Total Ankle Replacement for Management of Hemophilic Arthropathy

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Financial Disclosure

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NO CONFLICT TO DISCLOSE

- Presenters: Thomas Sherman MD, Megan Paulus MD, John Marcel MD, Mike Mariorenzi MS, Rebecca Canada FNP-C
- Our disclosures are in the Final AOFAS Mobile App.
- We have no potential conflicts with this presentation.

CONFLICT TO DISCLOSE

- Presenter: Paul Cooper MD
- My disclosure is in the Final AOFAS Mobile App.
- I have a potential conflict with this presentation due to:
  - Integra: Paid consultant
  - Small Bone Innovations: Paid presenter or speaker
  - Smith & Nephew: IP royalties
  - Wolters Kluwer Health - Lippincott Williams & Wilkins: Publishing royalties, financial or material support
Introduction

• Hemophilic Arthropathy Pathoetiology
  – Recurrent hemarthroses → proteolytic chondral degeneration, synovial hypertrophy, vascular disruption of the talus → severe arthropathy\(^1,2\)
  – AVN of the talus is estimated to be present in >50% of patients with hemophilic arthropathy\(^1\)

• Tibiotalar Arthrodesis
  – Standard treatment for end-stage hemophilic arthropathy of the ankle\(^3-6\)
  – Potential for limited mobility and adjacent joint disease\(^3,6\)

• Total Ankle Replacement (TAR)
  – Limited reports have shown promising results for TAR in end-stage hemophilic arthropathy\(^7,8\)

Figure 1. Chronological anteroposterior and lateral ankle radiographs of a patient with severe Type A Hemophilia.
Material & Methods

- Retrospective case series
- Patient demographics:
  - 8 consecutive individuals with end-stage hemophilic ankle arthropathy
    - Median age: 41.4 (range, 17.6 to 65.6) years
- Operative Technique:
  - TAR: Scandinavian Total Ankle Replacement STAR™ (Small Bone Innovations; Morrisville, PA) prosthesis
  - Polymethyl methacrylate (PMMA) cement fixation of the talar prosthesis to mitigate increased risk of subsidence secondary to talar AVN (“off-label” use)
- Factor Replacement: High-Level Replacement for 2-weeks postoperatively
Material & Methods

– **Clinical Evaluation:**
  - Visual analog scores (VAS)
  - American Orthopedic Foot and Ankle Society (AOFAS) Ankle-Hindfoot Scale
  - Short Musculoskeletal Functional Assessment (SMFA) questionnaire

– **Radiographic Measurements**
  - Weightbearing radiographs
    - 1) Immediate preoperative studies
    - 2) First postoperative studies
    - 3) The most recent studies obtained during patient recall
  - Kellgren-Lawrence radiographic criteria
  - Pettersson Radiologic Classification of hemophilic arthropathy
  - Aseptic loosening of either component was defined as periprosthetic radiolucency greater than 2-mm in width or migration of components as previously described\(^9\)

*Figure 2.* Anteroposterior and lateral schematic for evaluation of tibial and talar component positioning and loosening as previously described\(^9\).
Results

- The median change in Pain VAS from preoperative values to final followup was 5.5 (N=8; range: 1 to 8)
- Six (N=6; 75%) patients had an antalgic gait pre-operatively

<table>
<thead>
<tr>
<th>Patient Case Number</th>
<th>Follow-Up Duration (Months)</th>
<th>Pre-Op Pain Scale VAS* (Points)</th>
<th>Post-Op Pain Scale VAS* (Points)</th>
<th>Post-Op Angle Range of Motion (Degrees)</th>
<th>Post-Op Hindfoot Range of Motion</th>
<th>Post-Op AOFAS** Score (Points)</th>
<th>Post-Op SMFA*** Dysfunction Index</th>
<th>Post-Op SMFA*** Bothersome Index (Points)</th>
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Table 1: Clinical Outcomes. *VAS = Visual Analog Scale. **AOFAS = American Orthopaedic Foot and Ankle Society. ***SMFA=Short Musculoskeletal Assessment
Results

<table>
<thead>
<tr>
<th>Patient Case Number</th>
<th>Follow-Up Duration (Months)</th>
<th>Pre-Op Pettersson Ankle Scale</th>
<th>Pre-Op Ankle Kellgren-Lawrence Score (Points)</th>
<th>Pre-Op Subtalar Kellgren-Lawrence Score (Points)</th>
<th>Post-Op Subtalar Kellgren-Lawrence Score (Points)</th>
<th>Talar Component Loosening</th>
<th>Tibial Component Loosening</th>
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Table 2: Radiographic Assessment

Figure 3. Weightbearing radiographs of a 34 year-old male with severe Type A Hemophilia at (A) Preoperative (B) 1-month postoperative (C) 42-months postoperative time points.
Discussion

• Reticence to TAR for hemophilic arthropathy is likely based on historical experience with TKA and unfamiliarity with TKA\textsuperscript{10}
  – TAR Surgical techniques and prostheses have improved
  – Factor replacement protocols have been optimized\textsuperscript{10}
• Patient function by AOFAS scale
  – Comparable to previous studies of STAR\textsuperscript{TM} prosthesis in non-hemophiliac patients without a cemented talar component\textsuperscript{9,13,14}
  – Comparable to several reports specific to TAR for hemophilic arthropathy\textsuperscript{8,11,12}
Discussion

• Talar AVN
  – Estimated to be present in >50% of hemophilic arthropathy patients¹

• Cementless TAR in the presence of AVN¹⁵-¹⁷
  – Un-acceptably high complication risks
  – Subsidence of the talar component with reported rates as high as 100%.
  – PMMA cement fixation provides immediate peri-operative fixation

• First case series to describe PMMA cement fixation of the prosthesis to help mitigate the potential complication of talar implant loosening and subsidence in patients with hemophilic arthopathy
  – One patient had subtle radiographic evidence of loosening but remains clinically asymptomatic

Figure 4. Preoperative Sagittal 1.5 Tesla Magnetic resonance imaging: A) T1-weighted sequence demonstrating decreased signal in the talar body and chondral thinning. (B) T2-weighted sequence demonstrating high signal intensity in the talar body consistent with cysts
Conclusions

• Cemented TAR for the treatment of end-stage hemophilic arthropathy of the ankle results in functional outcomes that are similar to those reported in patients without hemophilia, improves postoperative pain levels, and is without significant increased complication risk.

• Cement fixation of the talar component may mitigate implant subsidence in the setting of AVN of the talus.

• Long-term follow-up needed and planned.
References