Ankle Distraction Arthroplasty: A Survivorship Review and Meta-Analysis

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- Institutional Review Board approval was not needed for this study and all aspects of this study were conducted ethically.
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Introduction

• Ankle Osteoarthritis (OA) affects 27 million in the US with 50,000 new cases/year\textsuperscript{1}
  – 12% of all symptomatic lower extremity OA\textsuperscript{2}
• 70% of ankle OA is Post-Traumatic\textsuperscript{3}
• Affects younger population
• Multiple treatments exist for ankle osteoarthritis
  – Most joint sparing options only beneficial for mild OA
Introduction

- **Gold Standard: Arthrodesis**
  - Sacrifices motion, risk nonunion and adjacent joint degeneration
- Young patients not candidates for total ankle arthroplasty
- Ankle distraction arthroplasty offers a joint sparing treatment without compromising future surgical options
- Utilizes external fixator to unload cartilage and promote healing$^{4-7}$
Methods

- **Scopus/PubMed searched**
  - Inception to 2021
  - 31 papers included after exclusions
- **25 papers reported clinical outcomes**
  1, 4, 8, 9, 10, 11-30
  - 1,072 patients
- **16 papers reports survivorship**
  1, 9, 10, 12-20, 24, 26-30
  - Endpoint = arthroplasty/fusion
  - 603 surgeries
  - Included for meta-analysis
Statistics

- Modified Coleman Methodology Score (MCMS)
  - Applied to assess quality of the individual publications
- Outcomes estimated as pooled proportion and 95% CI using random effects model
- Heterogeneity between studies evaluated with Q and I2 statistics
- Failure ratio and summary estimates demonstrated with Forest Plots
- Subgroup analysis conducted based on follow up (<5 yr, >5yr)
### Results - Demographics

- **Age at surgery**: 41.1 years
- **50.1% male**
- **1-12 years follow up**
- **95 failures in 685 surgeries**
- **MCMS 62.3 (Fair)**
- **36.8% of studies from USA**

### Score Comparison

<table>
<thead>
<tr>
<th>Score</th>
<th>Preop</th>
<th>Postop</th>
</tr>
</thead>
<tbody>
<tr>
<td>AOS Pain</td>
<td>+0.86 pts (54.5%)</td>
<td></td>
</tr>
<tr>
<td>AOS Function</td>
<td>+1.28 pts (33.1%)</td>
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</tr>
<tr>
<td>AOS Total</td>
<td>+1.07 pts (63.4%)</td>
<td></td>
</tr>
<tr>
<td>AOFAS</td>
<td>49.5</td>
<td>74.2 (+24.7)</td>
</tr>
<tr>
<td>VAS</td>
<td>7.6</td>
<td>1.3 (6.3 better)</td>
</tr>
<tr>
<td>VV Function</td>
<td></td>
<td>+49%</td>
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<tr>
<td>VV Pain</td>
<td></td>
<td>+52%</td>
</tr>
<tr>
<td>VV Clinical</td>
<td></td>
<td>+35.5%</td>
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</tbody>
</table>

**AOS** – Ankle OA score, **AOFAS** – American Orthopaedic Foot and Ankle Society, **VAS** – Visual Analog Score, **VV** – Van Valburg
Results - Meta-analysis

- Overall Failure ratio 11% (95% CI: 7%-15%; p ≤0.001; I² =87.01%)
  - 46.7±7.2 (12-120) months follow up
- <5 years failure ratio 9% (95% CI: 5%-12%; p ≤0.001; I²=81.59%)
  - 35.5±9.5 (12-64) weeks
- >5 years failure ratio 28% (95% CI: 16%-41%; p ≤0.001; I²=69.03%)
  - (80.25±17.75(46-120) months
Results

Overall Failure Ratio

<5 Year Failure Ratio

>5 Year Failure Ratio
Discussion

• Overall failure of 11% with higher rates after 5 years
• Significant improvement in all clinical scores measured
• Significant heterogeneity in technique and outcomes measures
• Need larger studies with uniform interventions and validated outcome measures
Conclusion

- Ankle DA provides a promising joint sparing surgical option for young and older patients
- The outcomes may deteriorate over time given higher failure rate after five years, but also allows multiple treatment options after failure
- Further research is needed to identify optimal patient selection, technique, timing, and adjuvants