8:30 – 9:20 am
SESSION 2:
SYNDESMOSIS

Moderators:
J. Chris Coetzee, MD
(Edina, Minnesota)

Matthew M. Buchanan, MD
(Arlington, Virginia)
8:30 – 8:40 am
SESSION 2:
SYNDESmosis

Syndesmosis Fixation 2012:
Should I use screws, suture or is the whole thing overrated?

J. Chris Coetzee, MD
(Edina, Minnesota)

The new focus of study is whether conventional screw fixation is still the gold standard, or if the perceived advantages of flexible fixation is truly beneficial

<table>
<thead>
<tr>
<th>Syndesmotic Function</th>
<th>Fibular Motion</th>
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<tr>
<td>• Maintains talar reduction</td>
<td>- 2.4 mm distal motion during stance</td>
</tr>
<tr>
<td>• Transfers load to fibula</td>
<td>- From plantarflexion to dorsiflexion</td>
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<tr>
<td>• Allows for fibular motion</td>
<td>= 1 mm of widening</td>
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<td></td>
<td>= 2-4 deg of external rotation</td>
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</tbody>
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Implications of Subluxation

• Ramsey & Hamilton: 1976
  — 1 mm lateral subluxation = 42% loss of contact
  Ramsey PL, Hamilton W. Changes in tibiotalar area of contact caused by lateral talar shift. JBJS-A 1976; 58:356-367

• Zindrick 1985
  — 2 mm subluxation = 49% increase in pressure

• Lloyd et al 2006
  - 1 mm of lateral shift result in a 40% loss of contact surface area compared to 42% in the original experiment

Reduction

• FAI Oct 2006 : Gardner, Helfet et al
  — Malreduction of the tibiofibular syndesmosis in ankle fractures
  — 52% !! Had a malreduction of the syndesmosis in the incisura in a Level one trauma center
What does the Literature say about treatment?


“In this paper, a systematic review of the literature was conducted to provide an evidence-based rationale in the diagnosis and treatment of syndesmosis (high ankle) sprains in athletes. It is obvious from the low level of evidence available in the literature on this topic that a great deal of work is needed before conclusive statements regarding the management of these injuries can be made with confidence. Although the recognition and diagnosis of these injuries have improved, there still exists a paucity of information on optimal conservative and operative management.”

**If there is no widening compared to the opposite side – treat conservatively**

**If there is widening of the mortise or lateral shift of the talus – FIX IT!**

= The jury might still be out on what the best fixation is, and even if it matters.

REFERENCES


MATERIALS AND METHODS:

Forty-nine patients with ankle diastasis, treated with Arthrex tightrope™, were reviewed retrospectively, using American Orthopaedic Foot and Ankle Society (AOFAS) and Foot and Ankle Disability Index (FADI) scores and radiographic parameters for syndesmosis integrity. The operative technique was slightly modified by the senior author in 31 cases to avoid soft-tissue complications requiring removal of the implant. The aim of this study was to assess the rate of hardware removal after tightrope fixation and the effect of the author’s modification to avoid soft-tissue complications.

RESULTS:

The mean radiological follow-up was 6 months. Final data were collected using a confidential questionnaire and FADI score at an average of 24 (12-38) months postoperatively. The average time to full weight bearing was 7.7 weeks and to return to normal activities was 11.2 weeks. Postoperative radiographic measurements demonstrated satisfactory reduction of syndesmosis. The Mean AOFAS score was 85.57 (95% confidence interval (CI) 77.96-93.18) and the mean FADI score was 81.20 (95% CI 73.86-88.53). There were three cases of hardware removal in the standard technique group as compared to none in the group with the modified technique.

CONCLUSION:

Arthrex Tightrope™ provides an effective method of syndesmosis stabilisation, which obviates the need for routine removal of implant and facilitates dynamic stabilisation. The results of this study are satisfactory and comparable to previously reported studies.

Treatment of tibiofibular syndesmotic ankle injury remains controversial in regard to the best method, although surgeons agree that the goal of treatment is reduction and operative stabilization. Ideally, the implant should stabilize the syndesmosis and allow physiologic micromotion and early mobilization, and conventional screws are limited in this regard. We reviewed use of the Ankle TightRope® fixation device for repair of syndesmotic injuries. From April to September 2006, 16 patients with evidence of syndesmotic injury were treated by means of ankle fracture open reduction with internal fixation, combined with use of the Ankle TightRope® device for repair of the syndesmosis. The mean age of the 16 patients was 36.6 ± 16.71 (range 15 to 69) years; they were followed up for at least 2 years. Mean follow-up duration was 26 ± 3.94 (range 24 to 38) months. The mean American Orthopaedic Foot and Ankle Society score at 2-year follow-up was 86.88 ± 11.49 (range 48 to 100). The mean time to full weight-bearing was 4.5 ± 0.87 weeks. Two (12.5%) patients had postoperative superficial wound infections, each of which was treated with oral antibiotics. One (6.25%) patient had the TightRope® removed because of irritation from the knot. There was no failure of syndesmotic fixation, despite early weight-bearing in the postoperative phase. The results of this case series indicate that tibiofibular syndesmosis repair with the Ankle TightRope® yields satisfactory results.


BACKGROUND:
Suture-button fixation for tibiofibular syndesmosis injuries is a relatively new surgical technique thought to provide semirigid dynamic stabilization. However, adequate information is still not available and there are controversies as to whether it provides enough fixation for syndesmosis injuries.

HYPOTHESIS:
Optimally directed suture-button fixation brings physiologic dynamic stabilization of the ankle syndesmosis.

STUDY DESIGN:
Controlled laboratory study.

METHODS:
Stabilization of the ankle syndesmosis fixed by a suture-button construct was examined using 6 normal fresh-frozen cadaver legs. After initial tests of intact and injured models, suture-button fixation and screw surgical techniques were performed sequentially for each specimen, with single suture-button fixation, double suture-button fixation, anatomic suture-button fixation, and metal screw. Anterior and medial traction forces, as well as external rotation force, were applied to the tibia; the diastasis of the syndesmosis and the rotational angle of the fibula related to the tibia were measured using a magnetic tracking system.

RESULTS:
Each traction and rotation force significantly increased the diastasis and fibular rotational angles in the created injury models. With single fixation, the diastases increased significantly compared with the intact model with an anterior traction force (P < .001), a medial traction force (P = .005), and an external rotation force (P = .015). The fibular rotational angles increased significantly with a medial traction force (P = .005) and an external rotation force (P < .001). With double fixation, the diastases increased significantly with a medial traction force (P = .004) and an external rotation force (P = .012). The fibular
rotational angles increased significantly with a medial traction force \((P = .035)\) and an external rotation force \((P = .002)\). With anatomic fixation, there were no significant differences compared with the intact model. With the metal screw, the diastases decreased significantly with an external rotation force \((P = .037)\).

**CONCLUSION:**
Neither single nor double fixation for syndesmosis injuries provided multidirectionally stabilizing syndesmosis. Anatomic fixation directed from the posterior cortex of the fibula to the anterolateral edge of the tibia allowed dynamic stabilization of intact cadaver specimens. The metal screw provided very rigid fixation.

**CLINICAL RELEVANCE:**
Optimal direction of the suture button can provide adequate stabilization of the ankle and could benefit athletes with syndesmosis injuries.


The purpose of this study was to evaluate the radiographic changes of the tibiofibular position and the ankle mortise after removal of trans-syndesmotic fixation to determine if there is loss or maintenance of correction. In addition, the effect of the type of rotational injury, early weight bearing, and the number of trans-syndesmotic screws used on the integrity of the inferior tibiofibular articulation or ankle mortise after screw removal were evaluated. An analysis was conducted of 86 patients, with an unstable rotational ankle fracture requiring open reduction with syndesmosis screw stabilization. Routine radiographic parameters were measured just after open reduction and just before syndesmotic screw removal. There was a high correlation of loss of the integrity of the syndesmotic parameters after screw removal. However, the medial clear space of the ankle changed an insignificant amount, suggesting that although there appears to be some loss of maintenance, the talus did not shift laterally at the expense of a mobile syndesmosis. Ankle injuries requiring stabilization of syndesmotic instability with use of temporary trans-syndesmotic fixation achieve a stable ankle mortise after removal. Tibiofibular diastasis is commonplace upon removal of the syndesmotic hardware, but the ankle mortise remains unchanged. Based on the radiographic criteria described in this study, the postoperative change in medial clear space or tibiofibular diastasis has no bearing on fracture type, deltoid injury, or the use of 1 or 2 cortical screws. As such, other unknown mechanisms affecting the integrity of the syndesmosis after screw removal are in place.


**MATERIALS AND METHODS:**
We reviewed the clinical and radiographic results of 24 patients with acute injuries to the distal tibiofibular syndesmosis who were treated with suture button fixation. Average followup was 20 months. The primary outcomes measure was the AOFAS ankle hindfoot score. Secondary outcomes measures included a calibrated measurement of the tibiofibular clear space and tibiofibular overlap.

**RESULTS:**
The average AOFAS score was 94 points. Syndesmotic parameters returned to normal after surgery and
remained normal throughout the followup period. One in four patients required removal of the suture endobutton device due to local irritation or lack of motion. Osteolysis of the bone and subsidence of the device into the bone was observed in four patients.

CONCLUSION:
The suture button device is an effective way to repair the syndesmosis. In our series, the reduction of the syndesmosis was maintained throughout the followup period. However, reoperation for device removal was more common than anticipated. Osteolysis of the bone near the implant and subsidence of the device may occur.


BACKGROUND:
Diagnosis and reduction of syndesmosis injuries in ankle fractures can be challenging. Previous studies have demonstrated that standard radiographic measurements used to evaluate the integrity of the syndesmosis are inaccurate. The purpose of this study was to determine the adequacy of standard postoperative radiographic measurements in assessing syndesmotic reduction compared to CT and to determine the prevalence of postoperative syndesmotic malreduction in a patient cohort.

METHODS: Twenty-five patients with ankle fractures and syndesmotic instability who had open reduction and syndesmotic fixation were evaluated. All patients had a standard radiographic series postoperatively followed by a CT scan. Radiographic measurements were made by three observers to determine the tibiofibular relationship. Axial CT scan images were judged for quality of reduction of the syndesmosis by measuring the distance between the fibula and the anterior and posterior facets of the incisura. Differences between the anterior and posterior measurements of more than 2 mm were considered incongruous.

RESULTS:
Six patients (24%) had evidence of postoperative diastasis using the radiographic criteria, four of whom had evidence of malreduction on postoperative CT scan. Conversely, 13 patients (52%) had incongruity of the fibula within the incisura on CT scan (average 3.6 mm, range 2.0 to 8.0 mm), only four of whom had one or more abnormal radiographic measurements. In 10 (77%) of the 13 malreductions seen on CT scan, the posterior measurement was greater, indicating that internal rotation or anterior translation of the fibula may have occurred. Sensitivity of radiographs was 31% and the specificity was 83% compared to CT.

CONCLUSIONS:
Many syndesmoses were malreduced on CT scan but went undetected by plain radiographs. Radiographic measurements did not accurately reflect the status of the distal tibiofibular joint in this series of ankle fractures. Furthermore, postreduction radiographic measurements were inaccurate for assessing the quality of the reduction. Although we did not seek to correlate functional outcomes, the known morbidity of postoperative syndesmotic malreduction should lead to heightened vigilance for assessing accurate syndesmosis reduction intraoperatively.


Ankle sprains in the athlete are one of the most common injuries, and syndesmosis or "high-ankle" sprains seem to being diagnosed at an increasing rate. As a result, there has been a heightened interest
in recognizing and treating these difficult injuries on a timely basis, particularly in the athlete. Although the recognition and diagnosis of these injuries have improved, there still exists a paucity of information on optimal conservative and operative management. In this paper, a systematic review of the literature was conducted to provide an evidence-based rationale in the diagnosis and treatment of syndesmosis (high ankle) sprains in athletes. It is obvious from the low level of evidence available in the literature on this topic that a great deal of work is needed before conclusive statements regarding the management of these injuries can be made with confidence. The current diagnostic tests are not very specific. Because this is a spectrum of injury, there is a lot of variability in the time lost from sport. It is clear that we need a much more definitive diagnostic process for this injury that allows us to predict the severity of the injury, time loss from sport, and the treatment required.

8) J Chris Coetzee, MD, Patrick B Ebeling, MD: Treatment of syndesmoses disruptions: A prospective, randomized study comparing conventional screw fixation vs TightRope® fiber wire fixation – medium term results
SA ORTHOPAEDIC JOURNAL Autumn 2009 Page 32-37
BACKGROUND:
Open reduction and screw fixation is the current standard treatment for displaced injuries of the ankle syndesmosis. Despite reduction and stable internal fixation, however, these injuries do not uniformly have excellent outcomes. In addition, screw fixation has potential disadvantages.
MATERIALS AND METHODS:
An ongoing prospective, randomized clinical trial comparing conventional screw fixation with TightRope® fiber wire fixation for syndesmosis injuries. The objective of this paper is also to provide an overview of the important anatomical and biomechanical issues relating to syndesmosis injuries.
RESULTS:
At medium term follow-up the TightRope® fiber wire fixation group had a statistically significant better range of motion compared to conventional screw fixation. The AOFAS ankle and hindfoot score did not show a significant difference between the two groups.