It is even denied by authors that the female is subject to this disease. It is difficult, in these cases, to elicit the whole truth; and this is, probably, the only reason why similar cases have not been recorded.

CASE VII.

Scrofulous inflammation of the hip-joint—Intra-capsular adhesions—Restoration of motion.

H. C—, when nine years of age, suffered from inflammation of the hip-joint, after exposure to cold. Excessive pain was experienced, with great effusion

about the articulation, which lasted many months, terminating in complete loss of motion.

I first saw him in November, 1856, when he was twenty-one years of age. I found the limb much atrophied and one inch shorter than the other, and the pelvis very oblique, so that the heel was four inches from the ground. The head of the femur remained in the cotyloid cavity. There was not perceptible motion at the hip-joint; the sensation which was communicated, however, was due to fibrous adhesions. The cicatrices of former abscesses surrounded the joint.

On the 20th of November, assisted by Drs. Gibb and Trouncer, I endeavoured to flex the thigh upon the pelvis, chloroform having been fully administered, and the pelvis having been firmly fixed. With a very slight effort the adhesions snapped audibly, and the motions of flexion and extension were immediately free. A gutta-percha splint was then applied, to keep the joint at rest. Very slight pain followed the operation, and in the evening he was entirely free from pain. He slept well during the night, without an opiate. On the third day the splint was discontinued, and the limb was slightly moved: there was no pain about the joint. After ten days he could bear the limb to be flexed at a

right angle, and for it to be moved freely. Power was gained rapidly, so that in the course of a month the thigh could be raised, unassisted, beyond a right angle with the trunk. In January he walked freely, with the support of a stick, the sole of his boot being raised one inch.

When I last saw him, about a year after the operation, he could walk three miles without fatigue, and he walked that distance almost every day. He carried a stick, but he did not require it for support.

CASE VIII.

Scrofulous disease of the hip-joint—Intra-capsular adhesions—Restoration of motion.

F. S—, when seven years of age, suffered from strumous disease of the hip-joint; abscesses formed and broke at various points down to the middle of the thigh, and adhesions took place which prevented all motion of the joint. It was anchylosed, and in such a condition, portions of bone having been separated at the time that the abscesses discharged themselves (probably from the shaft of the femur), that the restoration of motion in this joint was not thought of. But the knee of the same side (right) also had been inflamed,

abscesses had formed, and burrowing around the joint, had opened in front and behind and on all sides, and contraction had taken place of the hamstring muscles, fixing the knee at nearly a right angle. When this lady had attained twenty-three years of age, Mr. Chalk asked me to see her with him. We met on the 21st of May, 1857. Mr. Chalk had pointed out to her parents on previous occasions that measures ought to be taken for the restoration of motion, but his advice in this respect had not, until this time, been sufficiently considered.

When I perceived what was the condition of the knee-joint, it occurred to me to examine also the hip. The hip was motionless, and having been so for twelve years or thereabouts, no hope was entertained by the family of the restoration of the motion of the joint. On examination, it was clear that the adhesions were fibrous; so, as it was determined to give chloroform for the division of the hamstring tendons, we resolved further to examine the hip at the same time.

Dr. Snow having administered chloroform, we proceeded to examine the hip, and, with scarcely more force than was necessary for the examination, the adhesions were ruptured. No pain was felt at any time after the operation; and without any further attention, the entire motion of the joint was established.

CASE IX.

Scrofulous inflammation of the hip-joint—Intra-capsular adhesions—Restoration of motion.

L. S—, in 1853, when ten years of age, was attacked with inflammation of the hip-joint. She was seen by a surgeon in the neighbourhood of the metropolis, and was actively and very judiciously treated. Pain, however, was scarcely alleviated by the treatment; suffering was very great; the nights were passed without sleep, and the health had become seriously impaired.

I first saw her in March, 1856. Pain had then entirely ceased, and had not been felt during the preceding four months. The hip-joint was fixed, and without motion, at such an angle that, standing upright, the toes of the affected limb just touched the ground, the heel being raised; the pelvis was very oblique; the spine was slightly curved; the right buttock was flattened; the limb was wasted: it was, however, by measurement, of the same length as the other limb.

Having fixed the pelvis with one hand, I flexed the thigh, jerking the limb without using much force.

The adhesions were soft, and yielded readily. Very slight pain followed the separation of the adhesions. A gutta-percha splint was applied, and it was not removed for eight days; at the expiration of which time passive motion was instituted. At first, gentle movements only could be borne; but they were gradually increased, until the limb could be perfectly flexed and extended.

For six weeks after the rupture, there was scarcely any voluntary power of flexion of the thigh, notwithstanding that tenderness on motion had ceased. From this time, however, motion began to increase, so that in the course of another six weeks there was considerable power of voluntary motion. Obliquity of the pelvis was in great measure overcome, and the sole of the foot was in contact with the ground. The foot could now be thrown well forward in walking.

Five months after the operation the thigh could be flexed without assistance beyond a right angle, and it could be fully extended; the pelvis had regained its horizontal position, and the foot could be well flexed in walking.

In March, 1857, this patient walked with a stick, but firmly.

In March, 1858, in regard of size and firmness, the two limbs were nearly equal; the buttock, also, had

nearly regained its normal size. A stick was used for support when she walked to some distance from home, but in the house it was no longer used. All the motions of the hip were perfect, and they could be employed unaided, except extreme flexion of the thigh. This thigh could not be flexed so perfectly as the other.

I had an opportunity of seeing this patient in September, 1860. There was scarcely the slightest difference between the two limbs. The muscular power of the one was perhaps not quite so great as of the other, but the motion at the hip-joint was perfect.

CASE X.

Scrofulous inflammation of the knee—Partial anchylosis, with displacement of the tibia backwards, and contraction of the hamstring muscles, as well as of fasciæ and cicatrices—Section of tendons, fasciæ, and cicatrices—Restoration of motion.

A. M—, fifteen years of age, a healthy-looking boy, from the north of England, was placed under my care in the spring of the year 1854. In 1844, he suffered from strumous inflammation of the knee-joint. Ab-

scesses formed which, having remained open during many months, at length closed, leaving numerous cicatrices.

I found the leg flexed at an acute angle; the tibia slightly displaced backwards; the knee-joint covered with cicatrices, some of which were adherent to the patella, and some to the spine of the tibia; with just appreciable motion at the joint. The patella was not adherent to the femur.

Assisted by Dr. Edmund Waller, I divided the hamstring muscles, portions of tense fascia, and the adherent cicatrices; and a week later I commenced to extend the limb gradually by means of an apparatus which had been made for that purpose. The limb, however, was only slightly straightened by this gradual extension, and, as the adhesions appeared to be very firm and unyielding, I proposed to rupture them. Before this was done, however, I sought the advice of my colleague, the late Mr. Lonsdale. Mr. Lonsdale thought that, as a last resource, rupture might be had recourse to; but before he sanctioned it, he was desirous of seeing that nothing more could be gained by gradual extension. This having been proved beyond doubt, the patient was placed under the influence of chloroform by Dr. Snow, the tendons, fasciæ, and cicatrices having been again subcutane-

ously divided eight days previously, and the leg was forcibly flexed upon the thigh. The adhesions were wholly fibrous, but exceedingly solid and tough, and it required the application of considerable power, and at the same time nice management of the skin, to effect the rupture of the first, and to prevent that of the latter. They yielded, however, with a tearing sensation. The limb was then again placed in the splint at the same angle as before. Some pain followed the rupture of the adhesions, but it was entirely allayed on applying cold to the joint. The patient slept well at night without an opiate, and pain was not subsequently complained of, but tenderness only was felt.

On the third day extension was commenced, and from this time it was continued, day by day, until at the expiration of two months the limb was perfectly extended.

Extension being complete, chloroform was again administered, and the leg was flexed freely. Some pain and swelling succeeded, but this condition of the limb was rapidly removed on the application of cold, so that on the eighth day passive motion was commenced: it was subsequently repeated each day to the utmost extent that could be borne. At length, the limb could be bent at a right angle, and it could

be perfectly extended. This amount of motion, however, caused considerable pain, so that the patient himself was unable to flex the limb to this extent. He enjoyed, however, a range of motion which he could employ unassisted, and which was more than sufficient for the ordinary movements in walking. When so much freedom of the joint had been gained, Mr. Lonsdale again saw my patient, and he in consequence determined to adopt the same mode of treatment whenever he might have an opportunity. He subsequently broke down some adhesions in the manner above mentioned. The first operation in this case was performed in April, 1854, and the second at the end of August of the same year.

In 1856, I again had an opportunity of examining the limb. It had increased much in size; the muscles of the thigh and of the leg were much larger than formerly, though the limb was still considerably smaller than the other. The motion of the joint had diminished somewhat in extent, yet useful motion remained. A stick for support was only used when he left the house.

In 1858 he walked well and easily without a stick.

CASE XI.

Rheumatic synovitis—Partial anchylosis of the hip-joint—Intra-capsular adhesions — Restoration of motion.

A. G—, seven years of age, a small, ill-nourished, irritable, dark-haired child, had suffered two years before I saw her with acute inflammation of the hip-joint, which was thought to be rheumatic in character, and which had followed exposure to wet and cold.

I first saw this child in June, 1853. The thigh was flexed at a right angle with the trunk, and it was immovable. Under the influence of chloroform, just perceptible motion could be obtained. A sudden jerk ruptured the adhesions with an audible snap, when the entire range of flexion and extension was immediately gained. Some pain was felt during that and the following day, to allay which opiates were given. Afterwards, pain was felt only when the joint was moved. This tenderness lasted for ten days. After this time, the limb was moved every day, and each day a more extended range of motion was gained; also, the child was encouraged to move about the house, that the limb might thus be brought into

action. Voluntary power was gradually, but slowly, developed: the limb remained very feeble during several months.

In this instance the limb was much wasted; it was, however, of the same length as the other limb. It was evident that infantile paralysis to a slight extent was superadded to rheumatic inflammation, and that some of the muscles, especially the extensors of the leg, had lost their power of action. Stimulating liniments, galvanism, and other excitants, were used; while the limb was moved daily, to ensure the freedom of the joint.

After two years, the thigh could be raised beyond a right angle with the pelvis, the leg could be thrown forward in walking, and a stick only was used for support.

August, 1857.—The limb had nearly recovered its normal size; the buttock had filled out, though it was yet somewhat flattened; the motions of the hip-joint were perfect; and in walking about the room feebleness was not observable. After taking more than slight exercise, however, drooping of that side was apparent. No support for the limb was used.

CASE XII.

Rheumatic synovitis—Partial anchylosis of the hip-joint—Intra-capsular adhesions—Restoration of motion.

H. K—, aged sixteen, in the spring of 1857, having lain in the wet grass, suffered with rheumatic inflammation of the hip-joint. I saw him on the 16th of March, 1858, together with Mr. Cock and Dr. Braxton Hicks.

There was not any perceptible motion at the hip-joint; the buttock was slightly flattened; the pelvis was oblique, so as to raise the heel one inch from the ground; the limb was very slightly wasted.

On the 28th, we gave chloroform, and on using moderate force in the direction of flexion, the adhesions snapped readily.

Some pain was felt after this operation, but it soon subsided, and it was not again complained of until the 3rd of April, after the limb had been freely moved. There was considerable rigidity of the muscles of the thigh in this case, so that free motion was unusually painful, yet such a considerable amount of motion was gained that, on the 3rd of May, he

rode on horseback a distance of twelve miles, without leaving the saddle, and on dismounting had no pain whatever in the limb. He did not, however, gain all the advantage of the operation, from want of perseverance in passive motion.

CASE XIII.

Rheumatic synovitis—Intra-capsular adhesions—Partial anchylosis of the hip—Restoration of motion.

J. M—, an officer in a cavalry regiment, early in the year 1854, in India, joined a shooting party, and having been for some days on marshy ground, was attacked with rheumatism, and had to be carried home. He remained confined to bed for three months, suffering acutely, and unable to change his posture during the early period of his illness. A large bed-sore formed over the sacrum, and effusion was so great around the hip that suppuration was feared. Happily, however, swelling subsided; but it was found, when motion was at length attempted, that the hip was fixed and immovable. Several months elapsed before he was able to resume his regimental duties, and then he found the fatigue of walking excessive, and his seat in the saddle most insecure;

he also suffered excruciating pain on dismounting. These circumstances induced him to return home, for which he obtained leave.

On the 5th of March, 1857, he walked into my room, leaning on a stick. I found the thigh fixed in the extended position, and immovable at the hip-joint; the extremity of the same length as the sound limb; the pelvis slightly oblique. I proposed to give chloroform, and to proceed to rupture the adhesions at the same time, should they be found to be fibrous. To this he assented, and the following day was appointed for the examination.

Chloroform having been administered by Dr. Snow, the pelvis was firmly fixed by Dr. Gibb, when it was immediately apparent, on endeavouring to raise the leg from the bed, that the adhesions were fibrous. A jerk in the direction of flexion was sufficient to separate them, and the rupture took place with an audible snap, when the motions of the joint were immediately free. The limb was then bandaged, and encased in a splint, and thus it was allowed to remain undisturbed for five days. Very slight pain was felt after the rupture, so that opiates were not required. On the sixth day passive motion was commenced. Only very gentle and limited movements were at first permitted, for considerable tenderness in the joint was

complained of on moving the thigh. This tenderness, however, soon ceased to be felt, or the pain was not more than could easily be borne, and the splint was discontinued on the fourteenth day. After six weeks the thigh could be raised unassisted to a right angle with the trunk, and the limb could be fully extended: extension was executed slowly, but flexion by twitches rather than by a steady muscular action. The obliquity of the pelvis was entirely removed. The patient could walk without limping and without support for some steps, if he walked slowly; he could also sit flat on a chair, and he could even straddle across a chair, sitting in the centre of the seat; but both of these positions were painful, and the latter could only be borne during some seconds. Passive motion, especially of flexion and abduction, was continued vigorously for several months. Now he can mount his horse comfortably, and can remain in the saddle, as he says, "any number of hours," and has no pain on dismounting.

CASE XIV.

Rheumatic inflammation of the elbow-joint—Extra-capsular adhesions—Restoration of motion.

G. H—, aged twelve, suffered from rheumatic in-

flammation of the right elbow, which had terminated in entire loss of motion. Inflammation commenced six months before I saw him in 1858, and inflammatory action had entirely ceased when he was brought to me. The arm was flexed at an acute angle, and the elbow-joint was perfectly stiff.

With a brisk movement of flexion, and afterwards of pronation of the forearm, the movements at the elbow were freed. On the following day, passive motion could be borne, no pain having been felt after the separation of the adhesions. Motion, however, was slow in being restored. A dumb-bell was used in his hand, to enable him better to move the arm, the elbow being supported on the table. After four months, an abscess formed on the posterior surface of the elbow, which I feared was connected with the joint itself, in consequence of the synovial secretion, and the large amount of it, which flowed from the wound. It was, however, probably connected only with the bursa on the posterior surface of the elbow, and inflammation was probably occasioned by the pressure on the elbow in moving the joint, as I afterwards heard that this was frequently done with the bare arm on the table, and without an intervening pad. The abscess soon healed, and the motion of the joint afterwards im-

proved rapidly. The only mark of difference now between the two arms is the small cicatrix of the abscess. One arm is as strong as the other, and the anchylosed elbow has entirely regained its normal motion.

I relate this case with much satisfaction, for it is rare to gain such a perfect result in a ginglymoid articulation. These operations are usually more successful in the ball and socket joints than in the ginglymoid.

CASE XV.

Rheumatic inflammation of the knee-joint, followed by partial anchylosis—Motion restored by a fall.

Towards the end of July, 1858, a lady brought her son to me from the neighbourhood of Oxford, he having partial anchylosis of the knee-joint. He was twelve years of age. Four years previously, rheumatic inflammation had given rise to stiffness of the joint, which terminated in immobility. The limb was slightly flexed, the hamstring tendons were rather tense, the limb was somewhat atrophied, and one eighth of an inch shorter than the other. It was an admirable case for rupturing the adhesions; so I

pressed the operation urgently. Consent, however, was not immediately given, and time was asked for consideration.

The mother and her son returned home to the neighbourhood of Oxford.

In the first week of August, they again came up to town. I was astonished to see my patient bending his knee, and walking with only a slight limp. He had on the previous day been playing roughly with his brother, when he was thrown to the ground, and in falling he bent his knee under him. He felt something yield about the knee, and was much frightened; but on being carried into the house, and recovering from his fear, he had no pain in the joint.

I found that almost the entire motion of the joint could be borne, and that scarcely more had to be done than to order a thicker sole to be added to his shoe.

CASE XVI.

Rheumatic inflammation of the hip-joint — Intra-capsular adhesions — Gradual extension.

E. B—, in 1853, when fourteen years of age, was seized suddenly, and during the night, with

severe pain in the right hip. The joint continued to be painful for eighteen months, when the pain ceased, and the patient was again able to use the limb. Pain soon, however, returned, and the joint remained painful until Christmas of 1856. In April, 1857, he was sent up to London, to have the advantage of Sir Benjamin Brodie's opinion; and Sir Benjamin, thinking that it was a fit case for the forcible rupture of the adhesions, very kindly sent him to me.

The thigh was flexed, so that the heel was three inches from the ground; the buttock was somewhat flattened; there was slight motion at the hip-joint.

It appeared to me probable that the adhesions might be overcome and that the limb might be extended by mechanical means alone, and without the application of sudden force; and I consequently gained permission to try the effect of gradual extension before proceeding to forcible rupture.

In the course of three and a half months, the limb was perfectly extended, and such a useful amount of motion was gained that it was not necessary to resort to more force. Passive motion and friction were employed to gain the use of the extremity, and before he left London he could walk, using the limb very fairly. Motion caused very little pain, and it was, therefore, employed somewhat roughly after he had

returned home, in the hope that it would expedite the cure; and in consequence an abscess formed. But notwithstanding, when I last saw him, he enjoyed considerable power over the limb, with motion at the hip-joint.

CASE XVII.

Rheumatic inflammation of the hip-joint — Intracapsular adhesions — Section of tensor vaginæ femoris — Gradual extension.

A. B—, in 1850, when she was five years of age, after sitting on the damp grass, suffered from rheumatic inflammation of the hip-joint. Abscess formed around the joint, which broke and healed at various points: contraction took place, and the limb was rendered immovable.

When she was nine years of age I saw her. The thigh was flexed upon the pelvis, the foot being raised eighteen inches from the ground; an abscess in the neighbourhood of the trochanter discharged a small quantity of pus; very slight motion remained at the hip-joint, and attempts at motion excited pain.

Gradual extension was employed, and it had been carried only to a slight extent when the abscess healed.

It was continued, and flexion was, in a great measure, overcome, but the limb could not be entirely extended, in consequence, as it appeared, of contraction of the tensor vaginæ femoris muscle, as well as of some cicatrices in its immediate vicinity. With the concurrence and assistance, therefore, of Mr. Scannell and Mr. Mould, I divided the muscle at its origin, as well as the cicatrices subcutaneously, and again, after some days, when the punctures had healed, extension of the limb was recommenced. All difficulty seemed now to be removed, and the limb was soon fully extended. Passive motion afterwards completed the cure, and I had the satisfaction of knowing that, before twelve months had expired from the commencement of the treatment, the child was able to walk well and firmly with the aid of a stick.

At the present time the limb is strong. It is somewhat shorter than the other; but when this deficiency is compensated for by an extra thickness of the sole of the boot, there is little or no weakness apparent, and exercise can be taken freely.

CASE XVIII.

Inflammation of the knee-joint after scarlatina—Subluxation of the tibia—Intra-capsular adhesions—Section of hamstring tendons—Restoration of motion.

J. N—, fourteen years of age, of a healthy aspect and a dark complexion, was placed under my care in July, 1855.

When he was five years old he suffered severely from scarlatina, and he had not recovered when his knee became inflamed; abscess formed, which, burrowing, surrounded the joint, and discharged itself at various points. Numerous adhesions were consequently formed, the flexor muscles became contracted, and subluxation of the tibia resulted. The limb was atrophied; the knee was bent at a right angle; there was just appreciable motion at the knee-joint.

I divided the hamstring tendons and some tense fascia, as well as several points of adhesion; and a week later, the punctures having healed, I ruptured the adhesions in flexing the limb, being assisted by Dr. Dick, and by Dr. Snow who administered chloroform.

In consequence of the extensive adhesions of the skin, I was not able to liberate the joint entirely. But I was so efficiently seconded by the mechanical means at my disposal, that the subluxation was at length entirely overcome, and I was enabled to retain the tibia in its normal position. Passive motion was then instituted, and considerable power of flexion and extension of the limb was gained. At the end of four months my patient could walk about the house without support.

He had, before coming to London, used a crutch for eight years; and he had never walked without it.

In December, 1855, so strong was his limb, that on two or three different occasions he carried a gun, on a Scotch moor, for some two or three successive hours, without subsequent injury to the joint.

CASE XIX.

Rheumatic inflammation of the temporo-maxillary articulation—Intra-capsular adhesions — Gradual extension.

R. J—, nineteen years of age, and of a strumous diathesis, having suffered from rheumatic inflamma-

tion of the hip, shoulder, ankle, and jaw, consulted me, with Mr. Wolstenholme, in May, 1858.

Mobility had been restored to all these joints, with the exception of the right temporo-maxillary articulation, which was so far fixed that the incisor teeth could only be separated to the extent of one eighth of an inch. The masseter muscle of either side was extremely rigid, but especially on the right side, and in cold and damp weather this muscular action would entirely prevent the separation of the jaws.

It was agreed to try the effect of gradual extension, by means of a similar instrument to that which is described in Case IV. The blades of the instrument, covered with india-rubber, were introduced with great difficulty between the teeth. This having been accomplished, however, the jaws were readily separated, and in a short time the mouth was fully opened, the teeth being separated one and a half inch.

For a short time after the removal of the instrument from the mouth, the maxilla could be moved easily, and mastication could be effected with ease; but muscular rigidity soon returned, and extension had in part to be recommenced. However, in August, so much power over the lower jaw had been gained, that, with a very moderate daily use of the

instrument, the teeth could be well separated. He left town during this month, and I did not see him again until five months had expired. When he returned, I found that he had ceased to use the instrument, and that the motion at the articulation had much diminished. The masseters were rigid. I recommended the subcutaneous section of at least the right masseter muscle, hoping that the other might yield when this had been done, and feeling assured that this was now the only impediment to free motion. This was not, however, acceded to.

The inconvenience which is suffered from anchylosis of the temporo-maxillary articulation is excessive: nutrition is rendered defective, both on account of the difficulty which exists of introducing solid food into the mouth, and of masticating it; and utterance is most imperfect: of some words, and parts of words, it is impossible. Section of the masseter muscle is both simple and effectual, so that it is preferable to have immediate recourse to this operation, except in those cases where muscular retraction is slight, and where, consequently, it may probably be easily overcome.

CASE XX.

Rheumatic inflammation of the knee-joint—Anchylosis of the patella—Intra-capsular adhesions—Section of hamstring tendons—Gradual extension, followed by the rupture of adhesions.

J. R., having suffered from rheumatic inflammation of the knee, when he was twenty-three years of age, remained under surgical treatment during the following seven years; at the expiration of which time, I was asked to see him.

On the 22d of November, 1857, I found the knee contracted at an angle somewhat beyond a right angle, the patella anchylosed to the outer condyle of the femur, the hamstring tendons tense. There was scarcely perceptible motion at the joint; pain was excessive, even when the limb was at rest; the patient himself was a dark-haired, olive-complexioned, excitable man.

It had been proposed on more than one occasion to remove the limb, extension having been attempted without the slightest success, and the pain in the

joint being intolerable. Very large doses of opium (as much as 90 minims of the tincture) had been habitually taken, to procure even some few hours' sleep; but this large quantity often failed even to soothe.

Such being the state of the case, it was agreed with Dr. Metcalfe Babington, that the hamstring tendons should be divided, that gradual extension should be attempted, and that, this failing, the adhesions should be ruptured.

On the 25th of November, I divided the hamstring tendons; and on the 30th, the punctures having healed, gradual extension was commenced.

On the night after the division of the tendons, our patient was able to sleep without an opiate, the pain in the joint having been greatly relieved by the effect produced by the section of the tendons alone; but as pressure was more completely removed and spasm was entirely relieved by section of the tendons and by commencing extension, so pain ceased to be felt, and the general health began to improve.

Gradual extension was continued during three months, when, as it was found that the leg could not be fully extended, it was determined to separate the adhesions, after the inhalation of chloroform.

On the 22d of February, Dr. Snow having ad-

ministered chloroform, the adhesions yielded readily: those, however, connecting the patella with the femur could not be destroyed. The limb was placed in a somewhat more extended position than before, and it was kept perfectly at rest for six days; extension was then recommenced, and it was rapidly completed.

Our patient refused to take chloroform a second time, so that it was not possible to restore motion, although from the position of the patella, and the condition of the joint, some motion might have been obtained. He was well satisfied to have gained a useful limb; but he was even more pleased to retain his leg and be free from pain.

The cases which I have now related, together with those which are given in the former edition, and in the Transactions of the Royal Medical and Chirurgical Society, tend to illustrate every point to which it is necessary to call attention. I do not desire to increase unnecessarily the number of these quotations from my case-book.

Having now had experience of these cases for several years, and having had under treatment a very large number, I can speak with some precision as to

the results. The following table will show the comparative frequency with which the various joints have been submitted to treatment.

Hip	27
Shoulder	6
Knee	21
Elbow	10
Jaw	4
Wrist	6
Ankle	4
Toe	6
Finger	28

Of all these cases, inflammation was in one only set up as the result of treatment, and in this instance it was of a very mild character, and easily subdued. It would be difficult to show such a result in any class of cases whatever in surgery; and except in subcutaneous operations, such a result is unknown.

This is a class of cases which has been for the most part overlooked. Anchylosis has even been thought to be a desirable termination of articular disease, and to stiffen a joint to be rather laudable than

otherwise. Many surgeons seem to think that all has been done for a patient when the joint has been made firm and immovable. To restore motion seems to them hopeless, and the idea even to savour of presumption. I lately operated on a case of false anchylosis, on which several opinions had been taken before I was consulted. With one exception, all were averse to operative measures. I felt no hesitation as to the course to be adopted; and in six days after the operation the motion of the joint was perfect.

The adhesions in this case were singularly unyielding, and they were consequently thought to be osseous. Greater success, perhaps, attends the rupture of adhesions which are consequent on urethral rheumatism than when they depend on any other form of inflammation whatever. And this was such a case.

I entirely agree with Mr. Wickham, who says, "Anchylosis is to be regarded as a complete annihilation of the functions of the diseased joint; therefore, in all cases a serious evil, and if possible (consistently, that is, with security from greater evil), to be prevented. . . . . It is only when we know that the natural textures of a joint are destroyed that anchylosis may be hailed as a salutary termination of the disease. On the contrary, until such destruction

shall have been ascertained, every effort should be made use of to avert or remove it."* But although we may, at the first opportunity, and without unnecessary delay, remove an anchylosed condition of a joint, we must yet wait until morbid action has subsided. In the words of Professor Pirrie, "Anchylosis should on no account be interfered with, until all diseased action has ceased, and the parts have returned to a quiescent state;"† then, treatment will be advantageously employed. Whereas benefit can scarcely be expected whilst the limb is in an inflamed or a painful condition.

In conclusion, I will repeat, even at the risk of being tedious, that, when the muscles are so much contracted as to interfere with the rupture of adhesions, their tendons should be divided before force is applied. When, however, they are not rigidly contracted, adhesions may frequently be ruptured without section of the tendons, and the muscular contraction may subsequently be overcome by passive motion. And the same may frequently be done even when the

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* Op. cit. Chap. "Anchylosis."

† 'The Principles and Practice of Surgery,' 2d edition, p. 446.

muscles are rigidly contracted, if the adhesions can be ruptured in flexion of the limb.

But the cases which usually terminate most favorably are those where muscular rigidity can be entirely overcome by the inhalation of chloroform, and where, consequently, no question can arise as to the section of tendons.

When adhesions can be extended slowly and gradually, the limb may be placed in the desired position without the application of sudden force. Probably, however, when a flexed limb has been fully extended, passive motion may be impossible, except under the influence of chloroform. No time should be lost in gaining whatever motion is possible after the extending process is complete. Diseased action may recommence if the limb is allowed to remain permanently in one position, and anchylosis may then become complete in that position. More than once I have known contraction to have been fully overcome, and the articulating surfaces to have been brought well into position, so that nothing remained to be done but to restore the power of motion; when the patient has been recommended to move the limb, but nothing has been done by the surgeon himself to accomplish this end. The treatment is not complete until motion is gained and the patient

is placed in such a condition as to continue that motion.

Two years ago, I had occasion to watch such a case. Gradual extension had been employed after the section of the hamstring tendons; the adhesions had yielded; the articulating surfaces of the tibia and the femur had been replaced perfectly in position, when the patient expressed herself satisfied with the result, and obstinately refused to adopt such measures as would have ensured the free motion of the joint. Motion could be borne, even without chloroform, to some extent; but, although it was promised that passive motion should be used, nothing was done to increase the motion of the joint: the limb was held absolutely immovable. At the end of five months I was again sent for; when I found that bony consolidation was complete. During these five months, there had been no sensation of pain in the joint.

Lastly, I would explain the meaning of force as applied to the rupture of membranous and fibrous adhesions. When the weight of the limb is removed and the action of the muscles is suspended, a slight jerk is generally sufficient to separate any adhesions that may exist. I have never applied greater force,

even where the hip-joint was concerned, than I could exert with one hand; nor have I even then applied more than a very moderate degree of force, for more is not required.*

Careful after-treatment is not less important than the separation of the adhesions themselves. Gentle motion of the joint, daily repeated and increased,

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* This statement admits of one exception only, namely, a case which I saw with Mr. Prescott Hewett, in March, 1857. The patient was a very powerful man, an officer of Hussars, who had suffered from urethral rheumatism three and a half years before I saw him. At that time many of the joints were affected, but especially the right hip; where the effusion was so considerable that it was feared suppuration would result. From lying constantly in one position, extensive bed-sores formed over the sacrum and on the back, to dress which chloroform had been administered fifty times. Whether this influenced the result I am unable to say; but although Dr. Snow on this occasion administered a very large quantity of chloroform, he was unable to produce such complete relaxation of the voluntary muscles as was desired, and he was unwilling to carry the effect further. Also, I had not at that time the means of fixing the pelvis which I now possess. Through the combination of these several circumstances, it was necessary to employ, on this occasion, much more force than is usually required. But although I used whatever power I could command, I was unable to rupture the adhesions, though they were simply fibrous. It was evident that the adhesions were fibrous, for there was a certain slight amount of voluntary lateral movement of the thigh. After this attempt had been made, some pain was felt in the articulation, and some very slight increase of motion was obtained—increase which was measured by the patient himself in these words:—"When I move my leg about, I feel very strong cracks in the joint; much stronger than I have felt before." These "cracks" were loud and distinctly audible.

without causing pain—either after the inhalation of chloroform or after its local application in the form of liniment, or without chloroform, if motion can be borne; or in the hot-air bath, when profuse perspiration has been obtained and muscular relaxation is complete—will, in a very large number of cases where the joints have been doomed to remain stiff for ever, restore the power of motion.

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