



Stress Fracture Introduction

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Patient 1: Where is the fracture?





Our Patient

- CM presented with persistent hip and pelvic pain while walking i.e. bone pain
- Bone is tender to touch if palpable – otherwise it is painful on range of motion



Differential Based on History

Differential:

- Tumors (mets, or primary Ewing's)
- Osteoid osteoma
- Osteomyelitis
- Osteomalacia
- Stress fracture
- Shin splints



Menu of Radiologic Imaging Tests to Evaluate Bone Pain

Menu:

1. Plain Films
2. RN Bone Scan
3. Bone CT
4. MRI



Patient 2 : Typical RN Bone Scan with Stress Fractures



“Hot Spots”
in common
locations

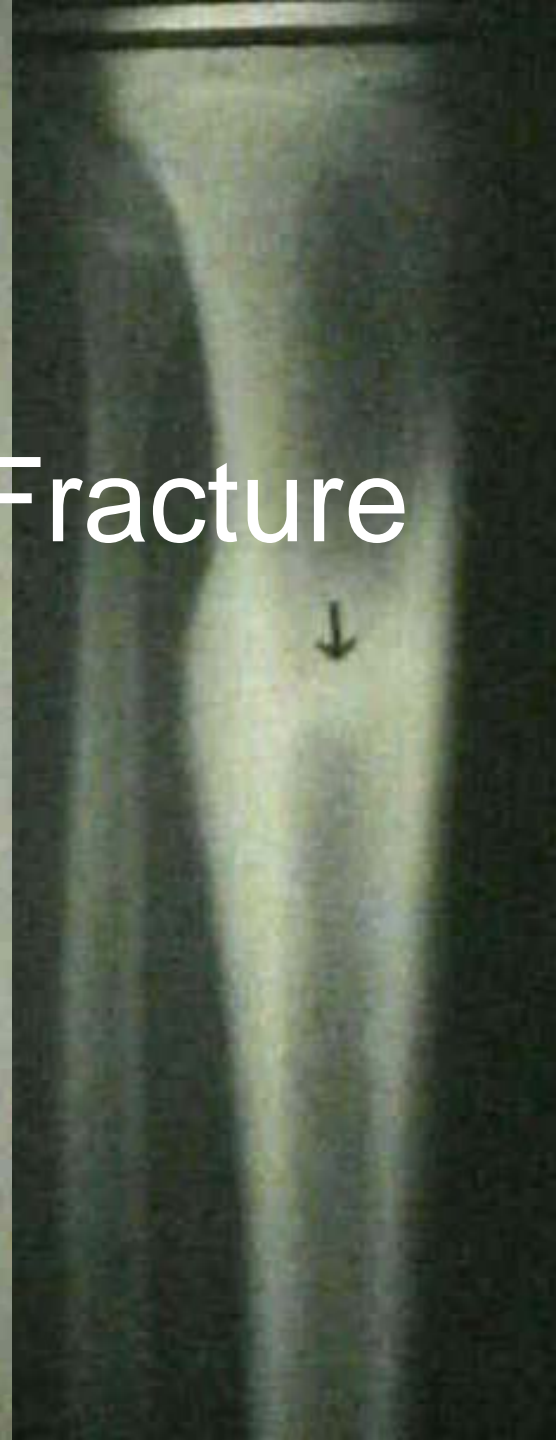


Stress Fractures

- Occur most commonly in lower extremity: metatarsals > calcaneus > tibia
- Uncommon locations are uncommon
- Bone Scan is a sensitive study. As early as 24 hours after injury it approaches 100%
- Plain film findings occur later



Patient 3: Evolution of a Stress Fracture



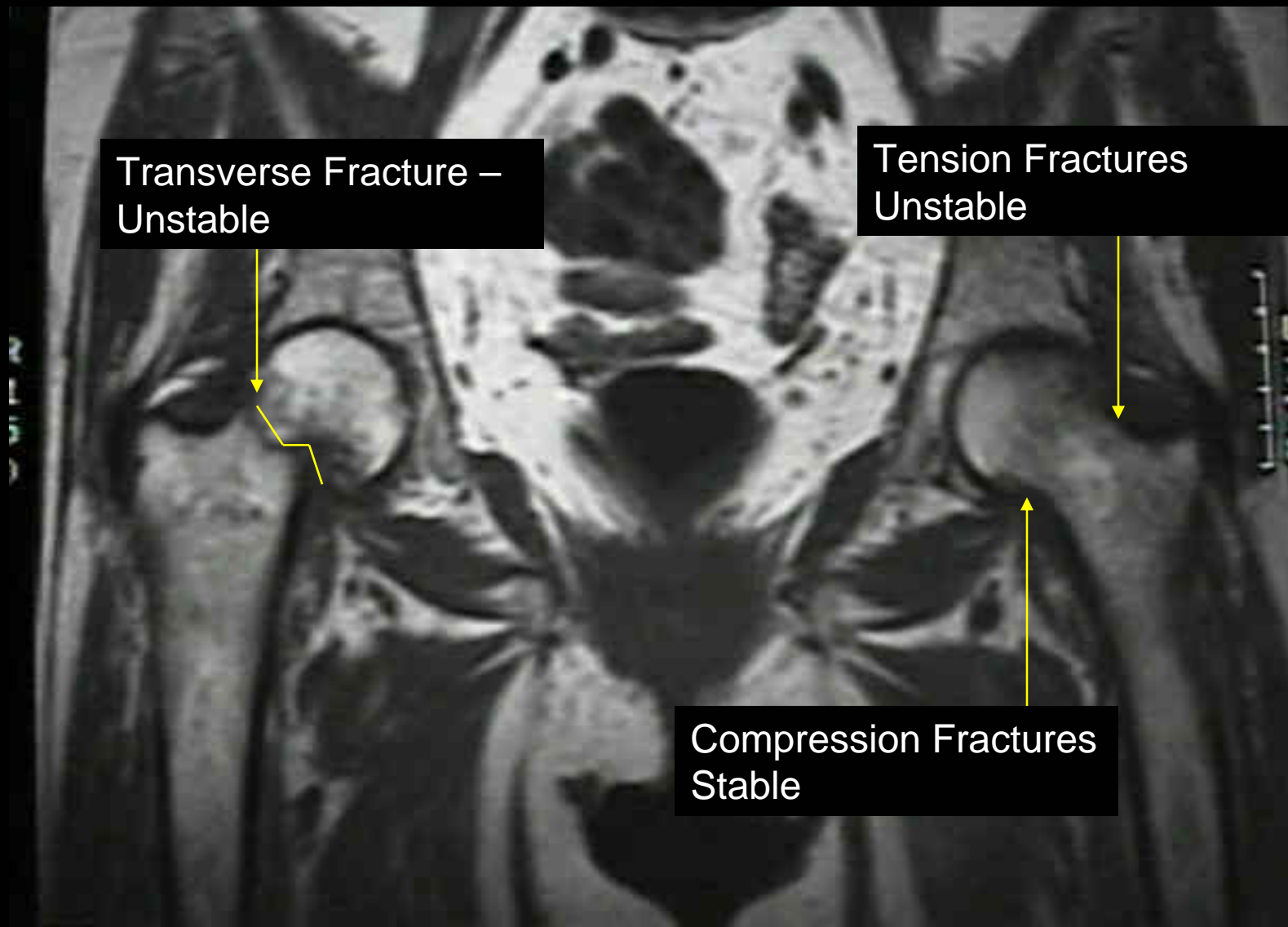


Stress Fractures

- MRI is both sensitive and specific. A recent study in military recruits examined the accuracy in diagnosing a stress fracture of the femoral neck – a rare type. The MRI was specific for stress fractures differentiating from many other diagnoses like synovial pits, iliopsoas tears, unicameral bone cysts, early AVN, and finally the all too common external obturator tendinitis.

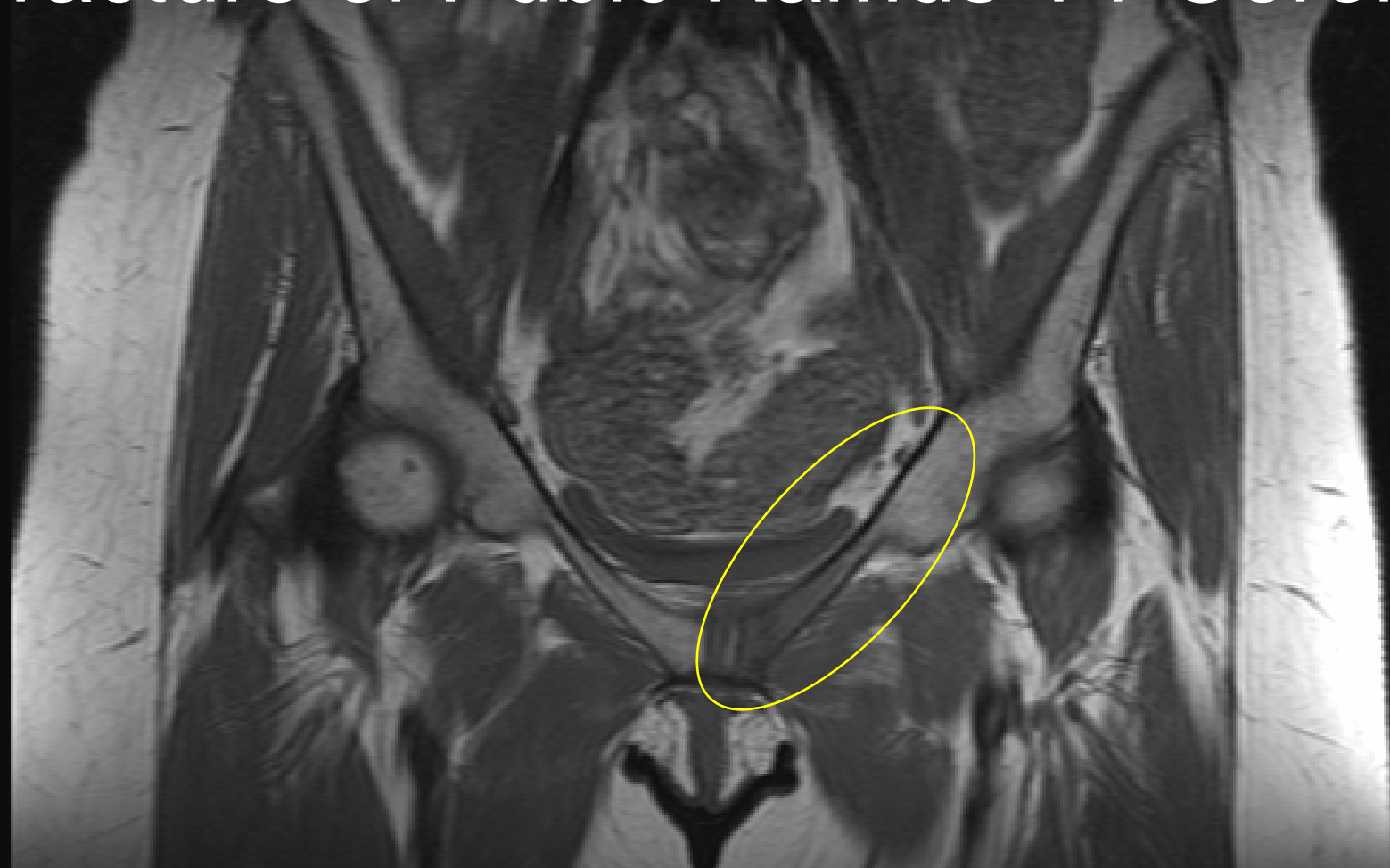


Patient 4: MRI Femoral Neck Stress Fracture





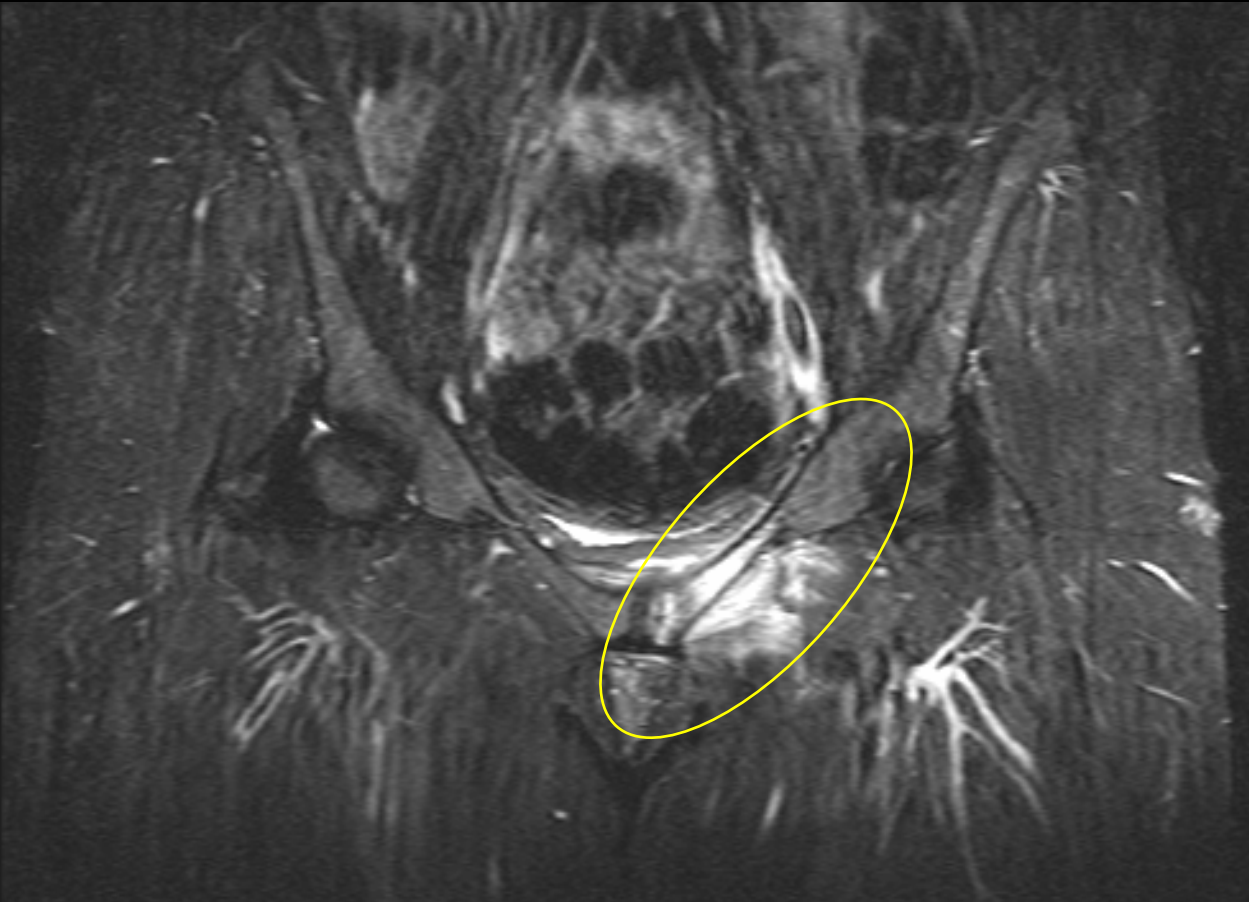
Patient 5: MRI Stress Fracture of Pubic Ramus T1 Coronal



Note the fracture line and
bone marrow oedema



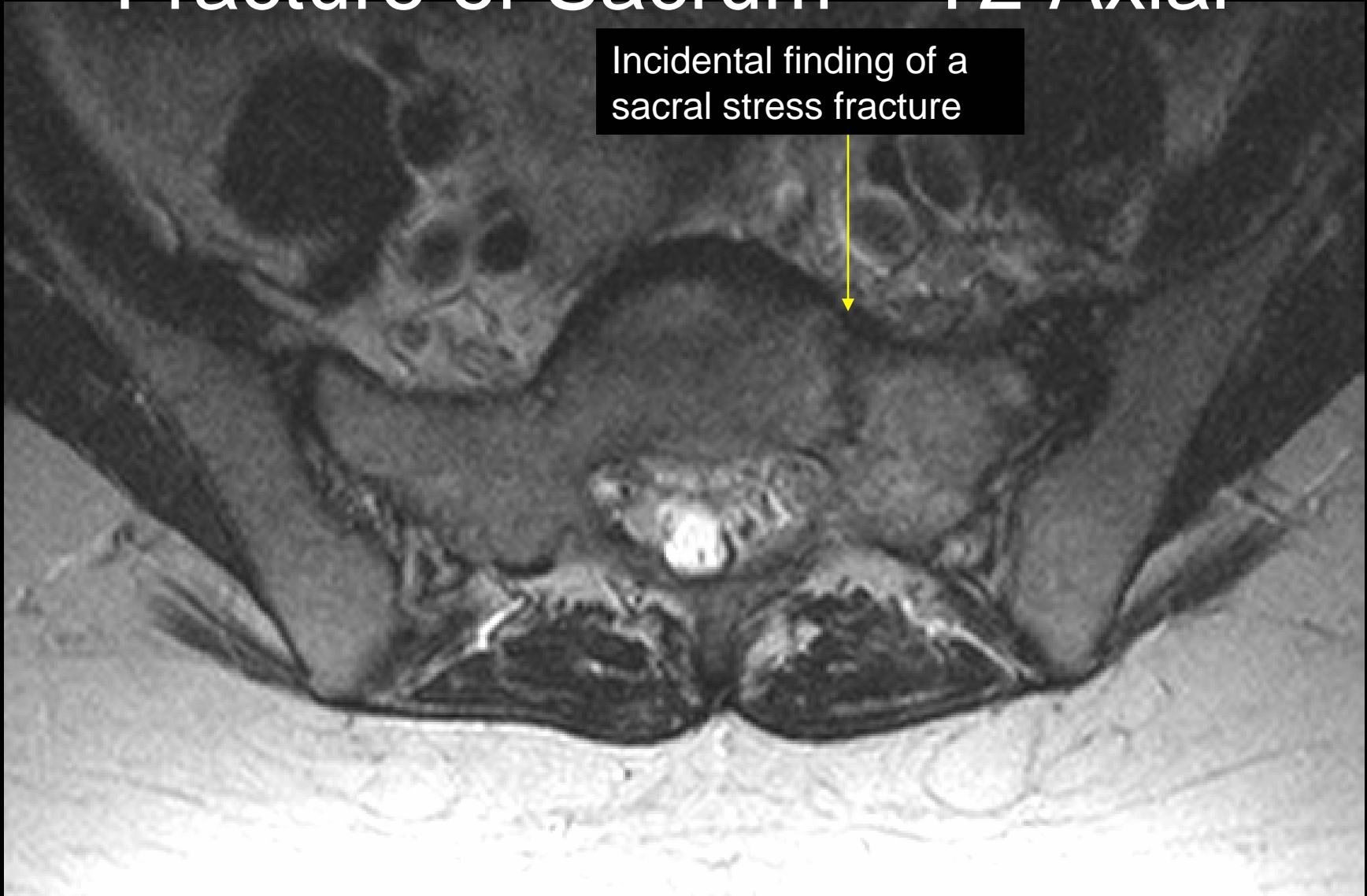
Patient 5 cont.: MRI Stress Fracture of Pubic Ramus on STIR Coronal



Note fracture, bone and
surrounding soft tissue
oedema



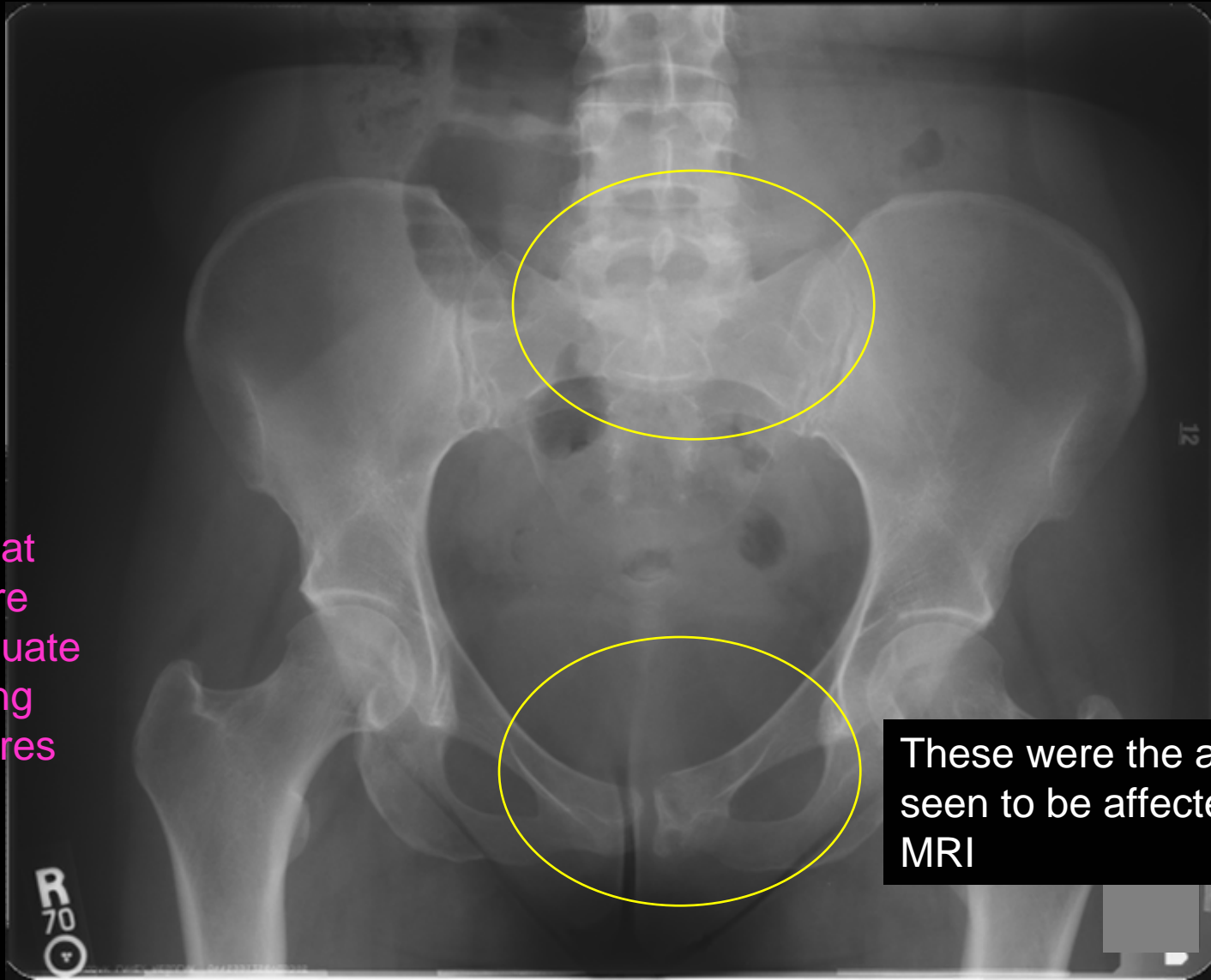
Patient 5 cont.: Stress Fracture of Sacrum – T2 Axial



Incidental finding of a
sacral stress fracture



Patient 5: Original Film: Do you see fracture now?



Highlights that plain films are often inadequate for diagnosing stress fractures

These were the areas seen to be affected on MRI

R
70
O



Distribution of Fractures

Female Athlete Triad (in between)



Terminology	Stress	Insufficiency
Where	Characteristic places	Anywhere
Stress	Abnormal or fatiguing	Normal
Activity	New onset strenuous	New or normal
Stereotype	Military, amateur marathoner	Elderly Women



Female Athlete Triad

- Some women athletes combine the cause of stress and insufficiency fractures by entering an estrogen deficient state
- Eating disorder, amenorrhea and resultant osteoporosis - due to an effort to minimize body fat.
- Some believe young teenagers with eating disorders are also at risk



Forces and Strength

- Fractures can occur in normal bone subjected to sub maximal, repetitive stresses, OR abnormal bone subjected to even minimal stresses.
- Muscle fatigue may plays a role in both of these scenarios by conspiring to expose bone to a greater or different load profiles



Putative Mechanism

- Any abrupt increase in stress is believed to jumpstart both osteoclastic and osteoblastic activity – So why does the bone fracture?
- The osteoclasts respond more quickly to impulse increases in bone stress. This leads to microfractures which grow to stress fractures - still small when compared to other types of fractures.



References

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