



History

MD 42 year old M presented 3/2023 after acute sharp anterior leg pain during Half Marathon. Seen next day in the ED; labs, XR-left tib/fib, LE doppler negative. MRI showed grade 3A stress fracture of mid/distal diaphysis. MD made non-weightbearing. Pain worsened and "burning" of L foot 4th/5th digits developed, so returned to ED a week later. Compartment testing deferred, repeat XR L-tib/fib and doppler negative. Symptoms persisted, MD underwent CT scan of left leg and compartment testing which were negative. Given minimal improvement, was started on vitamin C. Referred Ortho who advised weightbearing progression, home stretching and B vitamins. Symptoms continued despite conservative therapy. MD Referred to PM&R with concern for CRPS; was started on Medrol dose pack and gabapentin which provided relief.

Physical Exam

-General: AAOx4, Pleasant male.
-Skin: Redness at L anterior tibia.
-Neuro: No focal deficits. **Slight decreased intensity of light touch reported throughout LLE/RLE** peripheral and dermatomal sensation normal to light touch, DTR b/l LE 2+, Strength b/l LE 5/5.
-MSK: Mild edema and redness at left anterior tibia. Mild to moderate non pitting edema in L ankle/foot. **Palpitation: compartments soft, compressible.** Negative squeeze test. **TTP anterior distal 1/3rd of tibia.** Non-TTP L calf, Achilles, ankle or knee.
ROM: Full active ROM of L knee, ankle and great toe.
Strength-5/5 Dorsi and Plantar flexion, Inversion, Eversion, FHL, EHL
-Vascular: B/l LE well perfused Peripheral pulses equal in b/l LE. Negative Homans sign.

Differential Diagnosis

1. Left Anterior Tibial Stress Fracture
2. Complex Regional Pain Syndrome
3. Exertional Compartment Syndrome
4. Deep Vein Thrombosis
5. Peroneal Nerve Impingement

Workup



Figure 1,2: XR Left Tib/Fib (3/23): AP, Lat--flabella, otherwise Negative



Figure 3,4: MRI T2 PD Fat Sat Left Tib/Fib Sagittal and Coronal (3/23): Grade-3A stress fracture of mid/distal tibial diaphysis, extends 11cm.

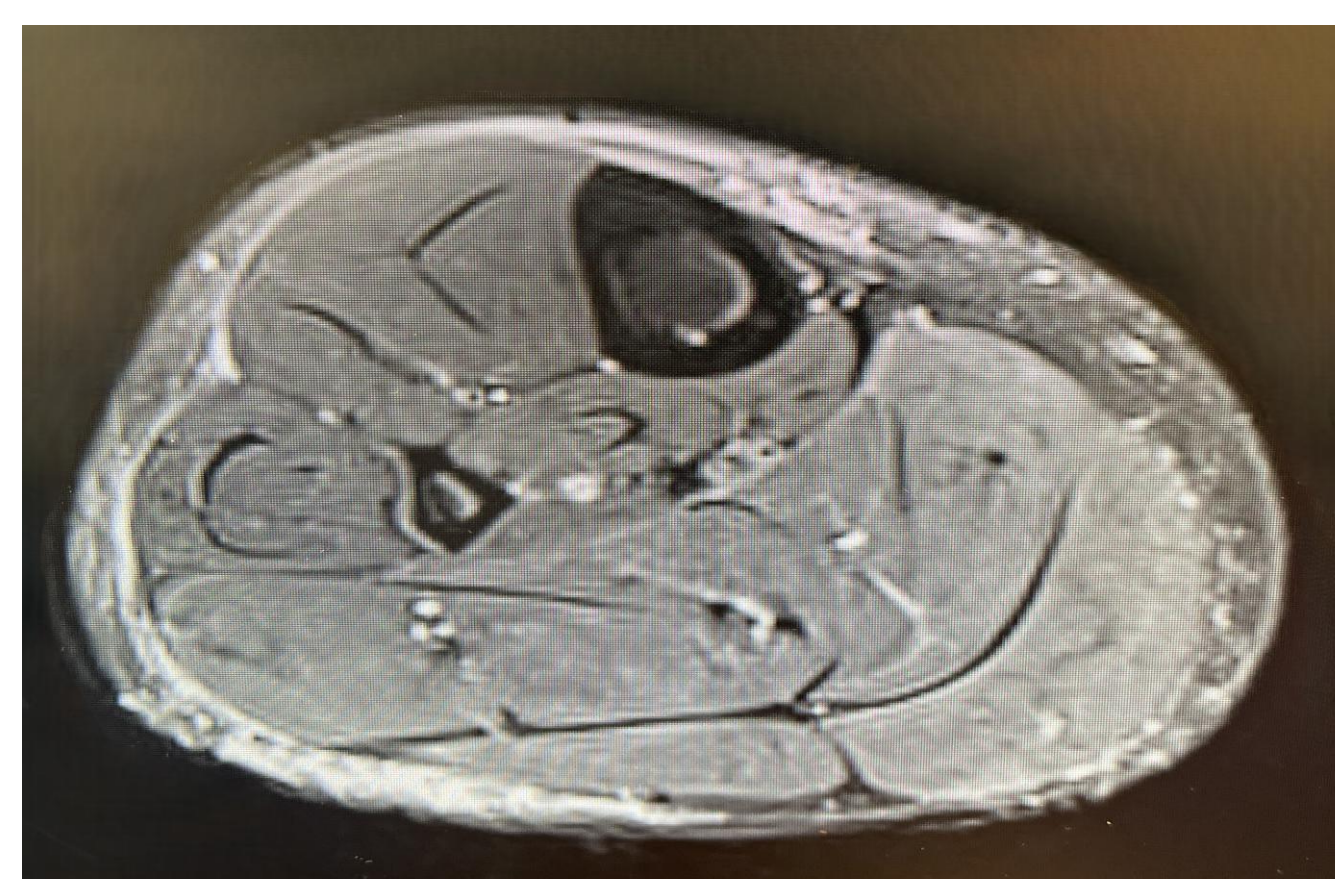


Figure 5: CT Scan Left lower Extremity (3/23)-- Negative



Figure 6: MRI T2 PD Fat Sat Left lower extremity (5/23)-- Grade 4B stress fracture of distal tibia. Extends 16cm.



Figure 7: MRI T2 PD Fat Sat Left lower extremity (8/23)--Grade 3A stress fracture of Left tibial mid diaphysis, diffuse soft tissue edema and soleus atrophy

- Left Lower Extremity Compartment Testing (4/23):** Ant-20, Lat-18, DP-0, SP-5
- DEXA Scan (5/23): Z-score -0.5.**
- Pertinent Labs (6/23):** CBC/CMP/Vit D wnl, Testosterone: 241, SBG 11.8

Final/Working Diagnosis

Stress Fracture with Concomitant Complex Regional Pain Syndrome

Discussion

Complex Regional Pain Syndrome(CRPS) is rare but recent studies suggest incidence in association with fractures is 3-7%¹. Etiology is poorly understood. Type 1 CRPS or reflex sympathetic dystrophy makes up 90% of cases and is differentiated from Type 2 CRPS or causalgia by lack of confirmed nerve injury on nerve conduction testing. CRPS is diagnosed clinically via the Budapest criteria. Treatment of CPRS should be multimodal. Early aggressive treatment with PT/OT, oral steroids and bisphosphonates has been shown to significantly improve pain and duration of symptoms. Mixed evidence suggests use of vitamin C to reduce risk of CRPS post fracture, but no evidence suggests utility of B vitamins

TABLE 2

Budapest Criteria for the Diagnosis of Complex Regional Pain Syndrome

Must exhibit continuing pain that is disproportionate to any inciting event

Must report at least one symptom in three of the four following categories:

- Sensory: hyperalgesia or allodynia
- Vasomotor: temperature asymmetry, skin color changes, or skin color asymmetry
- Sudomotor/edema: edema and/or sweating changes and/or sweating asymmetry
- Motor/trophic: decreased range of motion and/or motor dysfunction (weakness, tremor, dystonia) and/or trophic changes (hair, nails, skin)

Must display at least one sign at the time of evaluation in at least two of the following categories:

- Sensory: hyperalgesia (to pinprick) and/or allodynia (to light touch or deep somatic pressure, or joint movement)
- Vasomotor: temperature asymmetry and/or skin color changes and/or asymmetry
- Sudomotor/edema: edema and/or sweating changes and/or sweating asymmetry
- Motor/trophic: decreased range of motion and/or motor dysfunction (weakness, tremor, dystonia) and/or trophic changes (hair, nails, skin)

No other diagnosis better explains the signs and symptoms

Adapted with permission from Harden RN, Bruehl S, Stanton-Hicks M, et al. Proposed new diagnostic criteria for complex regional pain syndrome. Pain Med. 2007;8(4):330.

Outcome

Symptoms improved but during return to run experienced pain in anterior tibia. MD made non-weight bearing. Repeat MRI showed progression of distal tibial stress fracture. Endocrine was consulted, diagnosed with osteoporosis of unknown etiology, pre-diabetes and low testosterone. Was to continue Calcium/Vitamin D, androgen injections and start Forteo.

Follow Up and Return To Play

Forteo and bone stimulator denied by insurance. Completed 12 weeks of rest, TTP of anterior tibia continued. Repeat MRI noted bone healing but grade 3A left tibial mid-diaphyseal stress fracture. MD lost to follow up and returned to running. Later returned to clinic with left knee pain. MRI left he knee confirmed medial meniscal tear and now status post partial meniscectomy

References

1. Lloyd ECO, Dempsey B, Romero L. Complex Regional Pain Syndrome. Am Fam Physician. 2021 Jul 1;104(1):49-55.
2. Ferraro MC, O'Connell NE, Sommer C, Goebel A, Bultitude JH, Cashin AG, Moseley GL, McAuley JH. Complex regional pain syndrome: advances in epidemiology, pathophysiology, diagnosis, and treatment. Lancet Neurol. 2024 May;23(5):522-533.
3. Borchers AT, Gershwin ME. Complex regional pain syndrome: a comprehensive and critical review. Autoimmun Rev. 2014 Mar;13(3): 242-65.
4. Bruehl S. Complex regional pain syndrome. BMJ. 2015 Jul 29;351:h2730.
5. Abd-Elseyed A, Stark CW, Topoluk N, Isaamullah M, Uzodinma P, Viswanath O, Gyorfi MJ, Fattouh O, Schlidt KC, Dyara O. A brief review of complex regional pain syndrome and current management. Ann Med. 2024 Dec;56(1):2334398.