Does bunion surgery actually narrow the foot? Assessment using traditional angles and a new radiographic measure of severity

Ashok Marudanayagam FRCS (Orth)
Laura Beddard MBBCh
Anthony Perera MBChB FRCS(Orth)
Does bunion surgery actually narrow the foot? Assessment using traditional angles and a new radiographic measure of severity

Ashok Marudanayagam
Laura Beddard
Anthony Perera

Our disclosures are in the Final AOFAS Program Book. We have no potential conflicts with this presentation.
Introduction

• Traditional radiographic angles for hallux valgus deformity (HVA and IMA) are useful for surgical planning.
• However they do not correlate well with symptom severity or outcome from surgery\(^1\)
• Furthermore there are situations such as Metatarsus Adductus (Fig 1) in which these traditional angles can underestimate the severity of the deformity\(^2\)
• We feel that the fundamental issue in HV is the forefoot to hindfoot mismatch that results in problems with off the shelf footwear which are based on a standard foot
• The literature does not tell us whether HV surgery narrows the forefoot and if it does the degree to which this correlates with outcome

Fig 1
Background

• The senior author (AP) proposes a measure of Forefoot Line and also a Forefoot: hindfoot ratio in order to assess the severity of this mismatch

• Aim of this study using the proposed measures:
  1. Does bunion surgery actually narrow the foot?
  2. Do they correlate with symptom severity and outcomes?
Proposed Forefoot Measures

• Weight bearing DP views reliably show the lateral and distal surfaces of the calcaneum

• The proposed measures use these consistent landmarks and are therefore not affected by the presence of metatarsus adductus

1. Forefoot Osseous Width

• The Forefoot Line is the width of the forefoot. It is perpendicular to the hindfoot axis (Line A which is drawn along the lateral wall of the calcaneum) and it is measured between the outer edges of the 1st and 5th metatarsals

2. Forefoot: Hindfoot Ratio

• The Hindfoot osseous width is Line 2 is the width of the distal calcaneum. This has been chosen as it is a consistent and readily measurable, it is also perpendicular to Line A.
• The ratio is taken as Line 1: Line 2
Materials and Methods

• We identified 230 consecutive bunion surgeries performed between 2009 – 2012
• Of the 230 feet operated, radiographs could be retrieved for 200 feet.

Outcomes
1. Forefoot Osseous Width and the Forefoot : Hindfoot Ratio
   – We have previously validated these techniques.
2. Clinical outcomes were assessed pre-op and post-op using the Manchester Oxford Foot Questionnaire (MOXFQ) scoring system
   – This is a patient administered scoring system validated for Hallux Valgus
Results

1. The Technique of Measurement of Forefoot Osseous Width, Hindfoot Osseous Width and the ratio of these was reliable and reproducible.

2. We found that the bunion surgery narrowed the osseous width of forefoot significantly.

3. The Mean improvement was 7.1mm, but this varied according to the amount of correction that was required.

<table>
<thead>
<tr>
<th></th>
<th>Mean forefoot width</th>
<th>Mean hindfoot width</th>
<th>Forefoot:Hindfoot ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-op</td>
<td>91.7 (78.1 – 118.1)</td>
<td>26.3 (20.1 – 37.1)</td>
<td>3.50 (2.8 – 4.7)</td>
</tr>
<tr>
<td>Post-op</td>
<td>84.6 (74.6 – 106.2)</td>
<td>26.3 (20.1 – 37.1)</td>
<td>3.23 (2.2 – 4.3)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>P value</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-op</td>
<td>&lt;0.0001</td>
<td>No difference</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Pre-op</th>
<th>Post-op</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hallux valgus angle</td>
<td>30.9</td>
<td>9.2</td>
</tr>
<tr>
<td>Intermetatarsal angle</td>
<td>14.2</td>
<td>7.1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>P value</td>
<td>&lt;0.05</td>
</tr>
</tbody>
</table>
4. We found that forefoot: hindfoot ratio correlated with the symptom severity and that normalization of the ratio was associated with better outcomes

<table>
<thead>
<tr>
<th>MOXFQ score</th>
<th>Pre-op</th>
<th>Post-op</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain domain</td>
<td>57.3</td>
<td>10.0</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Walking domain</td>
<td>54.1</td>
<td>11.4</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Social domain</td>
<td>55.7</td>
<td>15.0</td>
<td>&lt;0.05</td>
</tr>
</tbody>
</table>
Conclusion

1. We have set out to define a measure of **Forefoot Osseous Width**, using a technique that we have validated previously.
   - This method is reproducible and reliable and allows for variations in forefoot adductus as the presence of this deformity reduces the magnitude of the HVA and IMA giving a spuriously mild deformity in cases with wide forefeet.

2. We feel that the **Forefoot: Hindfoot Ratio** is more helpful than HVA and IMA in symptom severity as this determines the ability to fit into off-the-shelf footwear rather than requiring bespoke or modified footwear
   - This is the first study to look at the ability to narrow the forefoot and has important implications in determining patient selection and post-operative outcomes.
References


