Anterolateral Tibial Trapezoidal Osteotomy for Accessing the Talus in Autologous Osteochondral Transplantation: Functional, Radiographic, and T2 MRI Analysis

Arianna L. Gianakos BSc.
Hospital for Special Surgery, NYC

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Osteochondral Lesions of the Talus

**Ankle sprains are common!**
27,000 per day in the U.S\(^1\)
Up to 50% may result in osteochondral injury\(^2\)

**Primary treatment strategy?**
Arthroscopic bone marrow stimulation – effective strategy for lesions less than 150mm\(^2\)\(^3\)
Autologous osteochondral transplantation for cystic lesions or lesions greater than 150mm\(^2\)

**Autologous Osteochondral Transplantation (AOT)**

**AOT as an effective replacement strategy:**

*Kennedy et al*[^4]  
FAOS scores improved from 52.67 to 86.19 with no failures at 28 month MFU (n=72)

*Scranton et al*[^5]  
90% good to excellent outcomes at 36 month MFU (n=50)

*Hangody et al*[^6]  
Excellent results in 92% of patients with femoral condylar implantations.

[^4]: Kennedy Cartilage 2011  
[^5]: Scranton. JBJS Br. 2006  
[^6]: Hangody Injury 2008

Intraoperative photograph of a recipient chisel used to prepare an osteochondral lesion for graft implantation.
Current Methods for Lateral Accessing OCLs

- Anterolateral arthrotomy with ATFL release

  - Fibular osteotomy with ATFL intact

  - Fibular osteotomy with ATFL release

  - Fibular osteotomy with ATFL/CFL release

Limitations of Current Approaches

• Ligament disruption leads to arthritis, loss of proprioceptive feedback, anterolateral impingement from scar tissue

• Syndesmosis disruption/fixation $\rightarrow$ malreductions of tibulofibular joint$^8$

• Some osteotomy techniques do not allow perpendicular access to talar surface – critical for AOT alignment$^7,10$

Anterolateral tibial trapezoidal osteotomy limits weightbearing disruption of the tibial plafond and allows perpendicular access to the talar articular surface.

Hypothesis

- Lateral tibial trapezoidal osteotomy approach is an effective method to access and treat OCLs of the talus.

- AOT utilizing this approach will result in complete bony union at the osteotomy site.

- Superficial and deep cartilage layers of the repair site of the osteotomy will resemble that of native cartilage.
Methods

• 17 patients, average age 37 years that underwent a lateral tibial trapezoidal osteotomy for AOT were retrospectively reviewed

• 64 month mean follow up (range: 17-96 months)

• Pre-and-postoperative FAOS scores and demographic data were recorded

• Magnetic Resonance Observation of Cartilage Repair Tissue (MOCART) assessed cartilage at osteotomy interface

• Quantitative T2-mapping MRI was analyzed in the superficial and deep cartilage layers of the osteotomy interface and in adjacent normal cartilage to serve as control tissue
Surgical Technique
Surgical Technique
Results

FAOS: mean improvement 39.22 (range 14-66) → 81.21 (range 19-98) (p<0.01)

Average MOCART:
= 73.89 (range 40-100)/100

Table: Osteochondral Lesion Location

<table>
<thead>
<tr>
<th>Talar Zone</th>
<th>Osteochondral Lesion Frequency</th>
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<tbody>
<tr>
<td>Anterolateral</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Centrolateral</td>
<td>10 (59%)</td>
</tr>
<tr>
<td>Posterolateral</td>
<td>7 (41%)</td>
</tr>
</tbody>
</table>
Results

<table>
<thead>
<tr>
<th>Region of Interest/Zone</th>
<th>Relaxation value (ms) +/- SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deep Zone</td>
<td>32.5 +/- 4.6</td>
</tr>
<tr>
<td>Superficial Zone</td>
<td>38.5 +/- 6.4</td>
</tr>
<tr>
<td>Control Deep Zone</td>
<td>35.4 +/- 5.6</td>
</tr>
<tr>
<td>Control Superficial Zone</td>
<td>37.7 +/- 4.8</td>
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</tbody>
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T2 mapping analysis demonstrated that both the deep half and the superficial half of the interface repair tissue had relaxation times that were not significantly different from the normal native cartilage.

Bony union at the osteotomy site was evident in all ankles (100%) on post-operative MRI.
Conclusions and Significance of Findings

- Lateral tibial osteotomy is an effective approach for accessing OCLs of the talus
- MOCART scoring and T2 mapping relaxation values suggest adequate cartilage infill at the osteotomy site
- Lateral tibial osteotomy results in functional improvement and reduction in pain
References