Objectives

Historically, unstable injuries to the distal tibiofibular syndesmosis have been repaired with syndesmosis screws. However, newer repair techniques with inherently flexible implants, including suture-button constructs, may be less susceptible to malreduction and more reliably restore the native anatomy. The purpose of this study was to compare the anatomic accuracy of reduction between a syndesmosis screw and suture-button constructs for syndesmosis repair using a pre-injury and postoperative 3-D model assessment. It was hypothesized that significant differences would be observed among repair techniques and suture-button constructs would most accurately restore the pre-injury syndesmosis volume.

Materials & Methods

Twelve matched pairs (all male; mean age: 54 years) of cadaveric lower leg specimens were dissected to identify the syndesmosis ligaments. Specimens were imaged with CT prior to the creation of a complete syndesmosis injury. The disrupted syndesmosis of each specimen was subsequently reduced using one of three randomly assigned repair techniques: (1) tri-cortical syndesmosis screw (3.5 x 50 mm), (2) one-suture-button construct and (3) two-suture-button constructs. Specimens were imaged postoperatively with CT. 3-D models of all scans and tibiofibular joint space volumes were created to assess restoration of the native syndesmosis. Volumetric joint space measurements were made starting at the distal aspect of the tibiofibular articulation and extended proximally with four 1 cm sections measured separately.

Results

For each of the three fixation methods, total post-operative volume of the syndesmosis was significantly decreased relative to the intact state. The adjusted least squares means for reduction of joint volume associated with each repair method are summarized in Table 1. Total overall decreases in volume compared to the intact state for the one suture-button construct, two-suture-button constructs, and syndesmosis screw were -561 mm³, -964 mm³ and -277 mm³, respectively. Fixation with one suture-button construct was not significantly different from screw or two suture-button fixations. However, the total decrease in volume was significantly greater with the two-suture-button repair compared to screw fixation ($p < .05$).

Conclusions

The most important finding of this study was that fixation with one suture-button construct was not significantly different from screw or two suture-button fixations. All repairs significantly reduced the volume of the syndesmosis postoperatively compared to the intact state. Fixation with two suture-button results in significantly greater decreased volume than screw fixation. The data from the present study suggests that syndesmotic over-compression at time zero, particularly when using multiple suture-button implants, may be another potential factor contributing to malreduction of syndesmosis injuries that deserves further investigation.

Clinical Significance

This study demonstrates that it is possible to over-compress the syndesmosis when repairing with either syndesmosis suture-button constructs. As such, this study highlights the need for further research aimed at defining optimal surgical techniques for syndesmosis repair.