1st MTPJ Arthrodesis- The Influence of Joint Pathology Surface Preparation & Osteosynthesis Technique On Union Rates

Ghosh A, Mahadevan M, Korim MT, Allen PE, Bhatia M, Mangwani J

Leicester General Hospital
Leicester UK
1st MTPJ Arthrodesis

• First described in 1894 by Clutton
• Established as Gold Standard for advanced hallux rigidus, degenerate hallux valgus and inflammatory arthropathy

However
• Known non-union rate
• Can be performed in variety of ways
• Various methods of joint preparation & osteosynthesis
Literature suggests union rates vary from 0 to 12%.
Recent systematic review of over 2800 procedures reported non-union rate of 5.4%.

Aim:
To determine the influence of
1) Joint pathology
2) Surface preparation
3) Osteosynthesis technique
On union rates
& whether above influence patient reported outcome
Methods

• Retrospective analysis of medical and radiographic records of patients who had undergone 1\textsuperscript{st} MTPJ arthrodesis at our institution between May 2003 & April 2013

• PROM and satisfaction survey obtained through postal questionnaire

• Institutional review board approval obtained
Joint pathology

Joint preparation

Osteosynthesis technique
Joint pathology

Joint preparation

Osteosynthesis technique

Hallux valgus
Hallux rigidus
Rheumatoid
Joint pathology

Joint preparation

Osteosynthesis technique

Group 1- Flat on Flat
- power saw

Group 2- Ball & socket
- Rongeur
- Rongeur & Burr
- Conical reamer system (Arthrex)
Joint pathology

Joint preparation

Osteosynthesis technique

Crossed compression screws
Dorsal plate and screw
Outcome Measures

Primary outcome

• Radiological union. Defined as bone bridging in at least 3 of 4 cortices in 2 orthogonal radiographic views

• 3 independent researchers

• Clinical review of notes

• Inconclusive- independent surgeon assessment

Secondary Outcome

• Patients satisfaction

• MOxFQ and EQ-5D-3L scores
Results

- 200 MTPJs (172 patients)
- 34 Male : 138 Female
- Mean age 62 (SD12) years
- 103 right : 97 left
- No patient lost to follow-up
- Median follow up for postal questionnaire- 43 months
<table>
<thead>
<tr>
<th>Group</th>
<th>Diagnosis</th>
<th>Osteosynthesis technique</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flat on Flat configuration (118)</td>
<td>Hallux Valgus (47)</td>
<td>Crossed compression screws (111)</td>
</tr>
<tr>
<td></td>
<td>Hallux Rigidus (37)</td>
<td>Plate &amp; screw (7)</td>
</tr>
<tr>
<td></td>
<td>Inflammatory (37)</td>
<td></td>
</tr>
<tr>
<td>Ball &amp; Socket configuration (82)</td>
<td>Hallux Valgus (44)</td>
<td>Crossed compression screws (67)</td>
</tr>
<tr>
<td>Rongeur only (21)</td>
<td>Hallux Rigidus (30)</td>
<td></td>
</tr>
<tr>
<td>Rongeur &amp; burr (27)</td>
<td>Inflammatory (7)</td>
<td></td>
</tr>
<tr>
<td>Conical Reamers (34)</td>
<td>Hallux Varus (1)</td>
<td>Plate &amp; screw (15)</td>
</tr>
<tr>
<td>Group</td>
<td>Diagnosis</td>
<td>Osteosynthesis technique</td>
</tr>
<tr>
<td>----------------------------</td>
<td>----------------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td><strong>Flat on Flat configuration 92.4%</strong></td>
<td>Hallux Valgus 90.9%</td>
<td>Crossed compression screws 93.8%</td>
</tr>
<tr>
<td></td>
<td>Hallux Rigidus 97%</td>
<td></td>
</tr>
<tr>
<td><strong>Ball &amp; Socket configuration 95%</strong></td>
<td>Inflammatory 92.7%</td>
<td>Plate &amp; Screw 90.9%</td>
</tr>
<tr>
<td>Rongeur only (100%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rongeur &amp; burr (96%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conical Reamers (91%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group</td>
<td>Diagnosis</td>
<td>Osteosynthesis technique</td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>------------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td><strong>Flat on Flat configuration 92.4%</strong></td>
<td>Hallux Valgus 90.9%</td>
<td>Crossed compression screws 93.8%</td>
</tr>
<tr>
<td></td>
<td>Hallux Rigidus 97%</td>
<td></td>
</tr>
<tr>
<td><strong>Ball &amp; Socket configuration 95%</strong></td>
<td>Inflammatory 92.7%</td>
<td>Plate &amp; Screw 90.9%</td>
</tr>
<tr>
<td>Rongeur only (100%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rongeur &amp; burr (96%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conical Reamers (91%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group</td>
<td>Diagnosis</td>
<td>Osteosynthesis technique</td>
</tr>
<tr>
<td>------------------------------</td>
<td>--------------------</td>
<td>---------------------------</td>
</tr>
<tr>
<td>Flat on Flat configuration 92.4%</td>
<td>Hallux Valgus 90.9%</td>
<td>Crossed compression screws 93.8%</td>
</tr>
<tr>
<td>Ball &amp; Socket configuration 95%</td>
<td>Hallux Rigidus 97%</td>
<td>Plate &amp; Screw 90.9%</td>
</tr>
<tr>
<td>Rongeur only (100%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rongeur &amp; burr (96%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conical Reamers (91%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inflammatory 92.7%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group</td>
<td>Diagnosis</td>
<td>Osteosynthesis technique</td>
</tr>
<tr>
<td>------------------------------</td>
<td>--------------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>Flat on Flat configuration</td>
<td>Hallux Valgus 90.9%</td>
<td>Crossed compression screws 93.8%</td>
</tr>
<tr>
<td>Ball &amp; Socket configuration</td>
<td>Hallux Rigidus 97%</td>
<td>Plate &amp; Screw 90.9%</td>
</tr>
<tr>
<td>Rongeur only (100%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rongeur &amp; burr (96%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conical Reamers (91%)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Patient satisfaction survey

- 156 responders (out of 172)- 91%
- 5% dissatisfied
- Males less satisfied

The satisfaction rating however, was similar when we compared
- joint configuration
- preparation technique
- type of osteosynthesis
- diagnosis
limitations

- Retrospective analysis
- Multiple surgeons
- Unmatched and underpowered
- No pre-operative functional scores
Discussion- joint preparation

• First study looking at influence of joint configuration and surface preparation technique on outcome
• Compared two commonly used joint configurations and osteosynthesis methods
• All procedures performed by foot and ankle surgeons in one unit
• Main outcome- union
• No statistical difference in union between flat cuts and ball and socket configuration
• Trend for reduced union with power-assisted tools
Discussion - osteosynthesis technique & pathology

Osteosynthesis technique
• Compared two commonly used techniques
• Found no difference in union rates between crossed-compression screws and dorsal plate and screw

Joint pathology
• Trend showing higher union in hallux rigidus compared to hallux valgus or inflammatory pathology
• no statistical difference in union rates
Discussion- patient satisfaction

- Satisfaction with surgery high
- Only 5% dissatisfied with outcome
- Satisfaction levels maintained
- Gender difference in satisfaction with males less satisfied than females
- May have implications in pre-operating counseling of patients
Conclusion

• Joint surface configuration, preparation, osteosynthesis method or pathology did not statistically influence outcome
  However trend towards increased non-union with power tools
• Trend towards increased union in hallux rigidus
• Overall satisfaction high
• Male patients less satisfied
END