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Review

An update on the treatment of malleolar fractures

Aktueller Stand in der Behandlung von Sprunggelenkfrakturen

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Summary

Malleolar fractures, occurring predominantly following inversion injuries of the ankle or falls, are among the most common fractures treated by orthopaedic surgeons. While proper diagnosis and fixation of bony fractures is required in patients with unstable patterns, it has become apparent that injuries to the complex ligamentous structures around the ankle, including the syndesmosis, can affect patient outcomes if not treated properly. This requires proper physical and radiographic examination techniques. Controversy still remains regarding proper fixation techniques and aftercare for complex fracture patterns and syndesmotic injury. The importance of recognizing patient comorbidities has also been demonstrated, as these medical illnesses have been demonstrated to increase the risk for complications, and therefore may require modifications to standard treatment protocol. In this review we highlight the growing body of evidence on this topic to identify the current best treatment practices and areas where further analysis is needed.

Zusammenfassung

Malleolarfrakturen gehören zu den häufigsten Verletzungen in der täglichen orthopädisch-chirurgischen Praxis. Sie entstehen vorwiegend bei Verdrehtraumen des Sprunggelenks oder im Rahmen von Stürzen.
Während eine exakte Diagnose und Osteosynthese der knöchernen Verletzungskomponente bei Patienten mit instabilen Verletzungsmustern erforderlich ist, wird zunehmend offensichtlich, dass Verletzungen der komplexen Bandstrukturen der Sprunggelenksregion, inklusive der Syndesmose, das Behandlungsergebnis negativ beeinflussen können, wenn sie nicht angemessen behandelt werden. Letzteres erfordert adäquate klinische und radiologische Untersuchungstechniken. Die korrekten Osteosynthesetechniken und Nachbehandlungsschemata komplexer Frakturmuster und Verletzungen der Syndesmose werden weiterhin kontrovers diskutiert.

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Die Bedeutung der Erkennung von Kormorbiditäten ist ebenfalls deutlich geworden, da diese inneren Begleiterkrankungen nachweislich mit einem erhöhten Komplikationsrisiko einher gehen und unter Umständen ein verändertes Behandlungsprotokoll erfordern.
In dieser Übersicht stellen wir die zunehmende Evidenz zu diesem Thema aus der Literatur heraus, um die aktuell besten Behandlungspfade und offene Fragen, die eine weitere Analyse benötigen, zu identifizieren.

Introduction

The ankle is a hinge joint consisting of articulation between the distal tibia, fibula, talus, and complex ligamentous systems that confers critical stability. The stability provided by these supportive structures maintains the talus centered on the tibial plafond joint to allow for controlled motion. When any of the three malleoli is fractured, the talus can sublux from under the tibia and hinder the normal motion needed for ambulation. Most ankle fractures occur following a low energy traumatic event, with either a fall or an twisting injury making up nearly 38% and 32%, respectively [35]. The majority of these fractures are an isolated injury, with only 5% of patients having an ipsilateral lower limb injury [44].

Ankle injuries are a common cause of emergency room presentation; responsible for more than 5 million visits annually in the United States [39,54]. Fractures of the ankle are known to be the most common intra-articular fracture of a weight-bearing joint and have increased dramatically since the early 1960s, with studies showing that it has an incidence of 187 per every 100,000 people per year [10,15,38]. While isolated malleolar fractures account for two thirds of ankle fractures, bimalleolar fractures account for nearly 25%. The remaining 5—10% of ankle fractures affect all three malleoli. One must be concerned with the distal tibiofibular syndesmosis in any ankle fracture, with a recent reported incidence of syndesmotic injury being anywhere in between 20% of all operatively treated ankle fractures [50] to as high as 45% in some series [61]. It is estimated that of the nearly 585,000 ankle fractures in the US each year, 25% undergo surgical intervention [20].

In this article, we will review recent developments in treatment of this common orthopaedic fracture. We will cover the most recent literature on surgical treatment options and report on how to best diagnose, classify for treatment decision making, and identify risk factors that could lead to long term complications of these injuries.

Clinical anatomy and biomechanics involved with ankle fractures

The ankle is subject to stresses across the joint anywhere from 1.25 to 5.5 times the normal body weight during ambulation. This is more than twice the force found in the hip or knee [7]. The complex ligamentous system includes the strong talofibular/calcaneofibular ligament complex surrounding the lateral malleolus, the deltoid ligament that provides support to the medial aspect of the ankle, and syndesmotic ligament complex that resists axial, rotational, and translational forces. Although motion at the ankle joint is predominantly in the sagittal plane (dorsiflexion and plantarflexion), lateral talar shift is known to alter the mechanics of the ankle, potentially leading to advanced degenerative changes and thus potentially making walking difficult and painful.

A landmark study by Ramsey and Hamilton, which was most recently confirmed by Lloyd et al., demonstrated that small shifts of the talus significantly alters the contact area and stresses of the joint, with a 1 mm lateral shift decreasing surface contact by 42% [34,52]. Clinical long-term studies have shown that residual talar displacement had resulted in unsatisfactory results, corroborating that these increased contact stresses can be extrapolated to overload of articular cartilage leading to degeneration of the ankle joint over time [30,65]. Recent works have revealed that ligament disruption also can affect contact pressures of the ankle. Transection of the deltoid ligament has been shown to increase talar external rotation during plantar flexion [40]. Another study by Hunt et al., using eight cadaveric specimens, demonstrated that mean tibiotalar contact pressure increased after interosseous and transverse ligaments of the syndesmosis were released. In particular, there were significant amplified mean contact pressure and peak pressure in the contact area during axial loading and external rotation [28]. These more recent studies reaffirm the importance of the integrity of the ligamentous system in ankle joint kinematics.