SURGICAL PROCEDURES IN GENERAL PRACTICE

This is one of a series of articles contributed by invitation

TREATMENT OF MUSCLE INJURIES

BY

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Minor isolated injuries to muscles are commonplace, but on account of the elasticity of structure of these organs such injuries are seldom the source of serious disability. When the trauma is more severe other structures will very likely be damaged as well. For example, in most fractures of long bones some laceration of the overlying muscles is necessarily involved. In severe contusions of the abdominal muscles the underlying viscera may be damaged. In these examples consideration of the muscle injury is a secondary matter. The repair of cut or torn muscle is effected by the formation of fibrous tissue from the granuloma formed in and about the primary exudate of blood and serum. Reproduction of new muscle fibre does not occur. When repair by fibrous tissue formation is complete the function of the injured muscle is rapidly restored by normal use if the separation of the fragments has not been excessive.

For the purposes of this contribution muscle injuries may conveniently be divided into four groups—namely: (1) open wounds (cuts and missile wounds); (2) direct injuries (closed)—contusions and ruptures; (3) indirect injuries—ruptures in long-bellied muscles; (4) strains—localized minor injuries at muscle insertions or muscle-tendon junctions. In addition myositis ossificans and ischaemic contracture are touched on, though properly these do not come within the scope of the present series.

Open Wounds

Damaged muscle and muscle haematoma form a favourable bed for the development of anaerobic infection. An immediate and careful wound excision under anaesthesia should therefore be carried out in any instance in which there is a suspicion of serious bacterial contamination in wounds involving muscle. The excision or débridement should be effected not later than twelve hours after injury. Antiseptic lavage is a poor substitute for the above method unless it be employed very soon after the event and the wound happens to be clean-cut and freely open.

No attempt should be made to suture muscle or tendon at the primary operation in any case where serious contamination is probable. As a secondary procedure when the wound is healed it may occasionally be worth while, especially when tendon has been involved. Prophylactic injection of anti-tetanic serum and anti-gas serum should be given if earth or faecal contamination is suspected. In case of spreading infection from the primary wound the general principles of wound treatment should be applied. Once infection is past and the wound is healed restoration of function should proceed on the lines laid down below.

Direct Injuries (Closed)

Contusions and closed laceration of muscle result commonly from kicks sustained at football. The immediate treatment will be to apply a firm strapping or bandage to support the injured part and to limit the effusion of blood. In practice these injuries must often affect the gluteal and thigh muscles, and effective support

in those situations is not very easily applied. An adhesive elastic bandage is usually most effective. A few days after the injury gentle massage may assist the absorption of the smaller bruises. If the injury is more extensive a longer period of rest is advisable; a definite haematoma will probably form, and massage of this will serve no useful purpose, and indeed may be harmful by renewing haemorrhage and delaying the repair process.

MUSCLE HAEMATOMATA

Small haematomata, if rested, will be absorbed in a week or so, and treatment to restore function can then proceed on normal lines. Large haematomata as met with most commonly in the gluteal region or thigh are best left untouched for ten to fourteen days or even longer. The clot will by then have shrunk down, leaving a serous cyst. At this stage evacuation by aspiration or through a stab incision will expedite the healing process. If the haematoma is not evacuated a blood cyst will probably form and will be slow to absorb, and the restoration of function will be correspondingly delayed. Suppuration occasionally occurs in a neglected haematoma. Evacuation of the pus by incision is then called for. Drainage, if employed, will be necessary only for a day or so.

Complete rupture of a muscle from direct violence is uncommon. The rectus femoris is the most often affected. A wide gap is formed, and suture of the torn ends may seem the proper procedure. In my experience the attempt is of no value unless the tear is in tendon or at the insertion into bone—for example, in the tendo Achillis or at the quadriceps insertion into the patella. In these cases, due nearly always to indirect violence, prompt suture is good practice. When a fleshy part of a muscle is ruptured repair by fibrosis occurs, and though a permanent alteration in the form of the muscle may be caused, little interference with function will ensue.

Indirect Injuries

Rupture of contracting muscle by its own force occurs as a rule in the muscular middle-aged taking unusual exercise, but sometimes in a relatively young man as a result of sudden severe physical effort. Some individuals are peculiarly liable to ruptures of this kind, and must be regarded as brittle-muscled. The commonest seat of these injuries is in the calf of the leg; the rupture may involve any part of this from the tendo Achillis to a few fibres in the gastrocnemius. At the time of the injury the patient feels as though he had been hit in the back of the leg with a stick, and he very likely falls to the ground. The hamstrings may be similarly affected, but the injury is not as a rule so disabling in its effects. In the case of the long head of the biceps cubiti the tear is usually in the tendon and in that part which passes through the shoulder-joint. The injury generally occurs in association with osteo-arthritis of the joint, the disease process having caused some disintegration of the tendon. The injury leaves an unsightly arm but much less disability than might be expected. Suture of the tendon to the biceps groove is worth while in a youngish man.

The diagnosis in these cases is made by the history associated with the presence of localized tenderness at the

seat of the rupture. As a rule there is no immediate haematoma, though a measure of this will develop in accordance with the extent of muscle and vessel injury. The large haematomata associated with direct injuries are seldom if ever seen.

TREATMENT

In the case of a partial rupture of the calf muscles, unless very severe, the treatment can be on ambulatory lines. The foot is placed in the plantar-flexed position and elastoplast or adhesive strapping applied from the calf down to and including the sole of the foot. A firm bandage over all will stabilize the application. After a few days the patient is allowed to walk with the strapping in place and the heel of the injured side elevated half to three-quarters of an inch so as to keep the muscle relatively relaxed, the foot being in the position of talipes equinus.

The more serious condition of rupture, partial or complete, of the tendo Achillis, which arises in a similar way, is dealt with in a previous section. The condition has also been observed in the rectus abdominis, occasionally in healthy people and as a complication of tetanic spasms. In rare cases the muscle has undergone a degeneration which makes it abnormally brittle. The treatment is on the lines laid down above. I do not think that operative treatment is of any value unless the rupture has been through a tendinous part of the muscle.

RESTORATION OF FUNCTION

Whatever the extent or cause of the primary injury to a muscle some degree of disability immediately results. Treatment directed to the restoration of full function should be based on similar lines for all cases, the severity of the injury determining the time required for complete recovery. Light massage a few days after injury will be comforting and will assist the absorption of minor haematomata. Massage in the presence of larger haematomata is unsound. Subsequently the use of the injured muscle by graded exercise is the most effective means, and the degree to which this is pressed will depend on the extent of the primary injury. In severe cases, and for those patients who are little inclined to help themselves, the use of gentle faradic stimulation will be helpful. This should not be employed until the haematoma has been absorbed and the repair process is well advanced—normally two or three weeks after the more serious injuries. Other physiotherapeutic measures are advocated, but, though mostly harmless, they play a very secondary part compared with graduated voluntary exercise in restoring the full use of the injured muscle.

Strains

An initial strain may rupture a few fibres at a muscle tendon junction or insertion. If the initial injury is not treated conservatively subsequent use of the muscle before it is restored to normality may result in a chronic effusion at the site of injury which causes pain from the tension produced by contraction of the muscle. Calcification or ossification is sometimes observed in the strained tendon. This condition is most often seen in the origin of the adductor muscles, and occasionally develops in the origin of the common extensor of the forearm and in the insertion of the deltoid muscle.

Treatment should be directed towards sparing the muscle involved from severe stress for a few weeks, while maintaining its condition by faradism and gentle exercise. Local treatment of a counter-irritant character is not often effective. In some cases the presence of focal sepsis may

be a cause of the continued irritation. The removal of dead teeth or other source of toxæmia may clear up the trouble.

Myositis Ossificans

This is a condition in which bone is formed in the substance of or immediately deep to a muscle. Its appearance is usually secondary to an injury which allows bone-forming cells to penetrate the haematoma of a muscle injury. It is most commonly seen as a complication of fractures and dislocations in the elbow-joint region. It is also observed from time to time in relation to the central part of a long bone, but for some reason it is relatively uncommon in this situation. It may also occur without a gross bone injury. This is seen in the thigh following a severe kick or even after the too firm application of a tourniquet. The result of this bone formation may be to limit the movement of the neighbouring joint either by muscle fixation, as is seen when the quadriceps is involved, or, by forming a bony block, checking movement by contact with the neighbouring bones, a state not uncommon about the elbow-joint. The condition itself is painless unless movement is roughly forced, but it may interfere very seriously with the function of the limb.

TREATMENT

In a case in which the irregular bone has recently formed complete rest of the part is essential. This is best procured by fixation of the affected limb in plaster-of-Paris. In the course of a month or so this usually leads to absorption of the unwanted bone. Forced movement will continue to irritate the new formation, preventing its absorption and even causing increase in its bulk. The period of rest necessary for complete absorption varies considerably, and is shorter in children than in adults. In the latter one may have to wait as long as six months before attempting to restore function. Operation for the removal of bone tissue is only justifiable when the condition has existed for a year or more, and when a definite formation that is blocking joint movement is present.

Volkman's Ischaemic Contracture

Though Volkmann's contracture is not primarily an injury of muscle, reference may be made to it here on account of its clinical importance. It is due to an interstitial fibrosis of the muscle which follows necrosis of greater or lesser amounts of muscle tissue from ischaemia. The condition is initiated by depriving muscle of its blood supply, partially or completely, for a relatively short time. The mechanism by which this temporary anaemia is brought about is usually a tight application of splints over an unreduced fracture. Occasionally a progressive effusion of blood beneath the fascial plane may produce the effect. It would seem that tourniquet pressure seldom, if ever, has the same result. At times partial or complete interference with the nerve supply to the part complicates the issue. For practical purposes the condition is met with in the flexor muscles of the forearm, and is most commonly noted after a supra-condylar fracture in childhood. Some authorities state that the condition is never seen in the adult—a statement true only of the more severe form.

TREATMENT

It is quite clear that prophylaxis is of the first importance. In fractures in the region above mentioned sub-fascial tension must be avoided or relieved as soon as possible. In the application of any rigid fixation to the arm there must be no undue tension, whether it be by bandage, splint, or bone pressure on major vessels. The

danger signals are a dusky blue appearance of the hand on the injured side and obstruction of the normal radial pulse. When these are observed action should be prompt either to relieve pressure of bandages and splints or to rectify the position at the seat of fracture.

Once the condition of fibrosis and contracture is established, it may, if not too severe, be considerably improved by graduated stretching of hand and wrist by suitable splintage. Various operative treatments have been devised for the more severe forms, but a consideration of them hardly comes within the scope of this article.

HEALTH OF THE NAVY

The report on the health of the Navy for 1935 (H.M. Stationery Office, 2s. 6d.) records a further decrease in the incidence of disease and injury. The America and West Indies Station showed the lowest sick rate. Improvement is especially noticeable in the incidence of diseases of the respiratory system. In 1935 there were 1,279 cases, in 1934 1,526, and in 1933 3,494. The causes of death in this group during the year under review were bronchopneumonia 5, gangrene of the lungs 1, and mediastinal abscess 1.

Infective Diseases

Despite the concentration, during the last quarter of the year, of large numbers of men at bases in the Eastern Mediterranean, where bacillary dysentery is prevalent, the increase in the case ratio for this disease was only very slight. From the China Station twenty-three fresh infections of dysentery are recorded. Ten of these were amoebic, and the report states that the favourable impression formed of the value of carbarsone (Lilly) in the treatment of amoebic dysentery was further confirmed. In several cases intercurrent tachycardia, attributed to emetine, was noted. Only nine cases, five of typhoid and four of paratyphoid, occurred in the enteric group, and this small incidence among so large a number of men at risk all over the world may be regarded as a tribute to modern preventive medicine.

One case of filariasis was returned by H.M.S. *Achilles* (Home Fleet). The infection was traced to previous foreign service in the Yangtse Valley. For three years the officer affected had suffered from recurrent skin conditions resembling erysipelas or cellulitis with lymphangitis. The diagnosis was ultimately confirmed by the finding of *Filaria loa* in his blood at midnight. The single case of leishmaniasis recorded also occurred on the Home Station. The officer affected had recently returned from the Persian Gulf. Oriental sores appeared on the right arm and left leg, and Leishman-Donovan bodies, intracellular and extracellular, were demonstrated. A course of intravenous injections of sodium antimony tartrate effected a complete cure.

The report records a decrease in the number of cases of malaria from 255 in 1934 to 180 in 1935. The East Indies Station again returns the highest incidence, although its ratio per thousand is more than halved. The largest number of cases in any one ship was twenty-two in H.M.S. *Endeavour*. The cases occurred during a two-months survey of the islands north of Penang. Prophylactic quinine was taken daily, but frequently parties had to spend the night ashore in camp. With regard to treatment a single course of atabrin, followed by plasmoquine, was administered to all cases at the R.N. Hospital, Hong Kong. In Ceylon, however, it is stated that the newer remedies proved disappointing, especially as regards the relapse rate, and reliance was placed on intramuscular and oral quinine.

Schistosomiasis japonicum

All of the twelve ratings whose infection with this disease at Chinkiang on the China Station was described in the previous report¹ were kept under observation during the

following year, but no positive findings of ova were notified. The most severe of these cases, however, a stoker aged 30, showed signs of damage to the pyramidal tracts and involvement of the higher centres. After a long course of hospital treatment at Hankow, Hong Kong, and Chatham, he was finally invalided out of the service. Only one fresh case of this disease was reported in 1935. This case is of unusual interest. While serving in the Home Fleet an officer, aged 30, had an epileptiform attack in the wardroom of his ship; another attack followed two days later. This officer had returned from three years' service in China in 1933, but he gave no history of tropical disease. A third seizure occurred a week after his admission to Haslar Hospital. Each attack was preceded by a feeling of "weight and tenderness" over the left parietal region and by a temporary "black-out" of vision. Examination revealed a small paracentral scotoma in the inferior temporal quadrant of the left field. A provisional diagnosis of cerebral tumour in the cortex of the left temporo-parietal region was made. Operation revealed a firm yellow spherical tumour, about one inch in diameter, and fairly sharply demarcated from the surrounding brain tissue. This was removed, and subsequent examination showed it to be made up of the ova of *Schistosomum japonicum*. Although a temporary paralysis of the right arm and difficulty in speech followed the operation the patient eventually made a good recovery and returned to duty.

TUBERCULOSIS ASSOCIATION AT OXFORD

The annual provincial meeting of the Tuberculosis Association will be held at the Dunn Laboratories, Oxford, from April 7 to 9. Accommodation for a limited number of men will be available at Exeter College; ladies and those who do not wish to have rooms in College should make early application for hotel accommodation. The charges (exclusive of a 10 per cent. tip to be added to the bill) are as follows: for all meals, including the annual dinner and accommodation in College, £2; for lunch and dinner but no accommodation in College, £1 5s.; for the annual dinner with wine, 11s. Those who do not take wine should deduct 4s. from these amounts. Meals and accommodation are from midday Thursday to midday Saturday, including lunch on both days. Members of the Tuberculosis Association should send cheques for the amounts to Dr. F. R. G. Heaf, Manson House, 26, Portland Place, W.1, by March 31, when the tickets will be sent to them. Guests may be invited on these terms. On the first day of the annual meeting papers will be read on the incidence of tuberculosis in young adult women, with special reference to employment, and later that afternoon problem cases will be discussed by Professor Girdlestone, F.R.C.S., and Dr. W. Stobie. It is suggested that an entertainment should be held in the evening. During the morning of April 8 papers will be read on extra-pleural pneumothorax, and what can be done to prevent the tuberculous patient from relapsing. In the afternoon visits will be paid to the Wingfield Morris Hospital and the Osler Pavilion, where tea will be taken. In the evening the president's reception will take place at Exeter College, followed by the annual dinner. On the morning of Saturday, April 9, papers will be read on the progress of radiology by Dr. Felix Fleschner of Vienna and others, and at 12.30 p.m. the annual meeting of the association will be held. Further information may be obtained from Dr. N. England, 1, Becket Street, Oxford.

It was decided at a recent meeting of the Oxford Graduates' Medical Club to extend the membership to all medical graduates of the University of Oxford and to abolish the subscription to the club. The secretaries are anxious to make the list of members accurate and complete, and would be glad to receive the names and addresses, with details of colleges and hospitals, and the date of taking the B.A. degree, from those who become members of the club under the new constitution.

¹ See *British Medical Journal*, October 10, 1936, p. 726.