Malunion following Bi-Plane Chevron Medial Malleolar Osteotomy: The Influence of Fixation

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Our disclosures are in the Final AOFAS Mobile App. There is no potential conflict with this presentation.
Statement of Purpose

• A medial malleolar osteotomy is primarily performed for exposure and treatment of talar osteochondral lesions and talar body fractures.

• Several osteotomy techniques are described in the literature including transverse, oblique, step-cut, crescentic, inverted “V” (chevron), inverted “U”, and bi-plane chevron.¹⁻¹⁴

• The challenge with medial malleolar osteotomy is to select an appropriate osteotomy orientation that provides adequate exposure of the talus while providing inherent stability to limit the risk of malunion or nonunion.
Statement of Purpose

• We recently published our technique for the medial malleolar Bi-plane Chevron osteotomy.\(^8\)

• We prefer this technique for it provides excellent medial talar exposure, and is exceptionally versatile

• The present study seeks to describe our experience with the osteotomy technique using a large patient cohort
Inclusion Criteria

• All patients treated at our institution with a bi-plane medial malleolar Chevron osteotomy between Jan. 2003 and Dec 2013 with a minimum of 6 months f/u were eligible

• Patients younger than 18 years and patients with a history of previous tumor / infection were excluded.

• Patients with a history of medial malleolar fracture or osteotomy were also excluded
Patient Demographics

- 50 patients met the inclusion criteria
  - 46/50 patients had 2 lag screws for osteotomy fixation
  - 4 patients had 2 lag screws and a buttress plate

- Demographic data collected:
  - Age, sex, BMI, diabetes, nicotine use
  - Prior surgeries, concomitant surgeries
  - Screw and osteotomy angle, osteotomy size
  - Screw diameter, length, starting point
### Osteotomy Displacement and Healing Data

<table>
<thead>
<tr>
<th></th>
<th>First Post-Operative Visit (n=47)</th>
<th>Second Post-Operative Visit (n=50)</th>
<th>Final Post-Operative Visit (n=50)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Osteotomy, n (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Congruent</td>
<td>29 (61.7)</td>
<td>25 (50.0)</td>
<td>35 (70.0)</td>
</tr>
<tr>
<td>Incongruent</td>
<td>18 (38.3)</td>
<td>25 (50.0)</td>
<td>15 (30.0)</td>
</tr>
<tr>
<td>Displaced proximally in mm, mean (SD)</td>
<td>1.3 (0.5)</td>
<td>1.3 (0.9)</td>
<td>1.8 (1.0)</td>
</tr>
<tr>
<td>Displaced medially in mm, mean (SD)</td>
<td>1.2 (0.8)</td>
<td>1.3 (0.9)</td>
<td>1.2 (1.1)</td>
</tr>
<tr>
<td>Osteotomy site healed on radiograph, n (%)</td>
<td>---</td>
<td>9 (18.0)</td>
<td>47 (94.0)</td>
</tr>
</tbody>
</table>

*Four to six weeks post-operative

Union was defined as presence of continuous trabeculation across the osteotomy site on each of the three radiographic views.

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Osteotomy Displacement Data

- 38% of initial post-op radiographs demonstrated osteotomy displacement
- 30% of osteotomies had measurable malunion on final post-operative radiographs
- Initial osteotomy displacement averaged 1.3mm proximal and 1.2mm medial
- Final follow-up osteotomy displacement averaged 1.8mm proximal and 1.2mm medial
Average osteotomy angle was 36.1 degrees

Average osteotomy size (as a % of plafond width) was 34.6%*

Average screw angle was 33.9 degrees

*Measured from the medial malleolar shoulder to the lateral tibial plafond, and from the medial malleolar shoulder to the osteotomy site. The second measurement was divided by the first, and multiplied by 100 to get a percentage of the plafond included in the osteotomy.
Complications

- 3 patients (6%) had a post-operative infection
- 15 patients (30%) required hardware removal
- 3 (6%) osteotomies remained unhealed on final post-op radiographs
Conclusions

• Standard medial malleolar screw fixation of the bi-plane Chevron osteotomy is associated with an unacceptably high rate of post-operative displacement and malunion.

• The addition of a distal medial tibial buttress plate to the osteotomy fixation construct should be considered. This practice has been adopted at our institution.
7. O’Farrell TA, Costello BG. Osteochondritis Dissecans of the Talus: The Late Results of Surgical Treatment. *JBJS.* 1982;64B:494-497.