Comparison pre- and post-operative alignment correction in patients with stage II flatfoot deformities treated with bony realignment procedure

Chamnanni Rungprai, M.D.

Co-authors

1,2 Tyler G. Slayman, B.S.; 1John E. Femino, M.D.; 1Annunziato Amendola, M.D.; 1Phinit Phisitkul, M.D.

1.University Of Iowa Hospital and Clinic, Iowa, USA
2.Phramongkutklao hospital and college of medicine, Bangkok, Thailand

AOFAS 2015 Annual Meeting ePoster
NO CONFLICT TO DISCLOSE

Comparison pre- and post-operative alignment correction in patients with stage II flatfoot deformities treated with bony realignment procedure

Chamnanni Rungprai, M.D.

My disclosure is in the Final AOFAS Mobile App.

I have no potential conflicts with this presentation.
Introduction

- Adult acquired flatfoot deformity (AAFD) is a common encounter condition in orthopaedic foot and ankle practice.

- AAFD is associated with tibialis posterior tendon dysfunction, arthritis, and Charcot arthropathy.\(^1,2,8\)

- Diagnosis bases on history, physical examination, and radiographic assessment.\(^1\)

- Conservative management is the first line of treatment and if this fails, surgical treatment is indicated.\(^1\)

- Bony realignment procedures such as medial calcaneal slide osteotomy, dorsal opening wedge of the medial cuneiform, lateral column lengthening have been demonstrated to be an effective method for treatment of patients with flatfoot deformities.\(^2-7\)

- However, there is a little evidence in the previous studies demonstrated the outcomes of foot and ankle angle and alignment.\(^8,9\)

- The purpose of this study was to compare pre-and post-operative radiographic correction after bony realignment procedures without tendon transfer.
Materials and methods

- Retrospective chart review of 113 consecutive patients (124 feet) diagnosed with flatfoot and underwent flatfoot reconstruction using either or combination of gastrocnemius lengthening with dorsal opening wedge of the medial cuneiform (Cotton), medial calcaneal slide osteotomy, and lateral column lengthening (EVAN) between 2008 to 2014.

- The patients were classified into 7 groups base on the procedures.

- **Group 1:** 11 patients (11 feet) underwent Cotton.

- **Group 2:** 5 patients (5 feet) underwent EVAN.

- **Group 3:** 17 patients (19 feet) underwent medial slide calcaneal osteotomy.

- **Group 4:** 40 patients (46 feet) underwent EVAN and Cotton.

- **Group 5:** 13 patients (13 feet) underwent medial calcaneal slide osteotomy and Cotton.

- **Group 6:** 3 patients (3 feet) underwent medial calcaneal slide osteotomy with EVAN.

- **Group 7:** 24 patients (26 feet) underwent medial calcaneal slide osteotomy, EVAN, and Cotton.
Materials and methods

- Mean age of 37.4 years (range, 12 to 79 years).
- The minimum follow up to be included in the study was 6 months with an average follow up of 11.8 months (range, 6 to 38 months).
- Allograft length of all osteotomy (Cotton and EVAN osteotomy) and distance of translation of medial calcaneal osteotomy were recorded.
- Radiographic measurement were
  - Calcaneal pitch angle
  - Lateral talocalcaneal angle
  - Lateral talo-first metatarsal angle (Meary angle)
  - Medial cuneiform-fifth metatarsal height
  - AP talonavicular coverage.
Results

- Pre- and postoperative measurements of all angle and distance were compared.
  - Gastrocnemius lengthening = 118/124 feet (95.2%)

- The mean graft length of Cotton are 6.6mm (range, 3.5-12mm).
- EVAN are 7.5mm (range, 3-15mm).
- The medial calcaneal translation was 9.3mm (range, 5-15mm).

- Overall improvement of
  - AP talonavicular coverage was 14.5%.
  - Calcaneal pitch angle was 5.5 degrees.
  - Lateral talocalcaneal angle was 2.6 degrees.
  - Meary angle was 16.9 degrees.
  - Medial cuneiform-fifth metatarsal height was 7.3 mm.
  - Hindfoot alignment was 9.9 mm.
Results

- Mean improvement of subgroup analysis:
  - Talonavicular coverage were 5.3%, 10%, 0.8%, 18.2%, 13%, 20%, 14.2%.
  - Calcaneal pitch angle were 0.4, 4.0, 1.8, 6.9, 4.2, 0, 6.7 degrees.
  - Lateral talo-calcaneal angle were 0.7, 3.0, 0.8, 3.3, 3.6, 3.0, 6.3 degrees.
  - Meary angle were 8.5, 8.0, 4.3, 20.2, 20.4, 5.0, 15.0 degrees.
  - Medial cuneiform-fifth metatarsal height were 2.4, 7.2, 1.4, 10.1, 2.4, 13.5, 15.9 mm.
  - Hindfoot alignment were 1.1, 7.5, 6.4, 9.6, 10.7, 9.6, 13.8 mm for group 1 to 7 respectively.

Table 1 Demographic characteristics of patient with flatfoot reconstruction.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Flatfoot reconstruction</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of patients/ no. of feet</td>
<td>113/124</td>
</tr>
<tr>
<td>Age of time at surgery (years) (range)</td>
<td>37.4 ± 18.2 (12-79)</td>
</tr>
<tr>
<td>Male : Female ratio (no. of patients)</td>
<td>39 : 74</td>
</tr>
<tr>
<td>BMI(Kg/m²) (range)</td>
<td>30.4 ± 7.01 (18.9-53.4)</td>
</tr>
<tr>
<td>Duration of symptom before surgery (range, months)</td>
<td>78.1 ± 101.3 (6-444)</td>
</tr>
<tr>
<td>Duration of follow up (months) (range, months)</td>
<td>13.3 ± 6.3 (6-38)</td>
</tr>
</tbody>
</table>
Radiographic measurement

- Gastrocnemius recession and isolated lateral column lengthening (EVAN) osteotomy, demonstrated improvement of alignment.
  
- AP talonavicular coverage 29 to 16 degrees.
  
- Calcaneal pitch angle 16 to 21 degrees.
  
- Meary angle was -14 to -5 degrees.
  
- Medial cuneiform-fifth metatarsal height was -7.6 to 2.1 mm.
  
- Hindfoot alignment was 16.9 to 0 mm.
Radiographic measurement

- Gastrocnemius recession, lateral column lengthening (EVAN), and cotton osteotomy, demonstrated improvement of alignment.

- AP talonavicular coverage 17 to 1 degrees.

- Calcaneal pitch angle 11 to 21 degrees.

- Meary angle was -16 to -1 degrees.

- Medial cuneiform-fifth metatarsal height was 2.7 to 9.7 mm.

- Hindfoot alignment was 9.2 to 0 mm.
## Discussion

<table>
<thead>
<tr>
<th>Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retrospective design, and therefore no randomization was used in the methods.</td>
</tr>
<tr>
<td>Small number of the patients in EVAN alone and medial calcaneal slide osteotomy with EVAN.</td>
</tr>
<tr>
<td>No evaluation of limb rotation in both pre- and post-operative hindfoot alignment measurement as this may lead to errors in the measurement as proposed by Buck et al.¹⁰</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Strengths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consecutive case collection.</td>
</tr>
<tr>
<td>Relatively large number of subject.</td>
</tr>
<tr>
<td>All surgeries were performed by the same group of fellowship-trained orthopaedic foot and ankle surgeons.</td>
</tr>
</tbody>
</table>
Conclusion

- All bony realignment procedure demonstrated significant improvement of alignment as measure with radiographic parameters.

- For single procedure, EVAN osteotomy is powerful to correct the overall alignment.

- The combination of bony procedure is more powerful to correct the deformities and should be considered to treatment of moderate to severe flatfoot deformities.
Reference:


