Tarsal Navicular Stress Fracture

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Disclosure:
I do have a relevant financial relationship and but will not be discussing products/services of the commercial interests with which relationships exist:
Extremity Medical – Consultant / Royalties
Fusiform – Consultant, Pitusan - Consultant
Navicular Anatomy

Arch with stress concentration at the “keystone” of the medial arch.

Vascular Supply

- Low Risk – Compression
  - 1st – 4th metatarsals
  - Medial tibia
  - Calcaneus
  - Posterior Tibial Diaphysis

- High Risk – Tension
  - Anterior Tibial Diaphysis
  - Medial Malleolus
  - Talus
  - Navicular
  - Proximal 5th metatarsal
  - Great toe sesamoids


Sofka CM.  Clin Sports Med.  2006;25:53.62.  Figure 2C
Foot and Ankle Stress Fractures

- Management of Stress fractures
  1. Recognition early vs late Local pain xray, mri, CT
  2. Rest—decrease forces Cam walker, Aircast Orthotics Pool therapy
  3. Bone stimulation electrical, ultrasound, BMP
  4. Surgery: medial mall, 5th met, navicular

NBA TNSF ALLSTAR TEAM

- Bill Walton
- Doug Collins
- Kevin McHale
- Andrew Toney
- Michael Jordan
- Zydrunas Ilgauskas
- Yao Ming
- Joel Embiid

Navicular Stress Fracture

- Grade 1—dorsal cortex on CT
- Grade 2—fx extends to mid body
- Grade 3—fx crosses two cortices
- Treat grade 1 with rest and protection NWB
- Grade 2,3 Rx ORIF
- Ave time to heal ~ 4 months all 19 healed

Risk factors for Stress Fractures

- Intrinsic vs extrinsic
- Gender, menstrual pattern, fitness, muscle endurance, bone vascularity, alignment
- Training regimen, nutritional, footwear, surface

LOOK FOR A REASON

- Cavus
- Modify Shoewear / Orthotic
- Adductus
- Impingement / CAM Lesion

Work Up

- X-rays (upwards of 30% undetected)
- CT (fracture pattern – sclerosis)
- MRI (see it earlier – edema)
**Navicular Stress Fractures**

- No prospective, randomized trials exist.
- Torg et al (Level IV)
  - 21 Navicular fractures dx’d 7.5 months after onset of symptoms
    - 10 patients NWB in short leg cast
    - Avg 3.8 months return to activity
  - Recommended nonweightbearing in a cast for 6-8 weeks for partial and nondisplaced stress fractures

**Tarsal Navicular**

- NWB cast 6-8 weeks

**Navicular Stress Fractures**

- Saxena et al (Level IV)
  - 22 navicular stress fx’s in athletes
    - 13 tx’d NWB
    - Avg return 4.3 months
    - 9 tx’d surgically
    - Avg return 3.1 months (p=0.02)
  - High performance athletes with navicular stress fractures may benefit from initial surgical intervention
Navicular Stress Fractures

- Torg et al. AJSM 2010
  - no advantage for surgical intervention
  - Healing at 16 weeks w/ sx
  - Non-op 21 weeks

Navicular Stress Fractures

- McCormack et al AJSM 2011
  - 10 pts
  - 2 non-unions
  - Complete displaced fractures
- Gross & Nunley FAI 2015
  - Type 1 – non-op
  - Type 2 – athletes sx
  - Type 3 – sx + graft
TNSF FRACTURE PATTERNS

- Partial Sagittal
- Complete Sagittal – may have Fx site resorption without displacement will heal.
- Dorsal Transverse Fragment – clinical lesion & response to treatment variable

Open or Percutaneous
Adjuncts

- Bone Stimulator
- Shockwave
- Vitamin D
- Forteo

Non-weight Bearing

- 6 weeks

Return to Play: High Risk Stress Fractures

- Return to play should only be recommended after proper treatment and complete healing of the injury
- More frequent complications
  - Delayed union
  - Nonunion
  - Refracture
- Poorer prognosis if progress to complete fracture
- Consider CT in higher level athletes before return to play

Boden BP, et al. JAAOS 2000;8:344-53. Figure 4B
Thank You

Case #1

- 31 y. o. female
- 3.5 history of right ankle pain
- Diagnosed with navicular stress fx
- Never completely healed
- Pain over the navicular anteriorly
- Pain with provocative inversion and eversion maneuvers

Pre-Operative Images
Case #1 Post-Operative Images

Case #2
- 17 y. o. male
- 1 yr history of right foot pain
- Basketball player
- Previously diagnosed with a 2nd MT stress fracture which was treated conservatively
- Pain over the navicular and mild discomfort over the base of the 2nd MT
- Impingement of the anteromedial ankle

Pre-Op MRI and CT
Pre-Op X-Ray

IntraOp

Case #2 Post-Op X-Rays (3 mo. f/u)