AMSER Case of the Month

21-year-old female swimmer presents with left rib pain

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Patient Presentation

HPI: A 21-year-old female is seen chronic dull pain at the left lower rib cage that has progressively worsened. Pain is most noticeable with trunk rotation and flexion, as well as during swimming. Advil is taken for the pain with minimal improvement. She has a history of negative left rib x-rays taken 3 months ago.

PMH: Heterozygous factor V Leiden mutation, Hypothalamic Hypogonadism, Amenorrhea x 2 years
Surgical History: None
Physical Exam: No deformity on inspection, ecchymosis, swelling, or erythema. Tenderness to palpation to the left lateral 10th rib with no crepitus or palpable step-off. No pain reproduced with coughing or deep inspiration.

Pertinent Labs

- All labs are within normal limits

What Imaging Should We Order?

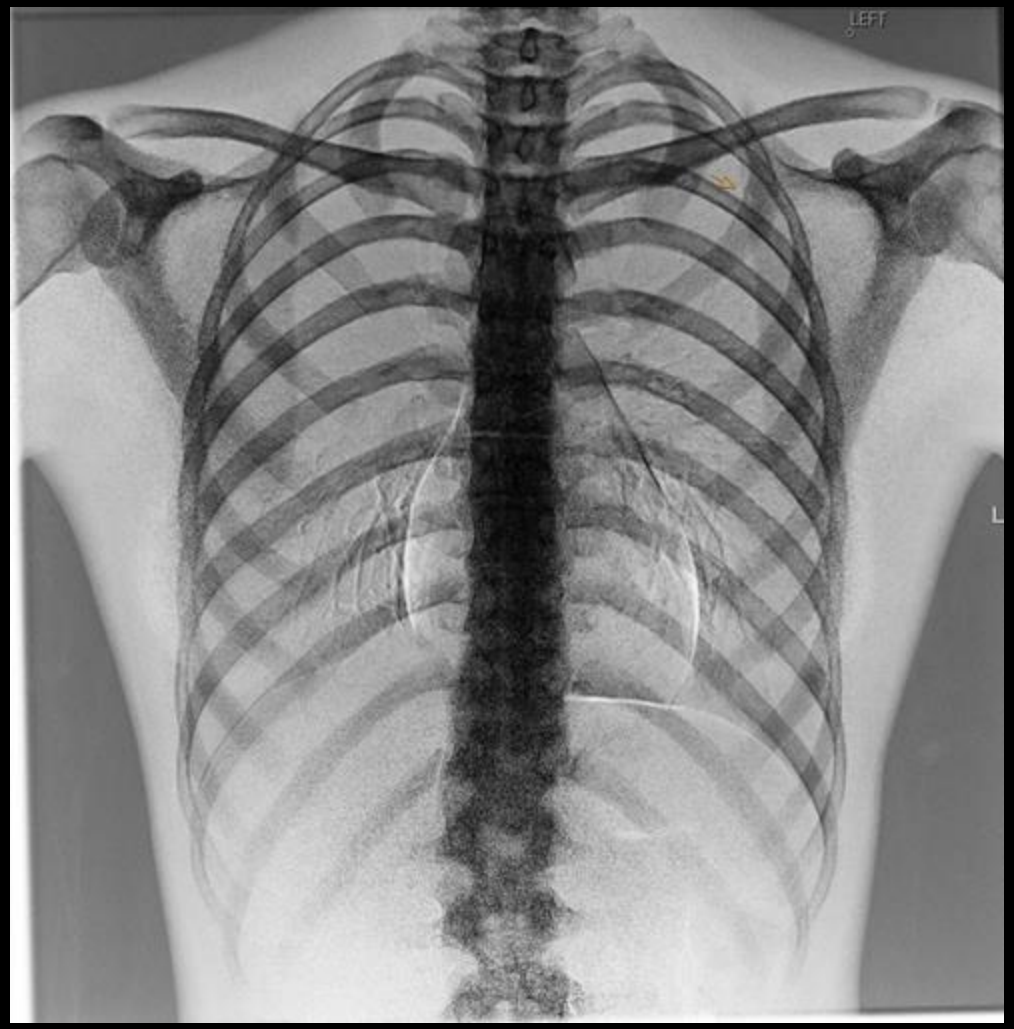
Select the applicable ACR Appropriateness Criteria

Variant 1: **Adult. Suspect stress fracture, excluding vertebrae. Initial imaging.**

Procedure	Appropriateness Category	Relative Radiation Level
Radiography area of interest	Usually Appropriate	Varies
Bone scan whole body with SPECT or SPECT/CT area of interest	May Be Appropriate (Disagreement)	☢☢☢
US area of interest	Usually Not Appropriate	O
MRI area of interest without and with IV contrast	Usually Not Appropriate	O
MRI area of interest without IV contrast	Usually Not Appropriate	O
CT area of interest with IV contrast	Usually Not Appropriate	Varies
CT area of interest without and with IV contrast	Usually Not Appropriate	Varies
CT area of interest without IV contrast	Usually Not Appropriate	Varies

This imaging modality was ordered at the initial orthopedic visit

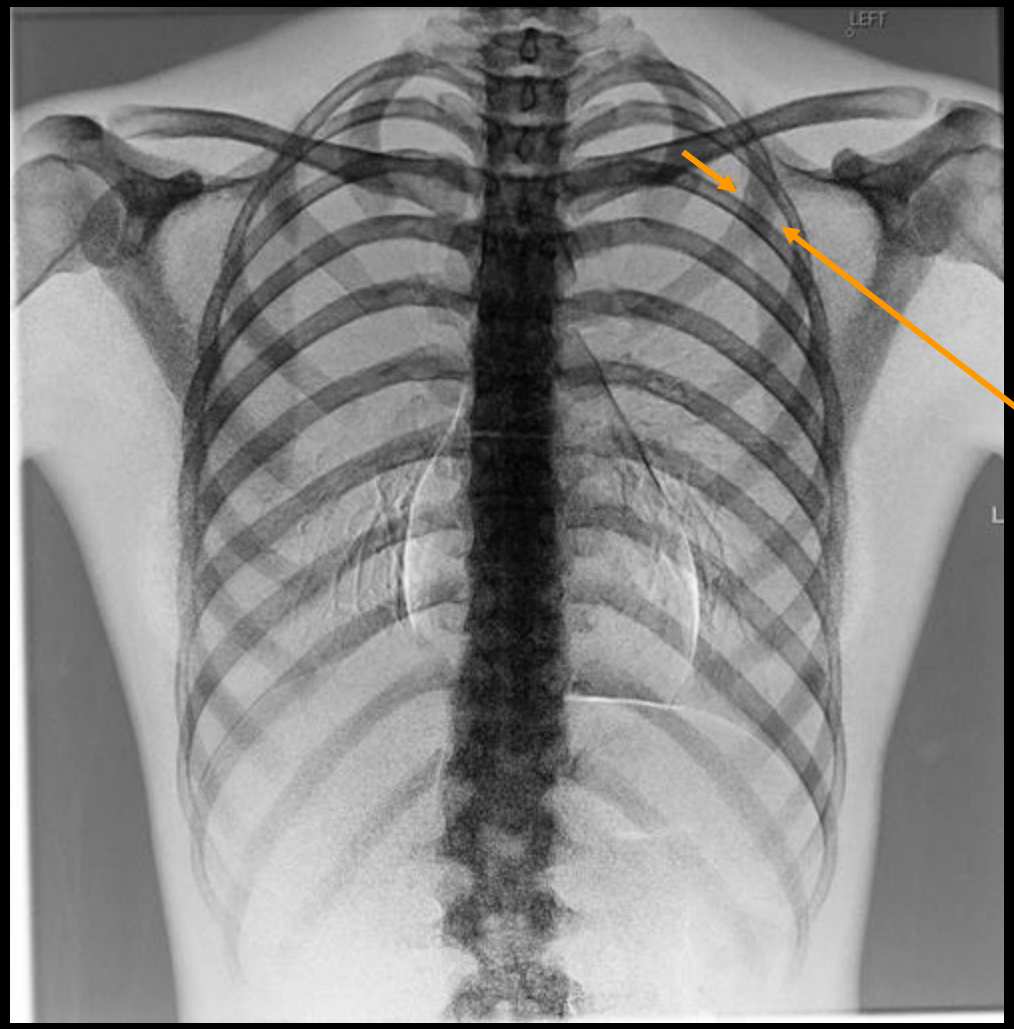
Findings (unlabeled)



Dual energy subtraction x ray

Radiograph

Findings (labeled)

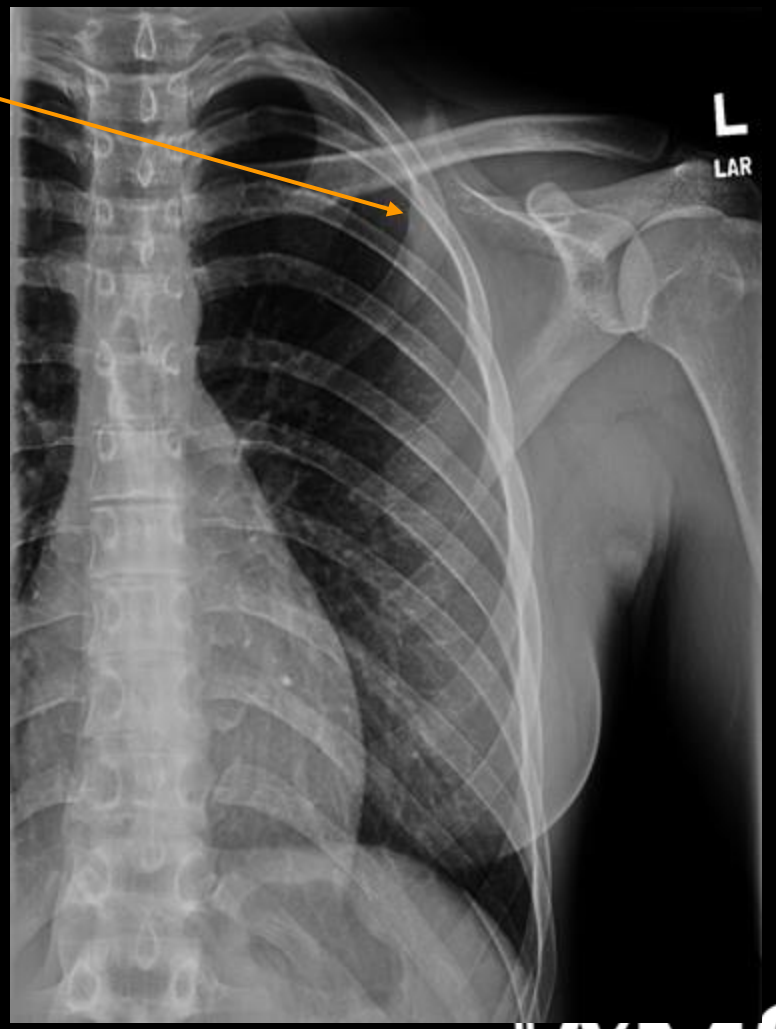


Dual energy subtraction x ray

mild cortical thickening

cortical irregularity of left 2nd rib

These images were originally interpreted as negative



Radiograph

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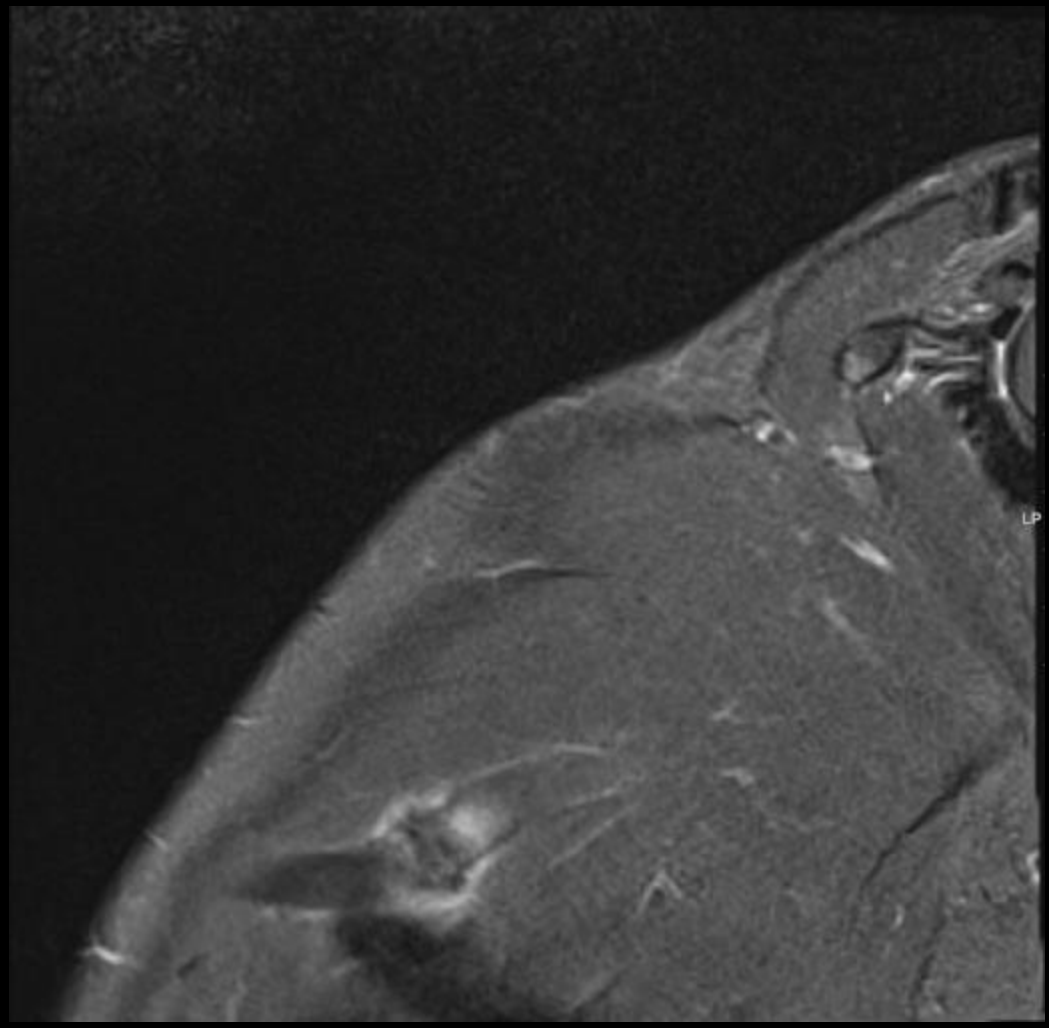
Select the applicable ACR Appropriateness Criteria

Variant 2: **Adult. Suspect stress fracture, excluding vertebrae. Radiographs negative or indeterminate. Next imaging study.**

Procedure	Appropriateness Category	Relative Radiation Level
MRI area of interest without IV contrast	Usually Appropriate	O
Radiography area of interest repeat in 10-14 days	May Be Appropriate	Varies
Bone scan whole body with SPECT or SPECT/CT area of interest	May Be Appropriate	☢☢☢
CT area of interest without IV contrast	May Be Appropriate	Varies
US area of interest	Usually Not Appropriate	O
MRI area of interest without and with IV contrast	Usually Not Appropriate	O
CT area of interest with IV contrast	Usually Not Appropriate	Varies
CT area of interest without and with IV contrast	Usually Not Appropriate	Varies

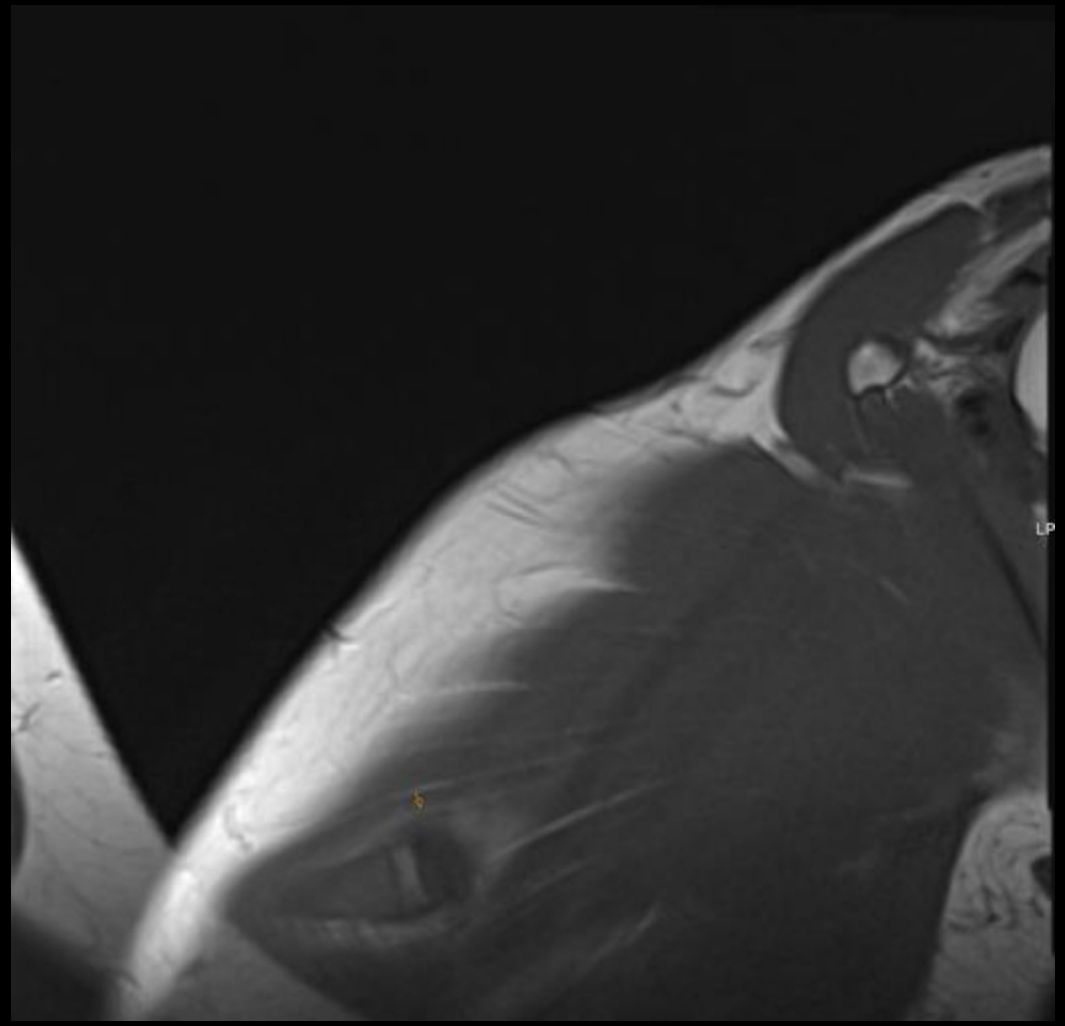
This imaging modality was ordered by sports medicine

Findings (unlabeled)



MRI STIR

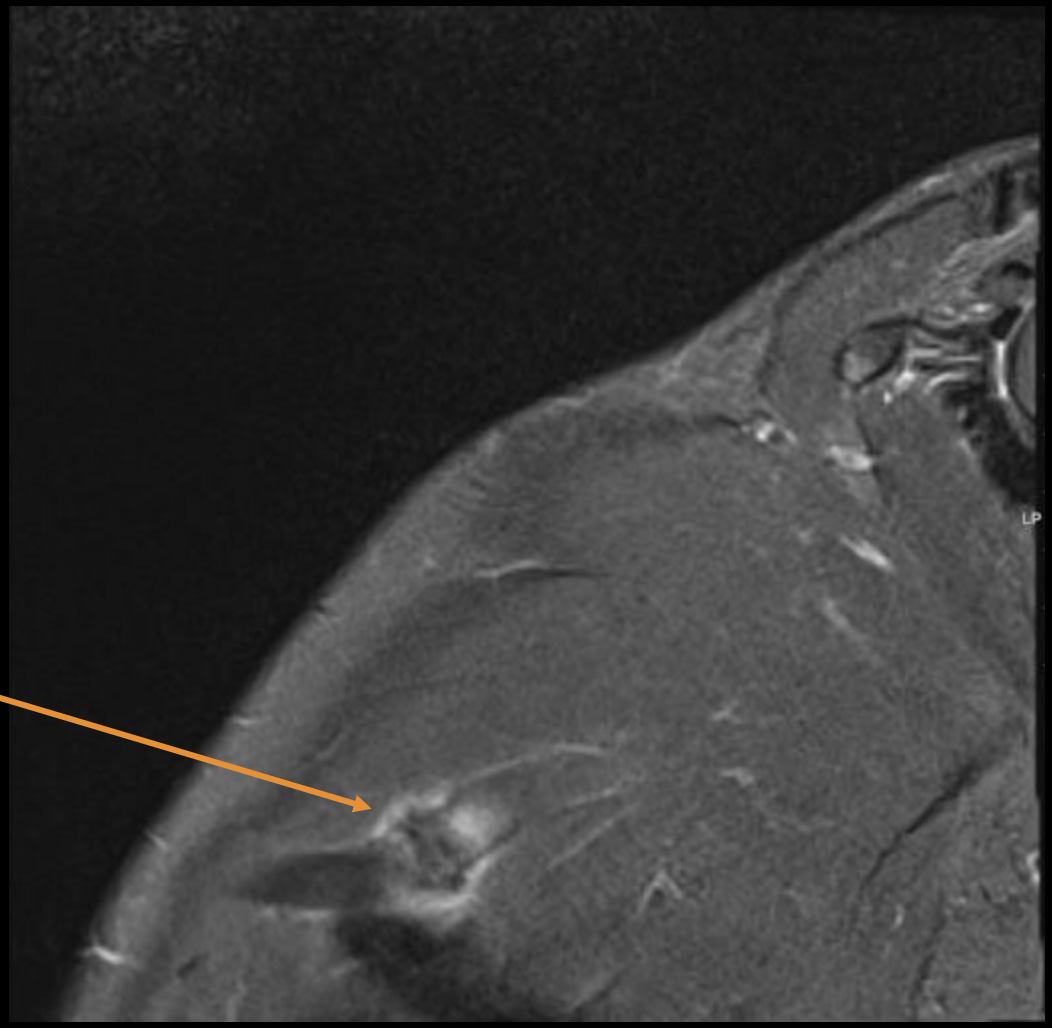
Findings (unlabeled), continued



T1-weighted MRI

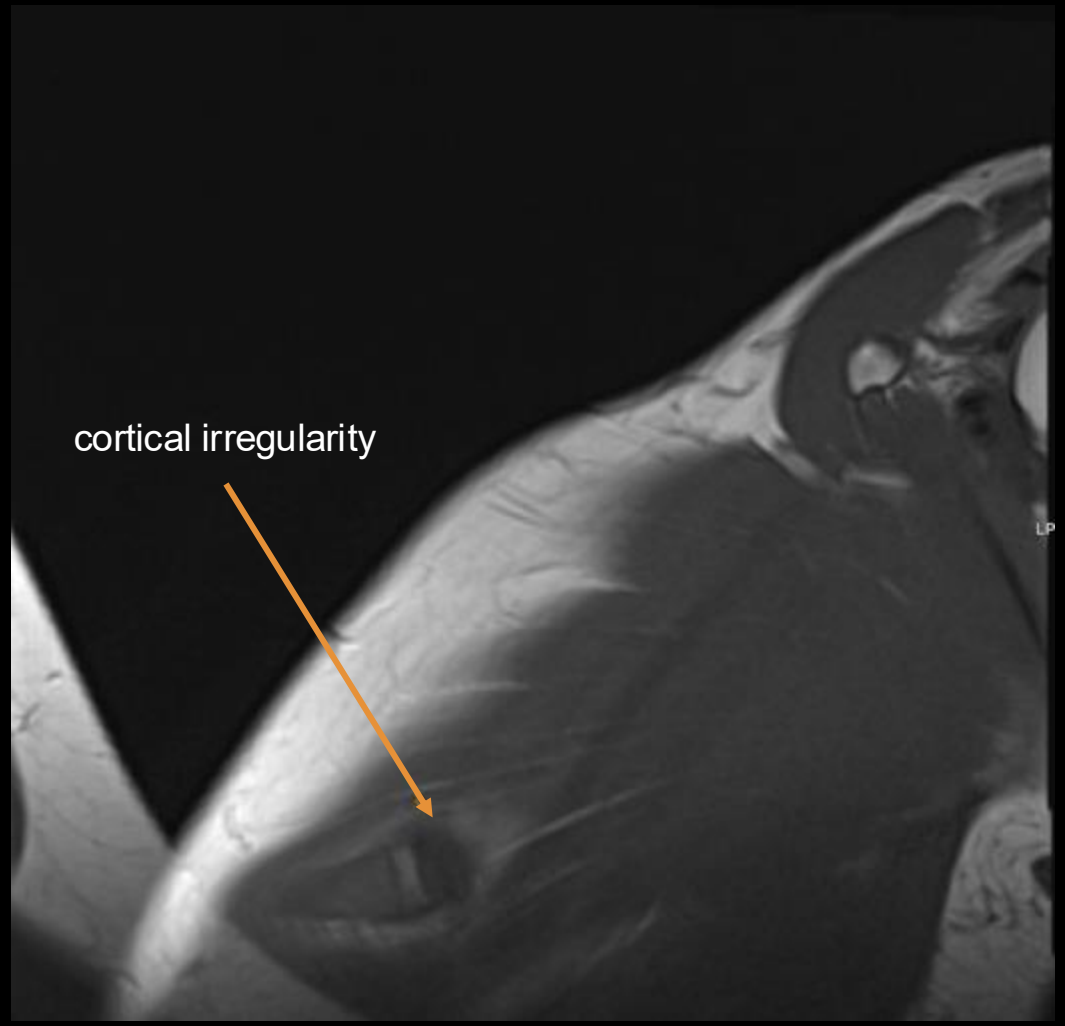
Findings (labeled)

marrow edema and periosteal reaction



MRI STIR

Findings (labeled), continued



T1-weighted MRI

Final Dx:

Stress Fracture of the 2nd Rib

Case Discussion

- Definition: Stress fractures typically present as worsening focal pain in the absence of trauma or injury. They are commonly seen in weight-bearing lower extremities and are caused by overuse or alterations in physical activity.

- Epidemiology: Rib stress fractures are uncommon but have been noted in athletes performing repetitive upper body movements including rowing, baseball, swimming, golf and weightlifting.

Case Discussion

- Risk Factors: Female sex, low bone density, nutritional disorders or deficiencies
- Clinical Presentation: Worsening pain in the absence of trauma or injury. Usually seen in athletes and individuals who train regularly.
- Diagnosis: Stress fractures starts are typically evaluated by plain radiography. Evidence suggesting stress fractures on plain films include periosteal and endosteal reaction. Fracture lines will also sometimes be visible.

Case Discussion (cont.)

- Pathophysiology: When bones are under significant tension for a prolonged period of time, the balance between osteoblast and osteoclast formation is disrupted. This leads to increased osteoclast activity and the resultant degradation of bone.
- Treatment: Rest for 2-6 weeks with a gradual return to normal activity.
- Differential Diagnoses: osteosarcoma, osteomyelitis, soft tissue bruise, osteoid osteoma

References:

1. American College of Radiology. ACR Appropriateness Criteria®. Available at https://acsearch.acr.org/list . Accessed <6/23/2025>.
2. Gaillard F, Salehzadeh H, Feger J, et al. Stress fracture. Reference article, Radiopaedia.org (Accessed on 25 Jun 2025) https://doi.org/10.53347/rID-7542
3. Schwanz, Kersten L. MD1; Karnovsky, Sydney C. MD1; Malafronte, Jack PT, DPT, LAT, ATC2; Borg-Stein, Joanne MD3; Tenforde, Adam S. MD4; McInnis, Kelly C. DO3. Rib Bone Stress Injuries: A Narrative Review with Protocol for Rehabilitation and Prevention. Current Sports Medicine Reports 24(6):p 153-163, June 2025. | DOI: 10.1249/JSR.0000000000001256
4. Bhugra D, Bhui K. Rorschach Test. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan–. Available from: https://www.ncbi.nlm.nih.gov/books/NBK554538/