LEADING ARTICLE

TREATMENT OF ANKLE FRACTURES

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Three bones form the human ankle joint: the distal tibia, the distal end of the fibula and the talus. The distal ends of the tibia and fibula form the "mortice" to articulate with the dome of the talus which forms the "tenon". Contrary to popular belief, the ankle is not a hinge joint. Inman[1] described the joint as part of a cone, with its apex directed towards the lateral malleolus. During standing, the two ankle joints provide a stable support of the body. They help absorb the loading forces of walking and running and accommodate for the movements of the knees and hips above and the uneven terrain below.

Ankle joint stability depends on the following bony and ligamentous structures: 1) medial malleolus and the medial collateral ligament, 2) lateral malleolus and the lateral collateral ligament, 3) anterior syndesmotic ligaments and their bony attachments, and 4) posterior syndesmotic ligament and the posterior malleolus. The stable relationship of the lower ends of the tibia and fibula is maintained by the syndesmotic ligamentous complex. It resists the rotational, translational and compressive forces separating the two bones. The named ligaments are the anterior tibiofibular ligament, the posterior tibiofibular ligament, the transverse tibiofibular ligament and the interosseous ligament.

Injuries to the ankle joint are common. The commonest are lateral collateral ligamentous injuries. They are the result of an acute inversion force. Fractures of the ankle joint are also common. Phillips et al[2] found that the ankle was the most commonly injured weight-bearing joint in the body.

Before the clinician embarks on the treatment of ankle fractures, he or she must take note of the following facts:

1) Due to the high congruency of the articular surfaces, the weight-bearing contact area is relatively big when compared to the knee or the hip.
2) Displacement of the talus results in reduction of the contact surface area. Ramsey[3] found that a 1mm lateral shift of the talus decreased the contact area by 42% and that a 3mm lateral shift reduces the contact area by more than 60%.
3) The fibula provides stability and prevents the lateral displacement of the talus. Yablon[4] clearly showed the importance of the restoration of fibular length.
4) Most ankle fractures are intra-articular and are associated with ligamentous rupture. Leeds[5] found a correlation between inadequate reduction of the syndesmosis and a poor clinical result.
5) A careful history and a thorough physical examination of the ankle are important in the management of the patient. The anterior drawer test assesses the integrity of the anterior talofibular ligament. Similarly, an inversion (supination) stress with the ankle in plantarflexion tests the same ligament. This same test when done with the ankle in dorsiflexion, evaluates the calcaneofibular ligament.
6) Radiographic evaluation should include the standard of AP and lateral projections and mortice views. From these, the surgeon can assess the tibiofibular line, the tibiofibular overlap, the talocrural angle, the talar tilt and the medial clear space. Stress X-rays may be used to confirm ligamentous laxity. Arthrography is used to assess the integrity of the capsule and the ligaments of the joint. Tomography, CT tomography and MRI may be used to assess more complex injuries.

Like in most areas of medicine and especially orthopaedics, eponyms are common in the field of ankle fractures: eg Pott's, Maisonneuve's and Dupuytren's fractures. These eponymous terms when used accurately, describe the fracture succinctly in a nutshell. A Dupuytren's fracture, for instance means a fracture of the medial malleolus (or rupture of the deltoid ligament), diastasis of the inferior tibiofibular joint (due to the rupture of the syndesmotic complex) and a fracture of the lower fibular diaphysis.

A useful classification serves to describe the severity of the injury, helps to select the most appropriate line of management and offers a prognostic guide. Perhaps the most widely known and comprehensive classification of ankle fractures is the one enunciated by Lauge-Hansen[6] in 1948 after a series of extensive experiments on cadavers. He first described 4 major groups of ankle injuries, each of which may be a combination of bony and ligamentous injuries. The first word in the classification indicates the position of the foot at the time of the injury. The second word indicates the direction of the deforming force applied to the foot. In 1953 he added a fifth group, pronation-dorsiflexion[7] to account for fractures caused by axial loading. The 5 groups are:-

1) Supination-adduction (SA)
2) Supination-eversion (external rotation) (SER)
3) Pronation-abduction (PA)
4) Pronation-eversion (external rotation) (PER) and
5) Pronation-dorsiflexion

Each of these groups has several stages of injury.

The authors of the article "Review of Results of Ankle Fracture Fixation in Alexandra Hospital, Singapore", published in this issue however, have used the Danis-Weber classification in their description of ankle fractures[8]. Danis[9] first described this classification in 1949. It was used by Weber[10] in 1972. It has since been adopted and popularised by the AO group of orthopaedic surgeons. It is a much simpler classification to use and it stresses the importance of the lateral side of the ankle in the assessment and treatment of these fractures. The classification is based on the level of fracture in the fibula in relation to the lower tibiofibular syndesmosis. The more proximal the fracture in the fibula, the greater is the risk of damage to the tibiofibular syndesmosis and the more likely that the ankle will be unstable. In type A, the fracture in the fibula occurs below the level of the

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tibial plafond and the tibiofibular syndesmosis. This corresponds to the Supination-adduction (SA) in the Lauge-Hansen classification. This type is considered to be the most stable and is amenable to treatment by a plaster cast.

Type B injury indicates a spiral or oblique fracture beginning at or near the joint line and extending proximally. This corresponds to the Supination-external rotation (SER) of the Lauge-Hansen classification.

Type C of the Danis-Weber classification is the most serious. The fibular fracture is proximal to the ankle joint. This corresponds to the Pronation-external rotation (PER) or the Pronation-abduction (PA) Stage 3 injuries of the Lauge-Hansen classification. The severe syndesmotic rupture and the resultant instability warrant an open reconstruction.

Several factors influence the development of secondary osteoarthritis in the ankle. Olerud[11] in 1981 said that the presence of a posterior tibial fragment indicates a more severe injury. Even if it is well reduced, there is an increased risk of osteoarthritis. Inadequate reduction makes the prognosis worse. Lindsjö[12] reported bad results in females aged between 45 and 60 years. Beauchamp et al[13] investigated 126 patients over the age of 50 years. They found that internal fixation achieved better fracture fixation but was associated with a high complication rate in women. Lindsjö also noted that in the majority, osteoarthritic changes were apparent within 12 to 18 months of the injury.

The authors of the article on ankle fracture fixation in this issue[8] have used the functional ankle scoring system of Olerud and Molander[14]. In addition, the local authors have also employed the same linear analogue scale in their subjective evaluation of ankle function. Their measurement of the loaded ankle movement probably simulates the normal physiological stress on the ankle. Therefore it is acceptable.

Ankle fractures, therefore should be reduced and held in position for them to unite. If closed reduction is possible, immobilisation in a plaster cast is acceptable. However, if it is not possible, open reduction and internal fixation are necessary in order to get a good functional result. Knowledge of anatomy, classification and "personality" of the ankle fracture, proper preoperative assessment, surgical skill and a good rehabilitative programme ensure the best results.

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