Syndesmotic Injuries: Semi-rigid Fixation – My Top 3 Technical Pearls

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1. Anatomic reduction of the syndesmosis provides the best chance for a good long-term outcome.\(^1\,^2\) Confirm reduction with open approach or arthroscopically.
   a. There is evidence that semi-rigid fixation is advantageous in comparison to rigid fixation with syndesmosis screws as a suture-button construct allows for natural correction of iatrogenic malreduction at the time of surgery. This was demonstrated by Westermann et al in a cadaveric model.\(^3\)
   b. Dynamic fixation of the syndesmosis is not a new concept. In 1991, Seitz et al reported on a “flexible syndesmosis repair construct” in 12 patients, which resulted in restoration of stability without deformity.\(^4\) Miller et al followed up with a biomechanical study in 1999 in formalin preserved cadaveric specimens and found no significant difference in strength or displacement in screw vs. a flexible construct with sutures for syndesmosis repair.\(^5\)

2. The syndesmosis is technically a synovial joint which moves in 3 planes. Therefore, place fixation in a way to create the least damage to the articular cartilage and to the interosseous ligament.
   a. Anatomical studies have shown the specific locations of the interosseous ligament starting at
      i. 4 to 5 cm above the plafond and ending 1 to 1.5 cm above the plafond.\(^6\)
      ii. 32.4 mm above the plafond and ending 8.1 mm above the plafond.\(^7\,^4\)
      iii. In our study, ITFL tibial fiber attachments began 49.4 mm proximal to the tibiotalar joint line and terminated 9.3 mm proximal to the central aspect of the tibial plafond, with an ITFL footprint center 26.6 mm above the lateral extent of the tibial plafond.\(^8\)
   b. Optimally, fixation devices should be inserted in line with the neutral anatomic plane (approximately 30 deg posterior to the coronal plane), and parallel to the plafond. Based on anatomical studies, the tibia-fibula fixation should be at least 9 mm proximal to the joint line to prevent damage to the articular cartilage, above 15 mm to avoid penetration of the distal tibiofibular joint, and below 25 mm to prevent damage to more than 50% of the interosseous ligament. The reduction forceps are placed on the lateral malleolar ridge of the fibula and central point of the medial tibial cortex, but care should be taken to avoid over-compression of the syndesmosis.\(^5\,^8\,^9\,^10\) (see figure below)

3. Rasmussen et al demonstrated that the AITFL provides significant resistance to increasing external rotation when intact.\(^11\) Biomechanical studies show that within physiologic range of motion the AITFL provides 24% of the stability of the syndesmosis against external rotation forces.\(^12\) Similarly, Ogilvie-Harris et al demonstrated that the AITFL provided 35% of syndesmosis resistance to 2 mm of diastasis.\(^13\) While endobutton fixation provides stability
against diastasis, repairing the AITFL eliminates the external rotation that is not completely eliminated with the endobutton.

References

Figure 4. Anterolateral “open book” view of the distal tibiofibular syndesmosis demonstrating the spatial relationships of clinically relevant syndesmotic structures. Left: Illustration depicting the interosseous tibiofibular ligament attachments and articular cartilage of the tibiofibular contact areas and their respective distances from aspects of the tibial plafond and inferior tip of lateral malleolus. Right: Dissection photograph showing the anterior inferior tibiofibular ligament attachments and tibial cartilage and their respective distances from aspects of the tibial plafond. (Williams BT, Ahrberg AB, Goldsmith MT, Campbell KJ, Shirley L, Wijdicks CA, LaPrade RF, Clanton TO. Ankle syndesmosis: a qualitative and quantitative anatomic analysis. Am J Sports Med. 2015 Jan;43(1):88-97)