Comparison of patient outcomes following ankle fracture fixation with or without arthroscopy trend toward improved outcomes with arthroscopy

Katherine Drexelius, BS; Kenneth Smith, MD; Shanthan Challa, BS; Kenneth Hunt, MD
University of Colorado Department of Orthopedics, University of Colorado School of Medicine Research Track

Introduction

Ankle fractures are one of the most common types of fractures, yet there is currently no consensus about how best to treat these patients. Open reduction internal fixation (ORIF) remains the gold standard treatment for unstable injuries, typically resulting in good to excellent outcomes. However, there is a subset of patients that do not achieve a satisfactory outcome, despite adequate reduction. One possible explanation for these poor outcomes is concomitant intra-articular injury at the time of ankle fracture. Thus, use of arthroscopy at the time of surgery can help identify and treat intra-articular lesions in acute fractures. While the rate of intra-articular injury associated with rotational ankle injuries has been reported as high as 63-79%, there is currently no evidence that arthroscopic intervention changes patient outcomes. This study aims to assess the clinical impact of arthroscopy accompanying ankle fracture ORIF. This is essential to promote positive outcomes while minimizing unnecessary complications and costs.

Methods and Materials

- Retrospective chart review of all patients who underwent operative fixation of bimalleolar or trimalleolar ankle fracture from Jan 2014 to Nov 2018
- 2:1 comparison of ORIF alone to ORIF with Arthroscopy
- Recorded:
  - Demographic data
  - Tourniquet time
  - Mechanism of Injury
  - Fracture pattern
  - Arthroscopic findings
  - Surgeon
  - Any additional surgical procedures performed
- Phone and email surveys
  - PROMIS Global Health Short Form
  - Patient Acceptable Symptom State (PASS)

Figure 1: Bimalleolar ankle fracture, before and after ORIF.

Figure 2: Intra-operative image depicting a large loose body in the lateral gutter of the ankle.

Results of Chart Review

Traditional ORIF group versus ORIF with arthroscopy group:

Groups were similar at baseline:
- Demographics (age, sex) between groups were statistically similar
- Injury mechanisms and fracture patterns were statistically similar between the groups except for a higher percentage of medial malleolus fractures in the ORIF alone group (Table 1)

General Findings:
- Complication rate and mean tourniquet time were equivalent between groups
- Proportion of patients with Kellgren-Lawrence osteoarthritis scores of 0 or 1 similar between groups
- No significant predictors based on injury mechanism, fracture category, or preoperative factors

Arthroscopic findings:
- 28% of patients had full thickness osteochondral defects
- 49% of patients had a small, partial thickness cartilage defect
- 34% of patients had loose bodies requiring removal
- Overall, 48% rate of arthroscopic intervention beyond the standard debridement of synovitis/hematoma
- Weber C fibula fractures were less likely to have a loose body noted on arthroscopy (5.9% versus 42.6%, p value 0.005)

Survey Results

Trends
- PROMIS Scores:
  - Mean physical function score: 42.7 in traditional ORIF group, 44.9 in the ORIF with arthroscopy group (p value 0.064)
- PASS Scores:
  - Considers surgery a success: 89% of traditional ORIF group, 97% of ORIF with arthroscopy group
  - Satisfied with function of ankle: 78% of traditional ORIF group, 89% of ORIF with arthroscopy group
  - Tibialotal joint dislocation patients who underwent ORIF with arthroscopy had higher satisfaction rates (90% versus 56%, p value 0.098)

Statistically Significant Findings
- Weber B fibula fracture and tibiotalotal joint dislocation patients who underwent ORIF with arthroscopy had higher PROMIS physical function scores than traditional ORIF patients
  - 45.9 versus 42.4, p value 0.01
- Weber B fibula fracture patients who underwent ORIF with arthroscopy had higher patient satisfaction rates than traditional ORIF patients
  - 93.1% versus 75.5%, p value 0.05

Discussion and Conclusions

Prior chart reviews, RCTs, meta-analysis, and systematic review comparing traditional ORIF to ORIF with arthroscopy present conflicting results. Some find no difference in functional outcome scores, while others report statistically significant improvements in scores. The addition of arthroscopy to an ankle ORIF creates a few concerns, including increased surgical time, increased complication rate, and increased cost.

Our study found no difference in complication rate or tourniquet time, which is in line with many studies on this topic. However, there are a number of complications unique to ankle arthroscopy, the majority of which are nerve injuries. Further research is necessary to delineate which patients are best suited for ankle ORIF with additional arthroscopy.

Based on our study, patients that underwent ankle arthroscopy at the time of an ankle fracture ORIF had better patient reported outcomes when compared to traditional ORIF, particularly in cases of Weber B fibula fractures and tibiotalotal joint dislocations.

Table 1.

<table>
<thead>
<tr>
<th>Injury Characteristic</th>
<th>ORIF with Arthroscopy (n = 71)</th>
<th>Traditional ORIF (n = 142)</th>
<th>Significance (p value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td>46 (64.8)</td>
<td>106 (74.6)</td>
<td>0.13</td>
</tr>
<tr>
<td>Sports</td>
<td>21 (29.6)</td>
<td>31 (21.8)</td>
<td>0.214</td>
</tr>
<tr>
<td>Motor Vehicle</td>
<td>4 (5.6)</td>
<td>5 (3.5)</td>
<td>0.469</td>
</tr>
<tr>
<td>Fracture Pattern</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weber B</td>
<td>54 (76.1)</td>
<td>104 (73.2)</td>
<td>0.677</td>
</tr>
<tr>
<td>Weber C</td>
<td>17 (23.9)</td>
<td>38 (26.8)</td>
<td>0.677</td>
</tr>
<tr>
<td>Medial Malleolus</td>
<td>19 (26.8)</td>
<td>59 (43.7)</td>
<td>0.017</td>
</tr>
<tr>
<td>Dislocation</td>
<td>16 (22.5)</td>
<td>32 (22.5)</td>
<td>0.927</td>
</tr>
<tr>
<td>Syndesmosis Injury</td>
<td>40 (57.9)</td>
<td>61 (36.2)</td>
<td>0.065</td>
</tr>
</tbody>
</table>
| Values are written as n (%). Boldface indicates statistically significant difference.

References

2. Bernwell and Curry, “The Treatment of Displaced Fractures at the Ankle by Fixation and Early Joint Movement.”

Acknowledgements

Funding provided by University of Colorado School of Medicine Research Track
Support from University of Colorado Department of Medicine Research and Equity in Academic Medicine (DREAM) Program
Many thanks to Dr. Ken Hunt and Dr. Buck Smith for their continued guidance on this project.