Congress on Ankle Distraction Arthroplasty
LLRS Specialty Day, AAOS annual meeting
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Disclosures

Small Bone Innovations: consultant and royalties

Smith and Nephew: consultant
Ankle Distraction

- Preserves motion
- Does not burn bridges
- “Cartilage” regeneration

Questions:

- Hinge
- Duration frame
- How much distraction
- Acute vs Gradual
- How much stability needed
- Adjuvant procedures
- Biological adjuvants
- Patient selection
- Prophylaxis for ankle fractures
Ankle Distraction

**Mechanical unloading of the joint**
- Cartilage reparative process

**Intermittent flow of joint fluid and changes in hydrostatic pressure**
- Weight bearing and ankle movement in frame
Ankle Distraction Components

- **Biology**
  - Microfracture
  - BMAC/Stem cells

- **Soft tissue**
  - Gastrocsoleus recession

- **Mechanical**
  - Anterior Osteophyte excision
  - Hinged frame
    - Maintain ROM
    - Correct equinus
Frame Duration
10-12 weeks
Talar osteonecrosis
preop

1.3 years later

Austin T. Fragomen, MD · Thomas H. McCoy, MD · Kathleen N. Meyers, MS · S. Robert Rozbruch, MD

5.8 mm needed in bipedal
Weight bearing x-ray
I do 6 mm acute distraction
Columnar morphology

Collagen I abundant in superficial layers
Collagen II abundant in deep layers

Abundance Of proteoglycans

Saw, Anz, Arthroscopy 2011

<table>
<thead>
<tr>
<th></th>
<th>Intra-Op</th>
<th>Post-op 2 years</th>
<th>H &amp; E</th>
<th>Safarin-O</th>
<th>Collagen I</th>
<th>Collagen II</th>
</tr>
</thead>
<tbody>
<tr>
<td>MTP</td>
<td><img src="intra-op-MTP.png" alt="image" /></td>
<td><img src="post-op-MTP.png" alt="image" /></td>
<td><img src="H&amp;E-MTP.png" alt="image" /></td>
<td><img src="Safarin-O-MTP.png" alt="image" /></td>
<td><img src="Collagen-I-MTP.png" alt="image" /></td>
<td><img src="Collagen-II-MTP.png" alt="image" /></td>
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<tr>
<td>MFC</td>
<td><img src="intra-op-MFC.png" alt="image" /></td>
<td><img src="post-op-MFC.png" alt="image" /></td>
<td><img src="H&amp;E-MFC.png" alt="image" /></td>
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<td><img src="Collagen-I-MFC.png" alt="image" /></td>
<td><img src="Collagen-II-MFC.png" alt="image" /></td>
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BMAC: Mesenchymal stem cells
Excision of anterior osteophyte
Gastrocsoleus recession
Two 6 mm HA half pins in tibia

Insert Along Malleolar Axis
Align Hinges with Wire
Test Hinges
2 calcaneus wires; 1 talar neck wire
Can do gradual Correction of Equinus contx

Locking Rod
Final Frame
AOFAS score improved from 55 to 74 *
91% of patients report improved pain
  • Best noted with increased follow-up
Age not significant factor
  • Older patients tended to have better results
Arc of motion maintained (38 deg.)
  • Improved DF in patients with equinus
This was first 25 patients (f/u 30 months)
  • Now we have done 250 patients
Table 4: Level II, III, and IV Evidence to Support the Use of Distraction Ankle Arthroplasty in the Treatment of Post-traumatic Arthritis

<table>
<thead>
<tr>
<th>Author (Year)</th>
<th>Level of Evidence</th>
<th>Control Population</th>
<th>Diagnostic Groups Included</th>
<th>Length of Minimum Followup</th>
<th>Good and Excellent Outcome Rate</th>
<th>Study Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>van Valburg <em>et al</em> (1999)</td>
<td>II</td>
<td>None</td>
<td>Severe OA who were considered for arthrodesis</td>
<td>2 years</td>
<td>13/17 (76%)</td>
<td>Prospective</td>
</tr>
<tr>
<td>Marijnissen <em>et al</em> (2002)</td>
<td>II</td>
<td>None Debridement group</td>
<td>Severe OA who were considered for arthrodesis</td>
<td>1 year</td>
<td>38/54 (70%)</td>
<td>Prospective</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 year</td>
<td>14/17 (82%)</td>
<td>Small RCT</td>
</tr>
<tr>
<td>van Roermund <em>et al</em> (1999)</td>
<td>II/III</td>
<td>None</td>
<td>Post-traumatic ankle OA</td>
<td>1 year</td>
<td>N/A</td>
<td>Prospective</td>
</tr>
<tr>
<td></td>
<td></td>
<td>None</td>
<td></td>
<td>1 year</td>
<td>N/A</td>
<td>Retrospective</td>
</tr>
<tr>
<td>van Valburg <em>et al</em> (1995)</td>
<td>III</td>
<td>None</td>
<td>Post-traumatic ankle OA</td>
<td>9 months</td>
<td>6/11 (55%)</td>
<td>Retrospective</td>
</tr>
<tr>
<td>Ploegmakers <em>et al</em> (2005)</td>
<td>III</td>
<td>None</td>
<td>Severe OA previously treated with distraction</td>
<td>7 years</td>
<td>16/22 (73%)</td>
<td>Retrospective</td>
</tr>
<tr>
<td>Paley <em>et al</em> (2008)</td>
<td>IV</td>
<td>None</td>
<td>Painful ankle arthrosis recommended for fusion</td>
<td>2 years</td>
<td>14/18 (78%)</td>
<td>Case series</td>
</tr>
<tr>
<td>Tellisi <em>et al</em> (2009)</td>
<td>IV</td>
<td>None</td>
<td>Post-traumatic ankle OA</td>
<td>1 year</td>
<td>21/23 (91%)</td>
<td>Case series</td>
</tr>
</tbody>
</table>
Alternative to fusion and replacement
  • Works well for advanced arthrosis

Joint ROM worth saving
  • Correct equinus contx

Too young for TAR
  • Older patient did just as well

Motivated for joint preservation

Avoid in pt. with stiffness, infection
Why does this work?

- Generate *reparative* tissue
- Correct equinus
- Maintain ROM
- Decrease subchondral sclerosis