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Review

Acute syndesmotic instability in ankle fractures: A review

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ABSTRACT

Ankle fractures are among the most common fracture types, and 10% of all ankle fractures lead to accessory syndesmotic injury. An injury that is challenging in every respect is syndesmotic instability. Since the range of diagnostic techniques and the therapeutic options is extensive, it still is a controversial subject, despite the abundance of literature. This review aimed to summarize the current knowledge on syndesmotic instability in ankle fractures and to formulate some recommendations for clinical practice. Chronic instability and the operative osseous treatment of ankle fractures are not part of this review.

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1. Introduction

Ankle fractures are common and occur in up to 187 per 100,000 persons annually [1,2]. Approximately 10% of ankle fractures lead to syndesmotic injury, and this percentage is twice as high in patients with ankle fractures requiring internal fixation [3–5]. A purely ligamentous syndesmotic injury can also occur, in which case it is mostly combined with damage to the lateral ankle ligaments; this is often referred to as a syndesmotic ankle sprain. Taken together, this results in an annual incidence of syndesmotic injury of 15 per 100,000 in the general population.

2. Anatomy

The distal tibiofibular syndesmosis is a complex of ligaments that provides dynamic stability to the ankle joint [6]. The syndesmosis consists of the anterior inferior tibiofibular ligament, the posterior inferior tibiofibular ligament, the inferior transverse tibiofibular ligament and the interosseous ligament [7]. The stability of the ankle joint is also promoted by the interosseous membrane and the deltoid ligament, but anatomically these are not part of the syndesmosis [8]. The syndesmotic ligament complex stabilizes the fibula to the tibia [9]. This is essential for the integrity of the ankle mortise and thereby for weight bearing and walking [10]. The integrity of the ankle is compromised by syndesmotic diastasis [11]. It has been reported that when the talus moves 1 mm laterally, the contact area in the tibiotalar articulation decreases by 42% [12–14]. Early reconstruction of the unstable syndesmosis is therefore indicated. Delay could expedite the development of long-term effects such as degenerative arthritis.

3. Trauma

Syndesmotic injury typically arises in ankle trauma with exorotation of the foot combined with supination or pronation, as was described by Lauge-Hansen [17]. The sequential stages of both supination-external rotation (SER) and pronation-external rotation (PER) have been described, leading to the conclusion that syndesmotic instability is most commonly caused by pronation-external rotation and less frequent by supination-external rotation trauma [15,16]. In SER injury, stage 1 involves rupture of the anterior syndesmosis. Stage 2 involves an oblique fracture of the fibula. Stage 3 shows rupture of the posterior syndesmosis or fracture of the malleolus tertius, and stage 4 shows an avulsion of the medial malleolus or a rupture of the deltoid ligament. In PER injury, on the other hand, stage 1 shows a rupture of the deltoid ligament or a medial malleolus fracture. In stage 2, there is a rupture of the anterior tibiofibular ligament and interosseous ligament. Stage 3 involves a fibular fracture above the level of the syndesmosis, and stage 4 shows a fracture of the malleolus tertius or a rupture of the posterior tibiofibular ligament.

However, not all syndesmotic injuries lead to instability of the distal tibiofibular syndesmosis [18]. Despite the abundance of literature, controversy exists on the need for trans-syndesmotic fixation of the distal tibiofibular joint for specific ankle injury patterns. Therefore, this review aimed to summarize the current knowledge on syndesmotic instability in ankle fractures and to formulate some recommendations for clinical practice. Chronic instability and the operative osseous treatment of ankle fractures are not part of this review.

4. Diagnosing syndesmotic instability

4.1. Clinical tests

Accurately diagnosing instability is a challenging task. Clinical tests include palpation of the syndesmosis, the squeeze test, the Cotton test, the fibular translation test and the external rotation test [19]. However, the value of these tests in the acute setting of an ankle fracture is questionable because of the symptoms of the ankle fracture itself. A thorough examination of the ankle can obviously help to distinguish between different ankle fracture patterns as described before and should therefore always be the first step in the diagnostic process.

4.2. Radiographic assessment

Syndesmotic instability has been evaluated by means of a number of radiographic measurements, such as tibiofibular overlap, tibiofibular, medial and superior clear space [20,21]. Harper and Keller reported that a tibiofibular clear space larger than 6 mm and tibiofibular overlap less than 1 mm could suggest syndesmotic instability and concluded that the most reliable parameter for detecting early syndesmotic widening appeared to be the width of the tibiofibular clear space on both anterior–posterior and mortise views[22]. However, the reliability of most of these parameters is highly dependent on the rotation of the ankle. The only one of these parameters that is not affected by ankle rotation is the tibiofibular clear space, which therefore is the most reliable measure [23,24]. Hermans et al. have proven that a more accurate prediction of syndesmotic instability can be achieved by combining radiographic measurements with the Lauge-Hansen classification [25].

4.3. CT

Harper suggested CT scanning as a more precise technique for detecting subtle rotational abnormalities of the fibula in patients with potential syndesmotic injury [26]. Ebraheim et al. showed that the CT scan was more sensitive than radiography for detecting syndesmotic injuries [27]. Despite evidence of more precise evaluation of tibiofibular diastasis and fibular displacement, no evidence is available on the predictive value of CT-scanning in syndesmotic instability. Obviously, CT-scanning can provide more accurate information on subtle bony injuries, which are sometimes not clearly visible on plain radiographs. Also it can be a useful tool in preoperative planning for fixation strategies in ankle fractures [28]. Besides, postoperative CT-scanning is regularly used to evaluate the tibiofibular reduction [29,30].

4.4. MRI

Takao et al. compared findings on MR imaging with arthroscopy of the ankle. They found good sensitivity as well as specificity for both the anterior inferior tibiofibular ligament rupture (100% and