Effect of CAM Boot Immobilization on Weight-Bearing Stability in Syndesmotic Injuries: A Cadaveric Study

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Purpose: Ankle injuries are one of the most frequent traumas of the lower limb. The syndesmosis is also affected in up to 18% of cases. The degree of instability of syndesmotic joint depends on which ligaments are affected. The syndesmotic complex is composed of the anterior inferior tibiofibular ligament (AiTFL), the posterior inferior tibiofibular ligament (PiTFL), and the interosseous ligament (IOL), which all play various roles in maintaining tibiofibular joint congruity. Radiographic widening of the syndesmosis is not evident when facing an incomplete injury. The primary goal of our study was to evaluate the effect of simulated weight bearing on syndesmotic instability resulting from isolated AiTFL injury and from combined AiTFL/IOL injuries. The secondary goal was to evaluate the effect of a controlled ankle motion (CAM) walking boot on syndesmosis stability following injury. We hypothesized that the CAM boot would prevent significant instability even in 2- ligament injuries.

Methods: Ten ankle cadaveric specimens were dissected to create progressive iatrogenic syndesmosis ruptures. Uninjured syndesmoses were compared to isolated AiTFL and combined AiTFL/IOL ruptures. The specimens were fitted in a custom-made device to allow stabilization of the leg and apply a reproducible axial load (AL) of 750N. For each specimen and injury pattern, CT images were obtained. Distal tibiofibular relationship was evaluated using a previously validated measurement system developed on CT. Wilcoxon tests for paired samples and nonparametric data were done to compare the different conditions.

Results: When comparing ankles with isolated AiTFL to combined AiTFL/IOL rupture with and without AL, the only significant difference was an increase in internal rotation between the incisura and a line drawn in the axis of the fibula. It appears that axial loading does not impact syndesmotic stability. With the CAM orthopaedic boot, no significant widening of the syndesmosis happened when either one or both ligaments were sectioned, in an axial loading state. We therefore confirmed our hypothesis that even with 2 syndesmotic ligament injuries, axial loading in a CAM boot does not affect distal tibiofibular anatomy.

Conclusion: This study reveals that weight bearing without rotational force does not affect the stability of the syndesmosis. Incomplete syndesmotic injuries can likely be treated with nonoperative treatment in a CAM boot and weight bearing as tolerated. Further clinical studies are needed to confirm these findings.