

REFRESHER COURSE FOR GENERAL PRACTITIONERS

"SPRAINED ANKLE"

BY

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The term "sprain" should be recognized as indicating a syndrome rather than an exact diagnosis. To say that a joint is "sprained" suggests a relatively minor accident to the joint, followed by pain, swelling, and spasm of the surrounding muscles, without the drama of obvious displacement, deformity, or bony crepitus, but it does not describe a definite pathological lesion. There is an old saying that "a sprain is worse than a fracture." It is perfectly true that the results may be worse, not because the lesion is more severe, but because an accurate diagnosis has not been established and treatment has been casual. Often a patient will state that he has a sprain, and all too frequently the doctor will agree without further investigation. The danger of readily accepting "sprain" as a complete diagnosis is nowhere better or more often exemplified than in those sad stories of missed fractures of the carpal scaphoid.

Some would assert that "sprain" is correctly used only for tears of those parts of the capsule of a joint which have not been exactly named by anatomists, but it is probably better to call those lesions—when they have been identified—"capsular tears" and to use "sprain" to include the whole syndrome of swelling, pain, and spasm which accompanies all injuries to joints of whatever degree of severity. If this is accepted it means that the treatment of a sprain can only be symptomatic, and that before treatment can be started the joint must be carefully examined to find out which anatomical structures have been injured.

The components of a joint which may be damaged in the "sprain syndrome" are, of course, ligaments, capsule and synovial membrane, the bones forming the joint, articular cartilage, and, in some joints, the intra-articular fibro-cartilages. There may or may not be dislocation or partial dislocation (subluxation) of the articulating surfaces. In addition, injuries to muscles or tendons in the neighbourhood of a joint give rise to symptoms and signs which may quite wrongly be described as a sprain—for example, the supraspinatus tendon or the long head of the biceps brachii at the shoulder, the flexor longus pollicis at the wrist, and the tendo Achillis at the ankle. Nevertheless, it is conventional to regard the term "sprained ankle" as describing lesions of the capsule and ligaments, and it is with these injuries that this article is mainly concerned.

Differential Diagnosis of "Sprained Ankle"

A twisting accident or fall which injures the ankle or posterior region of the foot is very rapidly followed by swelling, muscular spasm, and pain. The symptoms and superficial appearance of the foot are much the same after many different injuries, and swelling is often so considerable that quite marked displacement may be obscured. In any case of this sort the following lesions must be considered and excluded :

- Fractures of the malleoli.
- Fracture-dislocation of the ankle.
- Fracture of the calcaneum.

- Fracture and dislocation of the talus.
- Subastragaloid dislocation of the tarsus.
- Fracture of the navicular.
- Fracture of the base of the fifth metatarsal.
- Rupture of the tendo Achillis.

Most of these injuries can be detected by careful clinical examination, and all, except, of course, rupture of the tendo Achillis, are disclosed by x-ray examination, provided the films are properly taken and properly examined. Diagnostic films should include the subastragaloid joint, the heel, and at least the base of the metatarsal bones. It is probably easiest to miss those fractures of the anterior part of the calcaneum which run into the mid-tarsal joint (Fig. 1), fractures of the

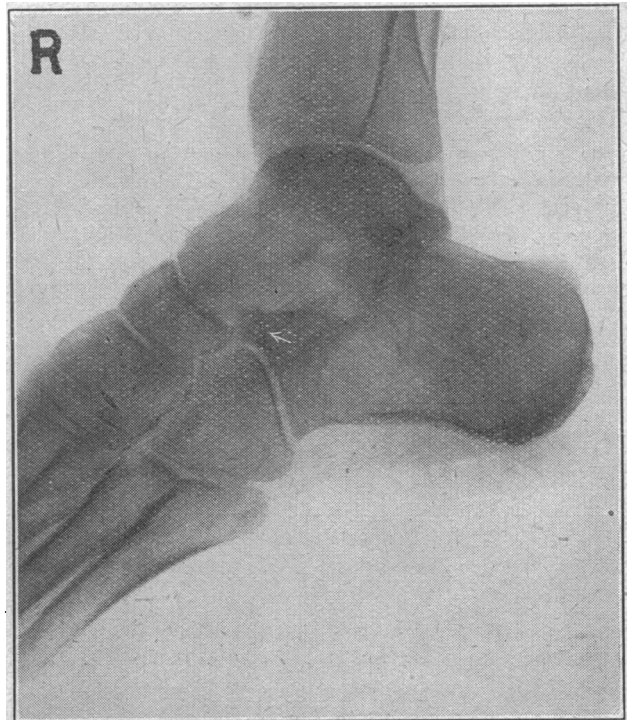


FIG. 1.—Proper scrutiny of this skiagram shows a fracture of the anterior tubercle of the calcaneum, involving the calcaneocuboid joint. The patient, a woman of 50, complained of continued pain and swelling for two months after a "sprained ankle." The symptoms cleared up after a few weeks in a walking plaster.

navicular, fractures of the base of the fifth metatarsal, and rupture of the tendo Achillis. Space does not permit a full description of the clinical features of all these injuries which will differentiate them from capsular and ligamentous injuries of the ankle, but the warning is perhaps sufficient (see Fig. 2).

Surgical Anatomy

Briefly the capsule of the ankle is strengthened on its inner aspect by the deltoid (tibial collateral) ligament and at its outer side by the fibular collateral ligament. The latter structure is in three parts—anterior talo-

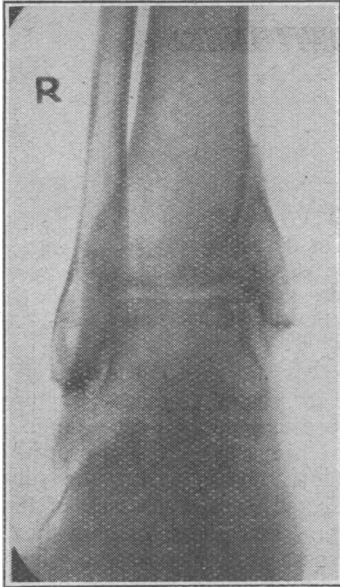


FIG. 2.—Skiagram showing fracture of the medial malleolus. The patient, a workman of 40, was treated for a sprained ankle, without a skiagram being taken. It was not until four months later, at an examination for insurance purposes, that the fracture was discovered.

the foot require further consideration. Inversion usually takes place at the subtaloid and mid-tarsal joints, so that an antero-posterior x-ray film of the ankle with the foot fully inverted will not show any movement of the talus itself. In some individuals the talus rocks or tilts slightly on inversion of the foot, and its upper surface may make an angle of up to 15 degrees with the articular surface of the tibia. This may be normal for the individual or may be the result of an old injury to the ligaments of the ankle. An accident which inverts the foot may be forcible enough to rupture the middle fasciculus of the fibular collateral ligament. When this occurs the talus

fibular, posterior talo-fibular, and a middle fasciculus attached above to the tip of the lateral malleolus and below to the calcaneum. The anterior portion of the capsule spreads out to its attachment on the neck of the talus, and blends with the superior tarsal ligaments. The deltoid ligament is a short, strong, broad, triangular sheet with its apex attached to the medial malleolus.

The only natural movements occurring at the ankle are plantar flexion and dorsiflexion, which if carried to excess may damage the capsule. The particular effects of inversion and of external rotation of

can be made to tilt, and the nature of the injury is shown by an antero-posterior x-ray film taken with an inversion strain on the foot; the angle of tilt may be as great as 50 degrees (Fig. 3).

A sharp turn of the body to the left when the right foot is firmly planted on the ground produces an external rotation strain on that ankle and foot. This is the commonest mechanism by which a Pott's fracture is produced. The impact of the talus on the lateral malleolus, if not sufficient to produce an oblique fracture, may tear some fibres of the anterior inferior tibio-fibular ligament, which secures the tibio-fibular syndesmosis, and minor injuries to this ligament are by no means uncommon. The deltoid ligament may be injured by external rotation strains, although complete rupture is most unusual unless there is a fracture of the lateral malleolus and dislocation of the ankle.

An inversion strain sometimes results in damage to the articular cartilage of the inner wall of the talus and of the medial malleolus. In elderly persons this injury often results in osteoarthritis, with prolonged disability from what at first seemed a trifling "sprain."

Repeated plantar flexion strains are common in professional footballers, and produce a troublesome disability known as "football ankle." Pain is referred to the anterior capsule of the ankle, and an x-ray film shows an osteophyte on the upper surface of the neck of the talus.

The injury which is usually described as the typical "sprained ankle" is the result of a combined inversion and plantar flexion accident. Pain and tenderness are localized to the front of the ankle towards the fibular side. An egg-like haematoma rapidly appears, but soon becomes obscured by general swelling. This injury is often said to be a tear of the anterior talo-fibular ligament and is supposed to be the most usual cause of those injuries classed as "sprained ankle." However, it is by no means certain that the injury does involve the fibular collateral ligament, and it is more likely to be the attachments of the capsule to the neck of the talus and to the dorsal carpal ligaments which are damaged. Furthermore, exact clinical and radiological investigations show that this injury does not predominate to such a marked extent over injuries to the middle fasciculus of the fibular collateral ligament or injuries to the tibio-fibular syndesmosis. Although most "sprained ankles" are simple anterior capsule tears, the relative proportions vary in different groups of the community. Ruptures of the middle fasciculus of the fibular ligament are apt to occur more often in the young and active, and probably as the result of a football, ski-ing, parachute-jumping, or a ballet-dancing accident.

Diagnosis

From what has already been said it obviously follows that a patient presenting the syndrome of "sprain" must not automatically be regarded as having sustained a simple capsular or ligamentous tear. For practical purposes cases may be divided into three clinical groups.

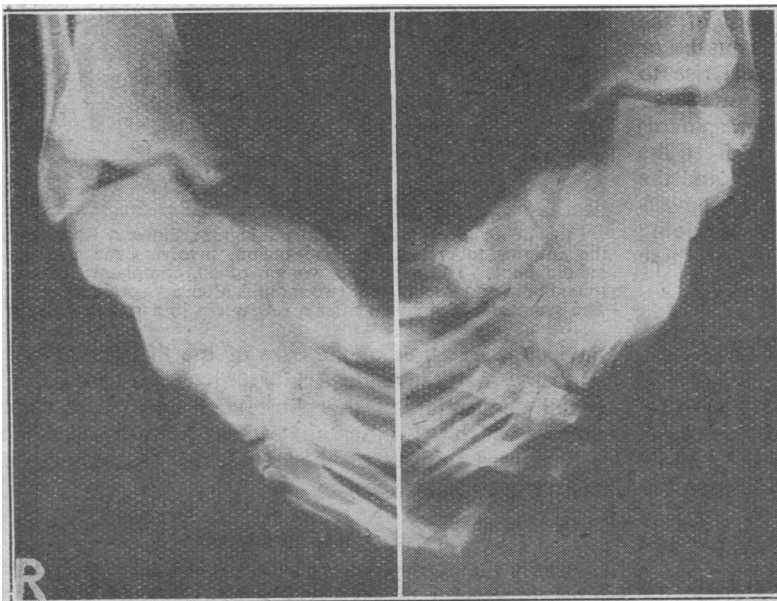


FIG. 3.—Skiagrams of the right and left ankles of a ballet dancer, taken during an examination under anaesthetic a few hours after she had "sprained" the right ankle. Forced passive inversion shows an obvious tilt of the right talus.

Group 1

This group comprises those patients with one of the injuries already listed under differential diagnosis. These lesions can be detected by eliciting the points of maximum tenderness, by observing clinical displacements, and by careful study of x-ray films. Even then some of them are easy to miss.

Group 2

This group consists of those patients who have sustained a rupture of the middle fasciculus of the fibular collateral ligament. This is an important group, because the ligament must be given an opportunity to heal, by protection in plaster. If the injury to the ligament is not diagnosed and is not treated properly there remains a permanent laxity of the ligament which allows the talus to tilt with inversion of the foot. This is perhaps the commonest reason for recurring instability of the ankle after a "sprain," and may produce quite considerable disablement. The diagnosis is established by clinical and radiological tests.

Clinically there is a point of tenderness just below the tip of the external malleolus, corresponding to the situation of the ligament. There may also be tenderness over the anterior capsular fibres and over the anterior talo-fibular ligament, when there is concomitant damage to these structures. Radiologically after routine antero-posterior and lateral films a special antero-posterior view is taken with the foot inverted; a similar control film of the normal ankle is necessary. If this picture shows an abnormal tilt of the talus, when compared with the unaffected side, the diagnosis is established (see Fig. 3). It may not be easy or kind to invert the foot of the recently injured patient. If an attempt without anaesthetic shows the tilt, all well and good, but if it does not, and the clinical signs of tenderness have been elicited, then x-ray examination must be repeated under thiopentone anaesthesia. Nitrous oxide anaesthesia will seldom give enough relaxation.

It is, of course, impractical to submit every patient with a "sprained ankle" to this rather elaborate x-ray investigation. In my experience the point of tenderness over the affected ligament is an invariable sign, and only those cases which show this clinical sign need to have the special radiological test. It does not follow that every patient with a tender middle fasciculus will show a "tilting talus," because in some cases the ligament, though strained, will not have been torn enough to lose its controlling hold on the talus.

There are two fairly obvious pitfalls in diagnosis. In the first place, sprains of the ankle are so common that the patient may already have an old rupture of the middle fasciculus of the uninjured ankle, so that an equal tilt of the unaffected talus does not mean that the tilt on the recently injured side is physiological. Secondly, the fresh "sprain" may have occurred in an ankle which is already the site of an old middle fasciculus rupture. The tilt in that case may be the result of the old injury. However, in a case of this sort it is worth while proceeding to treatment in plaster, if there is new tenderness and bruising, because it may be possible to persuade a fresh scar to secure both the old and new injuries. These points can, of course, be elucidated by careful history-taking before the x-ray examination.

It should not be imagined that this injury to the ligament is clinically more severe than simple capsular tears; neither can the displacement on inversion be detected at all often by ordinary clinical examination without special x-ray investigation.

Group 3

This group is composed of those patients with injuries of the inferior tibio-fibular and deltoid ligaments and those with anterior capsular tears. Severe injuries of the former ligaments are very rare except in association with fracture-dislocation of the ankle. The more common minor injuries are dealt with on the same lines as capsular tears. All three

injuries have characteristic points of tenderness over the ligaments and over the attachments of the capsule of the ankle to the neck of the talus.

First Aid

It is unusual for these injuries to occur in a hospital casualty department or in the consulting-room, and it is useful to discuss what can and should be done on the spot before definitive treatment is begun. Early examination of the ankle (by a medical practitioner) provides an excellent opportunity for establishing exactly what structures have been damaged. There may be very little swelling, so that any displacement can be easily seen; if spasm has not had time to develop it may be possible to detect an inversion tilt of the talus, without the need for anaesthetics. Points of tenderness over damaged ligaments, tendons, and bones can be more accurately localized within a few minutes of the injury than some hours later, when the patient has become a poor witness under the stress of the generalized throbbing ache of the "sprained ankle." First-aid treatment consists simply of rest and a firm bandage support to the joint. A crepe or flannel bandage applied over layers of wool is the best. Adhesive strapping must never be used. It is not pressure which is required in these cases but support and partial immobilization. The swelling is caused very little by haemorrhage, and is mainly a reactionary effusion in the joint and tissue planes. Pressure will control haemorrhage, but it cannot stop the vital cellular reaction. On the other hand, rest and support, by allaying irritation of the lacerated tissues, will diminish effusion.

Sprained ankles are, of course, common in athletic events of all sorts, and first-aid treatment may involve a decision on whether the player should continue the contest. If the injury is clearly in the group of simple capsular tears no harm will result if the injured player continues to play, wearing a supporting bandage, although he will have a far more painful Saturday night than if he had rested quietly in the dressing-room, and he will probably take longer to recover fully from the injury. Further play is absolutely contraindicated if there is any other of the more serious injuries. If the accident has occurred in a team game the captain may prefer not to have a courageous but unreliable player for the rest of the game.

Definitive Treatment**Rupture of Middle Fasciculus of Fibular Collateral Ligament**

If this diagnosis has been established, or is suspected, the patient should not be allowed to take weight on the foot until the ankle is secured in plaster. The cast may be applied at any time during the first two to three days after the accident, and should extend from below the knee to the metatarso-phalangeal joints and have a walking heel. There are the usual arguments for and against padding the cast, but the three following rules should always be observed: (1) unless the plasterer is expert and in good practice, the cast must always be completely padded; (2) there must be adequate arrangements during the first 24 hours for splitting or removing the cast if the circulation in the foot becomes embarrassed; and (3) the cast must be changed for a new one if and when it becomes loose or ineffective.

Once the plaster is satisfactory, usually the morning after its application, the patient is taught to walk, if necessary using two sticks for a few days. He is then

kept under supervision to see that he is walking properly and that the cast is remaining effective. Some authorities have recommended eight or even ten weeks in plaster, but most ligamentous tears will have healed soundly in a shorter period, and six weeks has proved sufficient. After removal of the cast a supporting adhesive or crepe bandage is advisable for a week or ten days, and it is again important to see that the patient is taught to walk properly. At this stage exercises are necessary to mobilize the ankle and foot joints and to re-educate and strengthen the controlling muscles. It is advisable not to press inversion exercises during the first two weeks after removal of the plaster. These exercises can be taught to the patient by the doctor, if he knows them and is prepared to demonstrate and supervise for a few days. Usually it is better to find a physiotherapist to undertake that part of the treatment; it is of no use just to tell the patient to do exercises by himself.

Anterior Capsular Tears

The stability of the ankle is not upset by a simple capsular tear, and firm healing will occur under quite ordinary conditions of activity; plaster is therefore unnecessary. The firm supporting bandage, applied as first aid, is continued; rest is advisable during the first two days. Early activity is the modern slogan in the treatment of injuries, but activity *too early* defeats its own object, and ultimate recovery will be more sound and rapid if the ankle is not walked on during the early stage of acute pain and swelling. Once the acute symptoms have settled and swelling has begun to diminish, the patient is shown how to exercise the ankle and taught to walk, wearing a crepe or adhesive bandage. A normal gait should be assumed at once. The single bedroom slipper or odd shoe encourages limping and is harmful. Most patients can wear an ordinary shoe if persuaded to do so, although something in the nature of golf shoes may be necessary to accommodate the bandage at first.

The patient is sure to ask how much he can do in the way of walking. The answer is that he should rest the foot as soon as it begins to ache. Probably a short rest of ten to fifteen minutes will be sufficient, and he can then begin again. Most young patients will walk without a limp from the start, but for those who do limp and for most elderly people sticks are advisable until the tendency to limp has been overcome. A single stick, although easier for the patient, does not eliminate limping, and two sticks are essential.

Exercises which the patient should do are simple, and consist of the following:

(1) Sitting with the affected leg crossed over the other, flex and extend the foot at the ankle six times; evert and invert the foot six times; carry out circumduction movements—that is, plantar-flex, invert, dorsiflex, evert, plantar-flex again, six times.

(2) Standing, steadying with the hands on the back of a chair, raise the heels and stand on the toes of both feet six times.

(3) Walk along a straight line, rhythmically and without a limp, at first if necessary using two sticks.

At the end of a week or ten days all swelling and pain will usually have cleared up. The bandage is then discarded and more vigorous exercises can be undertaken: walking on tiptoe, balancing on the affected leg alone, and balancing on tiptoe, on the affected leg alone. Finally, skipping exercises and trotting on level ground will complete the recovery of power and mobility.

Local Analgesics

Many accounts have been given of the treatment of sprains by injections of small quantities of local analgesic around the damaged structures. Leriche and Policard have claimed that the elimination of painful stimuli will prevent the reactionary oedema of the tissues and thus lead to more rapid recovery from the injury. But it is inconceivable that this method of treatment can aid the healing of a ruptured ligament. Indeed, if immediate use of the more severely damaged ankle is made possible by the injection of a local analgesic, considerable harm will result, so that this line of treatment is permissible only in simple anterior capsular tears. It may well be decided that this elaboration is totally unnecessary in injuries which respond so well to the methods of treatment described above.

Chronic or Recurring Sprains

A good many people who have at some time or other suffered from a sprain complain that the ankle often gives way afterwards. The derangement usually occurs when walking or running over uneven surfaces. Usually it is painful, but sometimes merely inconvenient and embarrassing. This "giving way" after a sprain is either due to the sudden rupture of adhesions or is the result of persistent laxity after a middle fasciculus tear.

Adhesions

"The formation of adhesions after a sprain of the ankle is minimized by controlling swelling and recurrent oedema, by early active non-weight-bearing exercises, and by avoiding passive stretching" (Watson-Jones). The formation of some adhesions is an unavoidable part of the healing of a capsular or ligamentous tear, and occasionally the sudden rupture of an adhesion may complicate an injury which has been soundly treated, but it is an almost inevitable sequel to those sprains which have not been correctly treated. The ankle is thought to "give way" because of a sudden reflex inhibition of the stabilizing action of the peroneal muscles in response to the painful stimulus of the tearing adhesions.

The pain as the ankle gives way is situated just in front of the lateral malleolus; there is tenderness in this region, and passive inversion and plantar flexion will be painful and usually somewhat limited in range.

The treatment is to manipulate the foot and ankle under an anaesthetic—it can be done by the swift and expert without an anaesthetic. The manipulation is followed up by exercises as in the case of a fresh sprain, and it is an advantage if the patient learns and practices the exercises for a few days before manipulation.

Persistent Middle Fasciculus Laxity

Instability from this cause is most often the result of failure to diagnose the torn ligament. The injury is not treated in plaster, and consequently the ligament is repeatedly stretched while healing and becomes lax and ineffective. The "giving way" in this case is due to an actual subluxation of the talus as it tilts, and not simply to peroneal muscular inhibition. It may be difficult to decide whether the recurrent derangement is due to adhesions or ligament laxity. Sometimes an excessive degree of inversion can be detected on passive movement, and a distinct gap may be palpable at the site of the old rupture of the ligament. When this condition is

suspected an x-ray film taken with the foot fully inverted will confirm the diagnosis, but, as when dealing with a fresh rupture, a negative x-ray test should be repeated with the patient anaesthetized.

An overstretched or unhealed ligament is not incompatible with a normally functioning ankle, provided the capsule is free from adhesions and the foot is well controlled by powerful muscles, and some cases of recurrent derangement can be cured by manipulation and exercises, although the ligament, of course, remains lax. In other cases symptoms are overcome by "floating out" the heel of the shoe (Fig. 4) and improving the strength of the peroneal muscles with faradism and exercises.

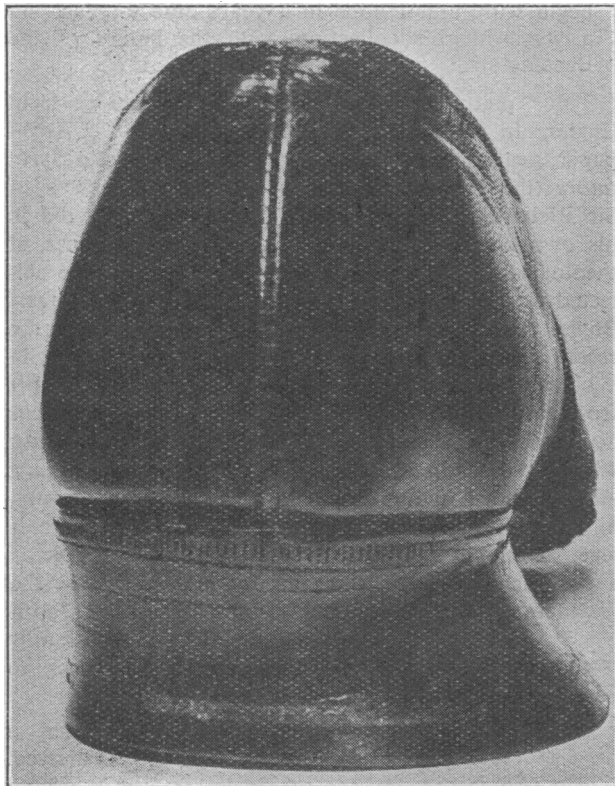


FIG. 4.—A right shoe showing the "float out" on the heel to control inversion twists.

In severe cases the victim must choose between avoiding all those activities which are likely to produce a derangement and submitting to operative repair of the lesion. The torn ligament cannot be sutured, but it can be replaced by transposition of the tendon of the peroneus brevis. An excellent method of doing this is described by Watson-Jones.

Other Causes of Recurrent Instability of the Ankle

There are other causes of recurrent "giving way" of the ankle, which although not the result of old sprains must nevertheless be considered in the differential diagnosis of instability.

Slipping Peroneal Tendons.—In this congenital condition the peroneal tendons are incompletely secured behind the lateral malleolus, and occasionally slip forwards with a palpable and sometimes audible "snap" or click. Young girls are most often affected and can be cured by an operation, in which an osteoplastic flap is raised on the malleolus.

Muscular Paralysis.—The peroneal muscle may become weakened in cases of pes cavus and as a result of anterior poliomyelitis, Friedreich's ataxia, or peroneal muscular dystrophy. This weakness allows recurring inversion of the foot, and a supporting appliance is usually necessary. Sometimes inhibition of the peronei is met with as a purely hysterical phenomenon.

Court Shoes.—Some young women cannot walk properly on high heels, and suffer repeatedly from inversion collapses. Usually this misfortune can be remedied by wearing better fitting shoes with broader and somewhat lower heels.

Osteoarthritis after Sprained Ankle

Degenerative arthritis will develop in many elderly patients who sprain their ankles, and may be the cause of persistent pain and swelling for some months before there are confirmatory x-ray changes. Sometimes the degenerative process is confined to the contiguous surfaces of the medial malleolus and the talus, and is the result of contusion of the articular cartilage. In this type of osteoarthritis symptoms may be relieved by a wedge, $\frac{1}{4}$ in. (6 mm.) deep, at the inner side of the heel of the shoe, in addition to the usual physiotherapy.

When generalized osteoarthritis of the ankle develops in younger persons it suggests that the articular cartilage was damaged in the original sprain, and this complication is more likely to occur when the sprain has resulted from a fall from a height.

Finally, the repeated trauma of recurrent instability of the ankle may in the long run produce a degenerative arthritis.

The study of neuroses in animals can help research in human medicine in two ways: emotions displayed in simplified form by animals may help to reveal vital underlying human feelings often masked by social conventions, and, secondly, controlled experimental work on animals yields much information which, although it cannot be directly applied to humans, sheds light on many problems (*J. ment. Sci.*, July, 1951, p. 584). Anxiety neurosis in cows is often seen, the cow refusing to part with her milk in the presence of a stranger, for instance. Horses, too, are prone to neurosis, and are especially susceptible to the temperament of the human beings they come in contact with—a neurotic rider can reduce a normally calm horse to a state of nervous tension in a few minutes, often making it quite unmanageable. Goats frequently become neurotic if they are made to do something they do not want to do, simulating epileptic fits which pass off immediately they are allowed their own way. Possible causes are threefold; heredity is probably the strongest. Inbreeding in dogs has led to an increase in hysteria and instability, and it is significant that dogs trained to lead the blind are now mainly first crosses from Labradors and Alsatis, and no longer pure-bred Alsatis. Environment also plays some part in the production of neurosis, and this is mainly the effect of the humans with whom they are in contact. Toxic factors in agenzied flour have been proved responsible for both fits and hysteria, but this cannot be taken as a universal cause, since groups of animals on identical diets have not all been so affected. In every species it is the most intelligent animals that display neurotic symptoms. The writer suggests that cure and not prevention should be the aim. Since temperament is inherited to a great extent no animal known to be neurotic should be allowed to breed, but this ideal will probably never be achieved because, for example, if a cow is a high milk yielder it is very unlikely that her owner will not breed from her, regardless of temperament.