Quantitative Analysis of Hallux Rigidus

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No conflict to disclose.

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My disclosure is in the Final AOFAS Mobile App.

I have no potential conflicts with this presentation.
Purpose

• To introduce a new index for describing hallux rigidus (HR)
  – First-to-second metatarsophalangeal (1:2 MTP) joint ratio

• To show that the 1:2 MTP joint ratio is an effective and reliable means to evaluate HR and quantify progression of disease

• To determine thresholds to use in diagnosis, management
Background

• **Hallux rigidus**
  – Most common foot DJD
    » No means currently to describe the progression of the disease and quantify extent of disease

• **Classification systems**
  – Coughlin and Shurnas “most closely approximates a ‘gold standard’” (Beeson, FAI 2008)
  – None tested for reliability
  – Do not quantify the progression of disease
• Need for quantitative system
  – Knee OA – quantified joint space narrowing = more reliable (MARS Group, JBJS 2014)
  – Apply same principle to hallux rigidus

• 1:2 MTP joint ratio
  – Analyze reliability
  – Analyze clinical relevance
    • Correlation of radiographic data with clinical exam
    • Use in evaluation and treatment?
Materials and Methods

• 100 feet with HR identified by ICD-9 code
• 100 feet with plantar fasciitis identified as age-matched controls
  – 1:2 MTP joint ratio measured on weightbearing AP radiograph

• Chart review
  – Mid-range signs = severe HR
  – Recommended treatment (nonop vs. op)
  – Procedure (joint-sparing vs. sacrificing)

• Statistical analysis
  – Reliability
  – Receiver operator curves (ROC)
    – Youden’s index- optimize sensitivity/specificity » threshold
Results

- **1:2 MTP joint ratio is reliable**
  - Interobserver = 0.84
  - Intraobserver = 0.86

<table>
<thead>
<tr>
<th></th>
<th>Hallux Rigidus</th>
<th>Control</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of feet</td>
<td>100</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Number of patients</td>
<td>82</td>
<td>82</td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td>29 male, 53 female (35.4%, 64.6%)</td>
<td>36 male, 46 female (43.9%, 62%)</td>
<td>0.34</td>
</tr>
<tr>
<td>Age (years)</td>
<td>55.1</td>
<td>53.4</td>
<td>0.25</td>
</tr>
<tr>
<td>1st AP mid joint width (mm)</td>
<td>1.67</td>
<td>2.25</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>2nd MTP joint width (mm)</td>
<td>2.31</td>
<td>2.2†</td>
<td>0.09</td>
</tr>
<tr>
<td>3rd MTP joint width (mm)</td>
<td>2.02</td>
<td>1.95</td>
<td>0.09</td>
</tr>
<tr>
<td>1:2 MTP joint ratio</td>
<td>0.72</td>
<td>1.03</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>1:3 MTP joint ratio</td>
<td>0.62</td>
<td>1.17</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>Dorsal osteophyte height (mm)</td>
<td>5.29</td>
<td>3.99</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>HVA (degrees)</td>
<td>13.45</td>
<td>12.32</td>
<td>0.20</td>
</tr>
<tr>
<td>IMA (degrees)</td>
<td>9.65</td>
<td>9.31</td>
<td>0.58</td>
</tr>
</tbody>
</table>

- significant difference in 1:2 MTP joint ratio between HR and control groups
• 1:2 MTP joint ratio is clinically significant
  – <0.89 threshold for diagnosis of HR
  – No clear correlation with age
• 1:2 MTP joint ratio is clinically significant

- Thresholds optimized using Youden’s index to guide diagnosis, management
Conclusion

• 1:2 MTP joint ratio is an effective and reliable means to evaluate hallux rigidus and quantify progression of disease

• Thresholds should be considered in diagnosis, management
  – <0.89 consistent with diagnosis
  – <0.70 severe HR; consider joint-sacrificing procedure

• Outcome analysis can refine cut-offs, add to diagnostic, therapeutic, and prognostic value
References