The RAM Classification: A Novel, Systematic Approach to the Adult-Acquired Flatfoot

Steven M. Raikin, MD, Brian S. Winters, MD, Joe N. Daniel, DO
Foot and Ankle Service
Rothman Institute
Thomas Jefferson University Hospital
Philadelphia, PA
Disclosure

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Our disclosures are in the Final AOFAS Program Book. We have no potential conflicts with this presentation.
Pre 1989 - Posterior tibial tendonitis (PTT)

1989 - Johnson classification
  - 3 stages of PTTD

1997 - Myerson added stage 4
  - Deltoid / Ankle involvement

2007 - Bluman
  - Divided each stage into A & B

2012 - RAM classification
  - Recognized ankle and midfoot contribution to flatfoot
The RAM Classification: A Novel, Systematic Approach to the Adult-Acquired Flatfoot

- **AAFF** deformity has contributions in development from:
  - **Rearfoot** = PTT
  - **Ankle** = Deltoid / Spring Ligament
  - **Midfoot** = 1st TMT joint

- **AAFF** deformity progression is not necessarily linear
  - May affect different zones of the arch to different degrees

- **Each level of deformity is graded independently**
  - Both clinically and radiographically

- **Specific treatment algorithms created for each**
  - Level of deformity (RAM)
  - Degree of involvement
### RAM Classification

<table>
<thead>
<tr>
<th>Stage</th>
<th>Rearfoot</th>
<th>Ankle</th>
<th>Midfoot</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ia</td>
<td>Tenosynovitis of PTT</td>
<td>Neutral alignment</td>
<td>Neutral alignment</td>
</tr>
<tr>
<td>lb</td>
<td>PTT tendonitis without deformity</td>
<td>Mild valgus (&lt;5°)</td>
<td>Mild flexible midfoot supination</td>
</tr>
<tr>
<td>Ia</td>
<td>Flexible planovalgus (&lt;40% talar uncoverage, &lt;30° Meary angle, incongruency angle 20° to 45°)</td>
<td>Valgus with deltoid insufficiency (no arthritis)</td>
<td>Midfoot supination without radiographic instability</td>
</tr>
<tr>
<td>Iia</td>
<td>Flexible planovalgus (&gt;40% talar uncoverage, &gt;30° Meary angle, incongruency angle &gt;45°)</td>
<td>Valgus with deltoid insufficiency with tibiotalar arthritis</td>
<td>Midfoot supination with midfoot instability—no arthritis</td>
</tr>
<tr>
<td>IIIa</td>
<td>Fixed/arthritic planovalgus (&lt;40% talar uncoverage, &lt;30° Meary angle, incongruency angle 20° to 45°)</td>
<td>Valgus secondary to bone loss in the lateral tibial plafond (deltoid normal)</td>
<td>Arthritic changes isolated to medial column (navicular-medial cuneiform or first TMT joints)</td>
</tr>
<tr>
<td>IIIb</td>
<td>Fixed/arthritic planovalgus (&gt;40% talar uncoverage, &gt;30° Meary angle, incongruency angle &gt;45°)—not correctable through triple arthrodesis</td>
<td>Valgus secondary to bone loss in the lateral tibial plafond and with deltoid insufficiency</td>
<td>Medial and middle column midfoot arthritic changes (usually with supination and/or abduction of the midfoot)</td>
</tr>
</tbody>
</table>

1) Benthien 2007  
2) Ellis 2010  
3) Vora 2006  
4) Logel 2007  
5) Jennings 2008
The RAM Classification

Rothman Institute of Orthopaedics at Thomas Jefferson University

- R2b A1a M2b
- R2a A1a M3b
- R3a A3b M2b
- R2a A1a M3b
Surgical Treatment Algorithm
REARFOOT

- **Stage R-Ia**: PTT Tenosynovitis
  - Tenosynovectomy

- **R-Ib**: PTT Tendonitis/Tendinosis WITHOUT Deformity
  - Débridement and repair of the PTT, combined with FDL augmentation

- **R-IIa**: Mild to Moderate Flexible Deformity
  - FDL tendon transfer + medializing calcaneal osteotomy (MCO)

- **R-IIb**: Severe Flexible Deformity
  - FDL tendon transfer plus lateral column bone block lengthening procedure
  - Spring ligament should be assessed, and if torn, be repaired or reconstructed

- **R-IIIa**: Moderate Fixed Deformity
  - Triple arthrodesis

- **R-IIIb**: Severe Fixed Deformity
  - Triple arthrodesis with additional deformity correction (ie osteotomies/MCO/CCDA)

**Stage A-Ia: Normal Deltoid Ligament**
- No treatment

**A-Ib: Strained Deltoid Ligament – Normal Alignment**
- Usually corrects itself after hindfoot realignment -> no treatment

**A-IIa: Deltoid Insufficiency WITHOUT Arthritic Changes**
- Deltoid ligament reconstruction

**A-IIb: Deltoid Insufficiency WITH Tibiotalar Arthritis**
- Pantalar fusion OR combining a deltoid ligament reconstruction with TAA

**A-IIIa: Bone Loss Lateral Plafond WITHOUT Deltoid Insufficiency**
- Ankle arthrodesis or total ankle arthroplasty

**A-IIIb: Bone Loss of the Lateral Plafond WITH Deltoid Instability**
- Ankle arthrodesis or TAA with deltoid ligament reconstruction
Surgical Treatment Algorithm

MIDFOOT

- **Stage M-Ia: Neutral Midfoot**
  - No treatment

- **M-Ib: Mild Correctable Supination**
  - No additional management is required in most cases
  - Medial forefoot post orthotic inserts can be used to balance the deformity if needed

- **M-IIa: Supinated Foot - Radiographically Normal Articulation**
  - Commonly seen with stage R-IIb
  - Dorsal opening wedge (Cotton) osteotomy of the medial cuneiform

- **M-IIb: Midfoot Joint Instability (WITHOUT Arthritis) 1\textsuperscript{st} TMT**
  - With mild cases, a Cotton osteotomy can be used
  - Usually requires plantarflexion arthrodesis of 1\textsuperscript{st} TMT joint

- **M-IIIa: First TMT Arthritis**
  - Plantarflexion arthrodesis of 1\textsuperscript{st} TMT joint

- **M-IIIb: Multiple Joint TMT Arthritis**
  - 1-3 TMT midfoot arthrodesis
Conclusions:

- Not every AAFF presents with a pattern of deformity consistent with the current classification systems.
- An ideal classification system needs to be reproducible and easily applied to predict prognosis and direct treatment.
- With our novel staging system, each level of deformity is graded independently, which in turn directs specific non-surgical and surgical treatment options.
- We feel that with this new, comprehensive classification system, one can successfully address the diversity of this complex problem in an easy, systematic fashion.