

CLINICAL LECTURE
ON
DISPLACEMENTS AND INJURIES OF MUSCLES
AND TENDONS.

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MANY instances of displacement of muscles, or—to speak more accurately—of their tendons, have been recorded.¹ The clearest, as well as the most familiar examples are displacement of the tendon of the peroneus longus to the front of the external, and of the tendon of the tibialis posticus to the front of the internal malleolus; and of the long tendon of the biceps inwards or outwards from the bicipital groove of the humerus. This accident to muscles, however, is rare. Many muscles are not liable to its occurrence. This is the case with all such as act in a straight line, and do not pass over any bony prominence—the coraco-brachialis, brachialis anticus,

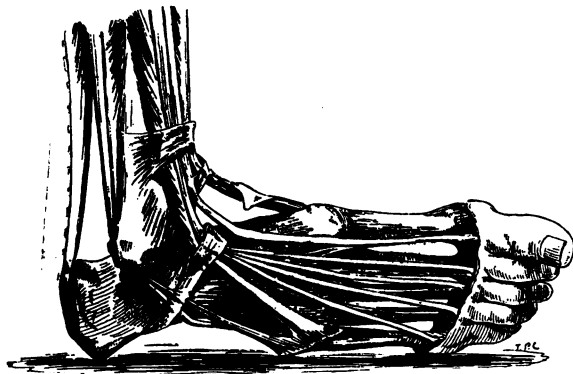


Fig. 1.—Showing that during inversion of the foot the tendon of the peroneus longus is securely fixed to the groove at the back of the external malleolus of the fibula.

palmaris longus, crureus, soleus, and many others. The muscles open to this liability may be grouped under the following headings: (a) Those which, at some part of their course, have their tendons suddenly or considerably deflected, and which, as they pass round some bony prominence that serves them for a pulley, lie in a groove bridged over by a ligamentous expansion. This is well seen in the case of the peroneus longus and the tibialis posticus as they pass behind the malleoli. If, while the foot is either inverted (Fig. 1) or pointed straight forwards, the peroneus longus contracts

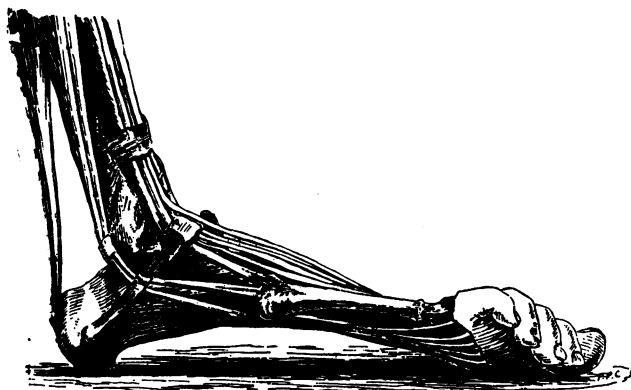


Fig. 2.—Showing that when the foot is everted the tendon of the peroneus leaves its bony groove at the back of the external malleolus and is then kept in place merely by its fibrous sheath.

it cannot slip, for its tendon is drawn tightly into the bottom of the groove at the back of the external malleolus; but when the foot is everted,² the peroneus has a tendency to leave its groove (Fig. 2), so that its sheath becomes its pulley, and this, if the strain is severe, may give way.

CASE I.—In Mr. Curling's well-known case, as a man, aged 21, was taking a jump, his left foot slipped on a stone and was turned outwards. On taking off his boot he found a cord on the outer and front part of his ankle. This he replaced himself with instantaneous relief.

CASE II.—Monteggia³ reports the case of a young man who dislocated both lateral peronei (longus and brevis) while dancing. They were easily replaced but did not remain in position; they used to slip in and out but without pain.

CASE III.—Benoit, a friend of Broca's,⁴ knew a dancing master whose peronei habitually slipped, but their condition did not prevent him from following his profession. In dancing the foot would be everted. Both Robert and Legouest⁵ report cases in which the peroneus longus and peroneus brevis were displaced.

CASE IV.—On March 16th of the present year one of the Sisters of the hospital, on leaving an omnibus, twisted her right foot and fell. It was found that the tendon of the peroneus longus had become displaced, and was lying on the front of the lower end of the fibula. The tendon was easily replaced by the house-surgeon, Mr. Crossman. Considerable extravasation of blood, and swelling followed. The foot was placed nearly at a right angle with the leg, and turned somewhat inwards, so that the tendon lay at the bottom of the groove behind the malleolus, and a leather splint was applied. The foot was kept in this position for six weeks. The splint was then removed, and passive movements and massage were cautiously used for a fortnight. At the end of eight weeks after the injury the patient was allowed to walk. At the present time she is walking freely on the limb, and the tendon remains in place.

If the foot instead of being everted is inverted (Fig. 3), and a strain is thrown upon it, it is the tibialis posticus that is in danger of displacement, for in this position the tendon escapes from its groove and pulls directly upon its sheath.



Fig. 3.—Showing that when the foot is strongly inverted the tendon of the tibialis posticus leaves its groove at the back of the internal malleolus of the tibia, so that the strain of maintaining it in position falls entirely upon its fibrous sheath.

CASE V.—In the *Bull. de l'Acad. de Méd.*, January 6th, 1874, M. Charles Martins has described the manner in which dislocation of the tendon of the tibialis posticus to the front of the internal malleolus happened in his own person.

M. Martins was in a balloon, which in its descent bumped violently upon the ground. Finding that he was being turned heels over head backwards he forcibly extended his foot in order to right himself. He experienced a sudden

¹ The earliest reference to this subject with which I am acquainted is by William Cooper (*Myotomia Reformatia*, p. 75, 1724), who relates a case of displacement of the long tendon of the biceps. Pouteau also refers to it (*Mélanges de Chirurgie*, p. 417, 1760.)

² Erichsen, *Surgery*, vol. i, p. 502, states, I venture to say erroneously, that the accident is caused by a violent twist of the foot inwards.

³ *Istituzioni Chirurgiche*, Part Second, 1802.

⁴ *Bull. de l'Acad. de Méd.*, p. 11, 1874.

⁵ *Gaz. des Hôpitaux*, p. 389, 1847, and *Gaz. des Hôpitaux*, 1868, p. 191.

pain, and afterwards found that the tendon had been displaced to the front of the malleolus.

There is a particular muscle which, from its deflected course, would appear at first sight to be peculiarly liable to displacement. This is the extensor longus digitorum (pedis). When the foot is inverted this muscle takes the direction shown in Fig. 1.⁶ Yet so far as I know, no example of its displacement has ever been recorded. The explanation of its immunity from this accident is clear when the structure of the anterior annular ligament is taken into account. It will be remembered that this ligament is \hookleftarrow shaped, and that the stem forms a loop through which the tendons of the extensor pass. It is this loop (Fig. 1) which binds down and serves as a pulley for the muscle, and effectually prevents it from "straightening out," no matter how much the foot is inverted or how forcibly the muscle acts. Mr. Waring, Senior Demonstrator of Anatomy at St. Bartholomew's Hospital, finds that the breaking strain of this loop is about 112 lbs.

(b) Those which pass over bony prominences that undergo considerable subjacent movement to one side or other of the line of the tendon. This is well illustrated by the long tendon of the biceps cubiti. Thus William Cooper⁷ relates that a woman, while wringing linen, felt something displace itself at her shoulder. Three days afterwards the surgeon noticed a depression at the outer part of the deltoid, a rigidity in the lower part of the biceps, and an impossibility to extend the forearm. Next day Cooper manipulated the arm in various directions, the tendon slipped back into place, and the patient at once recovered the use of her arm. In the act of wringing clothes, the upper end of the humerus would be strongly rotated outwards, and during this movement the bite of the tendon would be at first upon the inner border of the bicipital groove, where it is formed by the lesser tuberosity; but as the bone turned still further outwards, the strain would fall entirely on the strong aponeurotic expansion (derived from the insertion of the pectoralis major), which converts the groove into a canal. Rupture of this expansion would be followed by displacement of the tendon.

Monteggia⁸ reports the case of an old lady who was constantly subject to dislocation of the long tendon of the biceps. When she felt it go out, she put her hand on the shoulder of another person, and this movement restored the tendon to its place.

(c) Those that slip over some bony ridge or projection. A case that will serve as an illustration is recorded by Pouteau (Case vi).⁹ A girl who was leaning out of a window suddenly turned her head to look upwards and to the right. She felt acute pain, and found that her head was drawn down towards the right shoulder and fixed in that position. Pouteau, believing that a bundle of the splenius had slipped, relaxed this muscle, and manipulated the part. While this was being done, the patient felt a jerk, the pain at once ceased, and free movement was regained. A very similar case was under notice in the out-patient room of St. Bartholomew's Hospital in 1886.

CASE VII.—A boy, aged 19, while vigorously washing his face and neck, felt a sudden pain in the side of his neck, and found that he could not move his head. When he came to the hospital three hours afterwards, he presented the appearance of a person with wry neck, and any attempt at movement was very painful. He inhaled gas, and his muscles were kneaded where he had previously indicated that he felt the pain, and his head was placed in its proper position. When he regained consciousness, all his symptoms had disappeared. In both these instances it seems highly probable that a tendon of one of the deep muscles approaching its insertion, had slipped over the apex of the posterior tubercle of the transverse process of one of the cervical vertebrae.

CASE VIII.—A young cavalry officer, much given to athletics, when he raised his left arm suddenly to a right angle with the trunk, as for instance to protect his face when taking a fence while hunting, had severe pain at the insertion of the deltoid, and found that the arm was fixed and powerless. On moving

and rubbing the part the symptoms disappeared, but the arm over the lower part of the deltoid was tender on pressure for two or three days. Two years later, the right arm was affected in an exactly similar way, and the symptoms recurred so frequently that it became likely he would have to leave the service. It was impossible to say on what this condition depended, but it seemed probable that the deltoid ridge had become irregularly hypertrophied, and that there was some outgrowth or projection over which the tendon slipped.

I have elsewhere recorded a case¹⁰ in which the symptoms observed could best be explained by the view that one of the four or five tendons which lie on the deep aspect of the obturator internus as it passes out of the lesser sacro-sciatic foramen had slipped over one of the ridges by which the bone is often marked in this situation.

I have met with four instances in which, with each movement of the fingers from extension to flexion and flexion to extension, one of the tendons of the extensor communis digitorum slipped out and in over the subjacent knuckle. The tendon of the popliteus appears to be subject to displacement. It will be remembered that during flexion this tendon lies in a well-marked groove in the external condyle of the femur, which it leaves when the limb is extended. In osteo-arthritis the condyle of the femur in the neighbourhood of this groove, as elsewhere, may become "lipped," so that the edge of the articular cartilage is heaped up into irregular prominences, and over one of these the tendon may slip. I have never seen this condition demonstrated by dissection, but cases have presented themselves in which the knee was locked against extension by some impediment at the back of the joint in the course of the popliteus tendon, and in which the "lock" disappeared when the leg was flexed upon the thigh, rotated inwards and outwards, and then fully extended. I believe that some instances, although they must certainly be rare, of internal derangement of the knee-joint, are due to this dislocation of the popliteus tendon.

Among other muscles the displacement of which has been recorded are the triceps cubiti, pronator teres, rectus femoris, sartorius, plantaris, and slips of the erector spinæ, as in an instance related by Callender.

SYMPTOMS.

The symptoms of dislocation of a muscle are sometimes obvious, as in the case of the peroneus longus, the tibialis posticus, and the extensor communis digitorum of the fingers. Here the tendons can be both seen and felt close beneath the skin. Sometimes the diagnosis rests on indirect yet pretty clear evidence. Thus, in the case of the woman who was wringing linen, dislocation of the tendon of the biceps was indicated by the patient's sensation of a sudden slip near the head of the humerus, rigidity of the lower part of the biceps, fixation of the forearm in a flexed position, the impossibility of extending the forearm; and also by the fact that she was executing a movement at the time by which it seemed not unlikely that the accident might be produced. In the two cases of displacement of muscles in the neck, the evidence, while it seemed tolerably conclusive, was yet indirect in character.

In a third group the diagnosis of muscular displacement may be impossible, and the surgeon will be able to get no further than a suspicion that a displacement of some kind has occurred. In the case of what I believe to have been displacement of one of the tendinous subdivisions of the obturator internus in a boy, aged 14 (*supra*), the limb was slightly flexed, abducted, and rotated outwards; there was pain, together with tenderness on pressure over the ilium, just above and internal to the great trochanter, and lameness. The view I originally formed of the case was that there was some tuberculous mischief involving the ilium in the neighbourhood of the external rotators. All the symptoms, however, disappeared when the limb was manipulated by a bone-setter, who said "a bone was out." This imaginary bone, however, he located 4 inches down the thigh, in a line with the anterior iliac spine. A year later the boy, on suddenly rising from the sitting position, was seized with sudden pain in the old place; the limb was fixed in the same position as before, and

⁶ The inversion may be so violent that the fleshy part of the extensor brevis digitorum is ruptured.

⁷ *Loc. cit.*

⁸ *Istituzioni Chirurgicali*, Part Second, p. 334, 1803

⁹ *Loc. cit.*

¹⁰ *Diseases of the Joints and Spine*, 1895, p. 235

was now the seat of painful muscular spasms and tremors. On this second occasion the sudden onset of the symptoms following the act of rising, the fixed condition of the limb, and the spasmodic state of the muscles could, perhaps, best be explained by some muscular displacement, but such a view could scarcely have been more than a suspicion. However, having heard what had already taken place, I manipulated the limb under gas, and the symptoms at once disappeared.

The history may be of great assistance in this group of cases. It was the knowledge that the trouble had followed a sudden change of posture and that similar symptoms had on a previous occasion been relieved by manipulation, which afforded a strong suggestion as to the treatment that should be adopted.

TREATMENT.

Reduction is easily effected by manipulation after the part has been placed in such a position that the muscle concerned is relaxed. In Case VII the head was turned down towards the shoulder and rotated to the same side, and then the muscles at the seat of pain were kneaded and rolled backwards and forwards under firm pressure beneath the fingers.

In cases of mere displacement, unaccompanied by laceration of the retaining sheath, no treatment beyond reduction will be required. But when laceration of the sheath has occurred, after-treatment to prevent recurrence is of the highest importance, the more so because cases which are on record show that if adequate treatment is at once adopted, complete repair may be secured. As soon—in the case, for instance, of the peroneus longus—as the displacement has been reduced the foot should be placed at a right angle with the leg and somewhat inverted, and be enclosed for a month in a leather splint or plaster-of-paris (Case IV). In this position the tendon will lie secure from any liability to displacement at the bottom of its groove, and the torn edges of the sheath will have the best chance of falling together, while the inflammatory exudation which follows the injury, undergoing organisation, will, it may reasonably be expected, either produce union of the torn sheath or develop a new one. That a new sheath may be thus developed is proved by a case recorded by Stanley,¹¹ who in the dissecting room found the long tendon of the biceps dislocated out of its groove and lying on the top of the greater tuberosity of the humerus. A membranous sheath fixed to the bone and surrounding the tendon maintained it in its new position. This sheath was smooth and polished on its internal surface, and gave free play to the tendon.

In the case of C. Martins, of dislocation of the tibialis posterior, the leg, after reduction of the tendon, was placed in a silicate bandage. The foot was not put to the ground for two months. At the end of three months, he could walk without pain, when the ankle was supported with a bandage. He believed that no adhesions between the sheath and the tendon had been formed, and that synovial secretion had not been interfered with. Jarjavay met with a case of dislocation of the peroneus longus in which recovery took place in a month, the foot during this time having been retained in a rigid bandage. Gosselin, in a case of dislocation of the peroneus, endeavoured to produce inflammation by allowing the tendon to slip in and out for a few days, with the view of securing adhesions. In the case so treated, the patient walked well without any support and without a limp in six weeks. Many, I think, will doubt the advisability of endeavouring to promote inflammation in these cases, and I should myself doubt very much whether it contributed to the successful result, seeing that in other cases not so treated recovery has been met with. Here the question presents itself whether, in a recent case, the lacerated sheath should be exposed and sutured. As to this, I have no experience to offer, nor do I know of any instance in which the operation has been performed. That repair may take place without it is shown by published cases. Whether or not the proceeding is advisable cannot, I think, be decided till further experience is obtained as to the results of treating cases by fixation in an appropriate position of the limb. Should it prove that the results of the latter method are unsatisfactory, immediate suture, which would involve no risk when performed aseptically, would be clearly indicated.

¹¹ Lond. Med. Gaz., vol. iii, p. 12, 1829.

A drawback that some might anticipate after suture would be the development of adhesions between the tendon and its sheath. But if these formed they would at all events keep the tendon in place, and at the worst they could only embarrass or prevent the action of a single muscle which was already out of gear. If, however, the operation is aseptic, no adhesions are likely to form. When tendons which have been cut in wounds of the hand are sutured either immediately or after some time has elapsed, adhesions do not form unless suppuration occurs.

And clear evidence upon the question of the development of adhesions as the result of an operation is obtained from the following case: A young lady aged 19, who was training as a professional pianist, said that she could not use her left hand. On examination it was found by Dr. Little, of Wimbledon, that she had a bony outgrowth from the lower end of the radius beneath the radial extensors, which interfered with the movements of their tendons. In the operation for its removal, it was necessary to divide the posterior annular ligament of the wrist, and displace the tendons of the extensor secundi internodii pollicis and the extensor carpi radialis longior and brevior. Although this was done, and although after the growth was removed the tendon-sheaths were left resting on the exposed cancellous tissue of the radius, primary union occurred and absolutely unimpaired movement of the wrist and thumb was preserved.

In cases of long standing, in which the recurrence of displacement, for instance of the peroneus longus, was a frequent source of pain and considerable interference with the use of the part, and in which less radical measures, including suture, carefully tried, had all failed, the best course would probably be to throw the muscle entirely out of action by resecting so much of its tendon as would ensure the permanent separation of its ends. The patient after such a proceeding would no doubt have lost an important muscle, but it would be one whose functional activity had already been destroyed.

Rupture of Muscles.—The following remarks have no allusion to the laceration of muscles which is produced by external injury, or which occurs in tetanus or during parturition. They refer only to the rupture of single muscles by their own forcible contraction during ordinary movements. It is well known that the nervous system can stimulate a muscle to such a forcible contraction that the muscle either tears itself or its tendon, or fractures the bone upon which it is acting; which of the two structures—the muscle or the bone—will give way depends upon various circumstances. In the case of the quadriceps extensor femoris *versus* the patella, it is probably often a question of the position of the limb at the time. (If when the breaking strain is applied the limb is flexed (the usual case) the patella, which is subjected to leverage of the first order, fractures transversely; while, if the limb is extended, either the quadriceps tendon or the fleshy substance of the muscle higher up in the thigh will be ruptured.¹² Sometimes the bone concerned is much weaker than the muscle: thus the tip of the internal condyle, while it is still an epiphysis, may be detached by the vigorous action of the muscles arising from it. Sometimes part only of a muscle is thrown into sudden action, and, taken at this disadvantage, it gives way. Among athletes the partial rupture of a muscle under such circumstances is a frequent accident.

Rupture most commonly involves the tendo Achillis, or some part of the muscular substance of the calf, the quadriceps extensor, or the adductors of the thigh, and the biceps of the arm; but it is not rarely met with in the rectus and other muscles of the abdominal wall. Less frequently it involves the deltoid, the pectoralis major, and the muscles of the back and of the forearm. It would be useless as well as tedious to describe cases of ruptured muscles or of their tendons in any detail, but the following examples may be briefly related.

CASE I.—A lady, while skating, ruptured her tendo Achillis, but continued to walk upon the limb, and for some months attended regularly at a gymnasium.¹³ When

¹² Rupture of the ligamentum patellæ is noticed later on.

¹³ It may be worth while to allude to the fact that rupture of the tendo Achillis does not prevent a patient from walking on the limb. Unless this is borne in mind the accident may easily be overlooked. A gentleman, aged 66, who ruptured his tendon while stepping into a railway carriage, walked down the platform, a distance of about fifty yards, and

I first saw her, nine months afterwards, corresponding to the lowermost 3 inches of the tendo Achillis was an elongated elastic swelling about twice the normal size of the tendon, and evidently containing fluid. As the patient was not improving, and as the limb was very weak and the calf muscles were much wasted, the swelling was explored through a longitudinal incision. About 2 drachms of clear amber-coloured serum escaped from an elongated cavity containing the tendon. The tendon had been ruptured, and was still completely ununited. The upper end had become retracted. The lower end, about 2 inches long, was necrosed and shrivelled, and from long maceration in the serum mentioned above, presented the appearance of wet chamois leather. Below, it was still attached to the os calcis. The walls of the cavity were thick and formed of condensed cicatricial tissue. This material was so tough and substantial that it seemed capable of taking the place of the lost tendon. The necrosed piece was therefore cut away, and the edges of the incision into the sheath were brought together longitudinally. Thus the sheath was converted into a cylindrical column, which was about the size of, and felt very much like, a normal Achilles tendon. The wound healed by primary union. After the operation, the new tendon became firm and tolerably strong, and the patient was able to walk with the help of a light steel support. This has now been discarded, and the limb has gradually become much stronger.

CASE II.—A few years ago I had a patient in the hospital who had met with a somewhat unusual accident. One of his fellow workmen threw a small axe at him across the workshop in which they were employed. The axe struck his heel, and, cutting through his boot, cut also through the posterior part of his os calcis, so as to entirely detach the tendo Achillis. It was found that on raising the heel the parts came very readily into position. The detached piece of bone united firmly to the rest of the os calcis, and the patient recovered the full use of his limb. Had it seemed necessary, it would have been very easy to suture the detached fragment in place.

Rupture of the Ligamentum Patellæ.—In October of last year a man aged 28 was admitted with complete rupture of the ligamentum patellæ. The injury occurred as the result of a violent effort which the patient made to save himself from falling in the street. Mr. Crossman, Senior House-Surgeon, found the patella drawn up the thigh for nearly 3 inches above its normal level, and a wide and deep gap between its lower end and the tubercle of the tibia. The patella was pushed down into position, and a pad and bandage were applied above it, and the limb was placed on a back splint. As, however, the patella had been considerably displaced upwards at the moment of the accident, and then pushed down again, it seemed highly probable that the upper end of the ligament was rucked up just below the patella, and at such a distance from the lower end that good union could not be expected.

It was therefore determined to cut down on the ligament and suture the ends together. When the ligament was exposed by a median longitudinal incision it was found that it was not simply snapped across, so that it presented two compact square ends, but that it had given way about its middle, piecemeal and obliquely from before backwards and upwards, so that its ends were broken up into numerous separate fibres and shreds of different lengths and sizes. The knee-joint was widely torn open in front, and contained a good deal of partially-coagulated blood. The joint was freely washed out and the two ends of the ligament were brought together by three or four sterilised silk sutures passed transversely through them above and below the points at which they were respectively frayed out. These sutures were drawn only so tight as to secure coaptation. Care was taken to avoid putting any strain on them, as this would have made them cut their way out. The limb was

went home in a cab. He felt his foot weak, but he was quite unaware that he had met with any material injury, and supposed he had merely sprained his ankle. It was only on careful examination that the injury was discovered. It is well known that John Hunter ruptured his tendo Achillis. He met with the accident, at the age of 39, when he was dancing. "He did not confine himself to bed, but continued to walk during the cure." He kept the heel raised and compressed the muscle gently with a roller. The result, however, does not seem to favour this method of treatment, as the tendon underwent ossification (Palmer, *L'éc.*, p. 34).

placed on a back splint. The wound healed by primary union. At the end of six weeks the patient was allowed to be up, and was furnished with an appliance such as is worn after fracture of the patella, and so constructed as at first to maintain the limb in a position of full extension, but afterwards to allow a gradually-increasing degree of movement. At the present time the limb can be completely and strongly extended, and flexed to an angle of about 120 degrees, and this amount is slowly increasing.

Rupture of the ligamentum patellæ is a rare accident, but many examples are to be found in surgical literature. Recorded cases show that the injury may be produced (a) by muscular action, during a violent effort to escape a fall backwards,¹⁴ or in the act of jumping, running, or rapid walking;¹⁵ (2) by a fall in which the limb is forced into extreme flexion under the weight of the body;¹⁶ (3) by direct violence when the ligament is tense.¹⁷

The ligament may be ruptured either completely or, as a few instances show, only partially. It may give way in any part of its length, or it may be detached either from the patella or from the tubercle of the tibia; or again, a small fragment of either the patella or the tibia may be torn away with it.

The diagnosis of rupture of the ligamentum patellæ is usually very easily made. The rupture is generally complete. When this is the case, the patella is drawn upwards considerably above the condyles of the femur—it may be as much as 3 inches, or even more—a distinct gap can be felt, and the limb is powerless. The injury is usually met with in male subjects during some strong muscular effort, but it may occur even in weakly people when the limb, in a fall, is violently flexed. In incomplete rupture there would be the history of an accident, a powerless condition of the limb, and a gap involving only a part of the tendon. Any considerable displacement of the patella upwards indicates that not only the ligament itself is ruptured, but that the lateral expansions of the vasti also are torn. Generally the laceration extends into the knee-joint. The suture of the ligament therefore usually involves exposure of the joint cavity.

The treatment consists either (a) of the use of a back splint to maintain the limb in an extended position and of some means of keeping the patella in place, or (b) of suture. In many instances in which the former method has been adopted the results have been satisfactory. The patients have been kept in the horizontal position for about two months, and have then been allowed to move about, wearing some form of apparatus for a period varying from three to six months.

Rupture of the quadriceps extensor tendon in the thigh is an accident in regard to both the prognosis and the treatment of which much difference of opinion still exists. Some believe that it is likely to be followed by grave impairment of the functions of the limb, and, as to treatment, that the patient should not be allowed for many months to walk without an apparatus to keep the limb in a position of extension. This opinion is scarcely borne out by clinical experience. Those seem more correct who hold that favourable recovery is the rule, and that in the generality of cases the limb may be safely used for careful walking, without support, within about four months after the accident. The following cases confirm this view:

A surgeon, 50 years of age, while walking in the dark on uneven ground, stumbled and ruptured his left quadriceps tendon just above the patella. He lay in bed or on a sofa for six weeks wearing a back splint, and then for two months he walked with a stiff apparatus. After this—that is, in less than four months—he discarded all support and walked about as usual. For a year the limb was somewhat weak and the muscles were atrophied; but at the end of this time the limb, except for some remaining muscular wasting, was as good as ever, and he could get in and out of a high dogcart with considerable agility.

CASE II.—A gentleman, aged 61, on arriving at the bottom of a flight of stairs, stepped upon a loose mat lying on a polished parquetry floor. The mat slipped, and in spite of a

¹⁴ Author's case. *Blacher, Gaz. des Hôp.*, 1875, p. 563, et seq. Sellier (*Blacher, ibid.*, p. 580).

¹⁵ Cosmao Dumenz, *Thesis*, 1865, quoted by Blacher.

¹⁶ Dumenz, *loc. cit.*

¹⁷ Blacher, *loc. cit.*

violent effort to support himself he fell. He was helped up and left standing for a moment with his hands on the mantel-piece, when his limbs suddenly gave way under him, and he fell a second time. On examination it was found that both his quadriceps tendons were ruptured close above the patellæ. He was kept in bed, or on a sofa, wearing back splints, for six weeks, and was then allowed to walk, wearing an apparatus to keep the limbs extended. At the end of three months—that is, fourteen weeks after the accident—he left off the supports, and only used a stick. He met with no drawback, and three years later he could walk five miles easily, and the limbs were strong and only “gave a little sometimes.”

Whether or not it is advisable to suture the quadriceps tendon, when it is ruptured, is a question to which, at present, no definite answer, I think, can be given. No doubt the operation can be performed with safety under due precautions, and the accurate apposition of the two ends of the tendon, which could be effected by suture, would conduce to rapid and firm union. On the other hand, there is ample experience to show that without the operation such good repair may occur that the function of the limb is scarcely, if at all, interfered with. Union will take place just as it does when, after rupture of the tendo Achillis, the ends are adjusted by placing the foot in a position of equinus. Wide separation of the ends does not usually occur, for the upper fragment is prevented from extensive retraction by the two vasti, with which it is closely connected, and which skirt it on either side, and are attached by their fascial expansions to the upper end of the tibia and the sides of the patella. The best course at present will be to deal with each case according to circumstances. In a young adult, to whom time is very important, and whose tendon presents a gap of an inch or more, suture will probably be advisable; while in patients upwards of 40, and whose health is in any way or degree impaired, the operation should not be done. Here, as in the case of the ligamentum patellæ, it is to be expected that the synovial membrane will prove to have been lacerated, so that the operation involves opening, and, if blood has been extravasated, washing out of the joint.

CASE III. Rupture of the Adductor Longus of Both Thighs; Removal of a Portion of the Right Muscle.—A man, aged 20, having joined a cavalry regiment, noticed, after some riding lessons, that his thighs at their upper and inner part were blood-stained, and that, on the right side, a firm swelling projected against the saddle, so that he could not ride. On examination it was found that, on the left side, the adductor longus was partially, and on the right completely, torn across about 3 inches below its origin from the front of the pubes, and that, when the right muscle contracted, its uppermost 3 inches protruded abruptly inwards like a rounded stump, close beneath the skin. A few days later this portion of the muscle, which proved to be connected with the part below merely by loose scar tissue, was dissected out. The wound healed by primary union. The piece removed was as well nourished and plump and ruddy as were the neighbouring muscles. Its condition thus contrasted with the atrophy which follows, in some instances at least, after a muscle has been ruptured. Perhaps the absence of degenerative changes was dependent on the circumstance that the rupture had occurred only a few weeks before. It is an interesting fact that, although so large a muscle as the adductor longus had been thrown out of action, the limb seemed, when the patient left the hospital, as strong and useful as ever.

The rectus and other abdominal muscles may be ruptured by violent action at football, in riding a troublesome horse, or in the effort to avoid a fall backwards while a heavy weight is being carried. In a football player the left rectus was torn, with a thin plate of bone, away from the crest of the pubes. The fragment of bone necrosed and led to an abscess, which burrowed halfway up to the umbilicus, and in the cavity of which it was found. Demoulin¹⁸ relates a case of rupture of the rectus abdominis in a man who made a violent effort to save himself from falling backwards while he was carrying a sack of potatoes. A large tumour, due to blood extravasation, formed below and to the left of the umbilicus, which a surgeon regarded as a ventral hernia, and for which he advised a truss. In this

case the patient was free from discomfort when he was at rest or when he walked in a stooping position, but he had pain when he attempted to walk upright. In another case a surgeon mistook a rupture of the right rectus for an umbilical hernia, and proceeded to operate upon it.

Janey and Richardson have reported cases in which rupture of the rectus was complicated by laceration of the deep epigastric artery and the formation of a very large effusion of blood.

Boyer records the case of a young man who, in lifting a bucket of water, ruptured his psoas magnus. Suppuration occurred, and the patient died ten days after the accident.

In the upper extremity the biceps appears to be ruptured more frequently than any other muscle. The rupture may involve the short or the long head, or the belly of the muscle formed by the union of the two. Wilson¹⁹ reports a case of rupture of the biceps of both arms. A man, aged 54, of great muscular strength, while fighting, attempted to deliver a blow, but missed his antagonist, and his arm fell useless to his side. Six weeks later he was fighting again, and ruptured his right biceps in exactly the same way. When the patient was seen by the author of the paper, both biceps muscles were evidently ruptured in their lowermost third, where there was a wide depression. The patient could flex the arms, but the depression was much more marked in this position.

Other muscles liable to this injury are the pectoralis major, the deltoid, and the triceps, and probably, from time to time, the various muscles of the forearm. Last year I saw a girl, aged 11, a patient of Dr. Chapple, of Weybridge, who, while at a gymnasium, had ruptured the tendon of the flexor carpi radialis. There was a sausage-shaped swelling in the course of this muscle, and a gap between the lower end of this swelling and the annular ligament. When the patient was asked to flex the hand upon the forearm, no projection in the line of the tendon could be felt; but a well-marked groove extending for an inch and a-half above the annular ligament became still more distinct. The functions of the limb were not appreciably impaired. The case deserves to be recorded, for rupture of the muscles in children is a rare occurrence.

SYMPTOMS.

These are generally so well-marked that if care is used they are not likely to escape notice, but they vary a good deal in different instances. (1) There is often a history of a strenuous muscular effort, but in some instances the force in action seems to be comparatively slight. The suddenness of the contraction of a muscle which a moment before was in a condition of relaxation, has much to do with the result. The tendo Achillis is sometimes ruptured by so slight a force that the history the patient gives is very apt to mislead. (2) There is at the moment sudden pain and a sensation as if the part had been struck, but the pain may be very slight. (3) The snap may be distinctly heard. (4) A gap can usually be felt. (5) When a tendon is ruptured there may be scarcely any swelling at first; later on some swelling is caused by the effusion of lymph for repair. When a muscle is torn at its fleshy part swelling due to extravasated blood is often considerable, and may extend for some distance. Thus in Richardson's cases the swelling was large enough to simulate an umbilical hernia. In some cases, for instance, when the quadriceps extensor tendon is ruptured, the limb is powerless, but in others, for example, when the tendo Achillis is torn, the patient may be able to walk with so little difficulty that the injury is easily overlooked.

PROGNOSIS.

In the large majority of instances prognosis is favourable. Ruptured tendons may undergo perfect repair. This is often so with the tendo Achillis, and recorded cases tell the same in respect to the ligamentum patellæ and the quadriceps tendon of the thigh. Nor is this any matter for surprise. When, in cases of talipes equinus, the tendo Achillis is divided, and the foot is placed within a right angle with the leg, the gap which is left between the ends (often an inch and a half, and sometimes more, in length) is filled up by the development of a new piece quite as large and as strong as the original tendon. Rupture through the fleshy part of a

¹⁸ *L'Union Médicale*, October 7th, 1893.

¹⁹ *Pennsylvanian News*, October 5th, 1889.

muscle heals by the development of a fibrous scar by which the ruptured ends are more or less closely approximated. But even when the ends remain separated by a considerable interval, the functions of the part may be but slightly or not appreciably impaired. This is the case when the muscle involved is one of a group the other muscles of which can take its place. In the instance (*supra*) in which the upper 3 inches of the adductor longus were entirely removed, the patient was unconscious of any muscular defect in the limb.

TREATMENT.

As already said, everyday experience shows—for example, in the case of the tendo Achillis—that when a tendon is ruptured, if the limb is kept in such a position that the origin and insertion of the muscle concerned are approximated so that the ends of the tendon are not widely separated, the result is usually good. But whether operative interference is likely to secure a still better result can be determined only by considering the features of each particular case. Two circumstances may justify or even call for interference: a wide separation of the ruptured ends which cannot be otherwise corrected; and a considerable extravasation of blood, the presence of which would materially prolong the period occupied by repair. Neither of these two features is usually present in the case of a ruptured tendo Achillis; but they are more likely to be met with in rupture of the quadriceps extensor and the ligamentum patellæ. In the former the vasti on either side of the tendon are often also torn, so that a good deal of blood is extravasated and the separation of the ends is considerable.

When the fleshy part of a muscle is torn the attempt to unite the ends by suture would be useless, as the stitches would not hold. If, however, a large blood clot is present, and near the surface, it will be advisable to expose the swelling by a free aseptic incision and remove the clot. At the same time any available portions of the sheath of the muscle should be drawn together and sutured. I am not aware that this has been done in the case of the rectus abdominis, but when the rupture is extensive such a proceeding, as this muscle has a strong sheath, might be a material safeguard against subsequent yielding, and the development of ventral hernia.

AN ADDRESS ON SOME OF THE INDICATIONS AND LIMITATIONS IN CARDIAC THERAPEUTICS.¹

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I AM often impressed with the omissions in clinical records, and doubtless the same thing has impressed you. You know how a successful series of operations, or a successful series of cases of some disease treated by the same drug or by a common method impresses us. We are ready to learn, and we almost gladly adopt a drug or a method which appears to give so much better results than we have had in treating a long series of cases. When we try the new remedy we find that matters may not be much better than with the old; that if there are some points better, others are not so well, and so on. This seems to me to be very much due to the one-sided records we get. A surgeon gives us a series of successful abdominal or cranial operations, and we think what a harmless operation this or that is. But how many of us know that there is another side to this—that we do not hear much, if indeed anything, of the unsuccessful cases in other men's hands, the knowledge of which would very materially influence our position, and very largely determine the advice we might give a patient, advice which might be life or death to him. In medical cases we can only estimate fully the value of remedies when we know of the unsuccessful as well as the successful cases. A record of success only leaves the impression that success always follows proper administration, and that failure implies want of skill in the use of the remedy we are handling. This is rather implied or suggested than

¹ Read before the Hull Medical Society.

asserted, but it stirs in some minds the consciousness that their record has not been an unbroken chain of successes, and that therefore they must have failed where others would have succeeded. We know it is not necessarily so. In many matters this general position could find illustration, but meanwhile I am to confine myself to some practical questions concerning the treatment of heart conditions.

When I left Edinburgh with my degree, and full of ardour, belief, and faith, both in the then present, and in the future of scientific therapeutics, I was full of the value of digitalis in heart lesions. I had absorbed with avidity what was considered the most forward teaching of the time, and I followed it to its logical consequences. If a heart's compensation had failed from enfeebling of its contracting power, digitalis gave strength, and if the compensation were not being re-established, the patient was not getting enough digitalis.

In recent days, strophanthus, the new heart tonic for which we are indebted to Professor Fraser, has sometimes been advocated with an ardour that recalls my student days, as if history were repeating itself after twenty years. The impression I get must be much the same as that of my fellows—we fly to the new remedy with the hope that it is to do more wonderful things than the old drug, and for a time no case of heart disease is treated aright unless the new drug is being given. This may have its good side, but practically we soon discover that our new instrument fails, as the old one did. What I should wish is that we had definite indications given to us as to the limits within which we have a right to expect good results, and equally precise indications as to the cases and circumstances in which we need not look for success, or may look for a very fleeting success at best. As a profession we know the value of tonics which are mainly cardiac. We also know that in many cardiac cases treatment by tonics does not succeed, and yet how many of us could give any clear statement of why failure has resulted? Do we know (as we might, I think, know) when we need not expect much from their administration? Do we know when full doses and when small doses ought to be given, and when indeed a given drug is to be used or not? The largeness of the sphere of influence of cardiac tonics is known to everyone, but we are still in search of the limits of that sphere on every hand. This delimitation can only be satisfactorily attained by recounting our failures, and recognising the factors in individual cases which have determined failure; and also by seeking to give intelligent expression to the considerations which lead us to give digitalis in one case, strophanthus in another, and neither in a third. Of course, it is in the choice of remedy and the mode of administration that skill is shown, and it is in some an educated instinct. The indications which determine the choice are nevertheless capable of being defined, however difficult the analysis may be.

If I attempt in what I have to say to lay down some of the indications and limitations in the treatment of cardiac disease from the gleanings of my own experience, it is from no sense of over-confidence in these that I do so, but rather as an indication of the direction in which I think the profession requires and seeks more definite knowledge.

In the first place there are the cardiac cases which require no special cardiac treatment. Many cases of cardiac lesion, as we all know, are discovered accidentally, and when there are no symptoms referable to the cardiac lesion they are to be left alone. It is usually desirable, however, to tell your patient that his heart is not quite sound, and in some cases it may be necessary to warn against violent or sudden physical exertion. The question of necessity will depend upon the estimate formed of the effect the lesion has had upon the heart chambers, this being the indication of the probable future course of the case. The routine administration of cardiac tonics is a quite inadmissible position. I have frequently discovered cardiac lesions when the symptoms complained of were in the abdomen. Quite recently I had a case of this kind at the Infirmary. The symptoms in that case were definitely referred to the stomach, but the man had aortic valve lesion and aortic aneurysm, of which he was quite ignorant, and which assuredly had no connection with the gastric symptoms. The gastric condition was a trouble and a discomfort, the condition of the heart and aorta was not. The call for therapeutic assistance was from the stomach.