Symptomatic Accessory Navicular Bones It is Not Only Type II

Bariteau, Jason 1; Chamieh, Jad 1; Banerjee, Sima 1; Robertson, Douglas 1,2; Harmouche, Elie 1; Labib, Sameh 1; Terk, Michael 1

1. Emory Spine and Orthopaedic Center, Atlanta, GA 30329
2. Georgia Institute of Technology and Emory University, Department of Biomedical Engineering, Atlanta, GA
AOFAS DISCLOSURE SLIDE FORMAT

- NO CONFLICT TO DISCLOSE

- Symptomatic Accessory Navicular Bones It is Not Only Type II

- Jason Bariteau

- My disclosure is in the Final AOFAS Mobile App

- I have no potential conflicts with this presentation
Background

- Accessory navicular bone found medial to the tarsal navicular bone’s posteromedial tuberosity
  - 4-21% incidence
  - More common in females (up to 80% of symptomatic patients)
  - 50-90% bilateral
- Associated with focal medial foot pain and pes planus
- Three types
  - **Type I:** 2-3 mm sesamoid bone within the distal portion of the posterior tibial tendon (PTT)
  - **Type II:** triangular ossicle 8mm to 12mm in size connected to the navicular bone by a synchondrosis with fibers of the PTT inserting onto the accessory ossicle
  - **Type III:** bony union between the navicular bone and the ossicle producing a prominent navicular tuberosity
Aims

- Conventional thought is that type II may be symptomatic and type I and III are basically asymptomatic.
- No prior studies reported the MRI finding of PTT sheath fluid as fluid may indicate PTT dysfunction.
- We hypothesize that types I and III may also lead to significant clinical and radiologic consequences.

Aims
- Study all three accessory navicular bone types.
- Associate bone type with localized pain, pes planus, bone marrow reactive change, and PTT sheath fluid.
Methods

- 309 individuals with accessory navicular bones identified from 2 institutions
- Clinical symptoms and MRI findings analyzed
- Those with spring ligament injury were omitted
- Pertinent medical history retrieved
- Pes planus measured from weight-bearing lateral foot radiographs
- Ossicle size determined for type classification
- Studies reviewed by two experienced musculoskeletal radiologists
  - Recorded spring ligament injury
  - Categorized the accessory navicular type
  - Recorded the presence of bone marrow reactive change (BMRC)
  - Noted location of PTT insertions
  - Determined presence of posterior tibial tendon (PTT) sheath fluid
Methods

- Information from medical charts collected on:
  - Onset and duration of symptoms
  - Location and intensity of pain (score 1-10, 10 being highest)
  - Difficulty with ambulation
  - Foot wear and conservative treatment
  - Surgical treatment

- Only those with medial or medial dorsum foot pain were considered having a painful navicular bone

- Pearson’s chi square test used for type comparisons in:
  - Pain
  - Pes planus
  - BMRC
  - PTT sheath fluid
  - Age (below 50 years, 50 and above)

- Binary logistic regression model adjusted for:
  - Age
  - Gender
  - Type
Results

- 184 females
  - Mean age 46.7 years ±16.8
  - Range 5-96
- 125 males
  - Mean age 48 years ±14.6
  - Range 8-86
- Type distribution
  - 27.5% type I
  - 57% type II
  - 15.5% type III

- Reason for presentation
  - Trauma 52%
    - 58% sprain, inversion or twisting mechanism
    - 26% repetitive trauma from athletic activities
    - 10% had various mechanisms of injury
    - 5% lacked sufficient data
  - Pain 43%, mean score 6.23 ± 2.2 out of 10
    - 29% medial foot
    - 20% lateral ankle
    - 18.5% lateral foot
    - 18% heel
    - 4% lacked data
Results

<table>
<thead>
<tr>
<th></th>
<th>Type I</th>
<th>Type II</th>
<th>Type III</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain</td>
<td>25%</td>
<td>50%</td>
<td>8%</td>
</tr>
<tr>
<td>BMRC</td>
<td>9%</td>
<td>48%</td>
<td>6%</td>
</tr>
<tr>
<td>Pes Planus</td>
<td>32%</td>
<td>38%</td>
<td>8%</td>
</tr>
<tr>
<td>PTT Sheath Fluid</td>
<td>33%</td>
<td>42%</td>
<td>6%</td>
</tr>
</tbody>
</table>

Table 1. Characteristics distribution among types

- No statistical differences between
  - Bone type and gender (p’s>0.5)
  - Bone type and the two age groups (p’s>0.9)
- Two age groups with regards to
  - Pain
  - Pes planus
  - BMRC
  - PTT fluid
- Only gender difference with PTT fluid, twice as frequent in females (p=0.023)
Results

Type I vs Type II
- 9.2 [CI: 4 - 20] adjusted odds (OR_{adj}) of BMRC in type II, p<0.0001
- Pain, pes planus, PTT sheath fluid similar

Type I vs Type III
- 2 [CI: 1.1 - 3.5] OR_{adj} of pain in type I, p=0.02
- 2.4 [CI: 1.4 - 4] OR_{adj} of pes planus in type I, p=0.002
- 3 [CI: 1.6 - 5.6] OR_{adj} of PTT sheath fluid in type I, p=0.001
- BMRC similar

Type II vs Type III
- 6.6 [CI: 2 - 19] OR_{adj} of pain in type II, p=0.001
- 13.9 [CI: 4 - 46] OR_{adj} of BMRC in type II, p<0.0001
- 6.7 [CI: 2 - 19.5] OR_{adj} of pes planus in type II, p=0.001
- 11.5 [CI: 3 - 39] OR_{adj} of PTT sheath fluid in type II, p<0.0001
Discussion

- Highest prevalence of pain, pes planus, bone marrow reactive change, and PTT sheath fluid in type II accessory navicular bones
- MRI-detected bone marrow reactive change most prominent adjacent to the synchondrosis
- Fair prevalence of pes planus in Types I and II accessory navicular bone types, 32% and 38%
- PTT inserted into the proximal ossicle for all accessory navicular bone types
- Type I and type II accessory navicular bones are actually similar with regards to pain, pes planus, and PTT fluid
- BMRC greater in type II, explained by the type I ossicle’s small size making BMRC more difficult to visualize
- Higher prevalence of pain, pes planus and PTT sheath fluid in type I bones over type III
Discussion

- Type II and III accessory navicular bones are different for all our assessments.
- Conforms to conventional thought as type III bones are expected to be fairly asymptomatic and type II to be the most symptomatic.
- Presence of PTT sheath fluid only significant difference between genders.
  - Purely statistical significance, unlikely any clinical implication.
- No role for age group in all our assessments.
- Limitations:
  - Retrospective design.
  - Lack of surgical or histological correlation.
  - All subjects did have foot pain, albeit in other locations, or they would not have had an MRI.
  - Imaging screening of the population to identify individuals with accessory navicular bones with would be too costly.
Conclusion

- The results described here challenge the conventional thought that type I accessory navicular bones are mostly asymptomatic.
- No statistical difference in the prevalence of pain, pes planus, and PTT sheath fluid between type I and II bones.
- Our outcomes corroborate conventional thought that type II bones are the most symptomatic and type III bones relatively asymptomatic.
- In future work we plan to evaluate the effect of clinical interventions on the symptoms and findings of symptomatic accessory navicular bones.
References


