Letter to the Editor

Syndesmotic Injuries: Where Are We Now? Where Do We Need To Go?

Dear Editor:

Ankle fractures are among the most common lower extremity injuries. During treatment of these fractures, the surgeon must also examine the syndesmosis to ensure its integrity. The malreduction of this fracture can lead to accelerated posttraumatic arthrosis due to abnormal articular contact pressures. To fully understand the pathoanatomy distal tibiofibular syndesmosis, a thorough knowledge of the surrounding anatomic structures is needed. The ankle syndesmosis is composed of 4 ligamentous structures between the distal ends of the tibia and the fibula: the anterior inferior tibiofibular ligament, the posterior inferior tibiofibular ligament, the interosseous ligament/membrane, and the inferior transverse tibiofibular ligament. Traditionally, the radiography of the syndesmosis are described in the anteroposterior (AP) and mortise views. On the mortise view, the medial joint radiographic clear space between the talar dome and the distal tibia is within 2 mm. On the AP view, the tibiofibular bony overlap is $>$10 mm and the space between the medial wall of the fibula and the incisural surface of the tibia is $<$5 mm. According to many reports in the literature, AP and mortise radiographs have been shown to be inaccurate for determining the accuracy of syndesmotic reduction. Compared to radiographs, postoperative computed tomography (CT) provide a better evaluation of the syndesmosis. Often the intra-operative fluoroscopic images demonstrate acceptable fibular position radiographically, but on the CT scan, the fibula is perched slightly anteriorly or posteriorly in the tibial incisura. Further study will determine if this malreduction is typically the result of the reduction or clamping techniques. Surgical stabilization of syndesmotic injuries has a variety of described techniques including the number, size, location, and material of the screws used. Some surgeons place a single screw between the fibula and tibia for syndesmotic stabilization. Others place suture constructs in place of screws or multiple screws, particularly for Maisonneuve-type injuries. The lack of a consensus for the best fixation method for any 1 particular injury pattern has historically been an indication that one best method does not exist, and the ankle syndesmosis is no exception. Often, panel discussions among orthopaedic surgeons conclude that there is no difference in the fixation method as long as the joint is reduced and will be held as such until disrupted components of the joint injury have fully healed. Another fixation variable is the diameter of the screw chosen for this type of injury, which is a point of debate as well. Many studies have concluded that there are conflicting results comparing 3.5 mm and 4.5mm diameter screws. An additional variable is the optimal location of any screw relative to the plafond. From a theoretical point of view, the suprasyndesmotic screw position can cause a fibular deformity. It should be pointed out that these screws are holding screws and not lag screws. Lastly, the timing of syndesmotic screw removal is less clear. In the case of syndesmotic malreduction, a revision of fixation must be considered. Some studies have shown that screw removal permits reduction of a previously malreduced fibula. This finding may be reason enough for some surgeons to practice routine screw removal. In terms of screw removal, the use of a 4.5 mm screw has made it easier for some surgeons to locate this screw in office settings permitting outpatient removal. Revision surgery should probably be carried out through an open approach using advanced imaging modalities such as an "O"-arm, if available. Ankle fractures and syndesmosis injury diagnosis can be broken down into 5 components. It begins with the injury history, physical examination, and radiographic examination. This segues into a discussion with the patient regarding the risks and benefits of operative versus nonoperative management. Upon decision for surgical treatment, the reduction method, fixation technique, and postoperative rehabilitation protocol must be decided. In 2017, most of these areas have been fairly well investigated. There are limited studies, however, about the quantification of clamp force during reduction. We ask: How can we evaluate the effect of clamp force on fibular overcompression? What is the relationship between reduction clamp utilization application and syndesmotic malreduction? According to cadaveric studies (senior author D.S.'s unpublished data), clamp placement eccentric to the anatomic tibiofibular axis causes an external rotation and a sagittal plane malreduction. This may explain the findings in some postoperative CT scans that the fibula is noted to be anterior or posterior in the joint space. The compression vector of the commonly used peri-articular clamp may have been non-anatomic.

To our knowledge, there are limited studies identifying injury factors associated with an increased reduction clamp force. The question is if a syndesmosis having all of its associated ligaments disrupted is more prone to malreduction from an ankle clamp not ideally positioned. Where we need to go from here is to identify the reduction clamp forces associated with undercompression, overcompression, and adequate compression of the syndesmosis. We also need to study further the best clamp position for anatomic reduction of the fibula.

Future investigation into the clinical consequences of syndesmotic reduction positions in order to plan and execute the best ankle injury treatment method is another part of "Where are we now?" and "Where do we need to go?" Answers to these questions will help guide future research efforts and efficient allocation of current research resources.

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This work is dedicated to the spirit of Mohamed Taib Kassab for his pioneering work in orthopaedics.

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