Navicular Stress Fractures

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Acknowledgements

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Navicular Stress Fractures

Epidemiology

- Incidence 2.4-35% of all stress fractures (Jones MH. Clin Sports Med. 2006, Lee S. Foot Ankle Clin. 2004)
- Usual delay in diagnosis 4-7.2 months (Lee S. Foot Ankle Clin. 2004)
- Bilateral in 5%
- 30-50% complicated with delayed union
Aetiology

Limited evidence
- Pes cavus
- Pes planus
- Short 1st MT
- Long 2nd MT
- Metatarsus adductus
- Talar beaking
- Decreased subtalar ROM
- Decreased ankle ROM
- Medial narrowing of talonavicular joint

Some Evidence
- Sudden increase exercise intensity or duration
- Explosive push-off or change of direction sports
- Male

Ref’s
Jones MH. Clin Sports Med. 2006,
Lee S. Foot Ankle Clin. 2004
Pathophysiology

Tarsal kinematics
- During heel strike shear stress is focused on the middle 1/3rd of the Navicular as the navicular is squashed between the talus and the cuneiforms

Blood supply
- Water shed area in the middle of the navicular at the anastamosis of
  - Dorsal branch of Dorsalis Pedis
  - Plantar branch Medial plantar artery
Presentation

History

- Insidious onset
- Dorsomedial pain with exercise along the arch
- Progresses with lesser degrees of exercise to finally pain at night
- Recent increase in training load
- Sprinters, jumpers, change of direction athletes
Presentation

Examination

- Pain on the N-spot - Dorsal aspect of the navicular
- Pain on hop with plantarflexion
- Assess for
  - Excessive pronation
  - Restricted ankle dorsiflexion
  - Tarsal coalition
  - Morton's foot
Investigation

X-ray

- See changes at 3-6 weeks
- Lucency in middle 1/3rd of bone
- Detected 81% of complete and 24% incomplete fractures
- Classification
  - Type 1 - Linear lucency
  - Type 2 - Scleros of fracture edge a callous formation
  - Type 3 - periosteal reaction and callus formation
  - Type 4 - Mixed pattern

Bone scan

- Changes at 24-48 hours
- Positive on all 3 phases
- Sensitivity 100%
- Specificity - poor
- Negative - rules out
- Positive - requires clinical correlation
Investigations

**MRI**
- Sensitive
- More specific than Bone scan
- Some bony resolution
- Does not differentiate between bony oedema of Bone stress of AVN.

**CT**
- Gold standard - Fine slice
- Type 1 - Dorsal cortex fracture
- Type 2 - Dorsal cortex into body
- Type 3 - Through to other cortex
- Subclassification - Avascular, cystic and sclerotic
Treatment

NWB rest

- NWB cast 6 weeks the
  - Pain free - Functional weight bearing a graduated rehab
  - Pain - Boot until pain free the pain free step
  - Ongoing pain repeat CT at 6-8 weeks
Treatment

**WB rest**

- No cast activity restriction - 50% Full return to activity
- No activity restriction - 20% Full return to activity

Treatment

Surgery

- Percutaneous screw
- 82% full return to sport
- +/- bony grafting for displaced or no union fracture
- NWB cast for 4-6 weeks post procedure

Indications

- Complete fracture
- Displaced fracture
- Non-displaced fracture with sclerosis
- Failed conservative management
What are the differences?

TABLE 4
Differences of Treatment (Least Square Means)\(^a\)

<table>
<thead>
<tr>
<th>Treatment 1</th>
<th>Treatment 2</th>
<th>P</th>
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<tbody>
<tr>
<td>NWB</td>
<td>SURG</td>
<td>.6441</td>
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\(^a\)NWB, non-weightbearing; WBR, conservative, weightbearing permitted; SURG, surgery.

Torg et al, AJSM, 2010
What do you do if NWB fails?

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Variable</th>
<th>N</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Minimum</th>
<th>Maximum</th>
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<tbody>
<tr>
<td>NWB</td>
<td>Age, y</td>
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<td>17.6</td>
<td>4.04</td>
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<td>Onset of treatment, mo</td>
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<td>6</td>
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<td>Weeks in cast/boot</td>
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<td>1.2</td>
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<td>6</td>
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<td>Time to full activity return, mo</td>
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<td>7.6</td>
<td>3.5</td>
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<tr>
<td>SURG</td>
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<td>6.1</td>
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<td>Time to full activity return, mo</td>
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<td>6.82</td>
<td>1.8</td>
<td>3</td>
<td>8</td>
</tr>
</tbody>
</table>

aNWB, non-weightbearing; SURG, surgery.

Torg et al, AJSM, 2010
Treatment Summary

- NWB in cast for 6 weeks
- If still sore on N-spot repeat cast or Boot and re-CT at 6-8 weeks
- If fails again surgery
- Elite athlete?
  - Possible increase in rate of return with surgery although not statistically significant
  - May decrease issues with calf wasting associated with cast
  - May increase risk of repeat fracture with too early return
- Return to sport - average is 5-6 months
Tick the other boxes

Address

- Mid foot Pronation
- Ankle dorsiflexion
- Underlying coalition
- Calf strength
- Gradual return to running
Thanks