Implementation and Validation of Anatomic Triplane Hallux Abducto Valgus Classification

Robert Santrock, MD, W. Bret Smith, MSc, DO, Paul Dayton, MS, DPM, Daniel Hatch, FACFAS

Category: Bunion

Keywords: HAV / Bunion / Triplanar / Anatomic / Classification

Introduction/Purpose: The most common classification system for HAV deformity is based on two-dimensional radiographs. This system relies upon measurements taken of the transverse plane. (IMA and HVA) to classify and deploy surgical options based on the severity of these angles [1]. Recently, the understanding of HAV deformity as a three-dimensional problem has been described. A study by Kim et al. [2] utilized WB-CT to describe a frontal plane rotational component in 87% HAV cases. To develop a better understanding of HAV, a unique anatomic classification system (see figure) was proposed. The aims of this study were: (1) To use traditional WB radiographs to confirm the findings of Kim’s WB-CT study. (2) To use inter-observer and intra-observer analysis to validate the classification of HAV into this new system.

Methods: An Institutional Review Board approved multi-center retrospective study was performed utilizing four view WB radiographs (Anterior-Posterior, Oblique, Lateral and Axial Sesamoid) on patients presenting to the clinic for “bunion,” Hallux Valgus, HAV, Hallux Rigidus or “great toe pain.” The data were analyzed for the presence of frontal/coronal plane rotation of the first metatarsal, subluxation of the sesamoids, metatarsus adductus and degenerative joint disease of the first MTP (metatarsophalangeal) joint (Hallux Rigidus); these findings were compared to Kim’s study. Additionally, these data were used to categorize HAV deformities into a new 3D classification scheme and were tested for inter-observer and intra-observer reliability.

Results: The results established the presence of frontal/coronal plane rotation and subluxation in similar ratios as reported by Kim et al. thus confirming the utility of a four-view WB radiograph series in recognition of 3D deformity of HAV. The results also confirmed good reliability of the classification from both the inter-observer and intra-observer standpoint.

Conclusion: These data suggest that new protocols and tools are reliable in helping the surgeon recognize and better identify the three-dimensional components of HAV.
<table>
<thead>
<tr>
<th>Class</th>
<th>Anatomic Findings</th>
<th>MTP Joint Status</th>
<th>Treatment Recommendation</th>
</tr>
</thead>
</table>
| 1     | Increased HVA and IMA  
No first metatarsal pronation evident on AP and Sesamoid axial Radiograph  
Sesamoids may be subluxed. | No clinical or radiographic evidence of DJD | Transverse plane corrective procedure  
+/- Distal soft tissue procedures |
| 2A    | Increased HVA and IMA  
First metatarsal pronation evident on AP and Sesamoid Axial Radiograph  
No sesamoid subluxation on Axial | No clinical or radiographic evidence of DJD | Triplane correction with first metatarsal supination/inversion  
+ Distal soft tissue procedures |
| 2B    | Increased HVA and IMA  
First metatarsal pronation evident on AP and Sesamoid Axial Radiograph  
With sesamoid subluxation on Axial | No clinical or radiographic evidence of DJD | Triplane correction with first metatarsal supination/inversion  
+ Distal soft tissue procedures |
| 3     | Increased HVA and IMA  
>15 degrees MTA  
No first metatarsal pronation | No clinical or radiographic evidence of DJD | Metatarsal 2 and 3 transverse plane correction  
Followed by 1st metatarsal correction per class 1 & 2 recommendations |
| 4     | Increased HVA and IMA  
+/- First metatarsal pronation  
Clinical and or radiographic evidence of DJD | First MTP arthrodesis | |

Foot & Ankle Orthopaedics, 2(3)  
DOI: 10.1177/2473011417S000355  
©The Author(s) 2017