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Ankle Distraction Arthroplasty: A Survivorship Review and Meta-Analysis

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Introduction

- Ankle Osteoarthritis (OA) affects 27 million in the US with 50,000 new cases/year¹
 - 12% of all symptomatic lower extremity OA²
- 70% of ankle OA is Post-Traumatic³
- Affects younger population
- Multiple treatments exist for ankle osteoarthritis
 - Most joint sparing options only beneficial for mild OA



Introduction

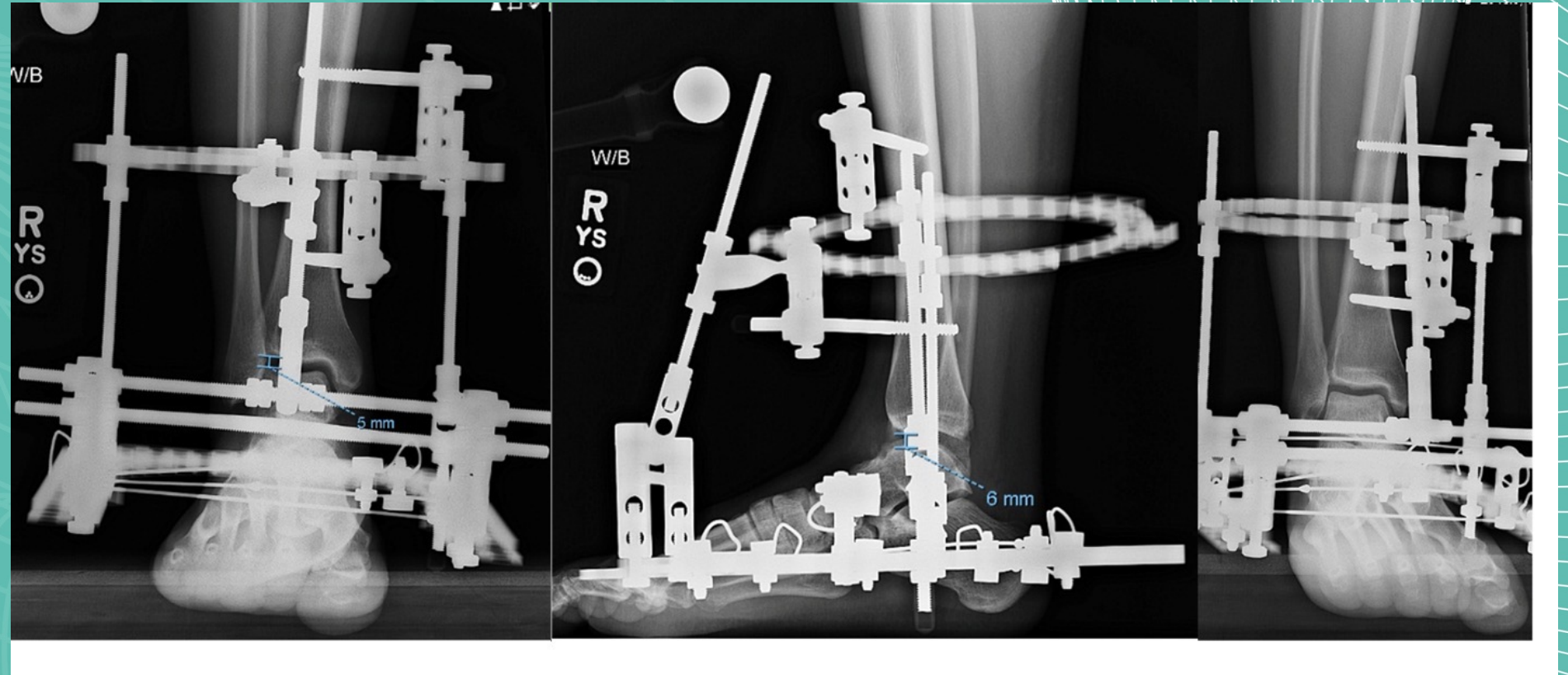
- **Gold Standard: Arthrodesis**
 - Sacrifices motion, risk nonunion and adjacent joint degeneration
- Young patients not candidates for total ankle arthroplasty
- Ankle distraction arthroplasty offers a joint sparing treatment without compromising future surgical options
- Utilizes external fixator to unload cartilage and promote healing⁴⁻⁷



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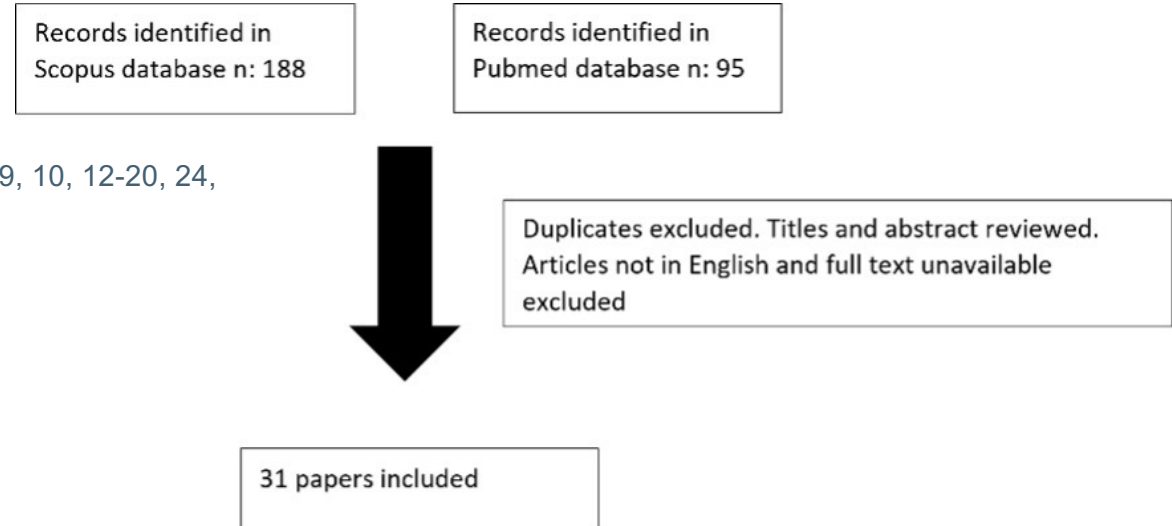
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Methods

- 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)



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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	Preop	Postop
AOS Pain		+0.86 pts (54.5%)
AOS Function		+1.28 pts (33.1%)
AOS Total		+1.07 pts (63.4%)
AOFAS	49.5	74.2 (+24.7)
VAS	7.6	1.3 (6.3 better)
VV Function		+49%
VV Pain		+52%
VV Clinical		+35.5%

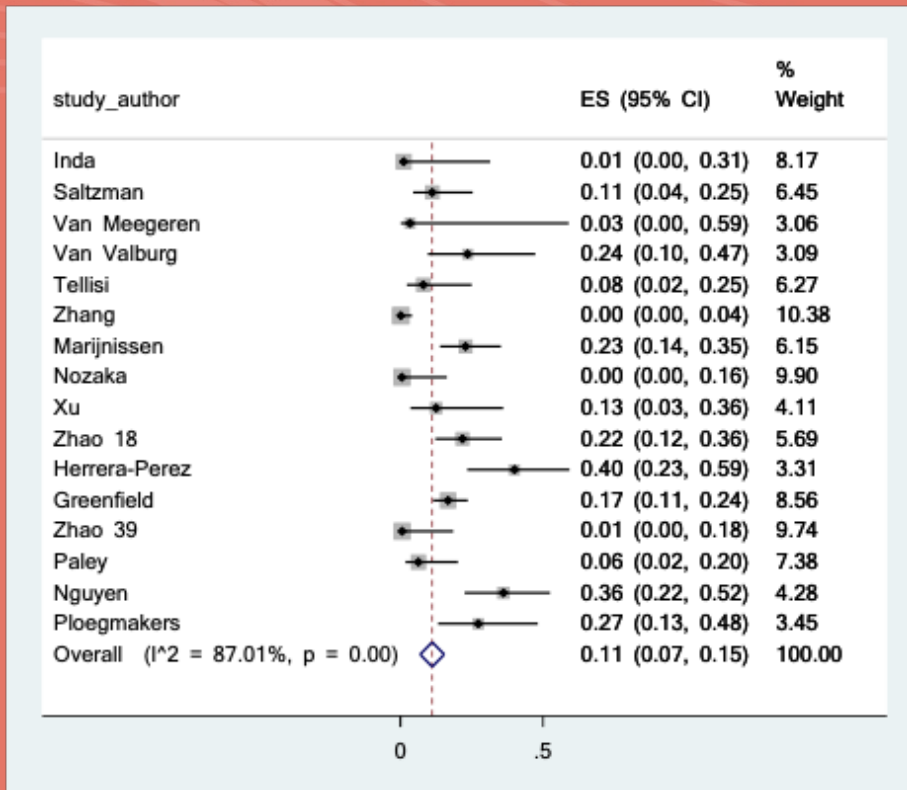


Results - Meta-analysis

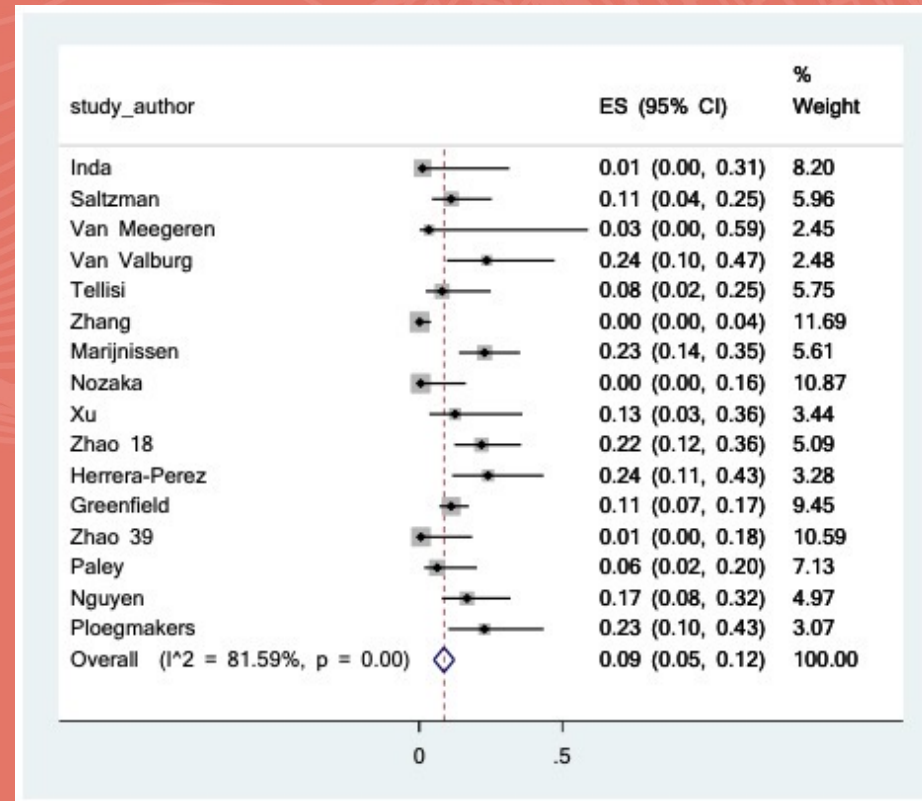
- Overall Failure ratio 11% (95% CI: 7%-15%; $p \leq 0.001$; $I^2 = 87.01\%$)
 - 46.7 ± 7.2 (12-120) months follow up
- <5 years failure ratio 9% (95% CI: 5%-12%; $p \leq 0.001$; $I^2 = 81.59\%$)
 - 35.5 ± 9.5 (12-64) weeks
- >5 years failure ratio 28% (95% CI: 16%-41%; $p \leq 0.001$; $I^2 = 69.03\%$)
 - (80.25 ± 17.75) (46-120) months



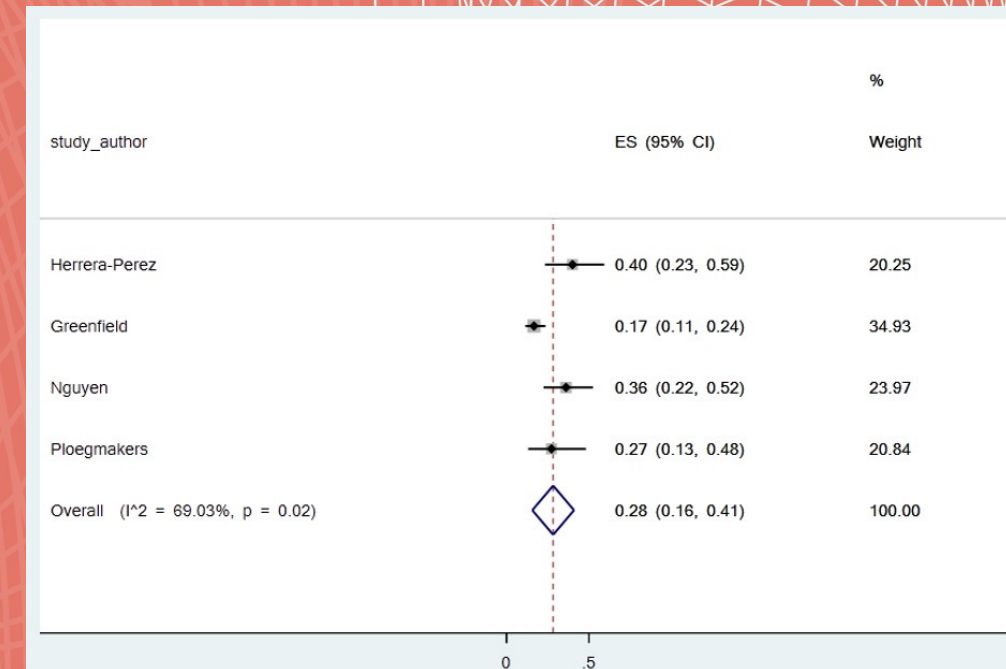
Results



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



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