

On the restoration of motion by forcible extension and rupture of the uniting medium of partially ankylosed surfaces / by Bernard E. Brodhurst.

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Two columns

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BY
FORCIBLE EXTENSION AND RUPTURE OF THE UNITING MEDIUM
OF
PARTIALLY ANCHYLOSED SURFACES.



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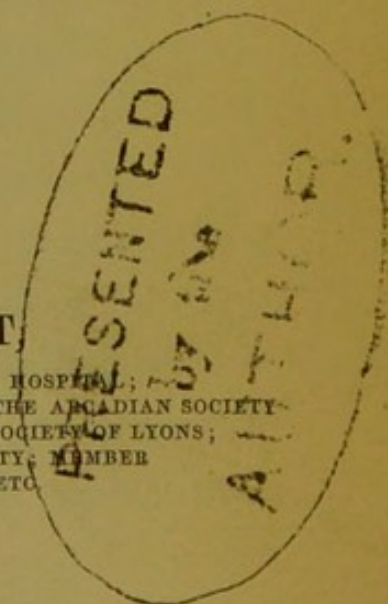
PARTIALLY ANCHYLOSED SURFACES.



BY

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ON THE
RESTORATION OF MOTION

BY
FORCIBLE EXTENSION, ETC.

IN a paper which was published in the last volume (vol. xl) of the 'Medico-Chirurgical Transactions,' several cases are recounted of partial ankylosis of the hip, knee, and elbow-joints, in which the uniting medium had been ruptured, and where, after a varying amount of time, the power of motion had been successfully re-established. The conclusions at which I had arrived when this communication was presented to the Society were, "That these partial ankyloses may without danger be ruptured, and that motion can be successfully restored."¹ Since that time my opinion has been further strengthened by several other cases of a like kind which have come under my observation.

The affections of joints to which this operation is applicable may be divided into two classes; namely, those in which muscular contraction coexists to so great an extent as to prevent the application of force to the adhesions until tendons and fasciæ have been subcutaneously divided, and those in which the adhesions may be

¹ On Forcible Extension and Rupture of the Uniting Medium of Partially Ankylosed Surfaces.—'Med. Chir. Trans.,' vol. xl, p. 140.

easily ruptured, on moderate force being applied, and without the previous section of tendons, fasciæ, etc.

In all cases of partial ankylosis some muscular rigidity exists. About the hip-joint it may prevent all semblance of motion: the extremity may be in its extended position, with the joint apparently rigidly fixed. At the knee-joint, also, the flexor muscles of the leg may be so rigidly contracted as to prevent the slightest motion of the joint. It is more common, however, to find slight motion (just appreciable motion) at the knee, even with great contraction of the flexor muscles.

Under the influence of chloroform, muscular rigidity may in some 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 the tense tendons before the adhesions can be reached. Now, it is 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 this is the treatment which was pursued by Louvrier, and was subsequently discarded on account of the fatal results which were induced by excessive violence. He applied so much force, and so suddenly, by means of an instrument which had been constructed for this purpose, that muscles were lacerated, arteries were torn through, and bones were fractured. Hence it is that I have divided these cases into two classes; namely, those in which from great muscular contraction, it is necessary to divide tendons and fasciæ, and subsequently to rupture the adhesions; and, secondly,

those in which muscular contraction may be sufficiently overcome by the exhibition of chloroform, to enable the adhesions to be ruptured without the use of the knife.

When tendons have to be divided, the punctures are to be allowed to heal before extension is made. Dieffenbach, who was among the first to direct attention to this question, divided the tendons subcutaneously, and immediately afterwards extended the limb forcibly.¹ The wounds were consequently made to gape; and they thus became starting points for extensive lacerations of the integument. Some of his operations were, doubtless, so far successful, that a crooked limb was made straight; but others were followed by violent inflammation and extensive suppuration, and in some instances it was necessary to resort to amputation. In none was the motion of the joint restored.

And, again, Langenbeck taught that the employment of anæsthetic agents caused perfect relaxation of the contracted muscles; so that the patient being under their influence it was not necessary to divide tendons, for the limb might then be extended without fear of rupturing the muscles.² That this statement involves an error was proved by his practice; for serious accidents, such as dislocations, not unfrequently attended these violent operations. Besides, when structural change has taken place in the muscle,—when it has been for a long period much contracted or when adhesions exist, it cannot yield to a suddenly extending force without its fibres being ruptured.

¹ Durchschneidung der Sehnen und Muskeln.

² *Commentatio de Contractura et Ancylosi Genu.*

Therefore, it is manifest that it became necessary to reconsider the treatment of partial ankylosis, that neither the danger which had been incurred by Langenbeck should again be encountered, nor the more serious consequences which had resulted from forcible extension with gaping wounds, as had been practised by Dieffenbach, Palasciano, Bonnet, and others.

It has been my first object in the treatment of these cases to remove such impediments to extension as are offered by contracted muscles and by tense fasciæ—to divide subcutaneously all such structures as would be likely to interfere with the extending process. The wounds were then closed, and reunion was promoted by rest. When this had fully taken place, the full effect of chloroform was obtained, and the limb was extended, a suddenly imposed force or a series of jerks in the direction of flexion being sufficient to cause the adhesions to yield suddenly with a snap or with a more prolonged tearing sound, or, indeed, without an audible result, and with sudden yielding. But when muscular tension could be entirely overcome by chloroform, and the condition of the limb was such that subcutaneous sections were not necessary, there being neither tense fasciæ nor adhesions of the skin, chloroform was administered, and its full effect having been obtained, the adhesions were ruptured, muscular relaxation being complete.

If one point is more worthy of attention than another, it is the management of the skin while the fibrous adhesions are being ruptured. Adherent cicatrices and points of adhesion 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. And 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 second 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 moderate 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, however, in consequence of partial dislocation, of extensive adhesions within the joint or from other cause, considerable force has to be employed, it behoves the surgeon to be careful as to the direction and extent of the force used, especially when cicatrices exist, that the integument may not, by a violent movement of the limb, be ruptured. With care this accident will never occur. But, as it is not always possible to destroy all the existing adhesions without endangering the continuity of the integuments, it is more prudent, when great tension has been induced and rupture of the skin appears to be imminent, to remit extension, and to complete the operation on a future occasion. After the subsidence of any inflammation or tenderness which may have been induced, the remaining adhesions will probably yield to gentle pressure or on the application of slight force.

Again, the following is a point to which I would especially direct attention, namely, that the adhesions having been ruptured, no further motion or examination of the joint should be permitted. The observance of this rule is, I believe, essential to ultimate success. On one occasion I disregarded it, and, having ruptured the adhesions, I examined the joint to ascertain that its motions were extended and perfectly free. Inflammation followed, which lasted several days. It is unnecessary to examine the state of the joint at this time. The surgeon 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, and it may be worn until tenderness about the joint has ceased. When tenderness has entirely or nearly disappeared, the limb may be moved gently. It may be necessary to give a small quantity of chloroform before motion is attempted for the first time, or even on two or three subsequent occasions. Each time motion will be borne more easily than the last time, and very soon forcible movements by means of ropes and pulleys may be instituted. Or, in the case of the hip, if the pelvis cannot be otherwise firmly fixed while the thigh is being moved, a chair should be constructed by means of which

the pelvis may be firmly grasped, and the thigh may then be flexed and extended to the full extent of motion, or as far as it can be borne, by means of a lever attached to the chair itself. Also, when the shoulder is the affected joint, some difficulty may be experienced in fixing the scapula firmly. This, however, may be overcome by means of a gutta-percha splint moulded accurately to the upper part of the back, the ribs and the lower part of the neck, leaving the joint itself uncovered. When this is firmly bandaged on to the thorax, motion may be given to the upper arm without fear of moving the scapula.

After the tendons have been divided, and the adhesions have been broken down, an extending apparatus is to be applied, and extension is to be carried on rapidly. And when extension is complete, motion is to be attempted, at first under the influence of chloroform, and passive motion may then be continued as has been above explained.

In some instances after rupture of the adhesions, pain is inconsiderable, and passive motion can be borne well; but in others motion cannot be borne, or it cannot be borne with sufficient force to re-establish the use of the joint. It is essential that passive motion should be employed during many weeks, not only that the joint may re-accommodate itself to motion, but also that, where the adhesions are intra-articular, the joint may be, so to say, re-developed, just as a "false" joint is formed by solution of the solid fibrous material connecting the broken ends of a long bone, where perfect union has been prevented by motion of the parts. Also, passive motion is essential that the muscles which have been long motionless may lose their rigidity, and

that, from being attenuated and pale, they may regain their fulness and colour. The time which is necessary to this end varies, and is in some measure proportionate to the period during which these organic changes have existed. A short time, however, suffices in a large number of instances to regain some power of motion, and when power of voluntary motion has commenced, it increases rapidly. Even in the "false" joint a capsule may be formed, and synovia may be secreted ; how much more readily the structures will re-accommodate themselves in the true joint to the purposes of motion will be shown by some cases which I have selected out of many, as examples of the restoration of motion in joints after the rupture of adhesions.

But, it may be asked, to what class of cases is this operation applicable? To which I would reply that it is applicable to all forms of partial ankylosis which have resulted from simple forms of inflammation. As, however, various meanings are attached to the terms true, and false, or partial ankylosis, it will be desirable to give an exact definition of the terms, that it may be fully understood what meaning is intended to be conveyed.

True ankylosis is said by some writers to consist of intra-capsular adhesions, and false ankylosis of extra-capsular adhesions. Others describe true ankylosis as "loss of motion in a joint," and false ankylosis as "that condition in which the movements of the joint are more or less interfered with." And, again, a third definition is, that bony adhesions constitute true ankylosis, while fibrous adhesions or muscular rigidity only, form partial, or false ankylosis. Therefore, it is

necessary to define the meanings which the terms "true" and "false" are intended to convey.

There is no doubt that the term "ankylosis" may be applied to rigidity of a joint, from whatever cause. In using the term "false ankylosis," however, I wish to be understood as referring to that condition of a joint in which fibrous adhesions have been formed between the articular surfaces entering into the formation of the joint or which connect the extremities of the bones—whether intra- or extra-capsular, in contradistinction to bony, or true ankylosis. And without limiting the term "false ankylosis" to fibrous adhesions within or without the joint, I wish for my present purpose to understand by the term false ankylosis fibrous adhesions within or external to the capsule, producing immobility of the joint.

I have adopted this definition of the term "false ankylosis" because it is not possible to distinguish between those adhesions which have been formed within and those which are external to the capsule until the adhesions are being ruptured, and also because the treatment of these two forms of adhesions (intra- and extra-capsular) is identical. It is important, therefore, to determine, not that the adhesions are intra- or extra-capsular, but that they are fibrous.

Diagnosis.—Bonnet wrote, "We have not any certain signs by which we can recognise bony ankylosis." This sentence was written, however, before anæsthetics were in general use in surgery. At that time it may have been strictly true; for, undoubtedly, an instance is occasionally found where, from the large size of the limb or from other cause, it may not be possible to assert

positively that the adhesions are bony. Generally, however, where true ankylosis exists, the sensation on grasping the limb above and below the joint, and on endeavouring to move one part on the other, is unmistakeable: the sensation of solidity which is communicated under these circumstances, is never felt when the adhesions are fibrous. Yet, as bony ankylosis is the exception, but fibrous adhesions exist so commonly as to constitute the rule, the full effect of chloroform should always be obtained before ankylosis is pronounced to be bony. Immobility alone is no sign of true ankylosis; but, on the contrary, it frequently exists where the adhesions are fibrous. And even where the full effect of chloroform has been obtained, so that all muscular influence has been removed, immobility sometimes remains as great as before. Indeed, I know no certain test which will enable true and false ankylosis to be at once distinguished, except the peculiar and unmistakeable sensation which is communicated by solid, bony union. But this is certain that, where the slightest motion exists, union is not bony. And again, when the muscles about a joint are rigid or the tendons are tense, union is not bony.

Prognosis.—When ankylosis is bony, forcible extension will generally be found to be insufficient to restore the straight position of the limb. It will be necessary, under these circumstances, to resort to excision of a wedge of bone to restore a more convenient position of the limb. Occasionally, however, a bridge of bone may be broken, and the motion of the joint may be restored. Such a case lately came under my care. In this instance some fibrous adhesions existed, together with a

narrow band of bone external to the capsule. The bone yielded with a loud snap, on flexing the limb forcibly, and the motions of the joint were immediately perfectly free. A very fair amount of motion was restored in this case. Doubtless, a large number of ankylosed limbs are incurable; *i. e.* a crooked limb may be made straight, but motion cannot be restored. Again, in perhaps a larger number, partial motion may be gained after the adhesions have been ruptured; and in a small remainder restoration of motion is complete, or nearly complete. Necessarily, the adhesions must be extra-capsular, or when they are intra-capsular they must be slight, that perfect motion may be re-established. I lately saw a young lady whose hip-joint had been ankylosed for nine years. On examination I detected motion, and it appeared to me that the adhesions were very slight. A jerk ruptured them, and the motion of the joint was perfectly free. These adhesions were intra-capsular. No tenderness followed the rupture, and in the course of a fortnight almost the entire range of motion had been acquired. In this instance voluntary motion to the normal extent was regained. Such a satisfactory result cannot be hoped for, however, unless the articular surfaces retain their natural form: the more these are altered, the more limited will be the motion of the joint.

Of 32 cases which I have submitted to rupture, the following has been the result: In 11 instances, complete power of motion, or nearly complete power, has been gained; in 14, partial, but useful, motion has been restored; and in 7, the limb has been rendered straight, and the joint has remained stiff. Of the 11 first-men-

tioned cases, 8 were of the hip, 1 of the shoulder, 1 of the elbow, and 1 of the ankle. Of the 14 in the second series, 5 were of the knee, 4 of the hip, 2 of the elbow, 1 of the shoulder, and 2 of the ankle; and of the remaining 7, 4 were of the knee, 1 of the hip, 1 of the ankle, and 1 of the elbow.

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. Pressure on the buttock soon becomes painful, and the leg of the affected side is cramped. Consequently, sitting is an awkward, and after a time, a painful position. But the most painful position is on horseback. Not only is the seat most insecure, but it causes much pain, 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 some few weeks ago, said—"I am in the saddle all day, and have no pain." The chief complaint of two other gentlemen also, who were similarly affected, was that in consequence of the pain produced 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 rupture of the adhesions was impossible; and it causes great satisfaction and pleasure to find that the power has been regained.

PARTIAL ANCHYLOSIS OF THE HIP-JOINT.

CASE I.—March, 1856.—L. S—, thirteen years of age, light-haired, and of a strumous complexion, was attacked with inflammation of the hip-joint three years prior to the above-mentioned date. She was attended at the commencement of the affection 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.

When I first saw her, pain had 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 could just touch 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 the same length as the other limb.

Having fixed the pelvis with one hand, I suddenly flexed the thigh, jerking the limb without using much force. The adhesions were soft, and yielded readily. Very slight pain followed the rupture. A gutta-percha splint was applied, and 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.

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 not now 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.

CASE II.—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.

March 5th, 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 was of the same length as the sound limb; the pelvis was 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.

The full effect of chloroform having been obtained, the pelvis was firmly fixed by an assistant, 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. 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; and, indeed, until the present time it is carried on daily. Now he can mount his horse comfortably, and can remain in the saddle, he says, "any number of hours," and has no pain on dismounting, but stiffness only. The motion of the joint is not so free, however, as I could wish to see it; but I have little doubt that whatever rigidity yet remains, will be in time removed.

CASE III.—F. C—, twenty-five years of age, an officer in the Royal Artillery, 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 limb was 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 the power of motion 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: 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.

January 24th, 1857.—'The full effect of chloroform having been obtained, I fixed the pelvis with one hand, and with the other jerked the limb, without exerting much 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 born. and 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 my patient could sit on his heels, each heel being equally in contact with the corresponding tuberosity of the ischium.

March 24th.—Exactly two months after the operation, the communication, to which I have already alluded at the head of this paper, was read before the Royal Medical and Chirurgical Society, 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 rupture. He walked without the slightest halt, and without support. I received a letter from him, dated December 24, 1857, from which I quote the following sentences:

“ I walk occasionally twelve or thirteen miles a day;

not bad, I think. The buttock has filled out wonderfully."

He was then, and had been for some months, performing his military duties. Now, I am glad to say, he has gained his promotion; and yet, I am more glad to add, he has no intention of leaving the army.

CASE IV.—June, 1853.—A. G—, seven years of age, a small, ill-nourished, irritable, dark-haired child, suffered two years before this period from acute inflammation of the hip-joint, which was thought to be rheumatic in character, and which had followed exposure to wet and cold. When I first saw this child 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. Myogenic paralysis is not uncommon in childhood. I have only observed it in two instances, however, combined with partial ankylosis. 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 was used. Stimulants were continued. There is little doubt that the power of the limb will be in time restored.

CASE V.—May, 1856, H. S—, twelve years of age, light-haired, with a florid complexion, was attacked with inflammation of the hip-joint after sitting on a damp bank, two and a half years before I saw her. She suffered acutely when inflammation was first developed, and was treated at the time actively, yet it produced only partial mitigation of suffering. This acute pain lasted nearly six months, when it began to diminish, and ceased entirely about ten months from the commence-

ment of the attack. The thigh had become flexed upon the pelvis during the period of confinement to bed at an acute angle; the pelvis was very oblique, and the spine was curved laterally; the heel barely reached as low as the knee of the opposite side; the buttock was much flattened, and the muscles of the limb were wasted, but the limb itself was not shortened.

The adhesions, which appeared to be extra-capsular, yielded readily on the application of two or three sharp jerks, suddenly and completely. The limb was then bandaged and placed in a gutta-percha splint, and so left perfectly at rest for a week. A very slight degree of pain followed the operation, and even when slight movements were commenced, on removing the splint, they were scarcely complained of. In the course of three months, the thigh could be flexed and extended passively to the full extent of normal motion, little or no pain being excited; there was very little muscular power, however: the patient could walk across the floor with a stick and a crutch, and without dragging the leg, but without lifting the foot. Stimulating liniments were used, and a small blister was occasionally placed behind the trochanter. A visible effect was produced in the course of some months, for muscular power was sensibly increased: yet progress was slow. In the summer of 1857, the thigh could be flexed, though not fully, and the patient could walk without other support than a stick. The obliquity of the pelvis had been entirely overcome, as well as the lateral inclination of the spine, without any special treatment being directed to either. Also, the tendo-Achillis, which was extremely tense,

yielded in the same manner, and allowed the foot to be well flexed in walking. At the present time a stick is used in walking, except in the house. There is much muscular power wanting, and I doubt if it will ever be perfectly regained.

CASE VI.—C. M—, an officer in the Royal Engineers, was returning from the trenches before Sebastopol, November 24th, 1854, with a friend, when he was struck in the median line of the abdomen, immediately below the umbilicus, by a bullet. In this position the ball struck on a button, and, glancing, entered about three inches above the pubis, and passed into the groin, carrying with it portions of a match-box, and other things, which it had encountered in the pocket of the friend, through which it passed 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 remained. 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 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.

March 30th.—The full effect of chloroform having been obtained, the pelvis was firmly fixed, and, 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 splint. 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, with heroic fortitude. 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, it soon moved from

the position which it had so long occupied ; less irritation was then created, 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 be flexed beyond a right angle, and it could be perfectly extended.

PARTIAL ANCHYLOSIS OF THE KNEE-JOINT.

CASE VII.—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. Abscesses formed, which remained open many months, and which 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 ; just appreciable motion of the joint existed ; the patella was not ankylosed.

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 by the application of a suddenly imposed force. 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, the tendons, fasciæ, and cicatrices having been again subcutaneously 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 slight extension was made; and from this time it was continued day by day

as rapidly as it could be borne, until at the expiration of two months the limb was perfectly extended. 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, and on the eighth day passive motion was commenced, and it was subsequently repeated each day to the utmost extent that could be borne. At length the limb could be flexed at a right angle, and it could be perfectly extended. This caused considerable pain, however, so that the patient himself was unable to flex the leg 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 this amount of 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.

PARTIAL ANCHYLOSIS OF THE ANKLE-JOINT.

CASE VIII.—E. O—, six years of age, 1857. Nearly two years before this time the ankle-joint became much inflamed, the inflammation assuming a rheumatic character, and following a slight sprain. The inflammation continued some weeks, then it abated, and it subsequently recurred. At length the joint became stiff, and fixed at a right angle.

February, 1857.—I found the leg slightly shorter, and the foot rather smaller, than the other; all the tendons around the joint were prominent, and the foot was firmly fixed at a right angle, with entire absence of pain and of power of motion. The tendons being tense, was evidence that anchylosis was not bony. I therefore divided them; namely, the tendo-Achillis, the tibiales, anticus and posticus, and the extensor longus digitorum, on February 26th; and, four days later, as the peronei remained very tense, I also divided them.

March 4th.—On suddenly extending the foot, the adhesions were torn through. This was not followed by inflammation, and there was scarcely tenderness of the limb after twenty-four hours. A Scarpa's shoe, with apparatus for exercising the various movements of the foot at the ankle-joint, was afterwards applied. Flexion and extension were, of course, the movements which it was most important to gain; and these, as well as slight power of abduction of the foot, were, to a great extent

gained by the end of May. At this time extreme extension and flexion caused pain, but all motion less than the extreme normal motion of the joint was painless. With an additional thickness of sole to her boot, the child could walk across the room, slightly favoring that foot, but without limping. Strength was gradually acquired, and also the size of the limb increased. The child wore a support for the ankle during many months, and wearing it there was scarcely an appreciable halt in the gait.

PARTIAL ANCHYLOSIS OF THE ELBOW.

CASE IX.—S. D—, eight years of age, 1856. When he was three years old, he was jerked up from the floor by his nurse, who held him by the wrist. Acute pain at the elbow followed this act of violence, and inflammation succeeded, which terminated in loss of motion.

November.—I found the forearm slightly flexed, and the hand in a semi-prone position; the limb somewhat smaller than the other, and the elbow stiff and immovable.

November 22d.—Chloroform was administered, and I attempted to flex the arm. In this, however, I did not immediately succeed, but on continuing my endeavours the joint gradually yielded, without imparting a distinct sensation of tearing, 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 rupture. 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.

November 24th.—The forearm was moved upon the arm slightly, without exciting pain, and these movements were continued on alternate days, until November 29th, when he was again placed under the influence of chloroform. Now the radius could be rotated perfectly, and with 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. Also, there was a limited power of pronation and supination.

CASE X.—E. S—, eleven years of age, November, 1855. Three years ago she fell and struck her elbow; much pain and swelling followed, and the joint continued

swollen and painful during many months. At length it remained stiff and immovable.

I found the entire limb somewhat diminished in size, the forearm slightly bent, and the elbow stiff and motionless. There was neither enlargement of the ends of the bones nor thickening about the joint, or this existed to a very slight extent only. And from the sensation communicated on attempting to flex the forearm, I could not doubt that the adhesions which prevented motion were fibrous. Consequently, I proposed to rupture them, and carried this into effect November 12th. They gave way instantly, on applying force, with a crackling sound. Some pain followed the rupture, and the next day slight effusion was observed about the joint. This, however, had entirely subsided on the third day. Gentle motion was then borne without complaint, and it was continued until the eighth day, when extended movements were again made. Some tenderness of the joint followed, which necessitated quiet for some days. Increased weakness was for a time felt, but motion was both more free and caused less pain. Passive motion was continued assiduously, and at the end of three months the movements of flexion and extension were almost perfect, and the power of motion existed to a considerable extent. She could now carry a spoon to her mouth with her right hand, which she had not previously been able to do. Power of motion was gained slowly; yet, after a year and a half of unwearied attention, a very useful joint was gained.

I have again called attention to this subject for several

reasons; both because forcible extension is used where it is not justifiable, and also because the greatest uncertainty seems to prevail as to the class of cases for which it is proposed.

Among other instances of forcible extension to which I have lately been a witness, was one of a contracted knee in a state of inflammation. The joint was acutely painful and swollen. The hamstring tendons were divided, and immediately afterwards the limb was forcibly extended. During this process of extension the wounds were much enlarged, so that they became at least one and a half inch in length; yet the limb could not be fully straightened even by the application of great force. The limb was then bound to a straight splint. But it need scarcely be said that this extended position of the limb could not be borne, and that the splint had to be removed; nor, that this violence caused a complication of evils infinitely greater than the contraction which it was intended to remove. This limb, which was lost by the force used, might have been most easily straightened by gradual extension after inflammation had been overcome.

Again, the following may be read in the 'Lancet' of March 13th, 1858, p. 265: "*Anchylosis of the elbow-joint.*—On the 11th February, a young man in University College, with extensive disease of the right elbow, was to have had the joint excised; but he was so low from unsuspected latent phthisis, that the operation was abandoned, and he died three or four days afterwards.

On the 18th of the same month, the same operation was

to have been performed upon the elbow of a lad, in the above hospital, whose joint was ankylosed in a faulty position, being perfectly straight. The arm was quite useless to the poor boy, as he could do nothing with it, and it prevented him from earning a livelihood. He had had disease of the joint for eight years, which originated in a fracture. The arm was in a flexed position for four or five years; but, as he was in the habit of lifting heavy weights with it, it became gradually straight, and remained in that position, in a state of almost complete ankylosis; there was, however, a very little motion in the joint. No appearance of disease was manifest externally, and pronation and supination were perfect. It was an illustration of one of the class of cases in which excision is quite justifiable, namely, ankylosis in a faulty position. However, it was determined to try flexion under chloroform first; and this perfectly succeeded, as the adhesions were only fibrous, and the forearm moved freely on the arm. This was a gratifying result; and we may add that the boy is going on well, and will have capital motion in the joint."

Now, making allowance for any errors of description, here is an instance, well and forcibly recorded (I may say two instances), of that *furor* which at present prevails for the excision of articular surfaces. In the first, the patient died of phthisis three or four days after that on which resection was to have been performed. The second "was an illustration of one of the class of cases in which excision is quite justifiable. *No appearance of disease was manifest externally, and pronation and*

supination were perfect." However, before proceeding to resection, it was determined to flex the elbow forcibly, when, wonderful to relate, the fibrous adhesions yielded, the forearm moved freely on the arm, and the boy "will have capital motion in the joint."

Comment is unnecessary. If any excuse were required for again bringing this subject under the notice of the profession, it is to be found in the few preceding lines.

But it may perhaps be urged, that these cases are incorrectly reported. Of this I know nothing. But this I may state, that these cases do not stand alone, for other "illustrations" might be added where resection was deemed justifiable, but the joint, on being opened, was found to be healthy. Three such instances I could reveal. Also, of the thirty-two cases above alluded to, it had been proposed to remove the articular surfaces in three instances. In two of these cases the limbs are now straight but stiff; in the third, very useful motion of the joint has been restored. It would be idle to assert formally, that a limb is more useful where the adhesions have been ruptured and where it remains straight though stiff (the knee for instance), than where resection has been performed; for the proposition cannot be denied. But when resection is proposed and practised, the joint being in such a condition as to admit of the restoration of motion, not only may it be said that such an operation is not justifiable, but that it is barbarous. And if this may be said in reference to a limb where motion is lost through partial ankylosis, language can scarcely be found sufficiently severe to comment upon resection in

such a case as that transcribed above from the 'Lancet,' in which "*no appearance of disease was manifest externally, and pronation and supination were perfect.*"

It is urged by some, that gradual extension is safer than rupture of the adhesions. To which proposition I give my cordial assent. There is a class of cases, however, in which gradual extension of adhesions is utterly impracticable, in which, indeed, it is never attempted, or if it is attempted, it cannot but fail; a class of cases which has been held to be incurable, except by resection. It is to this class that I would especially refer my remarks. Not only is it impossible that these adhesions should be overcome by gradual extension, even though the most carefully constructed apparatus be employed, but the restoration of motion has never under these circumstances been sought for, and could not possibly be obtained, without first rupturing the adhesions.

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