Session II

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Treatment of Muscle, Tendon and Minor Joint Injuries in Sport

Recent clinical surveys at a professional football club over a six-year period showed that, out of a total of 290 injuries during this time, by far the largest number occurred in muscle and tendon, and these plus the minor joint injuries accounted for 80·6% of the total number of trauma cases seen. The series showed in addition that this type of soft tissue injury, frequently labelled as 'minor sprains', 'strains', or muscle 'tears', accounted for some 75% of the lost training days. This paper gives a brief account of the methods of treatment used.

Injury to Muscle and Tendon
Injury to muscle, whether caused by direct external violence or by a tear during muscle contraction, results in hæmorrhage, the size of which depends upon the amount of muscle tissue damaged, and whether or not there is any damage to the small vessels supplying the area. Major muscle rupture is undoubtedly a surgical problem, but over a period of six years in the club concerned, no such cases occurred.

Clinical Classification
There appears to be no difference whatsoever in the initial behaviour of muscle lesions occurring as a result of direct external violence and those due to a tear during muscular contraction. In addition, on the few occasions when incision of muscular hæmatoma was performed after failure with needle aspiration there was no difference in macroscopic appearance.

Initially in both types there is marked muscle inhibition, pain and localized swelling. However, if these injuries are followed and examined at regular intervals their subsequent behaviour tends to fall in two distinct patterns and this led to the proposition that the lesions could be roughly subdivided as follows:

(1) Injuries which were predominantly deep within the belly of the muscle – intramuscular lesion.

(2) The type where the injury was in a relatively superficial position or on the surface of the muscle – intermuscular lesion. The probable difference between these two types of lesions is that the hæmatoma remains localized in the intramuscular lesion, whereas in the second type, relatively superficial bleeding is able to track more rapidly, relieving the localized pressure symptoms and allowing a rapid return of muscle power and mobility. The symptoms and signs in both groups are the same in the early stages but a definite difference in pattern emerges between forty-eight and seventy-two hours.

With a predominantly intramuscular lesion there is only slight reduction in swelling, muscle power is only fair and there is little return of function. On the other hand, with the intermuscular injury there is a marked reduction in the size of the swelling within seventy-two hours, and evidence of tracking as shown by bruising of the skin at sites remote from the primary lesion, these being dependent upon gravity and the anatomical attachments of the deep and superficial fascia. In addition, there is the reappearance of an almost normal muscle contraction and a greater return of function than that seen in the intramuscular injury. The importance in differentiating between these two types of muscle injury is more than academic, since muscle inhibition returns and further bleeding occurs if the intramuscular tears are activated too rapidly. Increased likelihood of scarring and possibly muscle rupture must also be borne in mind with the deeper lesions, whilst the total disability time may be two to three times as long with the intramuscular lesion than with the more superficial tear.

Treatment of Muscle Injuries
The initial treatment of all types of minor muscle injury is the same, and a regime of rest, compression, cold packs (when practicable) and static muscle activities is started. Clearly defined fluctuant hæmatomas should wherever possible be aspirated and some local spreading agent such as streptokinase-streptodornase (Varidase) or hyaluronidase introduced. In practice, however, it is found that unless aspiration can take place within a few hours of injury, an extremely wide bore needle is necessary, and unless the hæmatoma is large it is probably better to instil a spreading agent alone. In the few cases of our series where aspiration of a localized hæmatoma failed and incision was attempted, no localized hæmatoma was found and the macroscopic appearance showed only a generalized œdema in a small area of the muscle. Within 48–72 hours it becomes obvious whether the lesion is

predominantly intra- or inter-muscular. In the latter case, graduated exercises preceded by heat are used to improve the power and mobility of the affected muscle or muscle group. As power returns, a muscle stretch routine is added into the treatment programme, and the tempo of both activities is slowly increased until complete recovery has taken place.

With the intramuscular tear, the same general principles apply but the rate of progress is much slower. The time taken to achieve full power and stretch is two to three times as long as with an intermuscular lesion in the same site, and extreme care must be taken not to introduce the stretching routine too early, as this frequently results in a painful scar.

Full recovery from this type of injury cannot be claimed until there is: (1) Full power of the muscle. (2) Full extensibility of the muscle and tendon. (3) Full range of movement in those joints over which the muscle and tendon pass. (4) Restoration of the normal functional movement pattern.

Joint Injuries

Joint injuries accounted for about 35% of the total number of injuries seen during the period records were kept, and of this number the majority occurred around the ankle- and knee-joints. All the injuries were minor, in that no surgical procedure was necessary. Injuries were subdivided into: cases with ligamentous damage alone; those with synovitis and effusion; and those cases where both ligamentous damage and synovitis co-existed. Rehabilitation time was some two to three times longer in cases where both ligament and synovium were involved compared with those where the damage was ligamentous and extra-articular.

One of the problems met was the recognition of effusions. An effusion into the knee is fairly easy to recognize at an early stage because of the anatomical disposition of the synovial membrane around the knee. In the ankle-joint, however, the large number of structures passing over the anterior aspect of the ankle makes it impossible for any effusion to be recognized from the anterior aspect. But if the ankle is viewed from behind, confusion will not occur since bilateral filling of the retromalleolar fossæ is indicative of an effusion into the joint and is easily recognized.

Complete ligamentous rupture is a surgical problem but one should realize that there will not necessarily be an effusion when complete rupture occurs. Cases are not infrequently seen of complete rupture of the medial ligament of knee or lateral ligament of ankle with little if any effusion.

Treatment

In all cases where synovitis is present the treatment is rest, compression, and the use of anti-inflammatory drugs. In addition, the knee effusion should be aspirated if it is felt that it is large enough to cause quadriceps inhibition or if there is any danger that the effusion might in fact be a hæmarthrosis. Knee effusions are treated by compression bandaging of the Robert Jones type, but with the ankle the only method of achieving complete immobilization is with bed-rest or a below-knee non-weight-bearing plaster. In our series, attempts were made with some ankle effusions to institute a regime of crepe bandaging and non-weight-bearing activities on crutches, but these were completely unsatisfactory compared with the cases treated by plaster of paris immobilization.

With ligamentous damage alone, injection of a hydrocortisone and local anæsthetic mixture into the localized tender area leads to a more rapid resolution of symptoms and prevents the formation of scar tissue.

In those cases where the two lesions co-exist the more serious lesion is the synovitis, which should always be treated primarily by immobilization of the joint and aspiration where necessary, in addition to anti-inflammatory drugs.

General Principles of Treatment of Minor Joint Injuries

(1) Ligamentous damage alone: For the first twenty-four hours rest, compression and elevation of the affected limb is the treatment of choice. After it has been ascertained that there is no evidence of synovitis, localization of the ligamentous injury should be obtained and steroid and anæsthetic injected locally. This should be followed by a graduated activity regime, although it must be stressed that no great violence should be brought to bear upon the joint until the local anæsthetic has worn off.

(2) Synovitis: Compression, rest and anti-inflammatory drugs are the treatments of choice.

(3) Synovitis + ligamentous damage: In the early stages compression, anti-inflammatory drugs and immobilization are prescribed, but later, when the synovitis subsides, the lesion can be treated as for ligamentous damage alone.

Criteria of Recovery

Recovery sufficient to allow normal training cannot be said to have taken place until there is

(1) A full active range of joint movement. (2) A full passive range of joint movement. (3) No contracture of muscles around the joint. (4) Normal functional movement pattern. Other adjuncts available to the practitioner who treats sports injuries are drugs (by mouth or by injection) and ultrasound.

Drugs

The drugs most frequently used in lesions of muscles, tendons, and in minor joint injuries may be classified as: analgesic and anti-inflammatory agents; dispersal agents; muscle relaxants; local anæsthetics; local steroids (by injection).

Analgesic and anti-inflammatory agents: For convenience these may be grouped together, since the majority of drugs used possess both properties. Although they have only a small part to play in muscle injuries themselves, they undoubtedly play an important part in the cases of tendonitis resulting from trauma which are frequently seen. But their greatest use is in those cases where there is a traumatic synovitis. Experience suggests that the simpler analgesics such as aspirin, paracetamol, and codeine are less satisfactory than the more potent anti-inflammatory agents, which should be used in the same dosage as in synovitis due to rheumatoid disease or osteoarthritis. The following drugs have been used in the total daily dosages indicated and found to be most effective in dealing with this type of trauma: indomethecin 75 mg/day; phenylbutazone 300 mg/day; oxyphenbutazone 400 mg/day; mefenamic acid 1·5 g/day; flufenamic acid 600 mg/day.

Dispersal agents: There is little evidence that these so-called dispersal agents when used orally have any effect on the resolution of inflammatory exudates; there is, however, little doubt of their efficacy when injected locally.

Muscle relaxants: These have been found to be of very little value in muscle trauma, since inhibition rather than spasm is the main problem; it is possible that the so-called relaxant effect after acute fibromuscular injury in the lumbar or dorsal region results in most cases from a tranquillizing effect on the body as a whole.

Local anæsthetics: There is no evidence that these agents when applied superficially as a cream or ointment have any effect on underlying muscles or joints. They have, however, been used with success in the form of 0·5% or 1% lignocaine injections for two purposes: to produce local analgesia so that a joint may be examined more thoroughly; and, in conjunction with steroids, to hasten the resolution of inflammatory œdema and absorption of inflammatory exudate.

Local steroids: These injections have been in use for the past eighteen years and there is no doubt that when properly administered they decrease considerably the total disability time. The local anæsthetic and steroid mixture works by suppressing the local inflammatory response, thus reducing exudate and possible scarring due to the fibroblastic proliferation which may follow. Accurate localization of the ligamentous or musculoligamentous area is essential before injection in order that the smallest possible amount of mixture (and the finest possible needle) may be used. There appears to be no logical reason why a needle with a bore greater than 20 or 24 should be used with this technique. Use of a small amount and a fine needle reduces to a minimum the occasional painful reaction of which some patients complain for several days afterwards. Careful control of the post-injection environment is essential if success is to be achieved, and any participation in contact sport immediately after injection should be forbidden since additional trauma may occur with the anæsthetized or partially anæsthetized ligaments. When the local anæsthesia has worn off the patient's activities are increased, but only under strict supervision.

The following compounds have been used extensively and found to be about equally efficacious: hydrocortisone acetate, prednisolone acetate, prednisolone TBA, prednisolone TMA, methyl prednisolone, betamethasone, dexamethasone.

One controversial point on the local use of steroids concerns their use intra-articularly in the knee-joint. There is little reason to support their use in traumatic synovitis with effusion, since compression, or compression preceded by aspiration, will produce the desired clinical effect in nearly all cases. In addition, there is evidence that repeated injections of cortisone derivatives may cause long-term problems, including osteochondritis dissecans which may later require surgery. It is probable that their use could be defended only in those cases of hæmorrhagic traumatic effusion where the risk of severe post-traumatic stiffness due to intra-articular organization of the hæmarthrosis outweighs the other dangers.

Ultrasound Therapy

In the localization of muscle and ligamentous injuries prior to injection this method of treatment is extremely valuable. It is known that

ultrasound produces intense heat in bone and cartilage but less in muscle, tendon, and nerve, and almost none in fat. In addition there is local heating at tissue interfaces caused by reflexion of ultrasound, because of the change in impedance or acoustic mismatch. Many extravagant claims have been made for this type of therapy but in fact its efficacy is almost certainly entirely dependent upon the fact that it produces local areas of heating. It undoubtedly alleviates muscular tenderness and ligamentous discomfort and reduces spasm; it appears in addition to reduce post-traumatic œdema.

Much of the criticism of ultrasound therapy stems from its incorrect use and most faults can be attributed to inadequate contact of the transducer during treatment, or the use of an inadequate dosage. Experience has shown that unless the area to be treated is in complete contact with the transducer, an air gap occurs with the resulting inefficiency. The use of glycerol or liquid paraffin as couplants is in many cases inadequate, and by preference the part to be treated should be submerged in water or, alternatively, a thick jelly applied into which the transducer head can be completely submerged; in either case perfect coupling is assured.

Functional Testing after Soft Tissue Injuries

A disturbing feature with this type of injury in sport is the recurrence rate after apparent cure. The main problem is that the simple academic tests through which patients are put after recovery are inadequate for the stresses and strains involved in sport. It is for this reason that any comprehensive treatment of athletic injuries is incomplete without the development of functional tests, each of which is related to the specific structure that has been injured and to the strains involved in the particular sport concerned.

In the treatment of soft tissue injuries certain faults have become evident in testing procedures. Rough general guidance on the following lines is necessary to the physician who examines sports injuries and applies fitness tests following injuries.

With muscle injuries, a point frequently forgotten is that major limb muscles pass over not one, but two, joints; therefore, when testing the extensibility of the muscle compared with that on the contralateral limb, it is absolutely essential that one joint should be completely immobilized whilst the range of muscle extensibility is tested by moving the second joint only. With a basic knowledge of anatomy this is not difficult to apply to any muscle or muscle group, and a scheme for examining any of the muscles involved in sports injuries can rapidly be evolved by the individual physician.

In the case of joint injuries, it is essential to remember that not only must the active range be full, but every effort must be made to achieve a full passive range since this is frequently required, particularly in body-contact team sports. A typical example is the patient playing either Rugby or Association football, who, having recovered from his synovitis of the knee and regained an active range of movement, is brought down heavily and forced into full flexion. Even if his active flexion is full, it is certain that unless he has an accompanying full range of passive movement a further episode of synovitis in the knee-joint will occur. This same argument applies to all major limb joints and again the sports physician can rapidly evolve his own series of joint tests to ensure full movements.

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Evaluation of the Results of Treatment of Soft Tissue Injury

The assessment of the results of treatment of soft tissue injury can be made in two ways, through clinical examination and through functional assessment.

In the case of muscle or ligament injury, clinical examination alone can indicate if the treatment has been entirely successful and that the patient is ready for athletic activity. The cardinal signs of recovery following ligament injury are: (1) No tenderness. (2) No pain on stretching the damaged ligament. (3) No laxity, if necessary confirmed by special X-rays with appropriate strains. If these three tests are negative, treatment has been completely successful.

In the case of muscle injury the cardinal signs of recovery are: (1) No tenderness. (2) No muscle shortening and no pain on stretching. (3) No pain on contraction against resistance. (4) No weakness. If these four tests are negative, treatment has been completely successful and the patient is ready to resume athletic activities. The restoration of full length of the injured muscle is im-