CONSERVATIVE TREATMENT OF ISOLATED FRACTURES OF THE MEDIAL MALLEOLUS

Thesis

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INTRODUCTION

Fractures of the ankle occur at a rate of 187 per 100 000 person-years. [1] There is concern that a non-operative approach may fail to produce an anatomical reduction of the mortise, leading to instability and post-traumatic arthritis of the ankle. [2] It is therefore usually recommended that these injuries be treated by operation in order to obtain and maintain an anatomical reduction of the ankle. [3, 4]

Although studies have shown good outcomes using non-operative treatment, [5-7] this approach is currently reserved for patients in whom the fractures are not displaced, those whose medical co morbidities preclude surgical intervention, those who refuse surgery or, most often, as an intermediate step, used to stage displaced fractures until the soft-tissue envelope has sufficiently stabilized to allow operation. It has been feared that even if an anatomical reduction of the mortise is achieved without operation, the instability produced from the fracture and its associated soft-tissue injuries will ultimately lead to late subluxation of the ankle and an unacceptable result. [3, 8-10]

Instability of the ankle may result from injuries affecting both the medial and lateral columns. However, fractures presenting as isolated injuries to the medial, lateral or posterior malleolus may be associated with no instability on physical examination and an anatomical appearance of the mortise on a radiograph. Even if displacement of the mortise can be shown using stress radiography, these injuries have a good outcome when managed conservatively. [11]

Displaced unimalleolar fractures are high-energy injuries and often require surgical management to obtain a good outcome. [4, 8-10]However, in the absence of displacement of the mortise, operation may not be necessary. The recommendation that a displaced fracture of the medial malleolus should be treated surgically is often related to its presentation in bi- or trimalleolar injuries (International Classification of diseases (ICD-9) codes824.4 and 824.6). [12]

Since these are articular injuries it is suggested that surgery can produce higher rates of union, an earlier return to work or recreational activities, avoid prolonged periods of immobilization and prevent any residual displacement which may lead to the development of post-traumatic arthritis of the ankle. However, there are no large series which discuss the acute management of isolated injuries to the medial malleolus.

AIM OF THE WORK

To evaluate the outcome of patients with isolated fractures of the medial malleolus who were managed conservatively.

Historical Review

The problem of ankle injuries dates back to ancient times. Evidence of healed ankle fractures has been found in the remains of mummies from ancient Egypt.[13] Hippocrates (about 400 B.C) stated that the crural bones in the talocrural joint may luxate inward, outward, forward, and backward and recommended that closed fractures can be reduced by traction. [14]

Except for the anatomic descriptions of the ankle by Vesalius and a discussion of fractures of the fibula by Ambroise Pare in 1634,[15] there were few advances in the understanding and treatment of ankle injuries until the mid 18th century.

The writings during this time show that ankle fractures, often called luxations, resulted in a high incidence of deformity and loss of function, some as Duverney in 1751 even felt that these violent luxation fractures could be cured only by primary amputation.[16] In 1768 Percival Pott described a fracture of the fibula 2-3 inches above the distal tip, with an associated rupture of the deltoid ligament and lateral subluxation of the talus but he did not think that there was any damage to the syndesmotic ligaments that always present in this injury pattern. He recommended that the knee should be flexed to relax the calf muscles allowing reduction with minimal traction. [17]

The first trial to explain the mechanism of injury of ankle fractures was by Jean-Pierre David in 1771. He wrote that outward movement of the foot (external rotation) resulted in a fracture of the distal fibula. [18] In 1773 Bromfield emphasized the importance of diagnosis and repositioning of fibular fracture.[19] Later in 1814, Boyer the personal physician of

Napoleon described two different mechanisms of fractures of the fibula. He stated that for subluxation of the joint to occur, there must be either a malleolar fracture, a ligamentous injury or both. [20] In 1819, Baron Duputyren a student of Boyer was the first to use experimental methods in the study of ankle injuries by producing fractures in cadavers. He appreciated the importance of the distal syndesmosis in ankle injuries and the role of abduction and the position of the foot in the mechanism of ankle injuries. He described a fracture carrying his name in which there is a fracture of the fibula that occurs 2.5 inches proximal to the tip of lateral malleolus.

Duputyren believed that the fibular fracture should follow a tear of the deltoid ligament or a fracture of the medial malleolus. He observed that in order for a lateral dislocation of the talus to occur as a part of the injury, there must be a complete rupture of the inferior tibiofibular ligaments. [21]

Astely Cooper in 1822 was the first to describe fractures of the anterior and posterior tibial margins. It is worth mentioning that in 1912 Cotton drew the attention to fracture of posterior tibial margin as previously undescribed lesion, thus the labeling of a trimalleolar fractures as a "Cotton's fracture" is rather inappropriate.[22] In 1840 Maisonneuve a student of Duputyren,although ignored in his own time, was the first to compare the ankle to a mortise and tenon joint and to recognize the importance of both external rotation forces and the syndesmotic ligaments in determining the pattern of fracture. He applied external rotatory forces to the feet of cadavers and then observed the various injuries produced about the ankle.

He concluded that an external rotation force applied to the ankle could rupture the deltoid ligament. The same force could fracture the medial malleolus, with rupture of the tibiofibular ligaments in the absence of fracture of the lateral malleolus; he also noted that external rotation could produce two different types of fractures of the fibula. When the syndesmotic ligaments remained intact, an oblique fracture occurred at the level of the joint, if the anterior tibiofibular ligament ruptured first, a proximal fibular fracture then occurred. Although the distal fibular fracture is more common. Maisonneuve's name is associated with the proximal fractures. [23]

Bonnet in 1845, was the first to produce fracture of the medial malleolus experimentally by forced adduction of the ankle,[24] while in 1847, Malgaigne described two forms of fractures occurring at the medial malleolus, transverse fractures due to abduction injury and vertical fracture due to adduction injury.[25] Later Tillaux in 1848,incompletely described an avulsion fracture of the lateral tibia previously noted by Cooper. The same injury to the posterolateral tibia was also described later by Chaput in 1907, and has been called the fracture of Tillaux-Chaput. [26, 27]

Wagstaffe in 1875 described an avulsion fracture of the anterior margin of the fibula at the insertion site of the anterior tibiofibular ligament.

This injury was also described by Le fort in 1886, as well as others and has been called the Le fort-Wagstaffe fracture. [28, 29]

Destot in 1911 was the first to correlate x-ray findings with the previous anatomical experiments, providing the basis for determining the mechanism of injury from the appearance of x-ray. [30]

In 1922, Ashurst and Bromer presented a classification system based on mechanism and sequence of injury but they did not include injuries to the syndesmosis or the posterior lip of the tibia. [31] Also in 1939, Henderson presented a classification based on radiographic findings that separated injuries into three groups: isolated, bimalleolar and trimalleolar fractures. [32]

Lauge-Hansen in 1948 developed a classification system that correlated the mechanism and sequence of injury and emphasized the relationship between bone and ligament injury. [33]

The classification of Denis and Weber in 1966 correlated the level of the fibular fracture with severity of the bone and ligamentous injury. [34]

The AO group that was formed in 1985 began a systematic study of fracture treatment. [35]