The corrective ability of the double chevron and Akin osteotomies on medial sesamoid position in Hallux valgus deformity

Jie Chen, MD, MPH
Eugene Stautberg, MD
David Spak, MD
Gregory Schneider, BS
Vinod Panchbhavi, MD

University of Texas Medical Branch at Galveston, TX
Disclosures

The following individuals have no conflicts relevant to this presentation and disclosures are up to date on the AOFAS website/mobile app.

-Jie Chen, MD, MPH
-Eugene Stautberg, MD
-David Spak, MD
-Gregory Schneider, BS
-Vinod Panchbhavi, MD
Background

• Recurrence of hallux valgus deformity is a common post operative complication of hallux valgus correction with rates around 20-30%\textsuperscript{1}

• Recurrence leads to the need for further and oftentimes more complex surgery including fusion

• Failure to obtain intraoperative reduction of the metatarsal head over the tibial sesamoid is a proven risk factor for recurrence because the position of the sesamoid is a surrogate marker for the forces acting along the tendons\textsuperscript{2,3}.

• In addition to correcting the deformity, correction of sesamoid displacement is considered an important goal of surgery in order to reduce recurrence rates.
Background

The chevron osteotomy, a distal metatarsal osteotomy, combined with the akin proximal phalanx medial closing wedge osteotomy, can correct even severe deformity. But what effect does the chevron and akin have on sesamoid position relative to the metatarsal head?

Purpose: To investigate radiographically the corrective ability of the double chevron and akin osteotomy on sesamoid position in cases of hallux valgus correction surgery.
Methods – Study design

• Retrospective review of all patients who have undergone hallux valgus correction in the last 5 years

• Inclusion criteria:
  • Patients must have undergone both the chevron and akin osteotomy
  • Patients must have weightbearing pre-operative x-rays and weightbearing post-operative x-rays with the pins pulled

• Exclusion criteria:
  • Patients with previous surgery on the great toe
  • Patients with previous fracture to the great toe
  • Patients with a single or bipartate sesamoid
  • Children and prisoners
Methods - Measurements

For every case of hallux valgus, we measured preoperative and postoperative:

- Hallux valgus angle (HVA)
- Intermetatarsal angle (IMA)
- Sesamoid position based on the Hardy-Clapham (HC) scale

We classified cases into mild, moderate, and severe deformity based upon HVA and IMA values:

<table>
<thead>
<tr>
<th>Classification</th>
<th>HVA</th>
<th>IMA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal:</td>
<td>&lt;15</td>
<td>&lt;9</td>
</tr>
<tr>
<td>Mild:</td>
<td>15-19</td>
<td>9-10</td>
</tr>
<tr>
<td>Moderate:</td>
<td>20-39</td>
<td>11-15</td>
</tr>
<tr>
<td>Severe:</td>
<td>&gt;39</td>
<td>&gt;15</td>
</tr>
</tbody>
</table>
Methods – Hardy-Clapham (HC) Scale

- Commonly used and validated measurement of tibial sesamoid position\(^5\).
Methods - Readers

• Every x-ray was read by 3 authors: Dr. Chen, Dr. Stautberg, Dr. Spak

• Inter-observer agreement was examined to validate our measurement methods using the intra-class correlation coefficient

• All data demonstrated substantial or almost perfect agreement.

• As such, only Dr. Chen’s reads were used as that was assumed to be representative of the group
Results - overall

55 Cases
- 39 with displaced sesamoids preop
  - 35 corrected postop
  - 70.9%
  - 89.7% (p<0.01)
Results by HC grade and deformity severity

### Table 1. Sesamoid correction by HC grade

<table>
<thead>
<tr>
<th>HC Grade</th>
<th>V</th>
<th>VI</th>
<th>VII</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preoperative</td>
<td>22</td>
<td>5</td>
<td>12</td>
<td>39</td>
</tr>
<tr>
<td>Number corrected (percent)</td>
<td>(100)</td>
<td>(60.0)</td>
<td>(83)</td>
<td>(89.7)</td>
</tr>
</tbody>
</table>

### Table 2. Sesamoid correction by hallux valgus severity

<table>
<thead>
<tr>
<th>HV severity</th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preoperative</td>
<td>12</td>
<td>23</td>
<td>4</td>
<td>39</td>
</tr>
<tr>
<td>Number corrected (percent)</td>
<td>(91.7)</td>
<td>(87.0)</td>
<td>(100)</td>
<td>(89.7)</td>
</tr>
</tbody>
</table>
Discussion

- The double chevron and akin osteotomy can
  - Correct sesamoid position relative to metatarsal head 90% of the time
  - Correct mildly, moderately, and severely displaced sesamoids
  - Correct sesamoid position in mild, moderate, and severe cases of hallux valgus deformity
- The scarf osteotomy, traditionally indicated in severe hallux valgus deformity, is shown to correct sesamoid position 93% of the time
- We have shown similar results
- Potentially more cost effective as Chevron/akin can be done with just k-wires
- Future studies should focus on long-term recurrence rates and patient function/satisfaction
References


