Anatomical Repair versus Closed Reduction of the Syndesmosis: A Prospective Cohort Study

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My disclosure is in the Final AOFAS Mobile App. I have no potential conflicts with this presentation.
Background

• The outcome of high ankle fractures with syndesmotic disruption is determined by the quality of the reduction (1 - 4).

• Using fluoroscopy to gauge reduction has variable results. Open syndesmotic reduction can reduce malreduction rates from 40% to 15% (1, 5).

• The anterior inferior tibiofibular ligament (AiTFL) is the first lateral ligamentous stabilizer compromised in rotational syndesmotic injury, and is accessible with open reduction.

• Current syndesmosis repair techniques include either open or closed reduction, combined with fixation between the distal tibia and fibula. However, they do not fix the AiTFL.

• We hypothesize that restoration of the AiTFL combined with open reduction is more likely to provide an anatomic repair, compared with closed reduction and percutaneous screw fixation of the syndesmosis.
Purpose

• To compare the quality of reduction and functional outcomes between open reduction and AiTFL repair (Anatomic Repair Technique (ART)) to traditional closed percutaneous reduction and screw stabilization (CR) of the tibio-fibular syndesmosis (Figure 1).

Figure 1: Repair of unstable syndesmosis using A) open reduction, suture anchor AiTFL repair and B) traditional closed reduction.

(A) Anatomic repair (ART)  (B) Closed reduction repair (CR)
Methods

• 29 consecutive patients with ankle and syndesmotic disruption were enrolled (Figure 2).

• Traditional closed reduction with trans-syndesmotic screws (CR) or anatomic repair of syndesmosis (ART) was performed.

• ART patients had an open reduction of the syndesmosis, followed by a repair of the AITFL with 1 x 3.5mm suture anchor, and screw fixation with 2 x 3.5mm cortical screws.

• Closed reduction included percutaneous clamp placement, fluoroscopic judgement of reduction, and screw fixation using 2 x 3.5mm cortical screws.
Outcomes

• Primary outcome was quality of reduction on CT scan performed 3 months post surgery. An axial cut 1 cm proximal to the ankle joint line was used to determine the distance between the anterior and posterior facets of the tibial incisura along a line perpendicular to the joint and the fibula (AP difference) (6) (Figure 3).

• The AP difference was compared with the contralateral ankle, and a discrepancy of more than 1 mm considered a non-anatomic reduction.

• Maryland Foot Score, AOFAS Hind Foot Score and FAOS Foot and Ankle Survey were compared at 6 weeks, 3, 6 and 12 months post – op.
Methods continued

**Figure 2**: Treatment Groups.

![Treatment Groups Diagram](image)

**Table 1**: Patient Demographics (* p<0.05 ART vs CR).

<table>
<thead>
<tr>
<th>Patient Demographics</th>
<th>ART</th>
<th>CR</th>
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</thead>
<tbody>
<tr>
<td>Average Age (years)*</td>
<td>41.9</td>
<td>32.8</td>
</tr>
<tr>
<td>Male</td>
<td>70.6 (11 male)</td>
<td>58.3 (9 male)</td>
</tr>
<tr>
<td>Female</td>
<td>29.4 (4 female)</td>
<td>41.7 (5 female)</td>
</tr>
<tr>
<td>Mechanism of Injury</td>
<td>Low Energy Fall (65%)</td>
<td>Low Energy Fall (67%)</td>
</tr>
<tr>
<td></td>
<td>Sports Injury (24%)</td>
<td>Sports Injury (33%)</td>
</tr>
<tr>
<td></td>
<td>High Energy (12%)</td>
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</tbody>
</table>
Results

Figure 3: Axial CT scan of affected ankle 1 cm above joint (A) Anatomic Repair; (B) Closed Reduction.

Figure 4: Relative AP difference (mm) 1 cm proximal to the ankle joint. AR: AP difference 0.47 mm; CR: AP difference 1.09 mm; p<0.03.
Results - continued

- The reduction, measured using relative AP distance, was improved in the ART group (0.47 (± 0.37) mm) compared to the CR group (1.09 (± 0.69) mm) (p<0.03).

- 73% of CR group had a relative AP difference above 1 mm compared to only 11% of ART group.

- 9% of CR group had a relative AP difference above 2 mm, compared to none in the ART group.

- The Maryland Pain subscore showed a statistically significant (p<0.05) improvement in the ART group compared to the CR group (Figure 4).

- Improved outcome scores were consistently noted in the Total AOFAS Hindfoot Score, Total Maryland Foot Score, and Total FAOS Foot And Ankle Survey using the ART technique compared with the CR technique, but did not reach statistical significance (Figure 5).
Results continued

**Figure 5**: Functional outcome scores at 6 months for ART versus CR groups.

![Graph showing functional outcome scores at 6 months for ART versus CR groups. The graph includes Maryland Foot Pain Subscore*, Total Maryland Foot Score, Total AOFAS Hindfoot Score, and Total FAOS Score. The difference is significant at *P=0.03.](image)
Conclusions

• We have shown that an open anatomic repair of the syndesmosis results in better radiographic outcomes compared with percutaneous screw fixation.

• Pain at 6 months was significantly reduced in the ART group.

• Sample size calculation based on these results shows 20 subjects per group would be required to demonstrate statistical significance in functional outcome scores.

Future Directions

• Continue enrolling patients to achieve 20 per group.

• Randomized controlled trial
References


