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Bone stress injuries

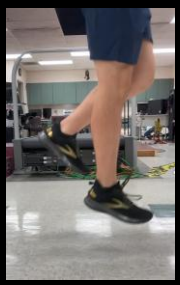
Evaluation and treatment workshops

Rich Willy, PT, PhD

1

Single leg hop test

Excellent screen for tibial BSI with *no* false negatives



Milgrom Positive test: Tibial bone pain of < 10 cm

Sensitivity: 1.00

Specificity: 0.45

+LR: 1.82

-LR: 0.00

Milgrom et al., J Sci and Med Sp 2021

Have confidence that <5cm of tenderness is likely BSI, >5cm is MTSS

Milgrom, C., Zloczower, E., Fleischmann, C., Spitzer, E., Landau, R., Bader, T., & Finestone, A. S. (2021). Medial tibial stress fracture diagnosis and treatment guidelines. *J. of Science and Medicine in Sport*, 24(6), 526-530.

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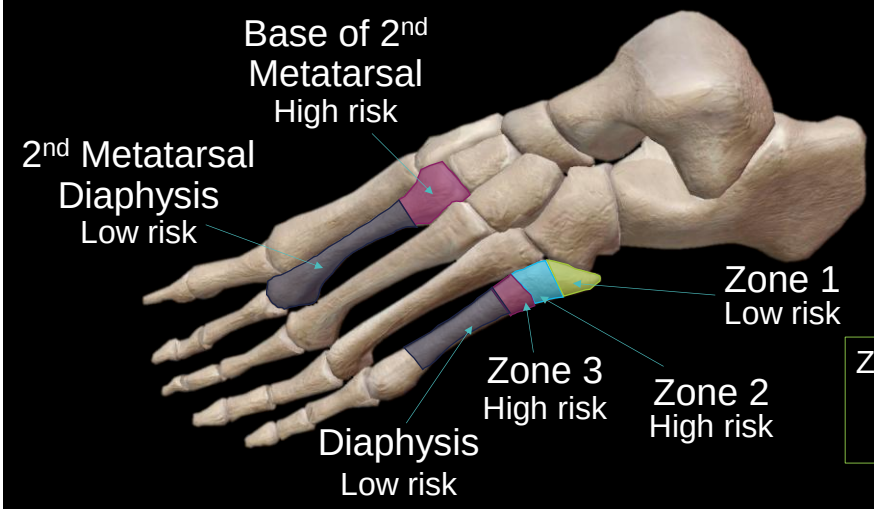
2nd & 5th Metatarsal bone stress injuries



Thomson A (2018)

Zone 2 & 3 Nonunion rates:
11-50% Nonsurgical
0-11% Surgical

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Patel, Karan A., et al. "Stress Fractures of the Fifth Metatarsal in Athletes." *JAAOS-Journal* (2021): 10-5435; Mandell, JC., et al.. (2017). Stress fractures of the foot and ankle, part 2: site-specific etiology, imaging, and treatment, and differential diagnosis. *Skeletal Radiology*, 46(9), 1165-1186

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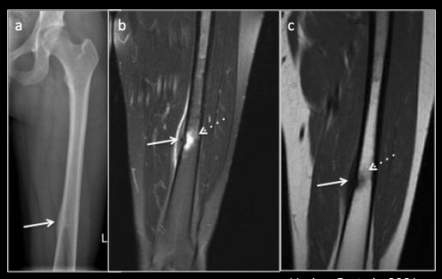
Femoral shaft BSIs

Examination



Hedge G et al., 2021

Fulcrum test
Sensitivity: 0.93
Specificity: 0.75
+LR: 3.72
-LR: 0.09

7.2-25.0% of BSIs

Mostly compression (medial) side. Mid-shaft and proximal shaft most common

Mimics quad strain

Positive hop test and fulcrum test => MRI. Radiographs: poor sensitivity

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Rizzone, K. H., Ackerman, K. E., Roos, K. G., Dompier, T. P., & Kerr, Z. Y. (2017). The epidemiology of stress fractures in collegiate student-athletes, 2004–2005 through 2013–2014 academic years. *Journal of Athletic Training*, 52(10), 966-975.

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Sacral Bone Stress Injuries

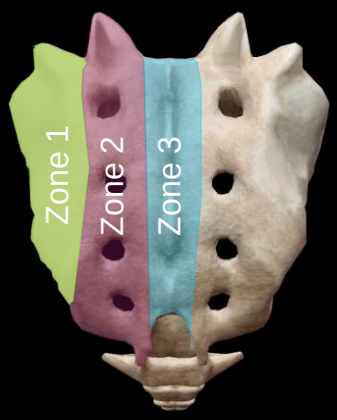
Trabecular rich: *Always* suspect REDs

Majority in Zone 1, adjacent to SI Joint

78-86% are accompanied with Pubic rami BSI

Low back, SI, or buttock pain present up to 95% cases

Denis Classification



Zone 1 Sacral Ala BSI

Aretxabala I, et al. Sacral insufficiency fractures. High association with pubic rami fractures. *Clin Rheumatol.* 2000; Tenforde, Adam S., and Michael Fredericson, eds. Bone Stress Injuries: Diagnosis, Treatment, and Prevention. Springer Publishing Company, 2021.

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Femoral neck BSI

Examination

Pain present at the hip, groin, anterior thigh, medial knee

Pain at rest

Exam findings:

- Positive hop test
- Painful endrange flexion, hip flexor and groin spasm
- Positive FADDIR test

FADDIR test

The runner presenting with hip and groin pain has a femoral neck BSI until proven otherwise

Adkins 3rd, S., et al. "Femoral neck stress fractures in sport: a current concepts review." *Sports Medicine International Open* 1.02 (2017); Bernstein, M., et al. "Femoral neck stress fractures: an updated review." *JAAOS.* 30.7 (2022).

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Navicular Bone Stress Injuries

Presentation and examination

N-Spot

Mandell et al., 2017

Axial CT Scan

Mandell et al., 2017

89% have midfoot pain with pushoff during walking

Palpation pain over “N-Spot”: 96% BSIs tender here

MRI Sensitivity: 71.4%; CT-Scan helpful follow-up

Gross CE, Nunley JA. Navicular stress fractures. *Foot Ankle Int*. 2015;36(9) ; Mandell, JC., et al. "Stress fractures of the foot and ankle, part 2: site-specific etiology, imaging, and treatment, and differential diagnosis." *Skeletal Radiology* (2017): Mehta, S, et al. "Tarsal Navicular Bone Stress Injuries: A Multicenter Case Series Investigating Clinical Presentation, Diagnostic Approach, Treatment, and Return to Sport in Adolescent Athletes." *AJSM* (2023)

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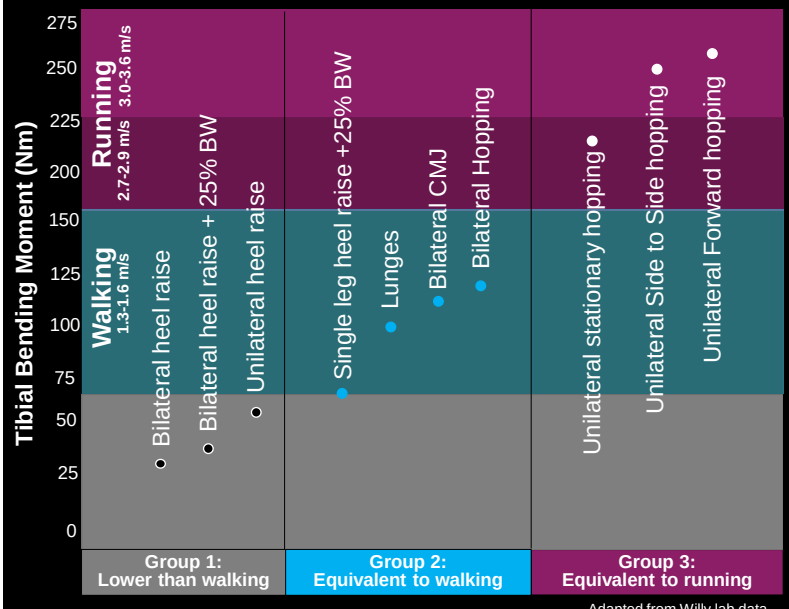
Tibial bone loading ladder



Adapted from Willy lab data

Interventions

High rep, low load (3X15) => low rep, high load (4x4-6)

CMJs & hopping: 2x10 reps, 2x/day.

Monitor closely for pain, either during or post-session

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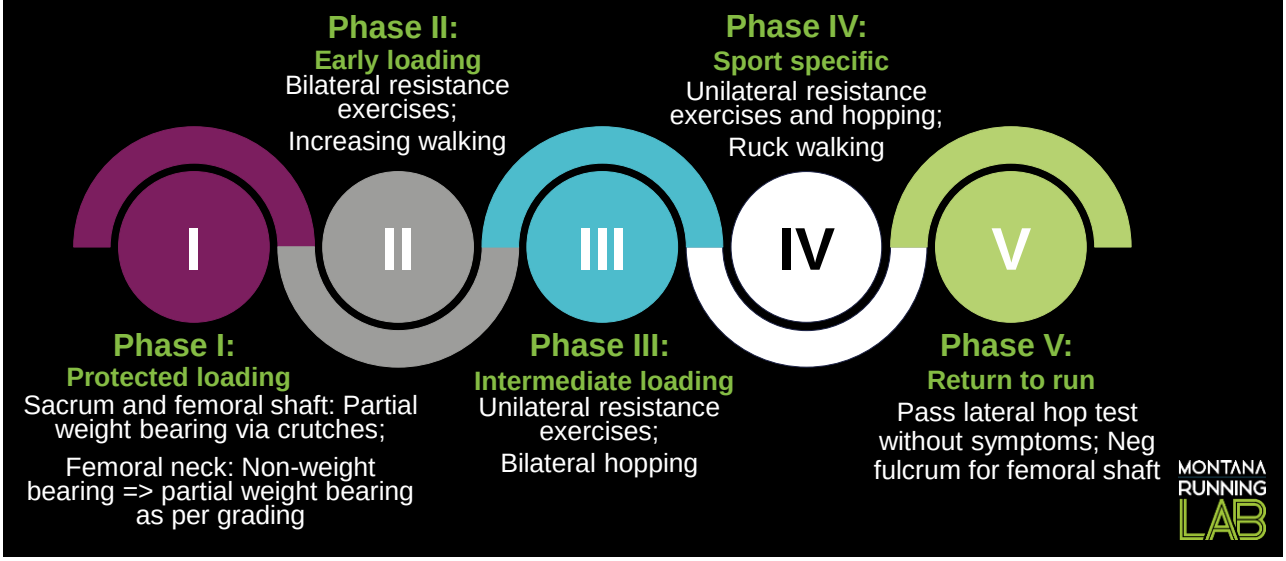
Overview of sacral, femoral shaft and neck BSI rehabilitation



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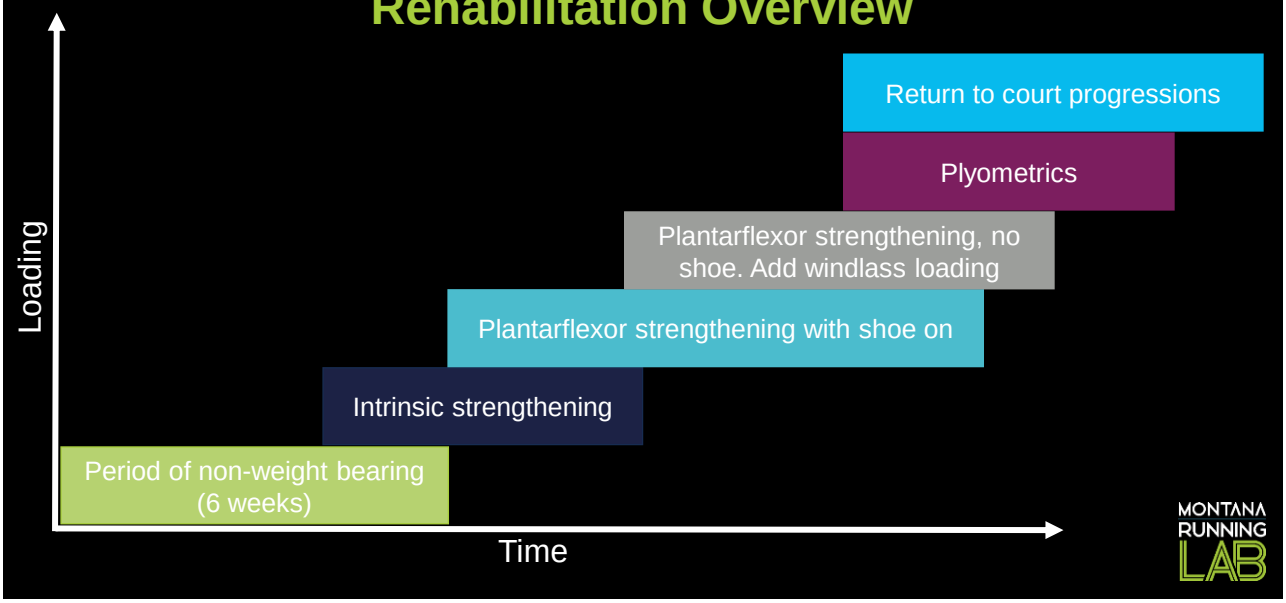
Navicular BSIs
Rehabilitation Overview



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