SURGICAL PROCEDURES IN GENERAL PRACTICE

This is one of a series of articles contributed by invitation

THE TREATMENT OF JOINT SPRAINS AND STRAINS

BY

R. C. ELMSLIE, M.S., F.R.C.S.

The terms "sprain" and "strain" cover a variety of injuries to joints in which there is no evidence of a gross fracture or dislocation. As a rule when a definite injury—a fracture, a dislocation, a complete rupture of an important ligament, or a displacement of a semilunar cartilage, etc.—has been found, the fact that an exact diagnosis has been made takes the case out of the category of sprains or strains. Therefore in all these cases of minor injuries of joints the first thing to aim at is an exact diagnosis. It is not uncommon to find that a joint injury which has resulted in an effusion is diagnosed as a case of traumatic synovitis. There are grave objections to this diagnosis because it is apt to lead to slack methods and to a failure to discover exactly what has happened. We ought to try to determine what has been the nature of the trauma and exactly what lesion has been produced in the joint.

Classification of Ligaments

From the practical point of view the ligaments of joints may be divided into three classes:

1. Those consisting of a simple thickening of the capsule which cannot be defined exactly by dissection except in an artificial manner. As is the case with the joint capsule as a whole, the attachment of these ligaments to bone is also indefinite; the fibrous tissue of the ligament is continuous with that of the periosteum beyond, which can be stripped up if the ligament is artificially lifted. The internal lateral ligaments of the knee and ankle, and in fact the majority of ligaments of joints, fall into this category.
2. Extracapsular bands which stand out, when dissected, as isolated structures. Such are the external lateral ligament of the knee and the middle and posterior fasciculi of the external lateral ligament of the ankle.
3. Intra-articular bands, such as the crucial ligaments of the knee, the ligamentum teres of the hip, and the intra-articular fibro-cartilage of the sterno-clavicular joint.

Injuries of Capsular Ligaments

Ligaments of the first category are not likely to be ruptured completely unless the capsule is itself extensively torn by such a force as may produce a dislocation of the joint. In a sprain the injury to the ligament is partial, and it is most likely to occur at the point of attachment to the bone. The joint cannot be sprung open, and no hypermobility or instability of the joint results. For example, in the case of the internal lateral ligament of the knee-joint forced abduction of the tibia on the femur strains the point of attachment of the ligament to the internal condyle of the femur. This point is tender, and some swelling and possibly discoloration appear over it. But the knee does not become hypermobile, and cannot be sprung open on the inner side by forcing the tibia outwards. In fact, mobility of the joint is restricted by pain, and the knee is generally held in a position of slight flexion because in this position the ligament is relaxed and therefore less painful.

The common sprain of the ankle is an injury of the anterior fasciculus of the external lateral ligament, produced by twisting the foot inwards while it is in a position of slight plantar flexion. Either the substance of the ligament or its attachment to the neck of the astragalus may be injured, and the tender spot varies accordingly. But the movement of the foot, particularly inversion, is diminished by pain. There is no hypermobility.

Sometimes in injuries of this class the strain upon the ligamentous attachment pulls off a portion of the bone, or it may, as already mentioned, pull up the periosteum for a short distance beyond the actual ligamentous attachment. The detachment of a fragment of bone constitutes a sprain fracture. These injuries occur frequently and characteristically in the interphalangeal joints and metacarpo-phalangeal joints of the hand, where a lateral or antero-posterior strain may either damage the point of attachment of the lateral or anterior ligaments or else may tear off a tiny fragment of bone from the margin of the phalanx or metacarpal head. On the posterior surface such injuries are uncommon because flexion of the joints is free; the terminal joint is an exception, but there the extensor tendon is commonly damaged and not the joint ligament. The tendon may rupture or tear off a fragment of the phalanx.

Sprain fractures also occur at the attachment of the internal lateral ligament of the knee to the femur, the usual site of an injury to this ligament. A fragment of bone may be torn off at the time of the injury and be shown by a radiograph; or the bony fragment may only appear later and be due to pulling up of the periosteum. In the latter case the bone may be high up on the condyle and not apparently at the site of attachment of the ligament. This fact has led to the naming of this condition Stieda-Pellegrini disease, in the belief that it is not due to injury of the ligament at all. This seems to be a quite unnecessary refinement. Sprain fractures also occur in a more gross and obvious form, as, for example, when the internal epicondyle of the humerus is pulled off by an abduction strain of the elbow and in fracture of the great tuberosity of the humerus.

Injury of Intra- or Extra-articular Bands

Rupture of such ligaments as the external lateral ligament of the knee, the crucial ligaments, and the middle fasciculus of the external lateral ligament of the ankle gives rise to instability of the joint which is immediate. Thus, in the knee if the external lateral ligament is ruptured the knee can be sprung inwards and opened up on the outer side; if the crucial ligaments are ruptured, even incompletely, excessive antero-posterior mobility of the joint is present. In the case of the ankle rupture of the middle fasciculus of the external lateral ligament allows excessive inversion of the foot, the astragalus tilting in its socket—a fact which can be demonstrated by taking a radiograph in full inversion. The posterior fasciculus of this ligament does not appear to be often injured; but when strained it may pull off the posterior tubercle of the astragalus, to which it is attached; this tubercle sometimes occurs as a separate bone (os trigonum). Such an injury leads to chronic pain and

swelling behind the ankle on the inner side, which may persist until the separate piece of bone has been removed.

This last injury is, again, an example of a sprain fracture. Other examples occur—for example, the external lateral ligament of the knee may pull off a fragment of the head of the fibula, or the anterior crucial ligament may pull up the mesial spine of the tibia.

Injuries of Muscles and Bones in the Neighbourhood of a Joint

In investigating a case of supposed joint sprain or strain it must not be forgotten that the injury may really be one of a muscle, tendon, or bone. For example, forced inversion of the foot may sprain the anterior fasciculus of the external lateral ligament or it may rupture the middle fasciculus, but it may cause an oblique crack through the external malleolus of the fibula; or the tension on the peroneus brevis muscle may pull off the base of the fifth metatarsal bone (Jones's fracture) or pull some of the muscle fibres off its origin from the fibula. These injuries are disclosed by the exact position of the point of maximum tenderness, and in the first two cases are confirmed by radiographs. After forced dorsiflexion of the foot the calf muscles and tendo Achillis must be carefully examined: rupture of the tendon may easily be overlooked if much effusion is present. In young persons an incomplete injury in the neighbourhood of the epiphyseal bone should be borne in mind, particularly in the case of the hip-joint.

Exact Diagnosis

The multiplicity of the injuries which may be present in a case of strain of a joint would seem at first to make diagnosis a rather formidable task, but with care this should not be difficult. If possible the exact mode of injury should be determined; this helps by showing what structures were put on the stretch. When the examination takes place after a considerable effusion has formed the latter may to some extent mask the symptoms, but there should be no hesitation about feeling firmly into this swelling, particularly over important tendons such as the tendo Achillis and the tendon of the quadriceps. The site of maximum tenderness to pressure is important. It may be over the ligament or its attachment to a bone; if the latter, and if the tenderness is considerable, a sprain fracture may be suspected and a radiograph should be taken. If the point of tenderness is over the shaft of the bone, a radiograph is essential in order that a fracture may be excluded. The mobility of the joint is important: hypermobility denotes complete rupture of some important structure. Limitation of mobility—without, however, complete blocking of movement—is the rule in the ordinary less severe sprain. The ideal would be to x-ray every case of joint sprain, but this may not be possible or practicable. A radiograph is essential:

1. When the maximum tenderness is over the shaft of a bone.
2. When the tenderness is over the point of attachment of an important ligament or tendon.
3. When movement of the joint appears to be mechanically blocked—for example, when extension of the knee-joint is blocked.
4. It is wise in the case of all severe sprains in children and adolescents because of the risk of bone injury. This applies especially to the hip-joint.

When other injuries have been separated those which are properly classified as sprains of joints may for purposes of treatment be divided into three groups: simple sprains; sprain fractures; and sprains which render a joint unstable.

Treatment of Simple Sprains

In treating a simple sprain of a ligament which forms part of the capsule of the joint and which is incompletely ruptured the first step is to prevent or limit effusion. This is best done by firm elastic pressure. For example, if an ordinary sprain of the ankle is seen within half an hour the site of injury may be wrapped in a complete covering of thick cotton-wool extending from the metatarsal heads to the middle of the leg and bandaged firmly from below upwards over this with a domette bandage, which should not extend beyond the cotton-wool. Some nervous patients will not tolerate this pressure; in these cases a cooling lotion, such as *lotio plumbi c. opio*, should be applied. In either case twenty-four hours' rest should be allowed. At the end of that time the bandage may be removed and the joint re-examined to confirm the diagnosis. If a radiograph is considered necessary it should be taken and bone injury thus excluded. The joint should then be firmly bound with an adhesive bandage of the elastoplast type, and the patient encouraged to begin use of the limb. In the case of the ankle a shoe should be worn if it can be got on, and the patient should walk with the help of a stick but not with crutches. He should be told to keep the foot under him and walk in as natural a manner as possible, allowing slight movements of the ankle-joint. In the case of the knee and elbow it is more comfortable to retain the compression bandage over cotton-wool, as the free range of movement of these joints is apt to lead to soreness of the skin under adhesive strapping.

At the end of a week the strapping is removed and is replaced by a simple crêpe bandage, and massage and movements are started. The masseur should be instructed first to get rid of the effusion, then to help all active movements through as full a range as possible, and to follow on with exercises in normal use. In the case of the ankle the patient must be encouraged to walk with a natural heel-and-toe movement, be given tiptoe exercises with support, and be persuaded to invert, evert, and dorsiflex the foot through a normal range. Finally, in the later stages of treatment movements which are incomplete must be forced gently until they are complete. If even a little restriction of dorsiflexion, plantar flexion, or inversion of the foot remains there may be persistent discomfort and a tendency to sprain the ankle again. Some nervous patients will not walk early upon a sprained ankle. In such a case it is better to retain the compression bandage and trust to the persuasive powers of a good masseur.

Treatment of Sprain Fractures

Sprains in which a small portion of bone has been torn off and those in which the periosteum has been lifted do not do well on treatment by the methods described above. There is a tendency to the production of a chronic painful thickening with limited movement. This applies to most sprains of the finger- and toe-joints and to sprains of the internal lateral ligament of the knee. These cases should be strapped up securely from the start and only a limited range of movement allowed; massage should not be given over the injured regions, and move-

ment should on no account be forced. The strapping should only be left off and increased use encouraged when the swelling and tenderness subside. This is likely to take at least six weeks, and may take several months, especially if injudicious use and movement have been allowed early. In the case of the knee-joint the use of a compression bandage with gentle walking exercise and some faradic treatment of the quadriceps muscle will suffice in the slighter injuries. In severe cases, in any region, when a radiograph shows ossification in the attachment of the ligament or beyond it the joint should be immobilized on a splint in an easy position just short of full extension until all pain and tenderness have disappeared, and movement then restored by gentle persuasive methods and without the use of force.

Treatment of Sprains which Render a Joint Unstable

These include ruptures of important ligaments and the cases of sprain fracture in which an important ligamentous or muscular attachment has been damaged—for example, fracture of the head of the fibula, the spine of the tibia, the internal epicondyle of the humerus, the attachment of the long extensor of the terminal phalanx of the finger, etc. The treatment of these injuries is really a part of major surgery and in many cases operation is advisable, but the recognition of the nature of the injury and its immediate treatment are important. The joint should be at once immobilized on a splint or, better, in plaster-of-Paris in a position in which the ligament affected is relaxed, and if there is difficulty in securing the position an anaesthetic should be given. Drop-finger due to damage to the extensor tendon should be splinted in hyperextension. Rupture of the middle fasciculus of the external lateral ligament of the ankle requires fixation in plaster with the foot at a right angle and everted. Rupture of the external lateral ligament of the knee-joint or fracture of the head of the fibula should be treated by plaster with the knee extended and the tibia forced outwards. Rupture of the crucial ligaments or fracture of the tibial spine requires fixation with the knee fully extended; in the latter case an anaesthetic is necessary in order to secure this position.

In the case of fracture of the internal epicondyle of the humerus operative fixation is essential because the fragment is pulled down by the pronator-flexor group of muscles. In all this group of cases the necessary surgical treatment by fixation support, etc., and possibly operation, can be facilitated by early diagnosis and correct fixation; in fact, in many cases the need for operative treatment may thus be avoided.

The third International Cancer Congress under the auspices of the International Union against Cancer will be held in the United States, September 11 to 16, 1939, at the Haddon Hall Hotel, Atlantic City, New Jersey. The president of the congress is Professor Francis Carter Wood, Director of the Institute of Cancer Research of Columbia University, New York City; Dr. Donald S. Childs of Syracuse, New York, is the secretary-treasurer; and Dr. A. L. Loomis Bell of Long Island College Hospital, Brooklyn, New York, is in charge of transportation and exhibits. The proposed sections are as follows: general research; biophysics; genetics; general pathology of cancer; surgery of cancer; radiological diagnosis of cancer; radiotherapy of cancer; statistics; and education. The membership fee is 15 dollars. All inquiries should be addressed to the Institute of Cancer Research, 1145, Amsterdam Avenue, New York, N.Y.

DIABETES AND ITS TREATMENT

LETTSOMIAN LECTURES BY DR. GEORGE GRAHAM

The first of the three Lettsomian Lectures under the auspices of the Medical Society of London was delivered on February 21 by Dr. GEORGE GRAHAM, who took as his general subject a survey of the changes and results of treatment of diabetes in the last fifteen years.

Dr. Graham began by remarking that Lettsom apparently never addressed the society on any subject connected with diabetes, although in his time the presence of sugar in the urine had been demonstrated. Lettsomian Lectures on diabetes, however, had been delivered in 1860 and again in 1912. During the twenty years before the introduction of insulin diabetes was regarded as a very serious disease, and it was generally held that patients did not live for more than two years. That was not quite true, though certainly the majority did not live very long. The fasting treatment had helped a certain number, and it had been possible sometimes to stop a patient from passing sugar.

It was now a common contention among anti-vivisectionists that insulin was discredited because since its introduction the deaths from diabetes had gone up. This was true, though the statement unqualified contained a great fallacy. The lecturer showed a number of graphs indicating the death rate in England and Wales during the present century. One curious point brought out was that there were formerly always more men than women in the mortality tables of diabetes, but since the war this position had been reversed, and for many years past far more women than men had died of the disease. There was also a mysterious drop in the figures during the war years. It was suggested that this was due to dietary restrictions imposed by the war, but possibly in the absence of many doctors abroad patients were not examined as carefully as at other times, and deaths were attributed to other causes.

Deaths from Diabetes

The answer to the anti-vivisectionist was evident when the figures came to be examined for each decade of life. During the last fifteen years the deaths from diabetes for the age period 6-15 showed a 34 per cent. decrease for both sexes; for the age period 16-25 also a decrease—29 per cent. in the case of females and 41 per cent. in the case of males. A decrease of similar extent was recorded in the two following age groups, covering the period 26-45. In the age period 46-55, while there was still a decrease in the number of deaths of males, though of smaller extent than in the earlier periods, there was actually an increase in the number of deaths of females, and for the later age periods there was an increase in the death rate for both sexes, specially marked in the case of women.

During the period covered by the statistics the number of persons of 70 years of age and over per 10,000 of the population of England and Wales had gone up from 297 in 1911 to 344 in 1921, 426 in 1931, and 455 in 1934. Thus there were many more old people alive, and because people were living longer they were more liable to those diseases, diabetes being one, which their shorter-lived predecessors had escaped, having died probably of some disease more frequently attacking the young and early middle-aged. A further factor which had to be remembered in studying the figures was that in the later years of the period under survey doctors were more careful with regard to the examination of the urine, not only for albumin but for sugar. There had also been a change in the practice of death certification, and if pneumonia or bronchitis was the immediate cause of death and diabetes a contributory cause, the latter as well as the former would be mentioned on the certificate.