Mobile- vs. Fixed-Bearing Total Ankle Prostheses: A Systematic Review and Meta-Analysis

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Disclosure

- No conflicts to disclose
In the last two decades, TAR gained more acceptance as treatment option in patients with end-stage ankle OA\textsuperscript{1-3}

Several designs:
- 2- vs. 3-component ankle prostheses\textsuperscript{4}
Objectives

- We performed a systematic review and meta-analysis of available TAR designs:
  - to determine the prosthesis survivorship
  - to analyze whether there is a statistically significant difference between mobile- vs. fixed-bearing TAR designs
**Methods Literature Review**

- Medical databases were searched from inception through February 1, 2016
- Search heading terms:
  - "ankle", "replacement", "arthroplasty", "prosthesis"

<table>
<thead>
<tr>
<th>Inclusion Criteria</th>
<th>Exclusion Criteria</th>
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</thead>
<tbody>
<tr>
<td>Study reports clinical, surgical, and radiographic outcomes</td>
<td>Review articles, case reports</td>
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<tr>
<td>Study reports surgical complication, including TAR revisions</td>
<td>Surgical technique paper, cadaver studies</td>
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<td>At least 2-years follow-up</td>
<td>Biomechanical/kinematic studies</td>
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<tr>
<td>Study includes at least 20 patients (20 TARs)</td>
<td>Gait studies</td>
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<td>Patient-oriented informative articles</td>
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<td>Double publications with the same patient cohort</td>
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<td>Revision surgery for failed TAR</td>
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Methods Literature Review

- **Data extraction:**
  - data were extracted independently by 2 reviewers
  - data extraction was verified by a 3rd reviewer

- **Meta-analysis:**
  - checklist was used as described by Meta-analysis of Observational Studies in Epidemiology (MOOSE)

- **Quality of included studies:**
  - assessment using Coleman Methodology Score by 2 reviewers
Statistical Analysis

- For each study, failure rate is estimated as number of failures / total exposure years:
  - Zaidi approach\(^5\)

- N year failure rate:
  - is calculated as \(1 - \exp(-N \times \text{failure rate})\)

- Pooled estimate of failure rate:
  - weighted average across studies using the universe variance weighting method
  - 95% CI is estimated assuming a Poisson distribution of failure rate

- Test for heterogeneity:
  - fixed effects models were used
Included Studies

- Descriptive statistics of included studies:
  - no statistically significant differences 2- vs. 3-component studies

<table>
<thead>
<tr>
<th>Variable</th>
<th>2-components (N=9)</th>
<th>3-components (N=22)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>RS vs. PS</td>
<td>5/4</td>
<td>14/8</td>
<td>0.70</td>
</tr>
<tr>
<td>MC vs. SC</td>
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<td>5/17</td>
<td>0.64</td>
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<tr>
<td>Observational vs. RCT</td>
<td>9/0</td>
<td>21/1</td>
<td>1.00</td>
</tr>
<tr>
<td>Invent bias yes/no</td>
<td>7/2</td>
<td>17/5</td>
<td>1.00</td>
</tr>
</tbody>
</table>

- both groups were comparable with regards to age, gender, ankle OA etiology
Failure Rate

- Estimated failure rate was comparable in 2- vs. 3-component prostheses:
  - average annual rate: 0.016 vs. 0.015 (P = 0.88)
  - 5 year failure rate: 0.077 vs. 0.074 (P = 0.75)
  - 10 year failure rate: 0.149 vs. 0.142 (P = 0.81)

- There is no statistically significant difference between studies with vs. without inventor bias:
  - average annual rate: 0.013 vs. 0.018 (P = 0.82)
Discussion

- Annual failure rate of TAR:
  - 2- vs. 3-component: 0.016 vs. 0.015
  - comparable to the current literature\textsuperscript{5,6}

- Publications with inventor bias:
  - publications by implant inventors may show a deviation from the outcome published by other users\textsuperscript{7}
  - in our study: no difference was found
Conclusion

- Patients characteristics and demographics were comparable in both groups:
  - 2- vs. 3-component TAR
- Quality assessment (Coleman Methodology Score) was similar in all studies
- Overall failure rate was comparable in both groups
- TAR designs:
  - different designs are currently available
  - no superiority of an implant design over another can be supported by the available data
References