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ANKLE LESIONS

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Few problems in traumatology have received such great attention and elicited such diverging opinions as the treatment of ligament injuries and fractures of the ankle. Consequently the literature on ankle injuries is very comprehensive. Lauge Hansen (1942) classified the evolution in ankle traumatology into three historical periods, viz. the clinical period, the experimental period and the radiographic period. Weber (1966) completed the list by adding two more periods, the geneticalconservative period and the operative period. In the early literature, French surgeons took a very prominent scientific position, while in modern times Scandinavian surgeons have been foremost in contributing to our present knowledge of the aetiology, diagnosis and treatment of ankle injuries.

Ankle injuries are indeed very common. Statistically, ankle sprain is the most frequent diagnosis in casualty departments of clinics of orthopaedic surgery. This means that ankle injuries constitute a quantitative therapeutic problem that must be solved in the best way considering the available economic and medical resources; however, the demand for high quality in the treatment must not be omitted.

Anatomy

The ankle is a rather complex hinge joint normally allowing only dorsal extension and plantar flexion. It is, however, greatly influenced by the subtalar joints, where supination and pronation of the foot take place. The ligamentous union between the distal fibula and the tibia is not quite rigid, thus allowing small passive physiological movements, viz. some millimetres of lateral and proximal displacement and a slight outward rotation of the lateral malleolus. These displacements appear when the talus takes up a position of dorsal extension in the ankle mortise because the trochlea tali is wider anteriorly than posteriorly.

Lateral injuries are much more frequent than medial ones because of different strengths of the malleoli and the ligaments and because of the specific construction of the three subtalar joints. While the slender lateral malleolus is movable, the medial malleolus is a strong process of the tibia. The rather tiny lateral ligaments are clearly inferior to the solid deltoid ligament. The oblique axis of the subtalar joints favours movements in the direction of supination, and the supination capacity per se is also greater than the pronation capacity.

Ligament injuries

Today we know that the anterior talofibular ligament is the most important stabilizing ligament of the ankle. This knowledge is based on experimental examinations performed by Dehne (1934), Pennal (1943) and Anderson et al. (1952). By sectioning the anterior talofibular ligament and the lateral portion of the joint capsule, they were able to prove that the foot could be displaced in a dorsoventral direction, thus producing a ventral subluxation of the talus. Andersen et al. also found that increased plantar flexion of the foot was accompanied by increased dorsoventral instability in the ankle. When the plantar flexion amounted to 20° they could displace the talus and the foot 7 to 8 mm ventrally. If the plantar flexion was increased to 35° they could, in addition to the displacement mentioned, also show the possibility for the talus to rotate in a medial direction. Staples (1965) and Coutts & Woodward (1965) have accounted for the clinical application of these observations and have shown that a rupture of the anterior talofibular ligament gives rise to a posteroanterior instability which can be roentgenologically registered. According to Broström (1966) the anterior talofibular ligament is damaged in nearly 90 % of all purely ligamentous injuries of the ankle (Table 1). As the anterior talofibular ligament is the most important stabilizing ligament, it is of course necessary that adequate diagnostic and therapeutic methods are available in order to prevent the occurrence of poor ligament healing and resulting instability. Chronic lateral instability most often means substantial symptoms of insufficiency and in the course of time the development of arthrosis deformans as well.

As to the diagnosis of ligament injuries of the ankle, there are both clinical and roentgenological methods. The *clinical* examination is very important. Unfortunately, its value is often underestimated, especially by the less experienced surgeon, who mostly relies on X-ray. As is well

Figure 1. Anterior drawer test. The lower leg is pushed dorsally in relation to the fixed foot.

Table 1. Distribution of ligament ruptures according to Broström.

	%
Anterior talofibular ligament	66.5
Anterior talofibular + calcaneofibular ligament	20.0
Anterior tibiofibular ligament	10.0
Deltoid ligament	2.5
Anterior tibiofibular + deltoid ligament	1.0
Total	100.0

known, a fresh rupture of the anterior talofibular ligament is characterized by a haematoma corresponding to the talofibular joint. The direct pain referable to the ligament is important. However, the indirect pain produced by the surgeon's gently forcing the foot in supination and inward rotation is far more important. Even if the clinical examination suggests an injury to the anterior talofibular ligament, it is often difficult to estimate the extent of the injury, i.e. if the ligament

rupture is partial or total, if only the joint capsule itself is damaged or if the injury is restricted to the soft tissue covering the ligament. Then stability tests, especially the anterior drawer test, are very useful. When the foot of the relaxed and above all surprised patient is pushed forward in relation to the lower leg, if the rupture of the ligament is total, one can register a marked pain reaction and very often also a ventral displacement of the foot (Figure 1). Sometimes the test can produce a clear crepitation when the foot is pushed forward. Using this stability test, Lindstrand (1974) could diagnose total ligament ruptures quite accurately. In a material of 100 patients clinically suspected of having a total rupture of the anterior talofibular ligament, he reduced the number of likely ruptures to 85 by using the anterior drawer test. All injured ankles were operated on, and the ligament was found to be totally ruptured in 81 patients, i.e. the anterior drawer test gave a false positive result in four patients. Those 19 patients who did not have a total rupture of the anterior talofibular ligament had instead a soft tissue lesion with bleeding (14 patients), a dorsal bone fragment avulsed from the talus (3 patients) or a rupture of the anterior tibiofibular ligament (2 patients). Thus, strangely enough, none of the 100 patients had a partial rupture of the anterior talofibular ligament, which obviously is a very rare type of injury. Many surgeons prefer the patient to be somewhat anaesthetized when performing the anterior drawer test, for example by peroneal nerve block (Ruth 1961) or spinal anaesthesia (Broström 1966). Even local anaesthesia is often sufficient to make the examination painless.

Roentgenologically the fresh total rupture of the anterior talofibular ligament can be diagnosed in different ways. Plain radiography can reveal an incongruity in the joint between the talus and the fibula (Cedell 1967) when the joint is examined at about a 20° inward rotation of the leg (Figure 2). False negative examinations are registered in patients with pain and muscle spasm. Sometimes plain radiography can also reveal the occurrence of small bone fragments avulsed from the lateral malleolus or very seldom from the collum tali.

Stress radiography is more reliable than plain radiography. With a total rupture of the anterior talofibular ligament, stress inversion radiography can register a talar tilt in a varus direction of up to 6–7° (Anderson et al. 1952). The method is most appropriate for the diagnosis of combined ruptures of the anterior talofibular ligament and the calcaneofibular ligament. Its clinical value is disputed, however, and strongly negative opinions about it have been expressed by Rubin

Figure 2. Rupture of the anterior talofibular ligament with incongruity in the talofibular joint.

& Witten (1960). Stress inversion radiography has more and more frequently been replaced by the anterior drawer test, which is considered much more reliable (Castaing & Delplace 1972) and which does not require the surgeon's presence in the roentgen room. The size of the ventral displacement of the talus is proportional to the extent of the injury, and the method can be used even on unanaesthetized patients if they are allowed to relax properly (Figure 3). As a rule both of the patient's ankles should be examined to discover a congenital hyper-mobile ankle.

Arthrography is stated to be a reliable method of proving a rupture of the anterior talofibular ligament. Methods and roentgenological observations have been described by a number of authors, e.g. Wolff (1940), Hansson (1941), Palmer (1941), Hendelberg (1943), Berridge & Bonnin (1944), Percy et al. (1969) and Fussel & Godley (1973). Broström et al. (1965) have published a fairly comprehensive material of ruptures of the anterior talofibular ligament but consider the method to be reliable only within the first week after the injury. In fact, arthrography has never been very popular as a routine method for diagnosing ankle injuries.

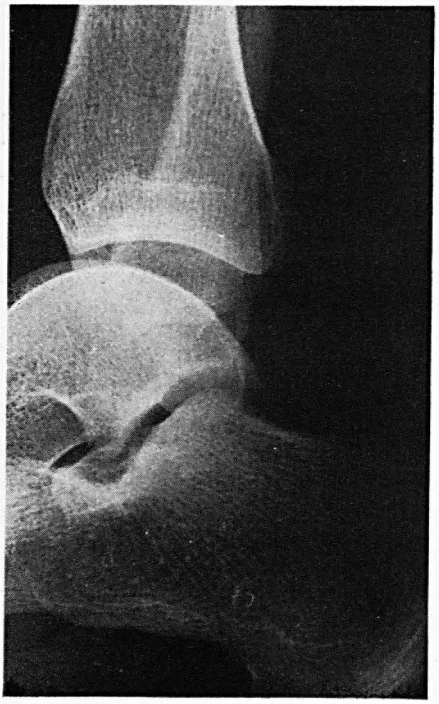


Figure 3. Anterior drawer sign registered by X-ray.

Summing up, total rupture of the anterior talofibular ligament can be diagnosed with confidence when the anterior drawer test has been employed both clinically and roentgenologically.

What, then, is the best way to *treat* the total rupture of the anterior talofibular ligament? Here opinions diverge strongly and the methods of treatment range from elastic bandaging to operation. Freeman (1965) reported a surprisingly bad experience with ligament suture combined with plaster immobilization and suggested that mobilization might be the treatment of choice for most, perhaps all, ruptures of the lateral ligament of the ankle. Broström (1966) was of the same opinion and thought that the injury should be treated by elastic strapping and early mobilization, which is, in fact, the treatment he recommends for all types of ankle ligament injuries. His conclusion is based on three groups of about 90 patients each, where the treatment was respectively elastic bandage, walking-plaster for 3 weeks and operation in combination with plaster for 3 weeks. At the follow-up examination the best results were found in the surgical group, where only 3 % of the patients had a remaining instability, against 20 % in each of the other

two groups. Because eighty per cent of the patients were cured by simple bandaging and had the shortest sick leave, too, and symptoms of instability can be managed by operation. Broström recommended treatment with elastic bandage. Objections can, of course, be made to his conclusions, e.g. why were his patients treated in plaster for only 3 weeks when the healing time for a ligament rupture by experience is at least 6 weeks? Many orthopaedic surgeons certainly resitate to practice a method that gives 20 % remaining instability, especially as it is impossible to guarantee the patient total freedom from ankle trouble by a reinforcing operation.

Immobilization in plaster, i.e. walking-plaster for 6–8 weeks, is widely accepted and is considered to give good results (Hughes 1942, Pennal 1943, Leonard 1949, Cave 1958, Caro et al. 1964, Russe 1967, Staples 1972).

Operative treatment entailing suture of the ligament is recommended by many surgeons as it appears to reliably prevent disability by producing a stable ankle (Bonnin 1950, Anderson & Lecocq 1954, Dziob 1956, McLaughlin 1959, Quigley 1959, Ruth 1961, Makhani 1962, Coutts & Woodward 1965, Niethard 1974, Reichen & Marti 1974). Everyone who has employed this treatment has seen convincing evidence of its efficacy. Even if surgery probably is superior to other methods of treatment it should perhaps not be recommended generally. Regarding the high frequency of total rupture of the anterior talofibular ligament, to always operate might mean that the operative resources of many hospitals would hardly be sufficient for other and more needed surgery. Many reasons speak in favour of plaster treatment being used as a routine method, and that the surgeon should carefully select those patients that should be operated on. Probably only younger people should be treated by operation. Two groups of patients should be selected: 1, patients with fresh avulsion fragments belonging to the fibula or the talus and 2, patients who even before the actual injury have had symptoms of ankle instability (preferably old rounded bone fragments in the roentgenogram). In addition, one can of course consider operating if the patient is an active sportsman or his profession demands an absolutely stable ankle. The recommendation to operate on injuries combined with avulsion fragments is based on the experience that these injuries often heal poorly; the ligament heals by fibrous union and with elongation resulting in repeated relapses of pain and swelling due to instability.

Unfortunately some patients with a "healed" rupture of the anterior

talofibular ligament have residual symptoms of lateral pain and swelling in spite of full stability. The reason for this phenomenon is not always quite obvious. Sometimes there is a localized synovitis or a painful scar in the ligament. Some patients have a functional instability because their fibular muscles are weak and perhaps even a proprioceptive deficit affecting the muscles of the ankle region (Freeman et al. 1965). Sometimes there are also patients who, in spite of having an unstable ankle, are totally symptom-free, which fact indeed does not facilitate the surgeon's choice of the most appropriate method of treatment.

Chronic instability of the lateral ligaments of the ankle, i.e. especially the anterior talofibular ligament, can be diagnosed much more easily and with the same methods as the fresh ligament injury. Even here the anterior drawer test plays an important rôle both clinically and roentgenologically. The displacement of the talus is often very obvious and is accompanied by a marked pulling-in of the soft tissue in front of the lateral malleolus. The treatment is operative. Good results of treatment with Watson-Jones' operation or modifications thereof have been reported by Clayton et al. (1951), Kelly & Jones (1951), Evans (1957), McLaughlin (1959), Stonham (1960) and Castaing et al. (1967). Broström (1966) considers that the anterior talofibular ligament often can be dissected free and resutured even years after the original injury.

Isolated rupture of the *anterior tibiofibular ligament* is a rare injury. The reason for this is unknown but may be that the ligament is very strong and that a trauma severe enough to rupture it will also usually fracture the distal part of the fibula. Clinically the injury is characterized by a direct and indirect pain localized in the anterior tibiofibular syndesmosis. The indirect pain is produced when the surgeon outwardly rotates or even dorsally extends the foot while the lower leg is stabilized. The injury cannot be diagnosed in the roentgenogram unless there is an avulsion fragment belonging to the anterior tubercle of the tibia (projection of 55° outward rotation of the leg, Figure 4). The ligament rupture can be diagnosed by arthrography, too. Treatment in plaster is sufficient for the healing of the ligament. Patients with avulsion fragments should be operated on to avoid the risk of defective healing and residual symptoms localized in the anterior tibiofibular syndesmosis.

Isolated rupture of the *deltoid ligament* is a very rare injury. Clinically, pain and instability can be produced by forced pronation of the

Figure 4. Avulsion fragment belonging to the anterior tibiofibular ligament.

foot. The ligament rupture can be roentgenologically diagnosed in those cases where there is an avulsion fragment from the tip of the medial malleolus or from the talus (Cedell 1974) and in those cases where the talus, owing to the ligamentous insufficiency, has been displaced in valgus position. A fresh rupture of the deltoid ligament can also be established by stress radiography and arthrography. Patients with avulsion fragments should be treated surgically, but as isolated ruptures of the deltoid ligament on the whole are so very rare it is probably a good policy to operate on them all.

Malleolar fractures

There is no sharp demarcation between ligament injuries and fractures of the ankle, as both lesions most often occur in combination. In fact, isolated ligament ruptures constitute so-called stage I injuries within the different typal lesions that characterize the ankle. A ligament rupture is also called a fracture when the size of an attached avulsion fragment is large enough. In more than 90 % of all malleolar fractures there is a total rupture of one or several syndesmosis ligaments. The anterior tibiofibular ligament, for instance, is ruptured in about

95 % of all supination-outward rotation injuries (Cedell 1967) and in all pronation and pronation-outward rotation injuries except stage I.

The classification of the malleolar fractures is very important and indeed constitutes a safe basis for the surgeon when he is treating the individual patient. In order to obtain good results of treatment and above all not to miss important components of injury, every surgeon must be thoroughly familiar with the anatomy of the ankle and with the different stages of ankle injuries. Today we employ the "genetic" classification of Lauge Hansen (1942), which is based on pathogenesis, or the classification of Danis-Weber (1966), which is based on the position of the fibular fracture in relation to the distal tibiofibular syndesmosis.

The *clinical* examination of a malleolar fracture is very important and should embrace the whole joint and also the whole fibula, because a fracture sometimes can be situated as far up as the knee joint. Stability tests are used only for the diagnosis of a rupture of the deltoid ligament, called by Staples (1960) "the invisible injury". The *roentgenological* examination should be performed in well-defined and hence reproducible projections (Bolin 1961). Both ankles should be examined for evidence of old injuries, incongruity in the joints between the talus and the malleoli, or a widening of the ankle mortise (Figure 5). Stress radiography and arthrography are of no great importance for the diagnosis of the malleolar fractures, even if these examinations sometimes facilitate the diagnosis of a rupture of the deltoid ligament.

The purpose of the *treatment* for the malleolar fractures is to bring about as anatomically satisfactory a joint reconstruction as possible to make an essential basis for optimal joint function and to prevent the development of arthrosis deformans. Felsenreich (1937) has summarized those factors that favour the development of arthrosis deformans. He considers mechanical injuries to the joint cartilage, nutritive disturbances in the joint cartilage, traumatically based incongruities, and disturbances in the cerebrospinal and autonomic innervation of the joint to be of importance for the development of arthrosis deformans. He particularly emphasizes the importance of non-union in ruptures of the deltoid ligament and fractures of the medial malleolus which result in valgus position of the talus with increased strain on the cartilage in the talofibular joint. Finally he considers step formation in the articular surface of the tibia, faulty weight-bearing and primary mechanical cartilage injuries to be a common combination of causes of arthrosis deformans after ankle fractures. Similar opinions

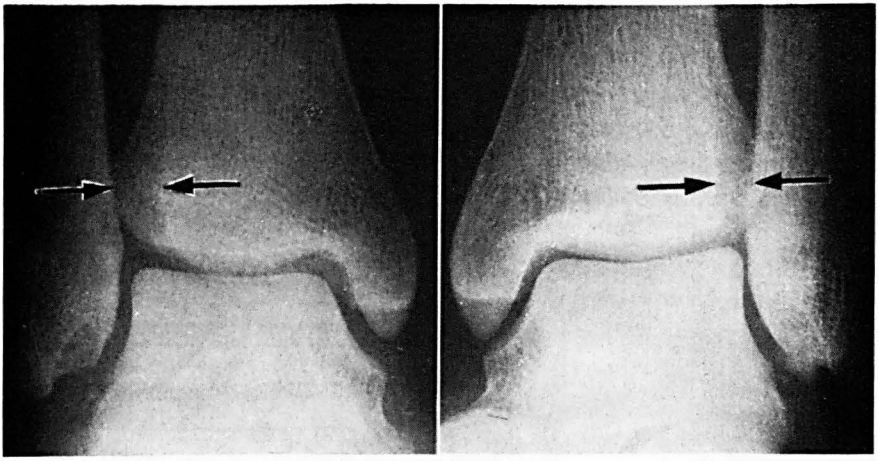
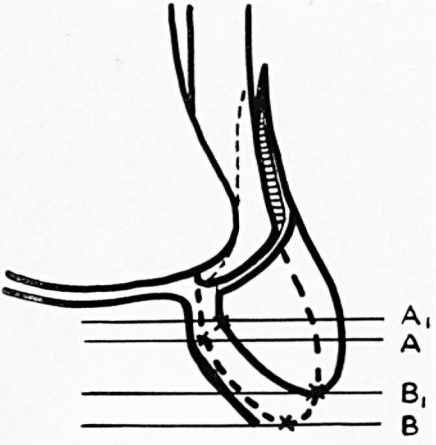


Figure 5. Pronation-outward rotation injury of the right ankle (to the left) with a total rupture of the deltoid ligament and all the tibio-fibular syndesmosis ligaments. The distance between the arrows, "la ligne claire" (Chaput), is larger in the right ankle.

have been expressed by Lewis & Graham (1940), Bergstrand (1944) and Palmer (1941, 1944). Sneppen (1972), on the other hand, considers malleolar pseudarthrosis to be insignificant in the development of arthrosis deformans.

As to the methods and means of achieving good joint reconstruction, the opinions of different authors are widely divergent. Many surgeons consistently employ conservative treatment involving reduction and fixation in plaster and resort to operation only in those cases in which conservative treatment, in spite of repeated attempts, does not result in acceptable fracture position (Kristensen 1949, 1956, Bonnin 1950, 1965, Portis & Mendelsohn 1953, Fackert 1954, Watson-Jones 1955, L. Böhler 1957, Jergesen 1959, Kleiger 1961, Bedogni & Bergami 1962, Frankel et al. 1963). Some surgeons believe that some injuries should be primarily operated on, such as displaced large posterior tibial fragments, displaced medial malleolar fragments and ruptures of the deltoid ligament, but in other cases they recommend conservative treatment (Müller 1945, McLaughlin & Ryder 1949, Cox & Laxson 1952, Trojan 1964, Buck-Gramcko 1955, Dziob 1956, Braunstein & Wade 1959). Yet, other surgeons consistently employ operative treatment for every injury, reconstructing all or almost all of the injury components because, in their opinion, conservative treatment does not allow satis-

Figure 6. Supination-outward rotation injury with displacement of the distal fibular fragment in outward rotation and in lateral, proximal and dorsal direction ($AB \rightarrow A_1B_1$). The displacement makes possible a lateral subluxation of the talus even if the deltoid ligament is not damaged.



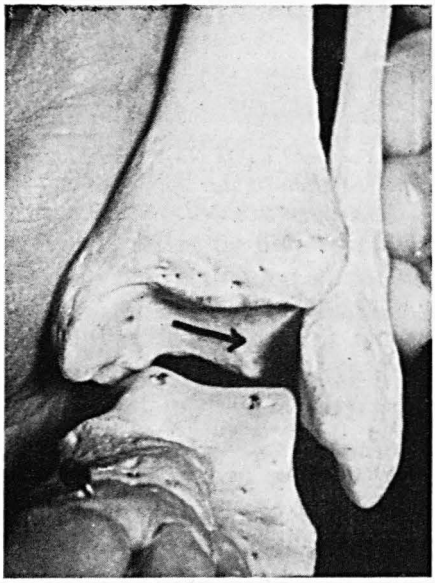


Figure 7. Normal joint function demands the precise fit of the articular ridge of the distal tibia (arrow) into the articular groove of the talus.

factory joint reconstruction (Danis 1949, Hachez-Leblanc 1950, Hohmann 1950, Palmer 1950, 1962, Desenfans & Evrard 1952, Picaud & Poucel 1952, Reimers 1953, Proctor 1954, Sturzenegger 1954, de Marneffe 1955, Vasli 1957, Devlies 1959, Calvetti 1960, Willenegger 1961, Soeur 1963, Willenegger & Weber 1963, Denham 1964, Goltermann 1964, Burwell & Charnley 1965, Weber 1966, Cedell 1967, Gherlinzoni et al. 1968, Jansen 1971). During the past 10 years, more and more attention has been paid to the necessity of a careful reconstruction of the injuries of the lateral malleolus, a view advanced by Danis as early as 1949. The operative treatment of malleolar fractures is being adopted by a growing number of surgeons. The modern surgeon versed in biomechanics is convinced that only operative treatment can make

possible an anatomically satisfactory reconstruction of a malleolar fracture. For purely mechanical reasons, conservative methods very seldom can produce an exact joint reconstruction. New observations have proved that even minute rotation and ad latus displacements of lateral malleolar fragments by displacing the vertical axis of the talus give rise to a considerably reduced contact surface between the tibia and the talus (Breitenfelder 1957, Willenegger 1961). Thus the precise fit between the articular ridge of the tibia and the corresponding articular groove of the talus cannot be disturbed without leading to incongruity, dysfunction and arthrosis deformans (Figures 6 and 7).

One frequent cause for failure in conservative methods of treatment is interposition. Soft tissue, cartilage and bone fragments can all be interpositioned. Fascia, periosteum and ligament tissue are often trapped in the fractures and especially in the fractures of the medial malleolus. Even very small pieces of cartilage and bone fragments can prevent an exact reduction, fragments that often are so small or so poorly mineralized that they can scarcely be seen in the roentgenogram. In addition, the short ligaments of the ankle often heal defectively because of displacement or interposition of their free portions, preventing the normal stabilization of the talus in the ankle mortise.

The operative treatment generally suffers from rather few and mild complications providing the surgeon employs a careful preoperative skin treatment and an atraumatic technique of operation. Several methods of operative treatment have been published. The osteosynthesis devices used vary greatly. Postoperative immobilization in plaster is used by some surgeons but is condemned by others. Early mobilization after operation has been advocated by Müller (1945), Danis (1949), Rehn (1953), de Marneffe (1955), Willenegger & Weber (1963), Denham (1964), Weber (1966), Gherlinzoni et al. (1968) and Jansen (1971). Some surgeons try to restore ankle function by active joint mobilization for a few days or even weeks previous to the aplication of plaster (Hachez-Leblanc 1950, Vasli 1957, Burwell & Charnley 1965). Surgeons representing the so-called AO-group (Willenegger & Weber 1963, Weber 1966) aim at a totally stable joint reconstruction and at a postoperative treatment without immobilization in plaster. They assert that plaster is deleterious to the nutrition of the joint cartilage and favours the development of joint stiffness and muscle atrophy. They also recommend early walking exercises with tibia condyle-bearing orthoses. The principles of the AO-group have been adopted by many

surgeons today, but there are certainly many surgeons who recommend a "softer" view on these problems. They believe that malleolar fractures are suitably treated by fixation or strengthening of the reconstructed injury components by means of a few osteosynthesis devices that are lenient to tissue and fairly small (i.e. cerclage, syndesmosis staple, pins and screws) and by employment of plaster for external fixation. Perhaps "the truth" lies somewhere between these two extremes of opinion. Undoubtedly, large ankle incisions followed by a time-consuming deposition of rather voluminous osteosynthesis devices necessarily favour the development of nutritive injuries to the soft tissue, disturbed healing of the fractures and deep infection. Probably the AO-group is exaggerating the risks of using plaster, which otherwise is known to reduce postoperative pain and enhance the healing of the wound and the sutured ligaments.

Of course not all malleolar fractures should be operated on. Children and elderly people seldom require surgical treatment. Strong indications for operative treatment are present in ligamentous avulsion fragments belonging to the tibia or the fibula, displaced malleolar fragments, and displaced large posterior tibial fragments. Widening of the ankle mortise, i.e. mainly in serious pronation-outward rotation injuries, should be given much attention as they are difficult to manage by conservative methods (Figure 8). As a rule the results of treatment are good provided that the width of the tibiofibular mortise is made normal again. In all probability the low oblique syndesmosis screw should be abandoned because it most often gives too narrow an ankle mortise with accompanying deleterious effects on the joint cartilage. On the other hand, the high syndesmosis screw recommended by the AO-group seems to be a good expedient when it is difficult to make the ankle mortise stable.

Highly comminuted fractures of the articular surface of the distal tibia constitute severe therapeutic problems. Early surgical treatment, including reduction and internal fixation, is the method of choice. However, the frequency of post-traumatic arthrosis deformans is so high that many surgeons recommend a primary arthrodesis.

Is there in fact any proof for the statement that the operative treatment of malleolar fractures is superior to the conservative one? Unfortunately there are very few follow-up materials published where the two methods of treatment have been compared. Most materials are also small and above all very seldom comparable concerning sex and age of the patients and types of injuries. However, a comparison has

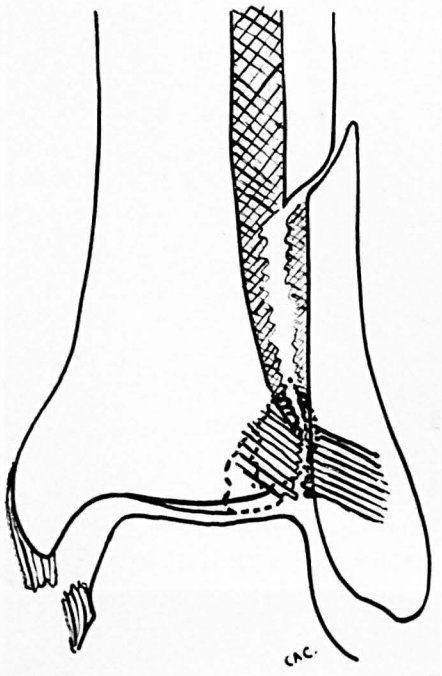


Figure 8. Pronation-outward rotation injury of stage IV with a severe derangement of the joint.

Table 2. Frequency of arthrosis deformans in supination-outward rotation injuries treated conservatively (Magnusson 1944) and by operation (Cedell 1967).

Stage	Frequency of arthrosis deformans			
	Magnusson's material		Cedell's material	
	No.	%	No.	%
II	35/118	(29.7)	1/38	(2.6)
III	18/29	(62.1)	1/7	(14.3)
IV	42/53	(79.2)	8/34	(23.5)
IV, LUX	9/9	(100.0)	13/21	(61.9)
Total	104/209	(49.8)	23/100	(23.0)

been made between the results of conservative treatment (Magnusson 1944) and surgical treatment (Cedell 1967) of supination-outward rotation injuries. The length of the follow-up was about 5 years. The two materials originated from the same hospital and were comparable concerning sex and age of the patients and distribution of the stage of the injuries. Both materials used the same classification in graduating the

Figure 9. Supination-outward rotation injury of stage IV. Anatomical reconstruction by ligament suture, cerclage, syndesmosis staple and posterior screw.

changes of arthrosis deformans. The frequency of arthrosis deformans of the conservatively treated material was more than twice as large as that of the surgically treated one (Table 2). There was very good agreement among the subjective, the objective and the roentgenological results of treatment and above all a significant correlation between the roentgenological results of treatment and the occurrence of arthrosis deformans.

Serious *sequelae* to malleolar fractures, i.e. grave arthrosis deformans, can be treated very successfully by a fusion of the talo-crural joint. Compression arthrodesis according to Charnley (1953) is undoubtedly a very good surgical method. The advantages of this method are that it gives rapid and reliable healing and includes a resection of the malleoli and the ligaments which, in other arthrodesis methods, sometimes give rise to residual symptoms even if the tibia and the talus are solidly fused. Charnley's ventral approach, however, should be abandoned in favour of the combined lateral and medial approach that leaves the anterior soft tissue undamaged, thus allowing normal blood circulation and normal function of nerves and tendons in the foot.

What about *the future* in ankle traumatology? Most of the problems concerning the diagnosis and treatment of ankle injuries have probably now been solved. The past 5 years have added nothing significant to our knowledge in this field. It is doubtful if better osteosynthesis devices can be produced, although we probably can learn more about biomechanical problems. A natural evolution in conformity with what has characterized hip and knee surgery would be the introduction of total joint prostheses for the ankle. Already today such prostheses are available; however, so little experience is at hand that nothing can yet be said about their function and tenability. Of course the technical improvement of joint prostheses will proceed even though many orthopaedic surgeons today do doubt that a total joint replacement in the long run could afford the patient a better situation than an ankle arthrodesis that has healed solidly in good position.

SUMMARY

The author gives an account of the different clinical and roentgenological methods that are used today in diagnosing ligament injuries and fractures of the ankle. Therapeutically the importance of an anatomically satisfactory and preferably stable joint reconstruction is empha-

sized in order to reduce the frequency of ankle instability and arthrosis deformans. Probably most of the problems in ankle traumatology are already solved; however, total joint replacements may become a valuable contribution to our therapeutic arsenal.

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