

IMAGING IN THE MANAGEMENT OF SPINAL DISORDERS

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I-MED RADIOLOGY, AUSTRALIA



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MINNEAPOLIS, USA

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SPINE IMAGING MODALITIES

- PLAIN X-RAY
- MRI
- CT
- US
- FLUOROSCOPY
- NUCLEAR MEDICINE
- DEXA



SPINE IMAGING MODALITIES

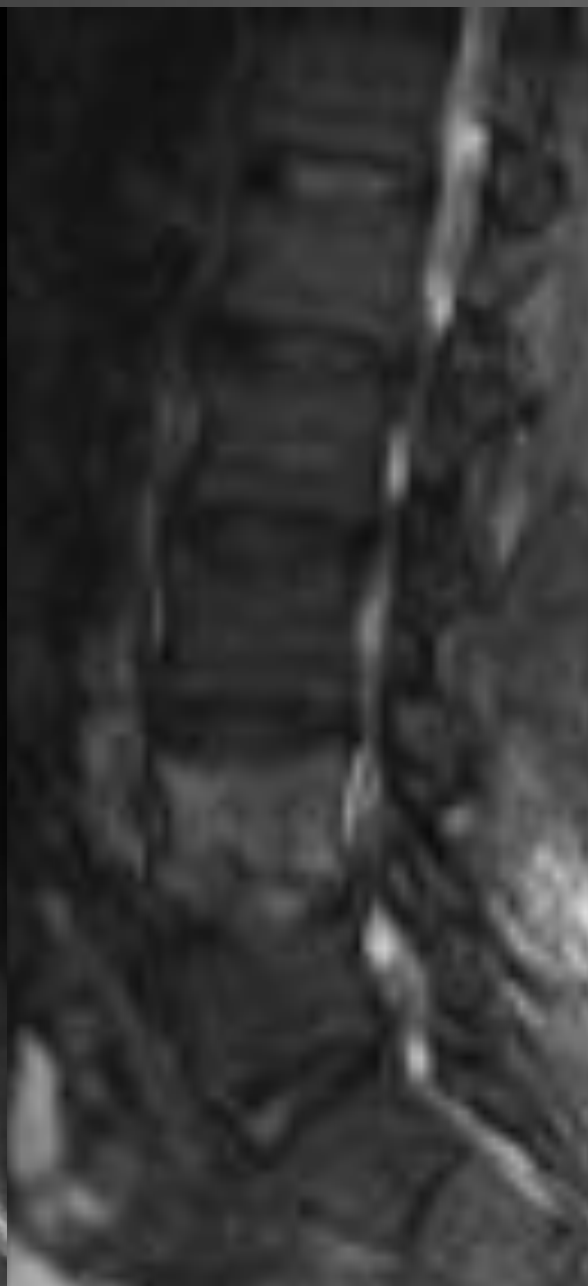
- PLAIN X-RAY
- MRI
- CT
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- NUCLEAR MEDICINE
- DEXA



SPINE IMAGING MODALITIES

- PLAIN X-RAY
- MRI
- CT
- US
- FLUOROSCOPY
- NUCLEAR MEDICINE
- DEXA





BUT FIRST A QUIZ.....

- Name this country?





Newcastle
Sydney

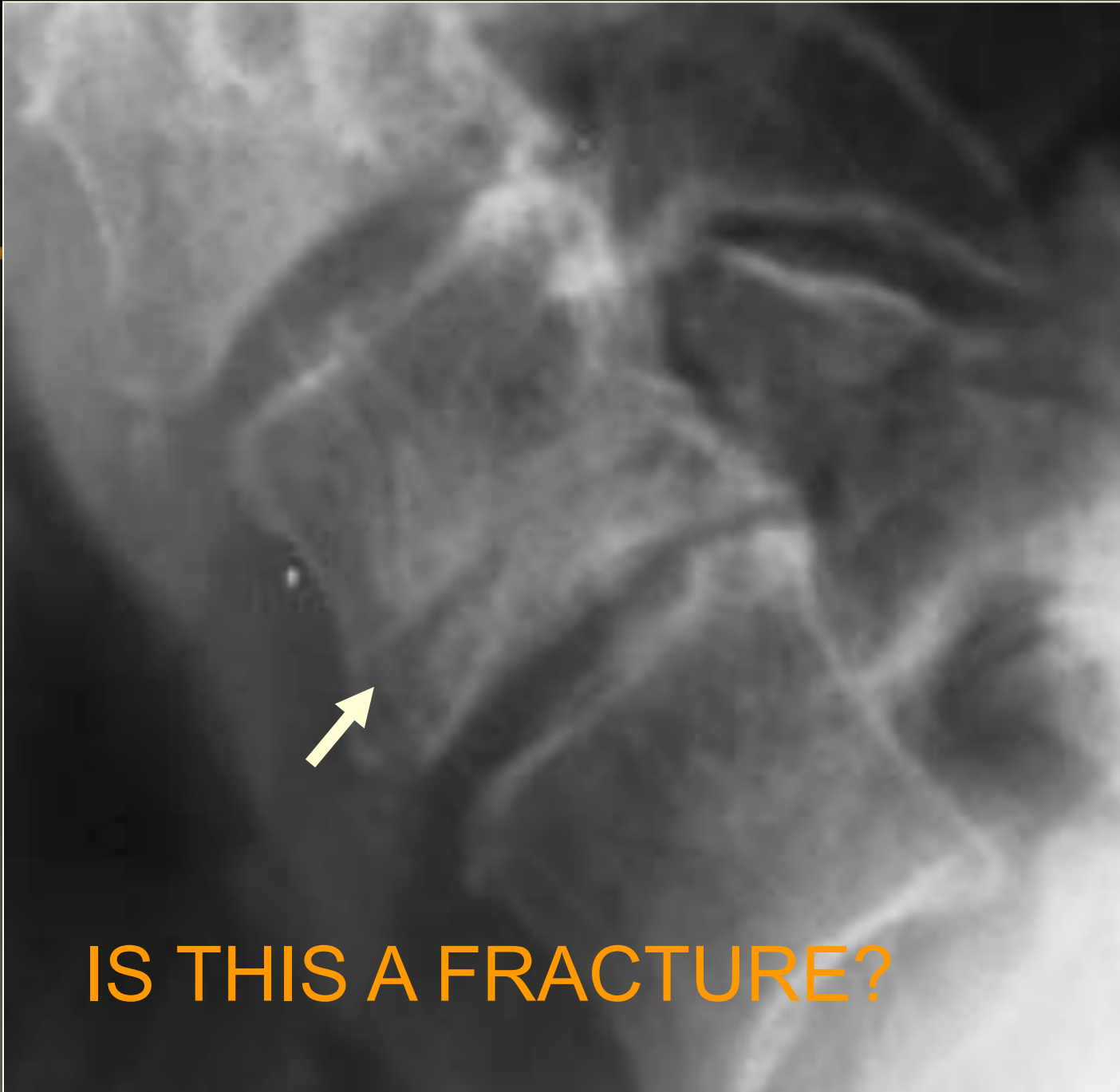


JOHN HUNTER HOSPITAL, NEWCASTLE
AUSTRALIA





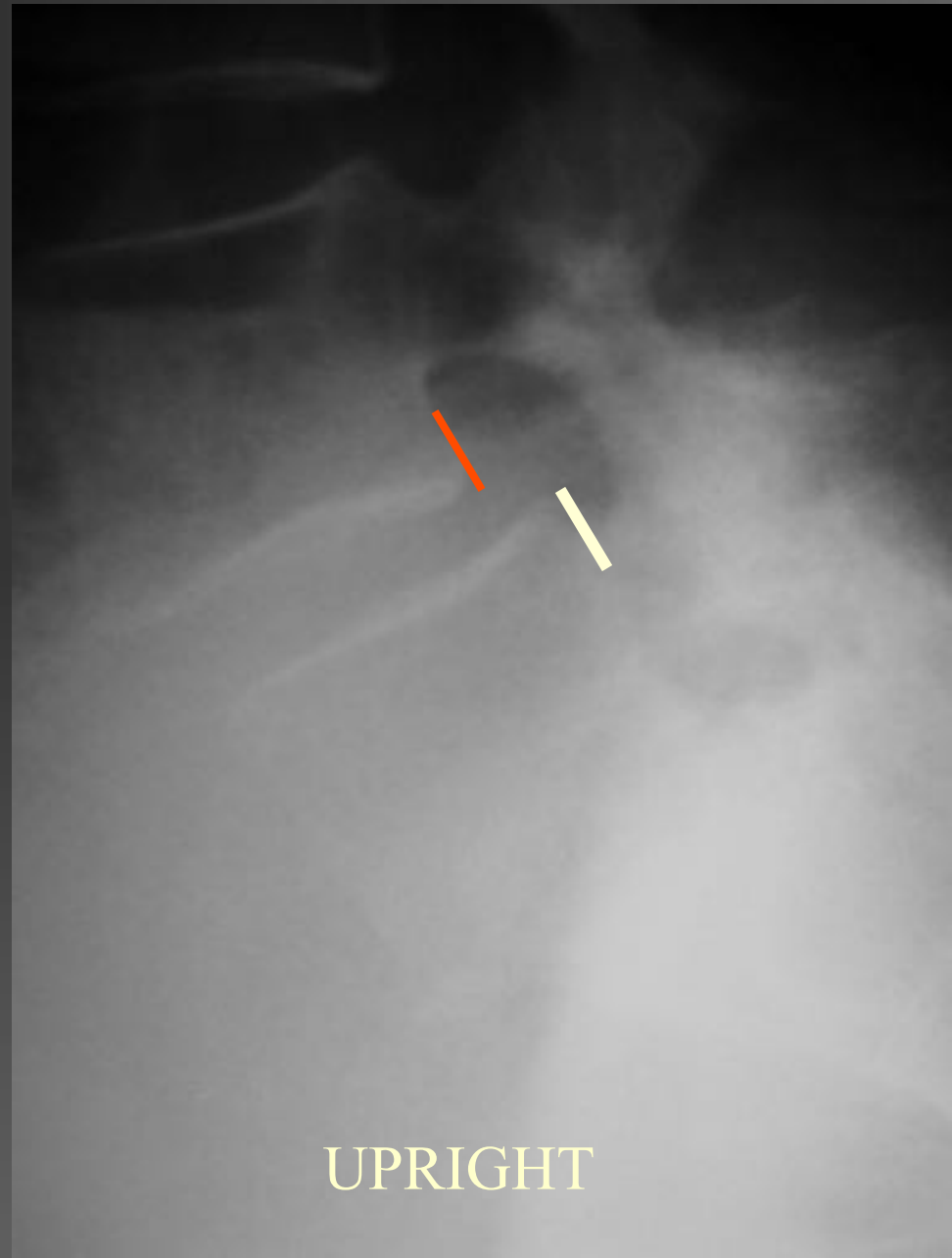
12mm



IS THIS A FRACTURE?



DEGENERATIVE SPONDYLOLISTHESIS







NEWCASTLE, AUSTRALIA
2003



DIFFUSE IDIOPATHIC SKELETAL HYPEROSTOSIS (DISH)

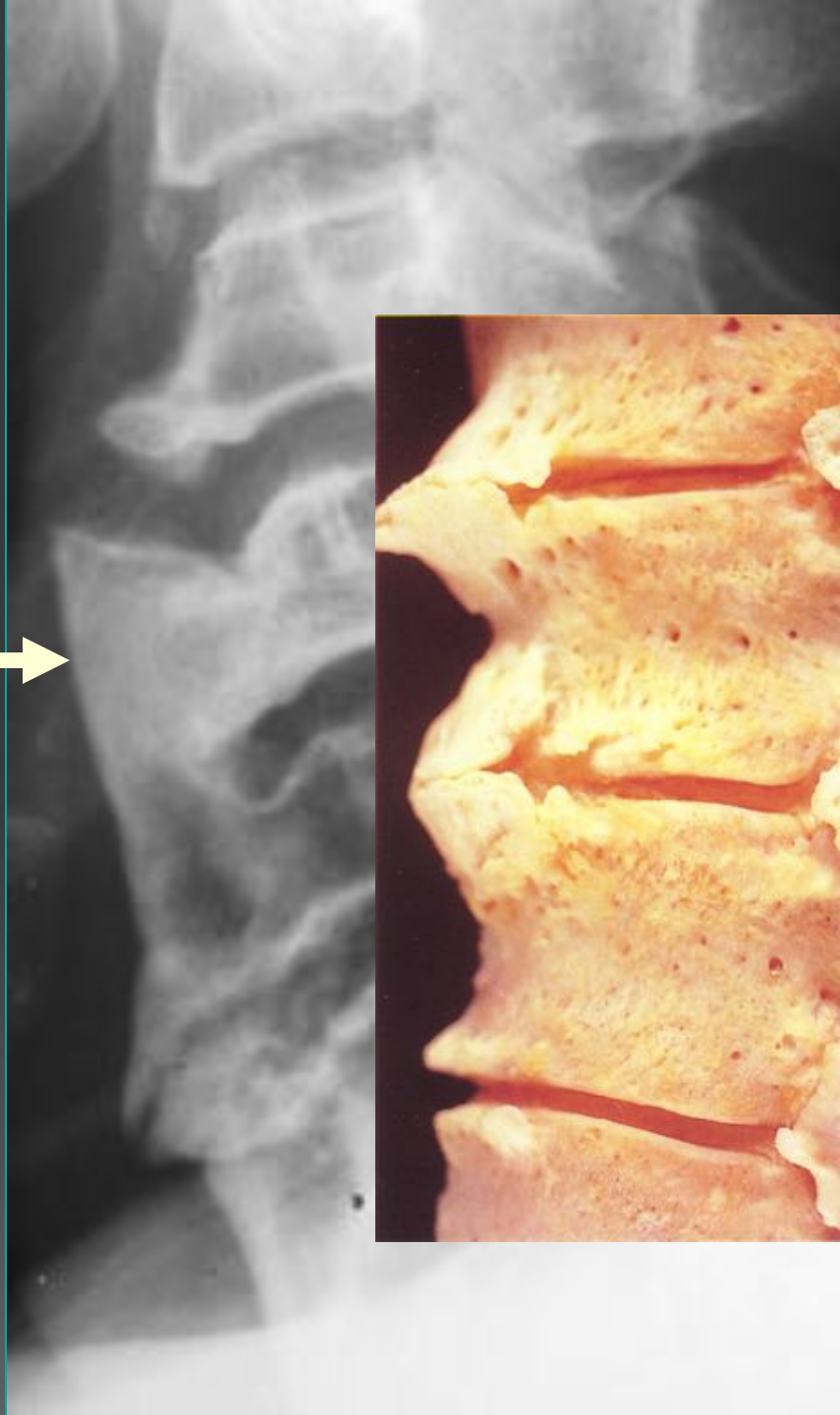
- Synonyms
 - Forrestier disease
 - Ankylosing Hyperostosis (Rotes-Querol)
- Diagnostic Criteria
 - Four or more contiguous segments
 - Anterior hyperostosis
 - Normal disc
 - Normal facet joints



- IMAGING FEATURES

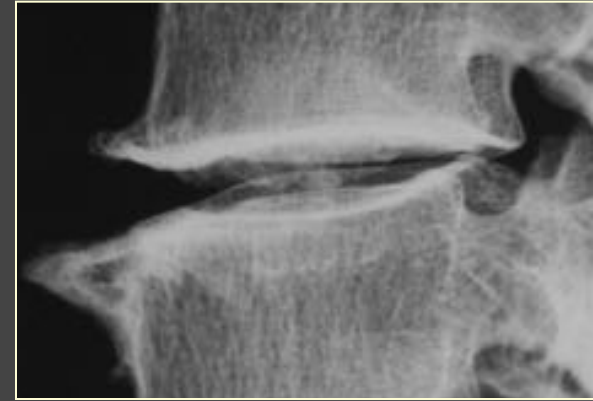
- Hyperostosis

- Non marginal
- Extend to mid body
- Vertical and “flowing”
- Thick
- Cortex and medulla
- Smooth external surface
- Fuses to anterior body

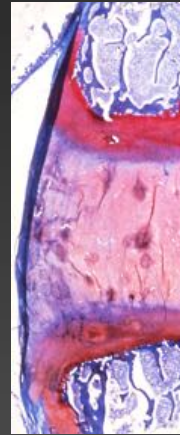


SPINAL PHYTES

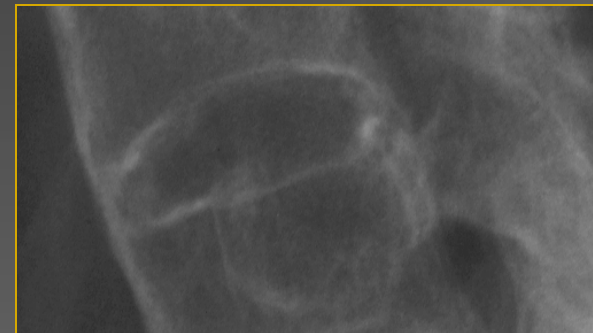
- OSTEOPHYTE

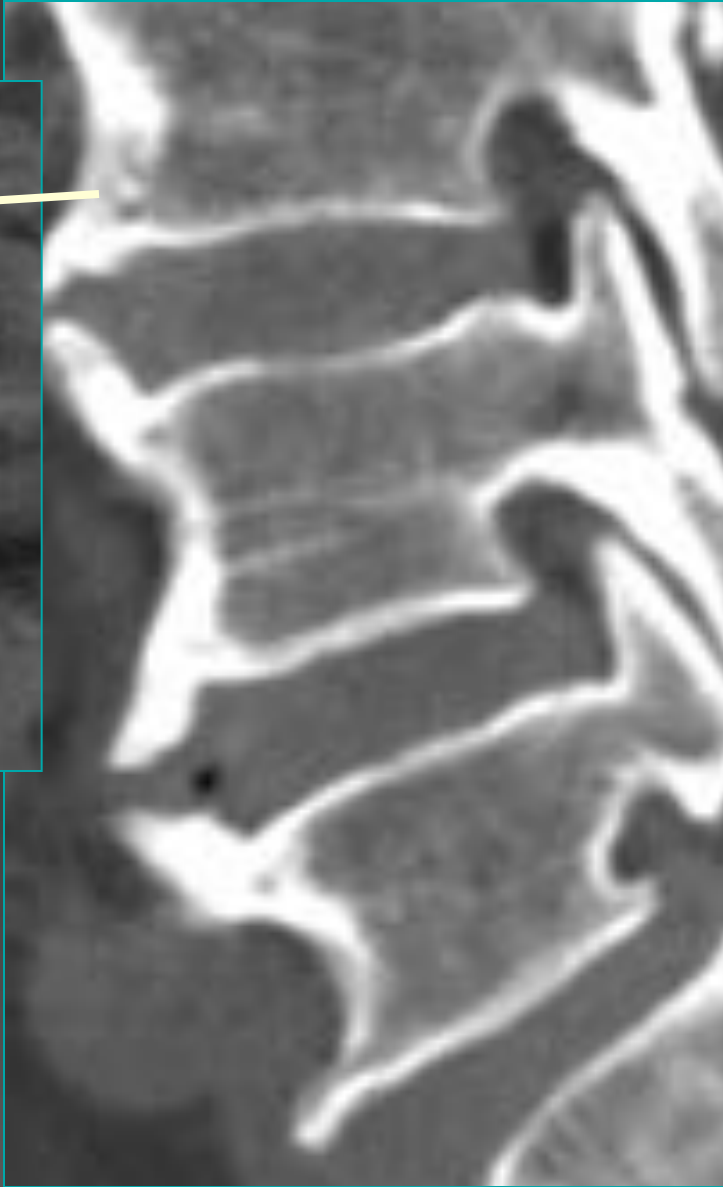


- HYPEROSTOSIS



- SYNDESMOPHYTE





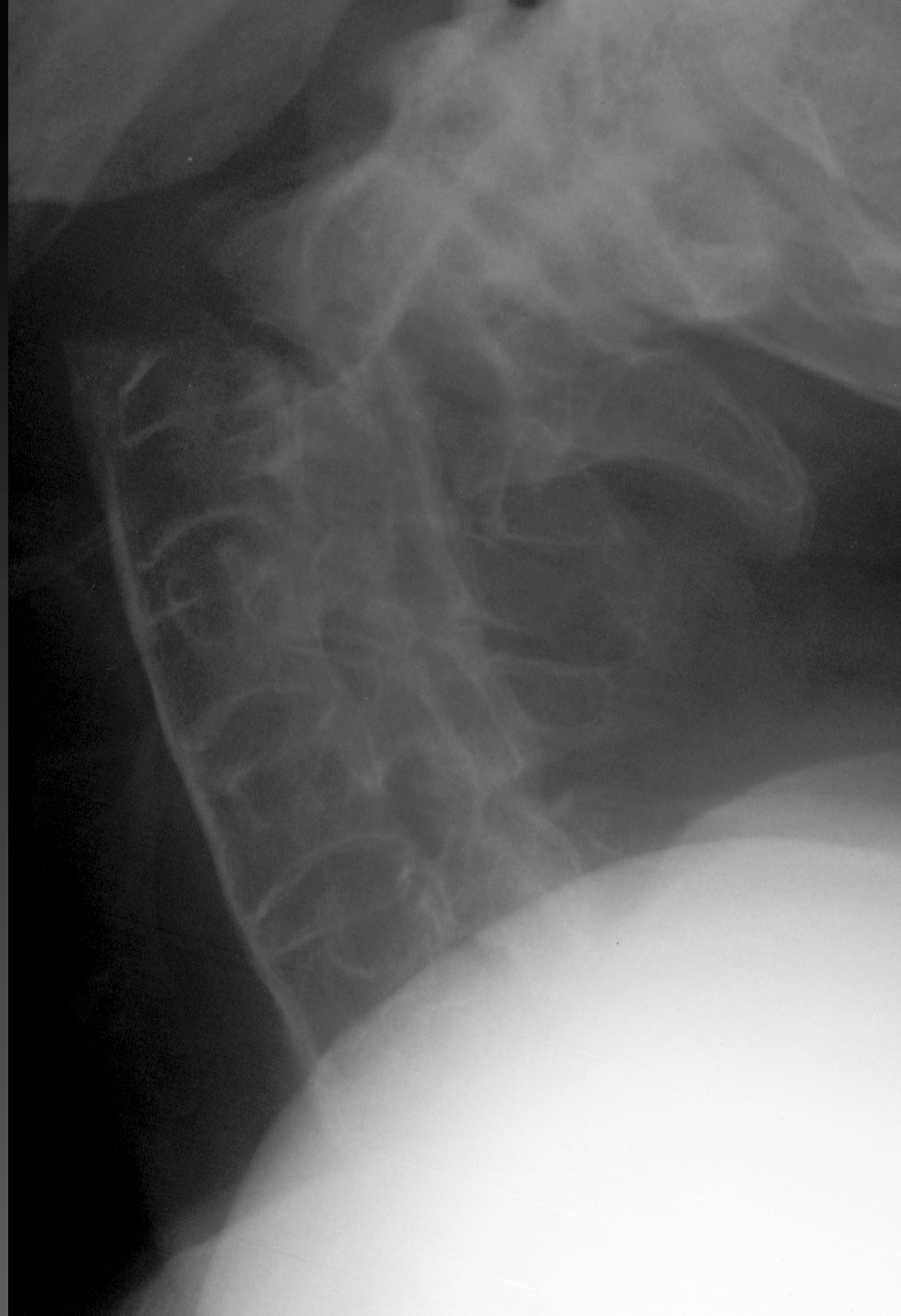
DISH

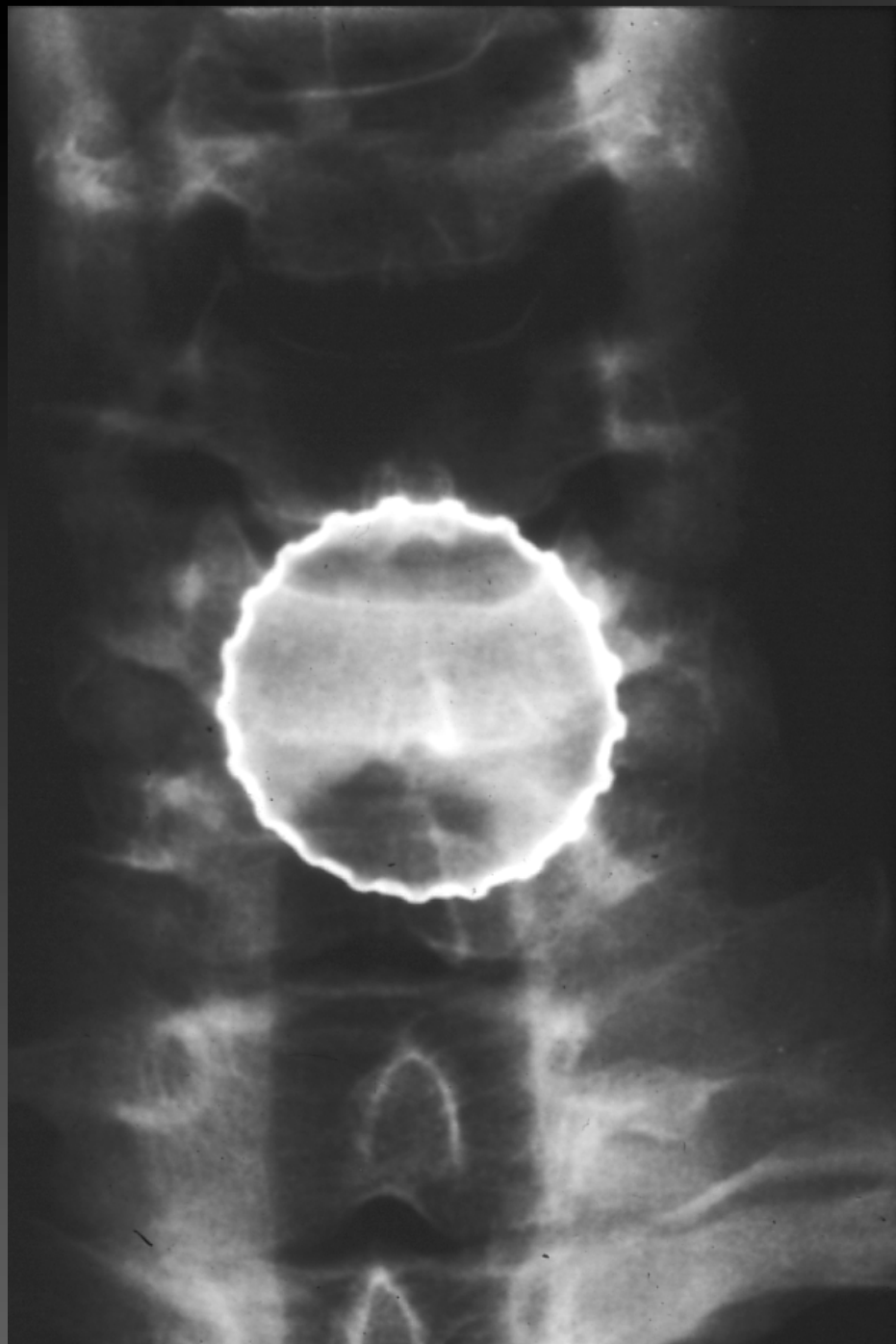
OSSIFIED POSTERIOR LONGITUDINAL LIGAMENT SYNDROME (OPLL)





NEWCASTLE, AUSTRALIA 2012

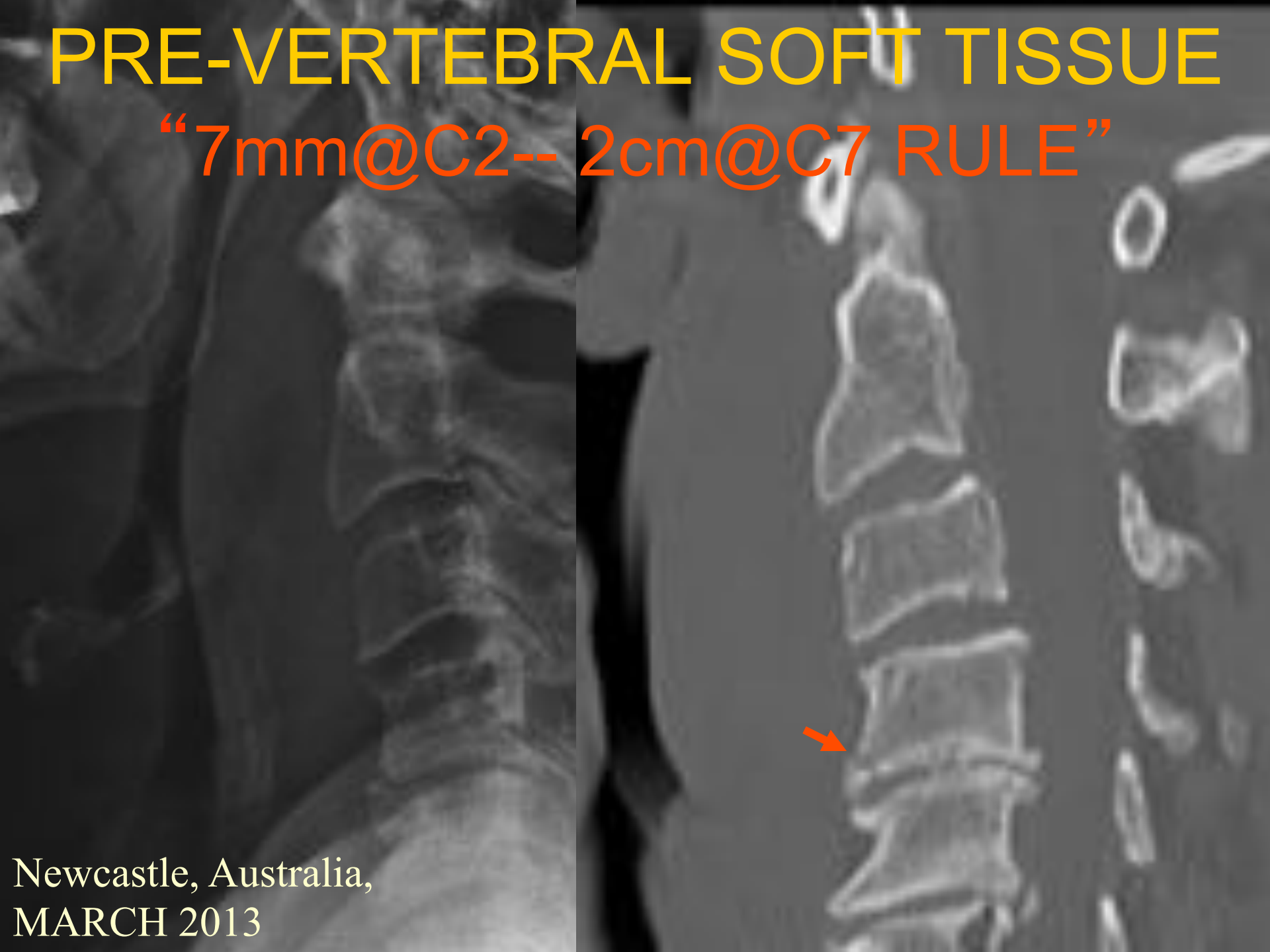




PRE-VERTEBRAL SOFT TISSUE

“7mm@C2-- 2cm@C7 RULE”

Newcastle, Australia,
MARCH 2013



A 25 year old with neck pain.

Minneapolis, USA 1985

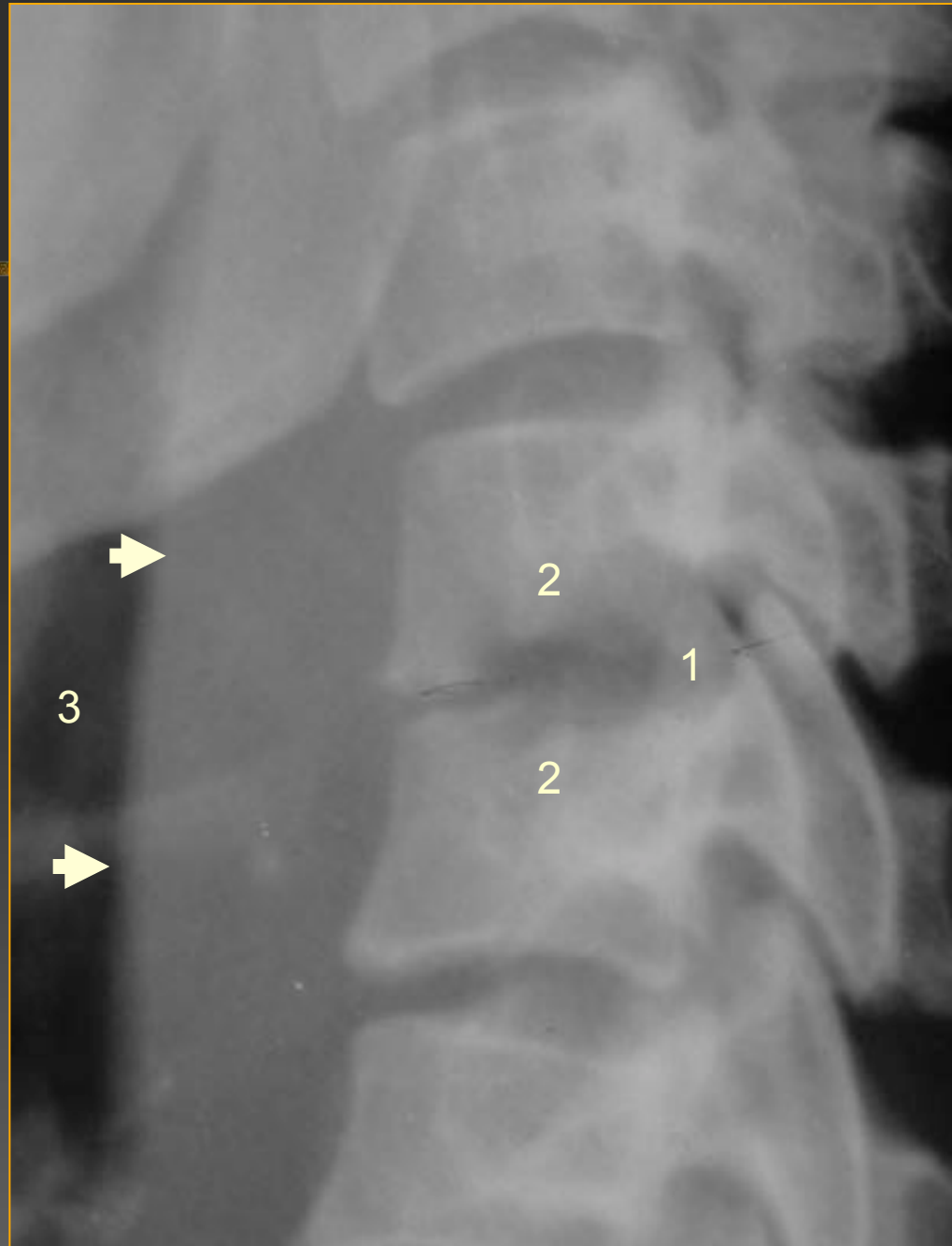


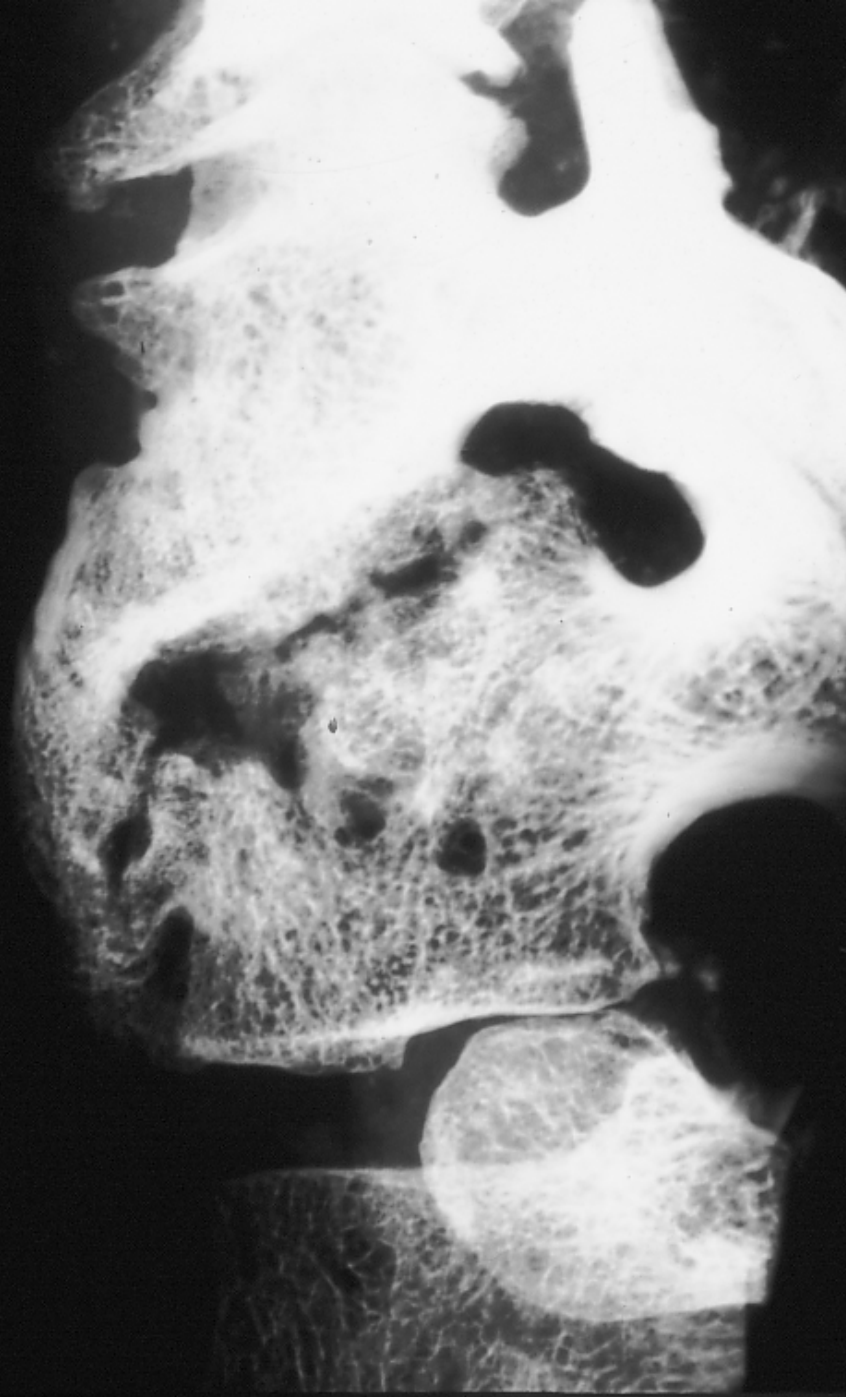


NORMAL

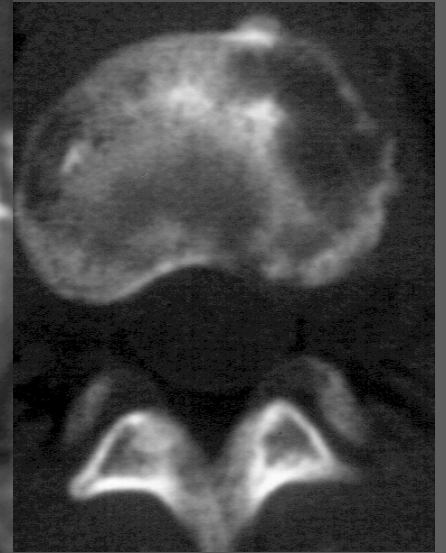
DISC INFECTION

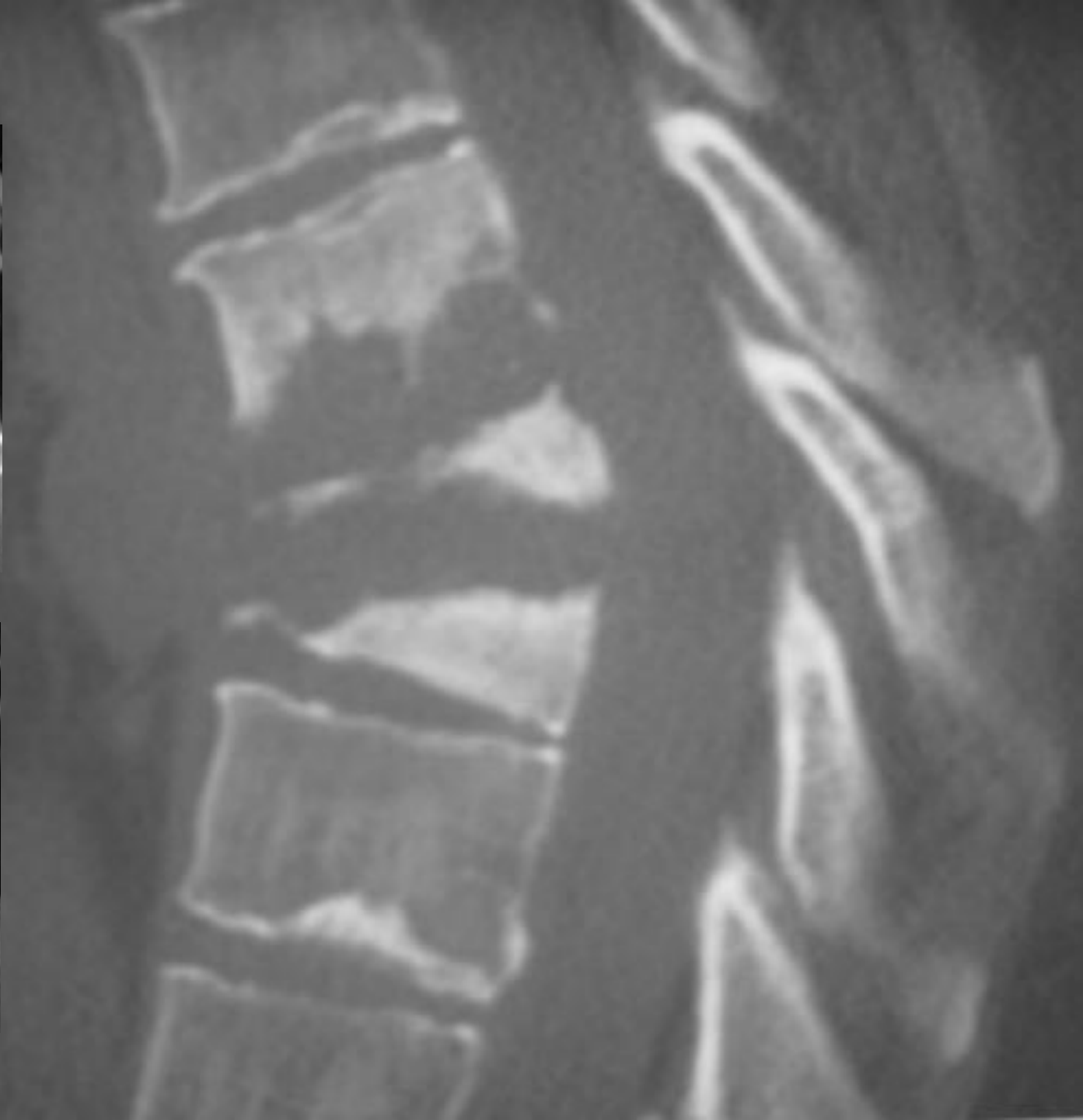
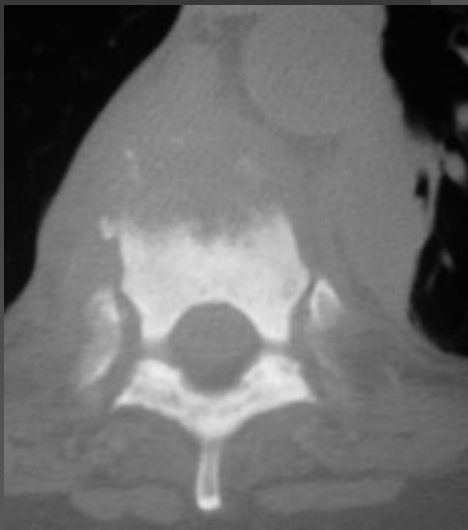
1. Loss of disc height
2. Destroyed cortical end plates
3. Pre-vertebral swelling





“DISCITIS”







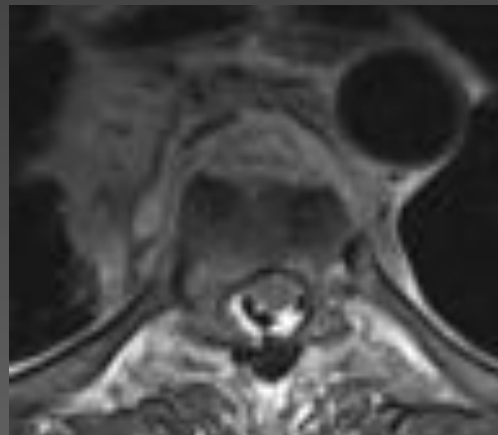
T1



T2

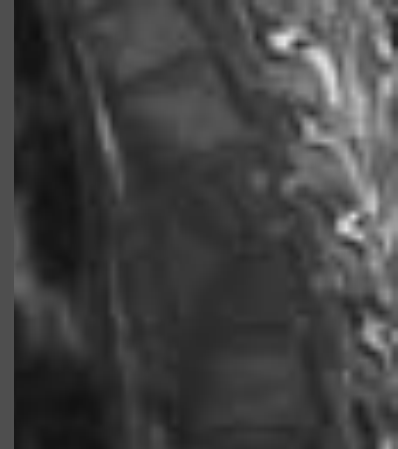
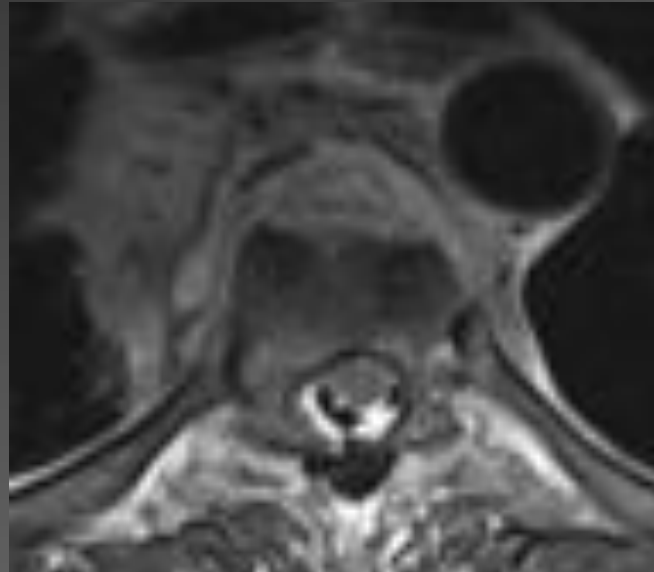


T1 FS POST GAD

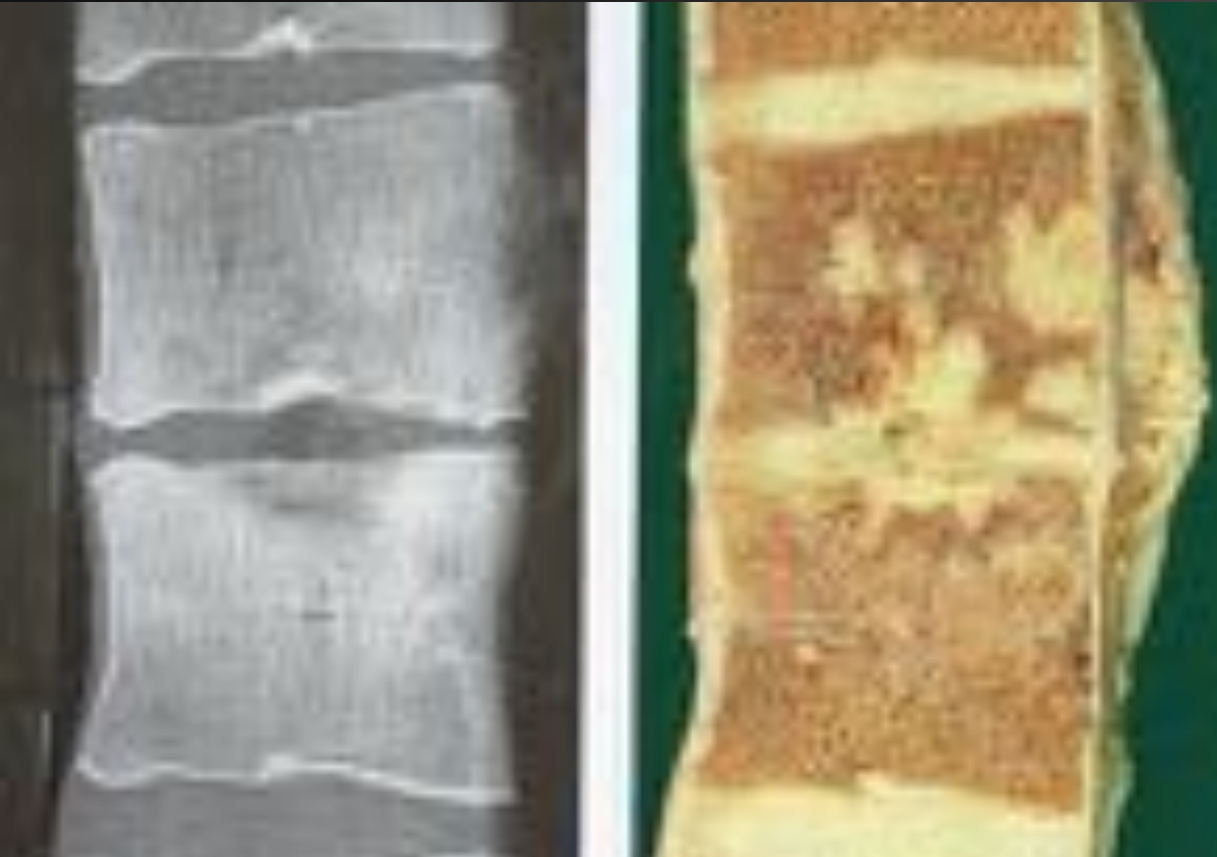


TUBERCULOSIS

- Discovertebral
 - Transdiscal
 - Anterior
 - Loss of disc height
- Anterior abscess
 - Subligamentous ALL
 - Calcifies when chronic
- Anterior body erosion
 - “Gouge defect”
- Multilevel involvement

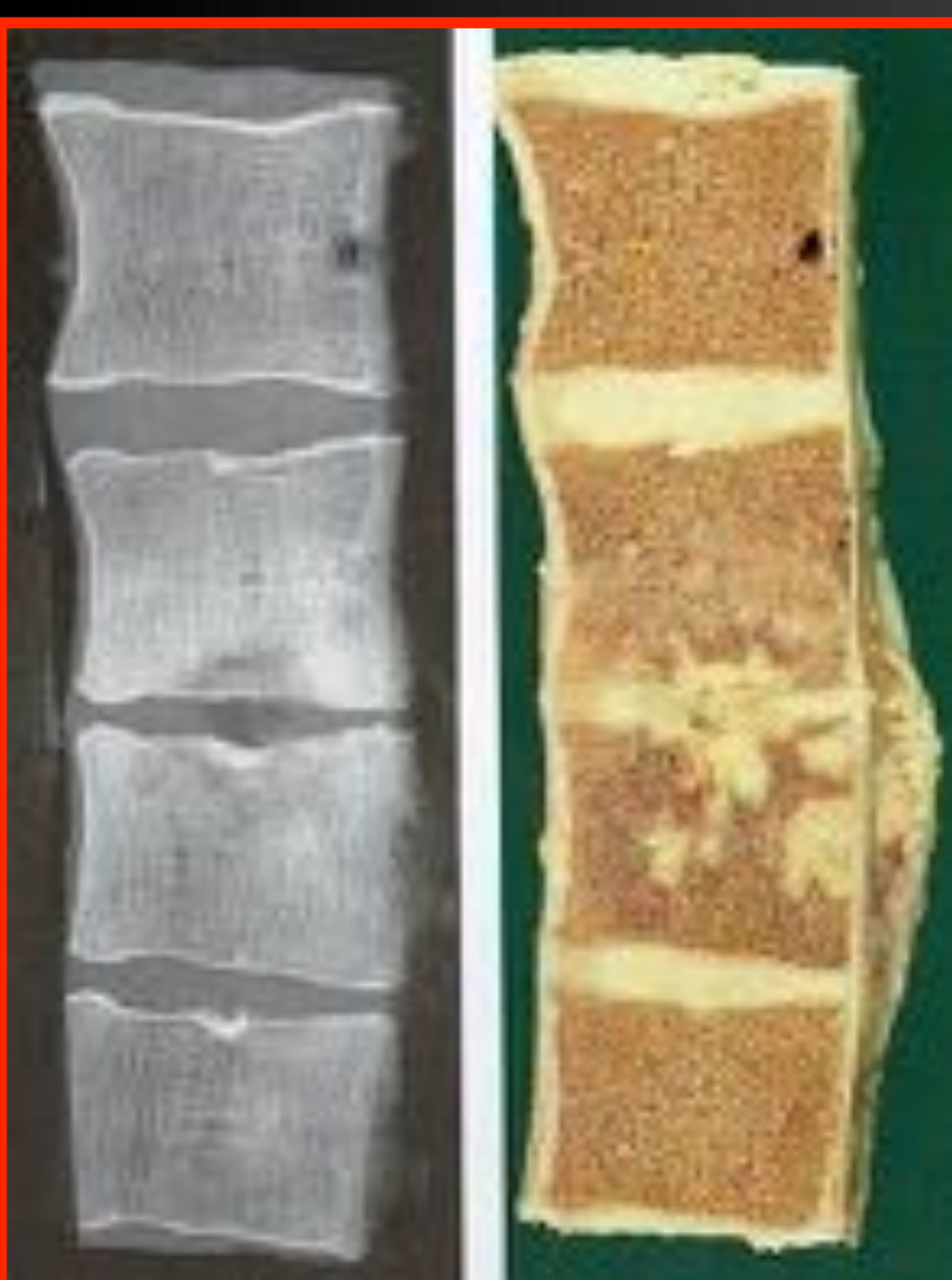


EPIDURAL ABSCESS









HIV AND MUSCULOSKELETAL DISEASE

■ SPINE

■ MUSCLE

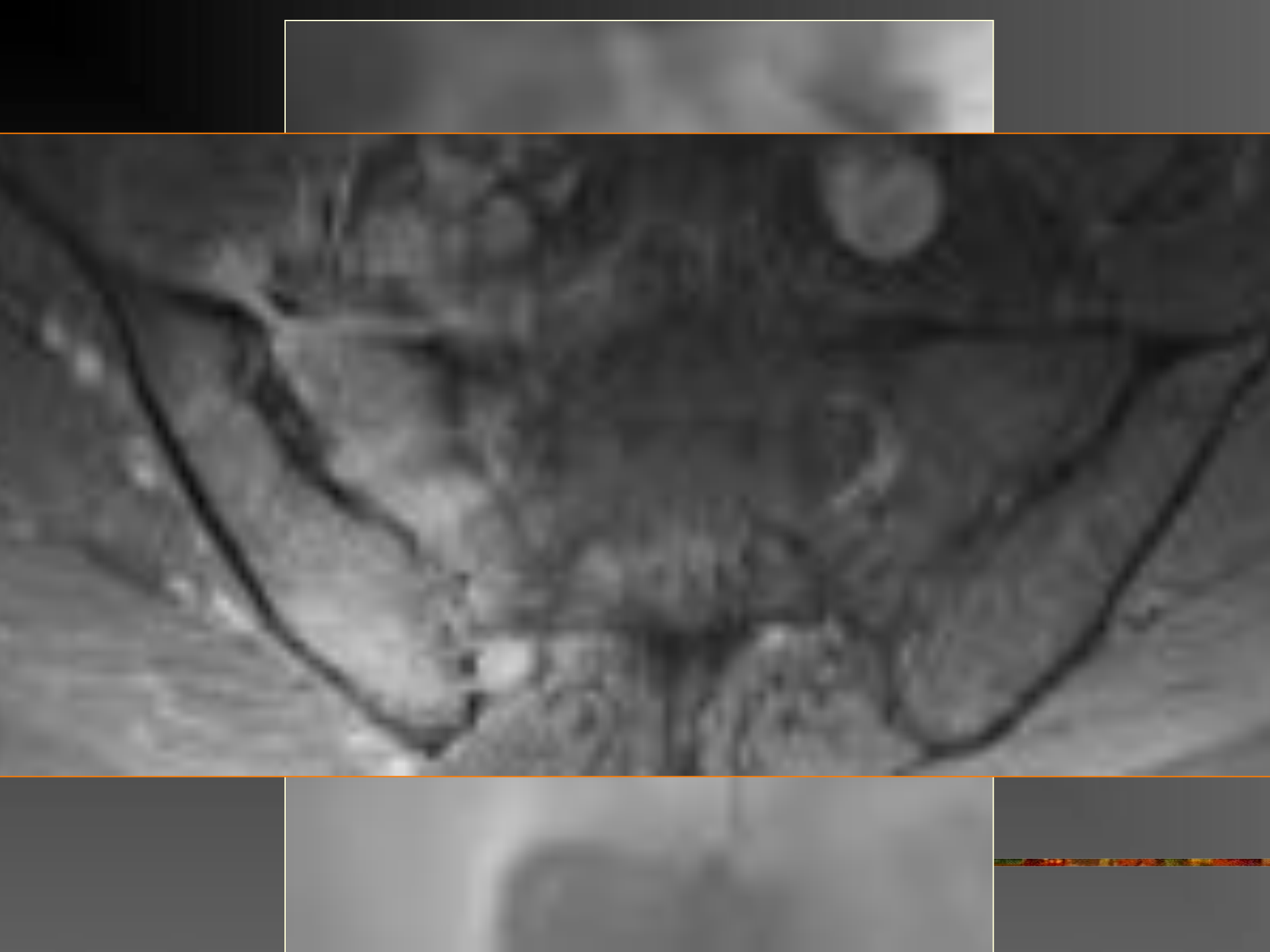
- Myositis
- Pyomyositis
- Rhabdomyolysis

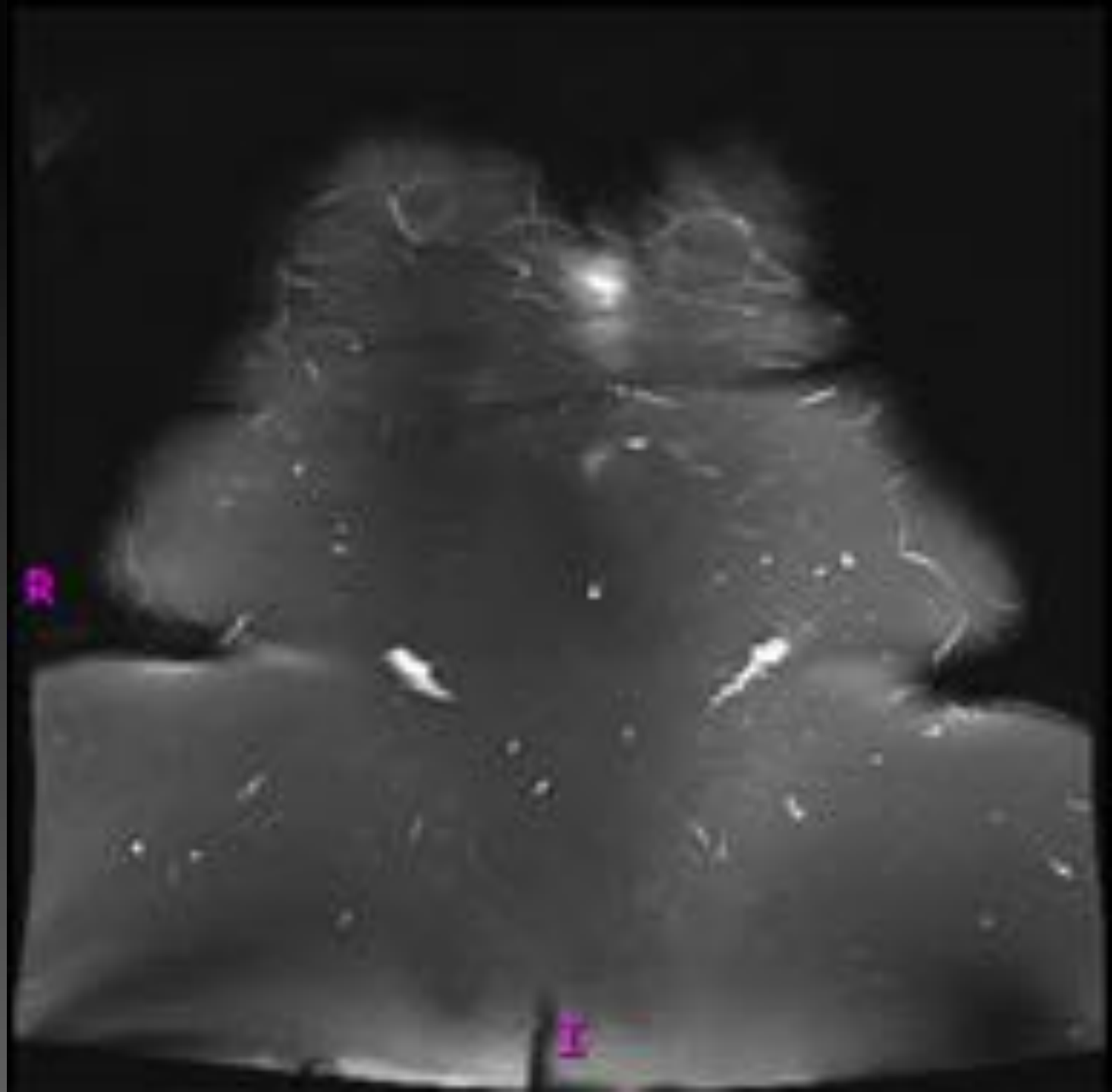
■ BONE

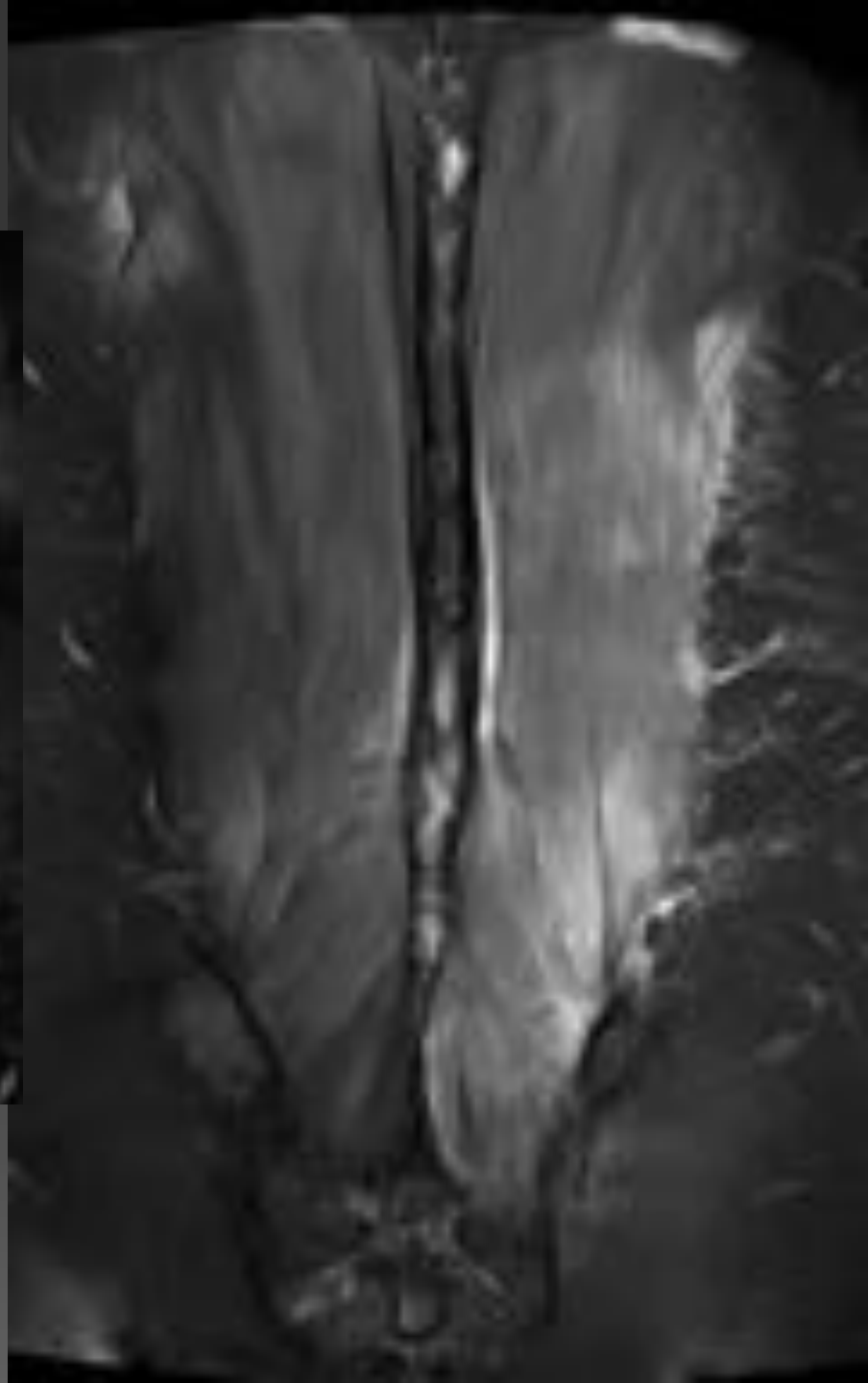
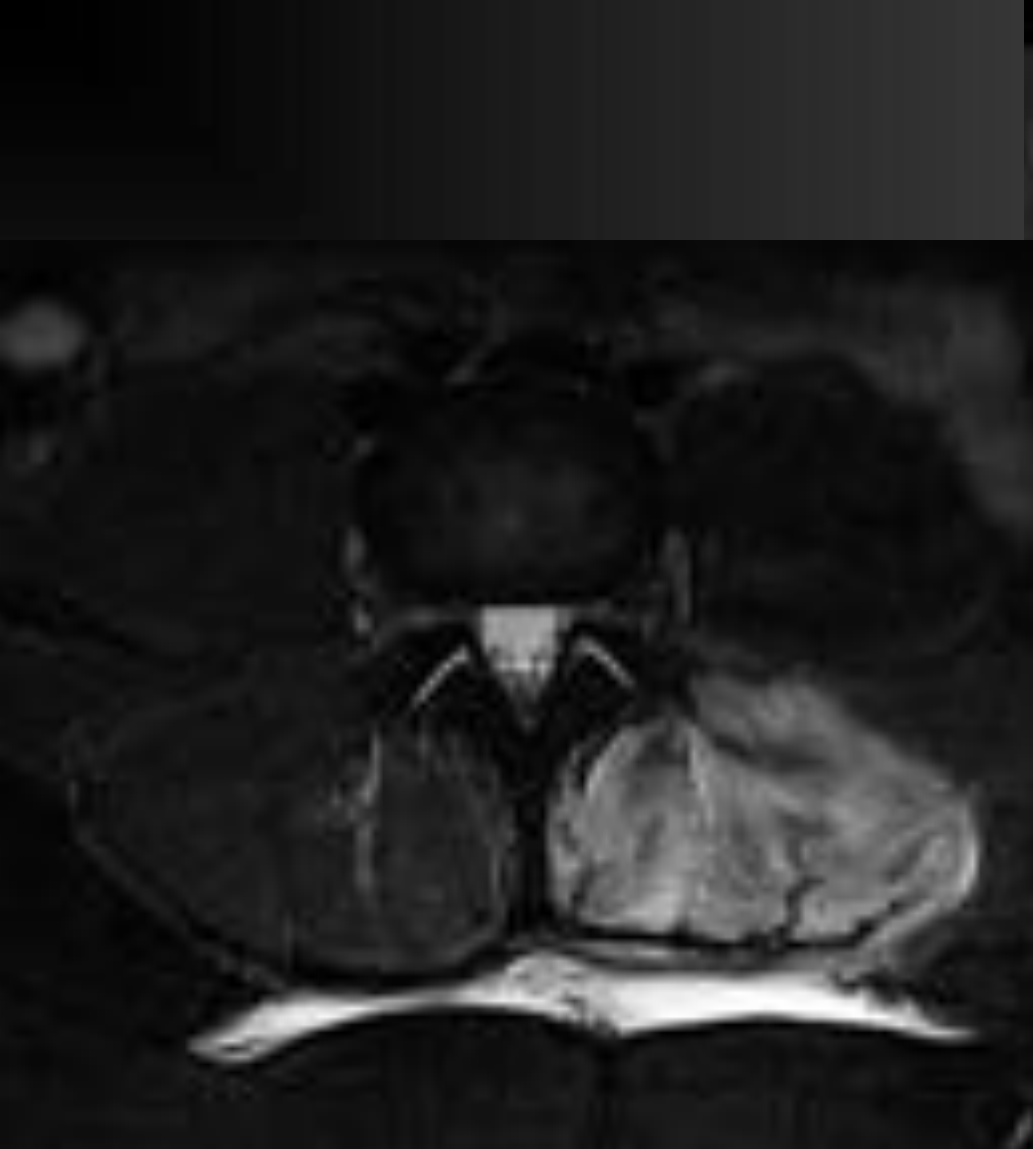
- Infection
- Osteoporosis (45-67%)
- Anemic bone marrow
- Lymphoma
- Kaposi sarcoma

■ PERIPHERAL

- Osteoporosis
- AVN hips
- HOA
- Myositis



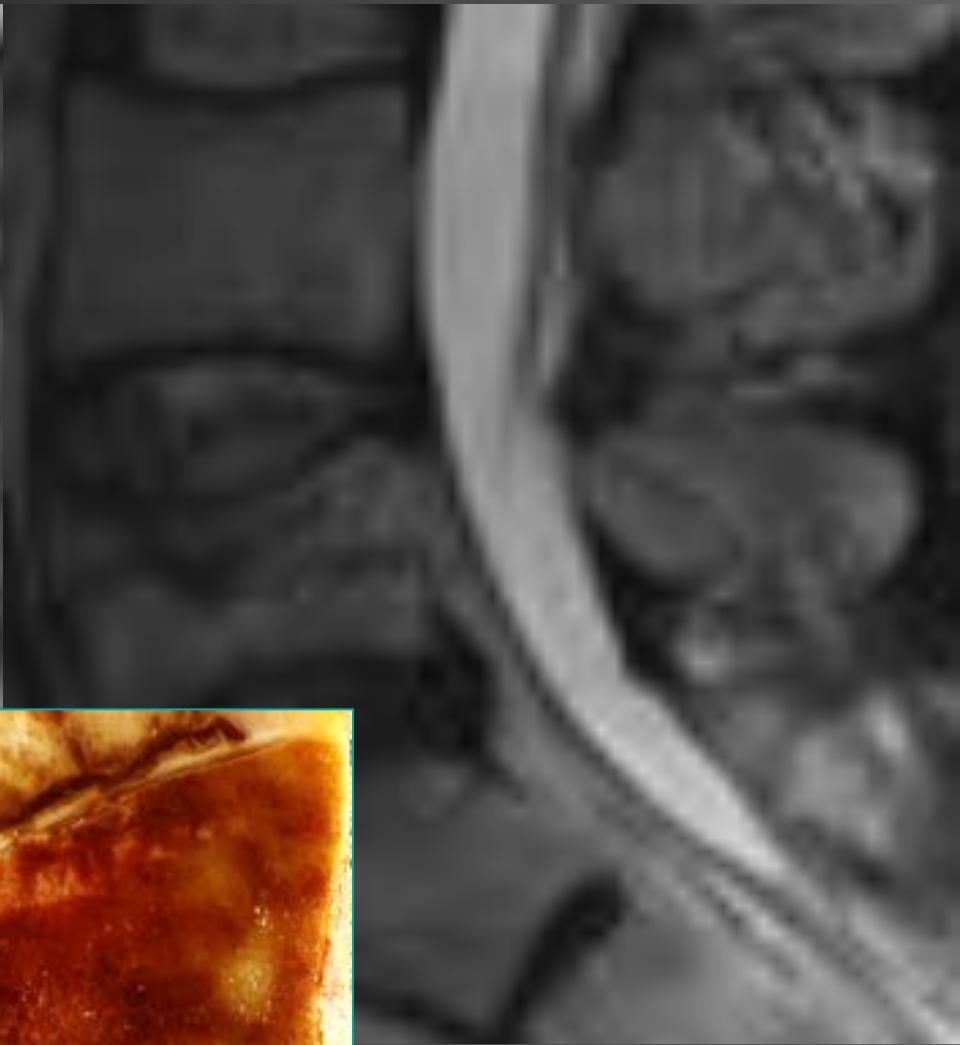
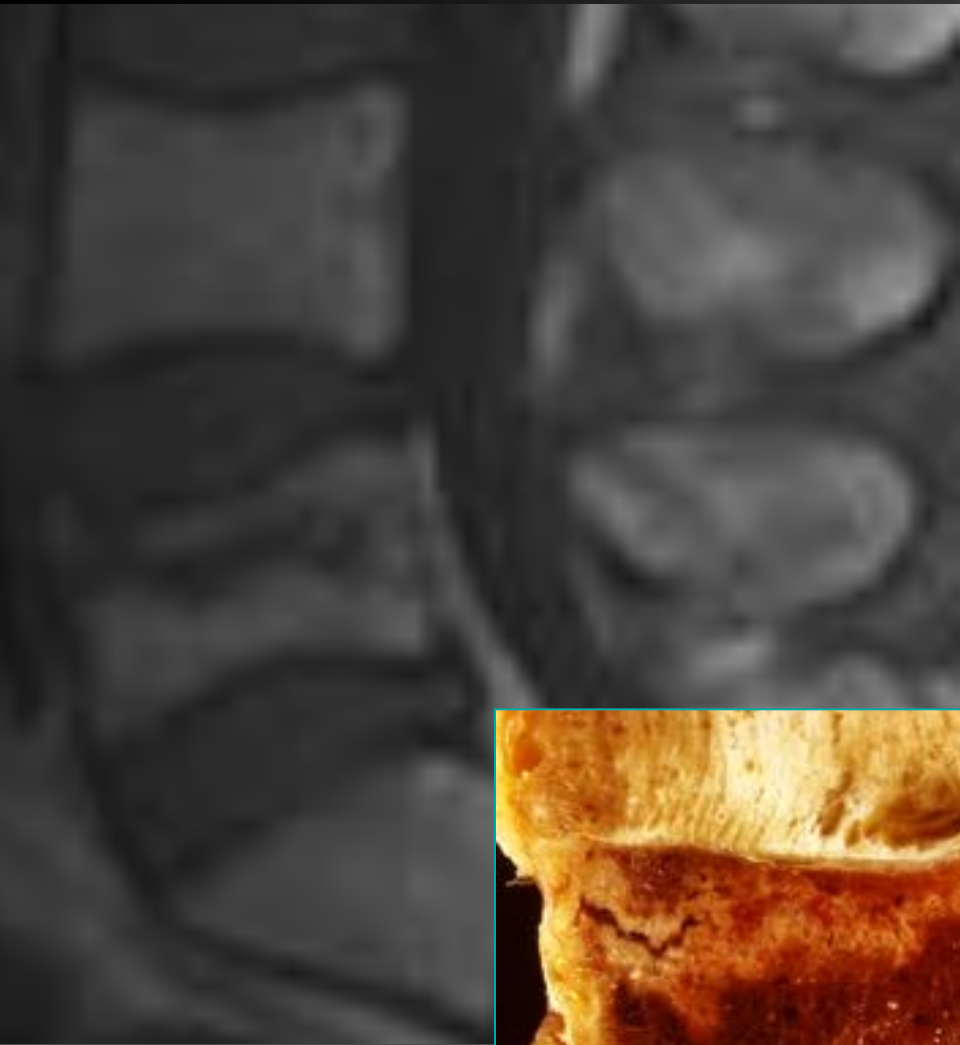






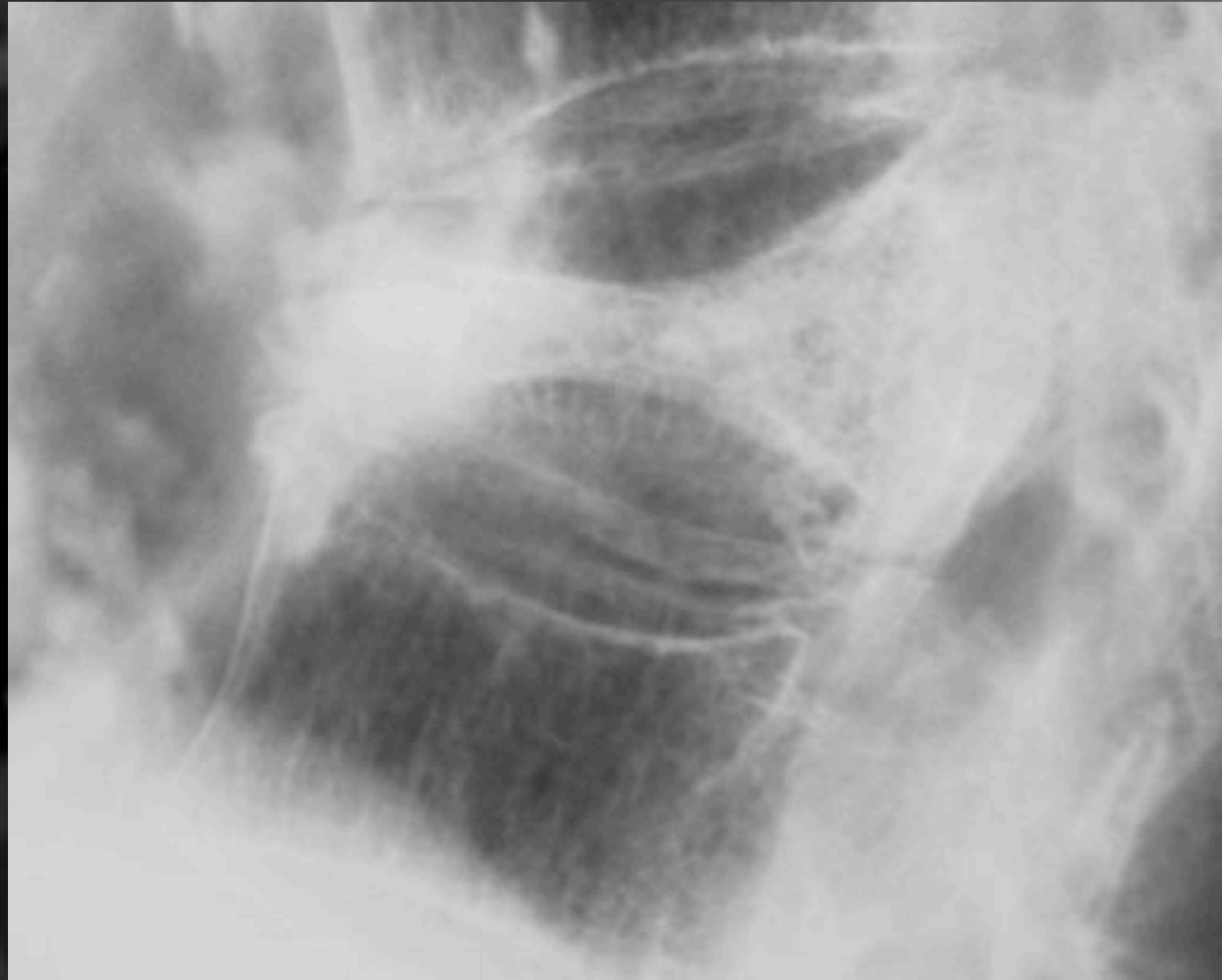






PSEUDO-HAEMANGIOMA

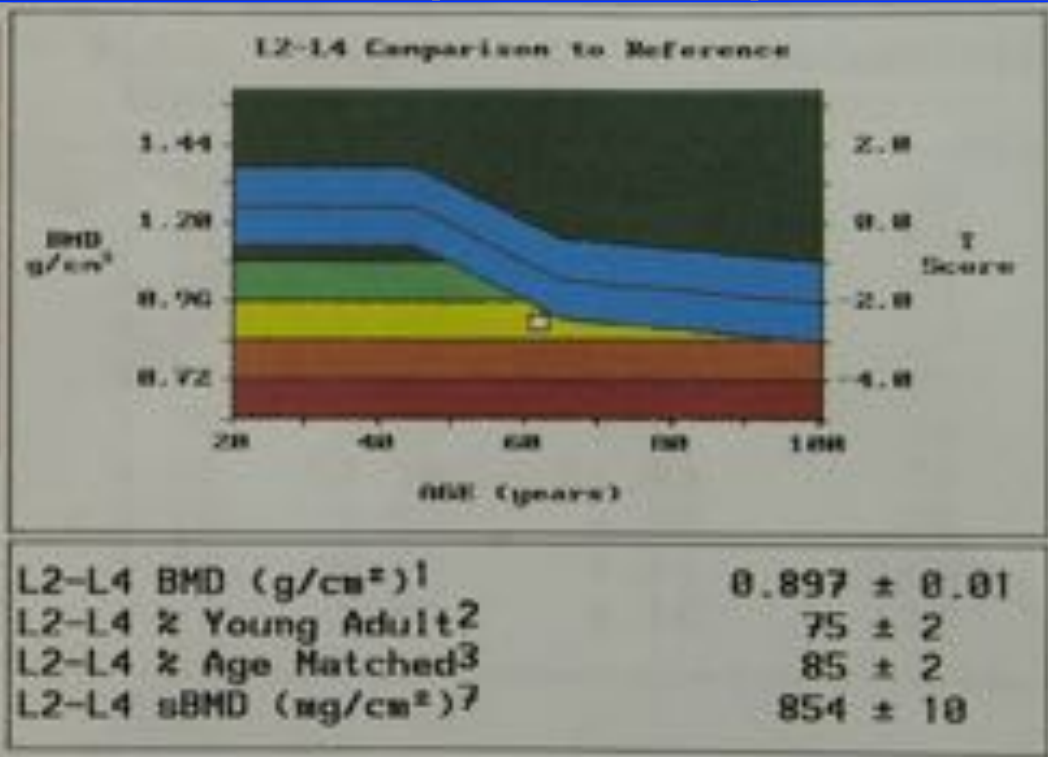




HAEMANGIOMA



BONE DENSITOMETRY (DEXA)



Thin x-ray beam at three sites:

- Distal radius (wrist)
- Femoral neck (femur)
- Lumbar vertebrae

Measure of bone mass how much x-ray passes through the bones.

“Bone Mineral Density” (BMD)

“Score” calculated relative to age

Plotted on graph to give estimated fracture risk

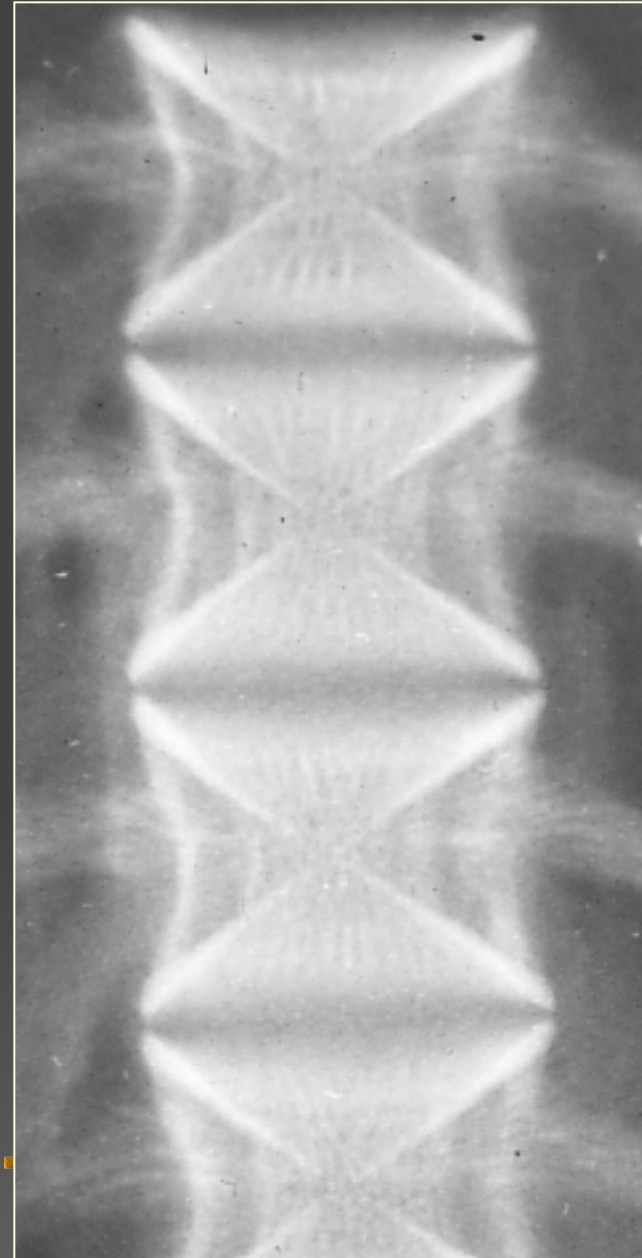
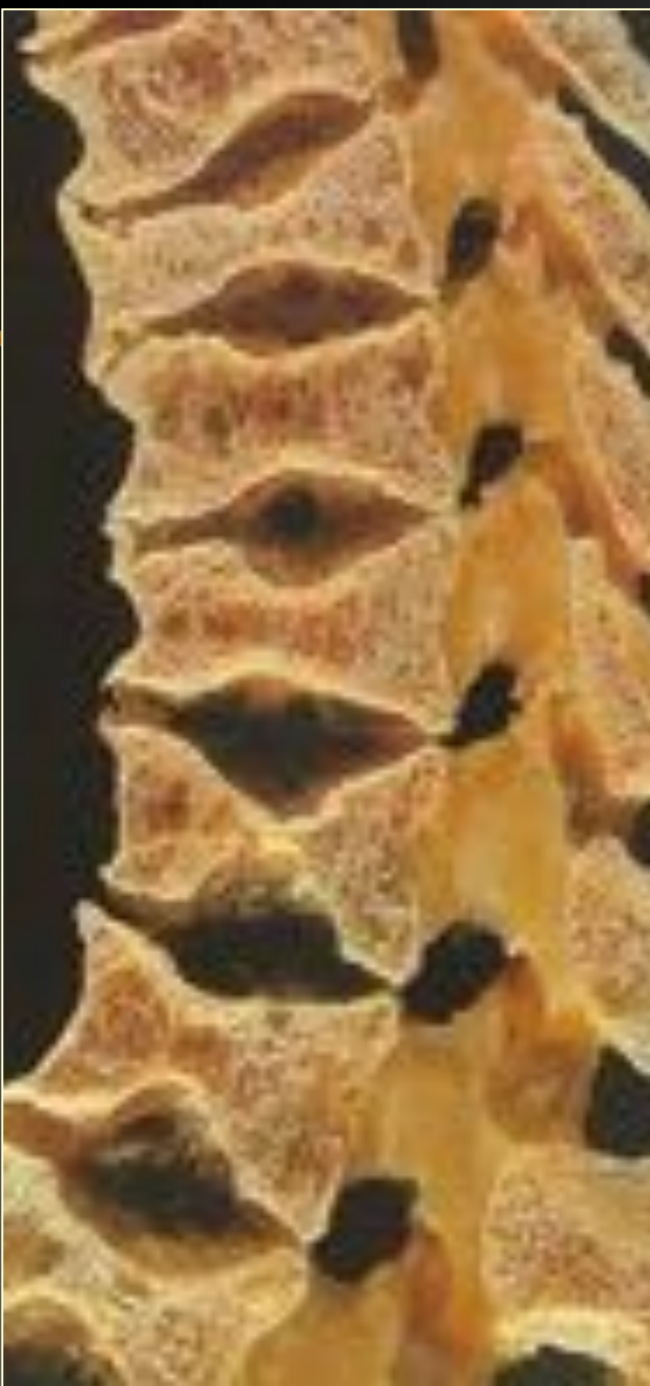
Abnormal if >2 SD outside range

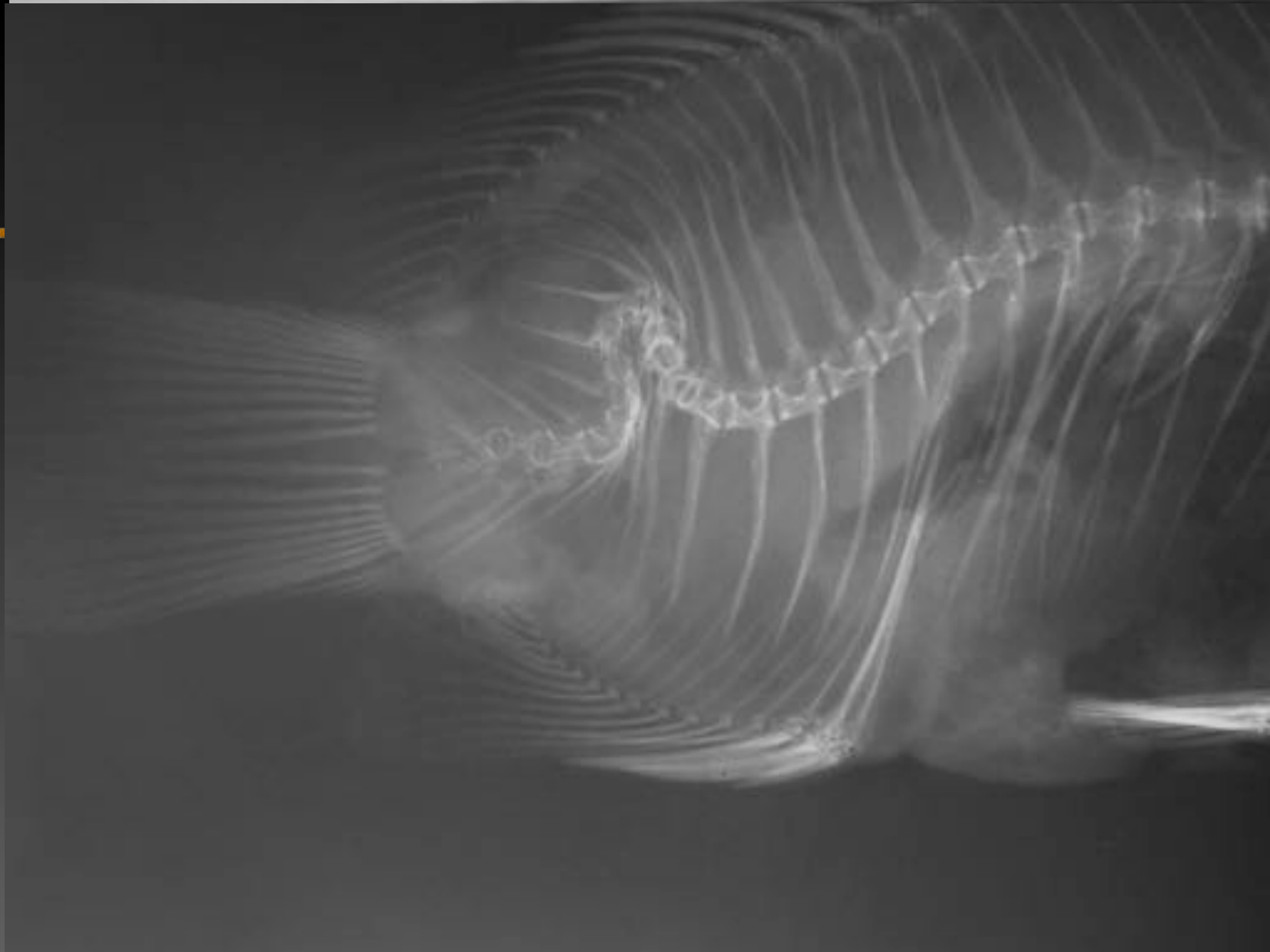


www.orthobase.com

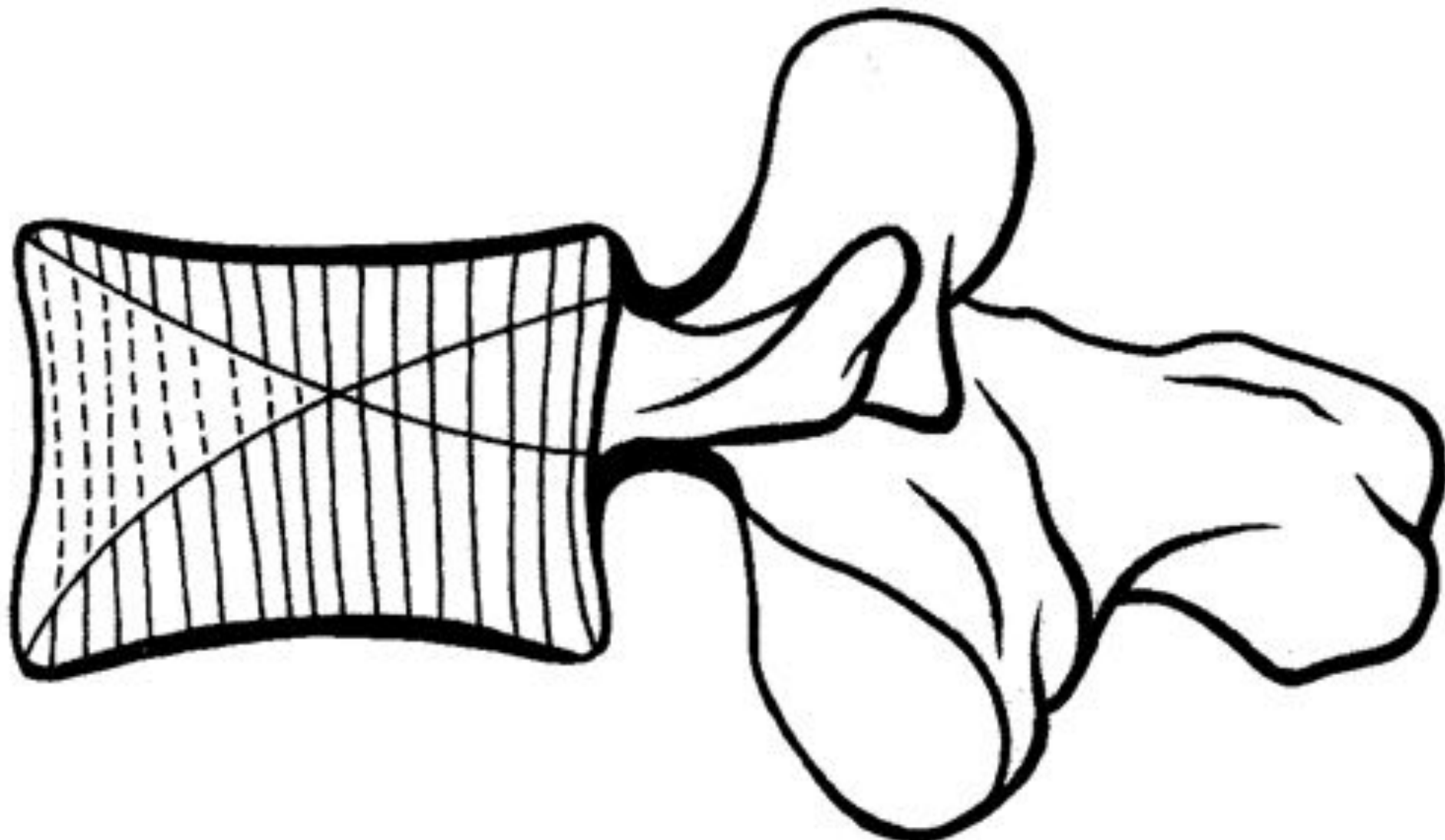


"FISH VERTEBRAE"

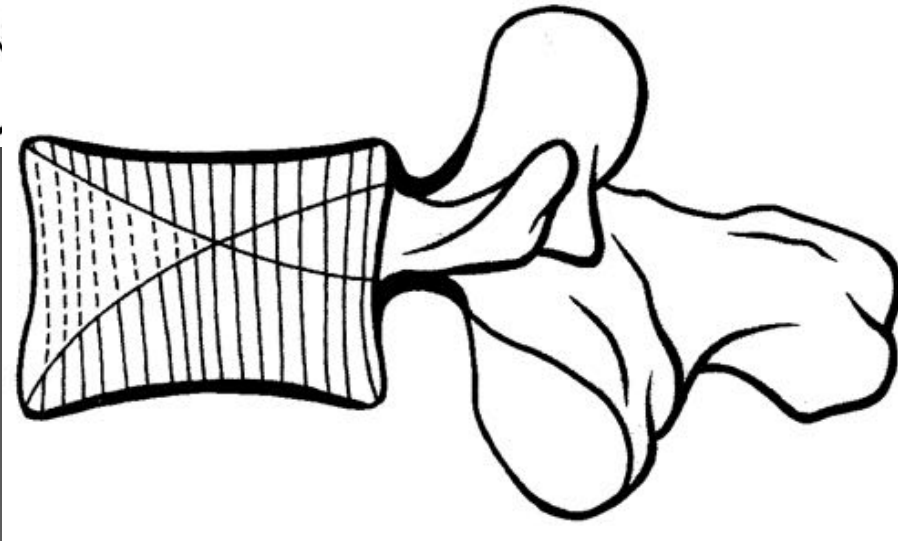
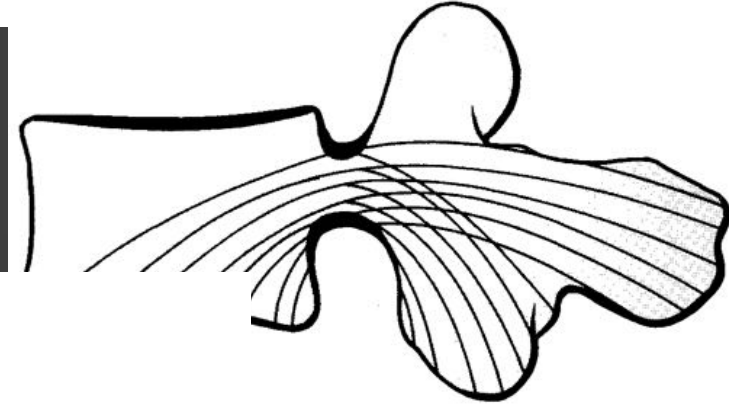
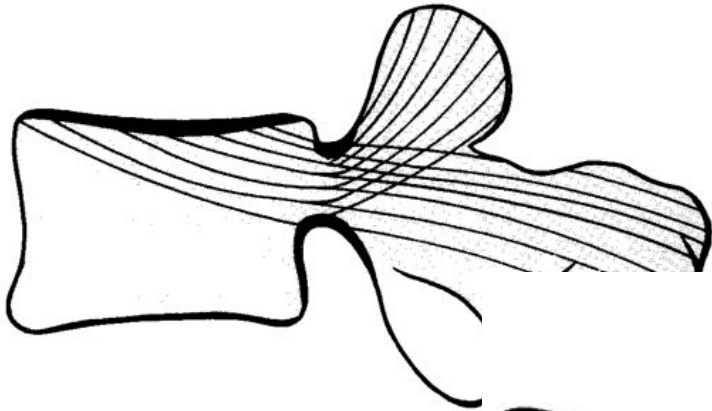
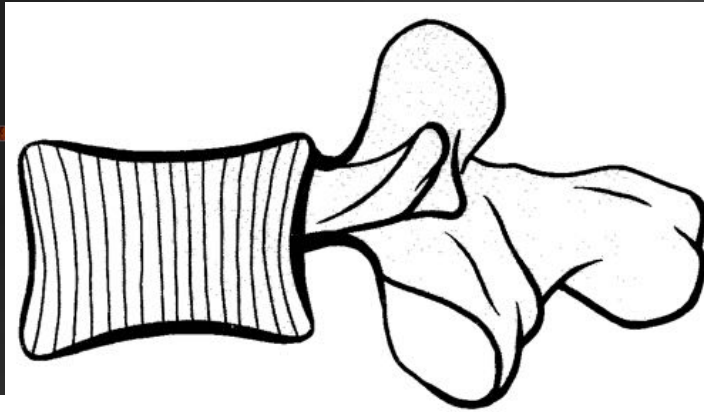




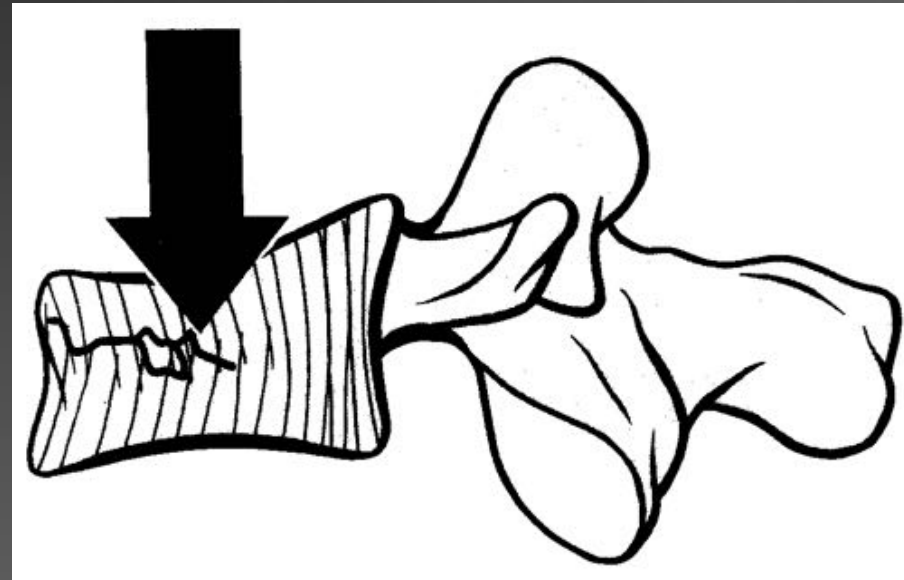
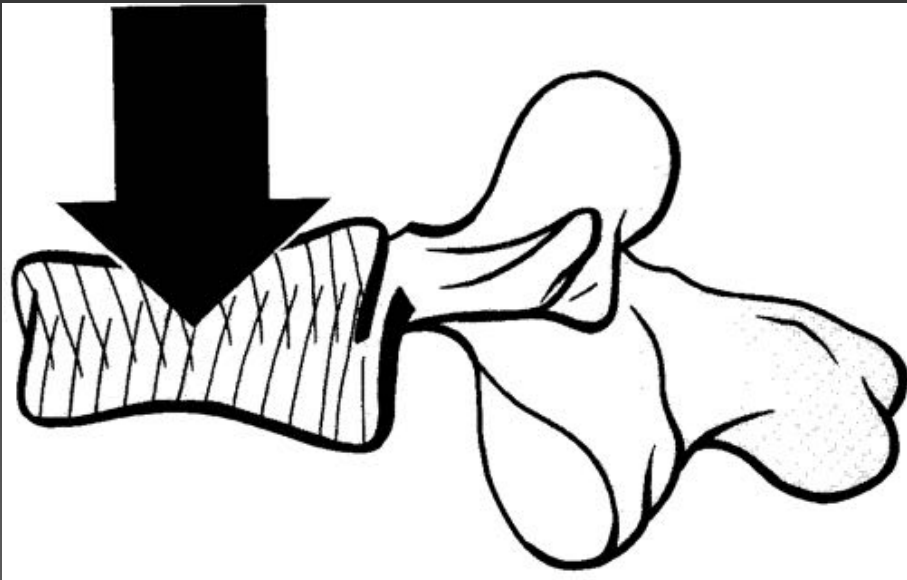
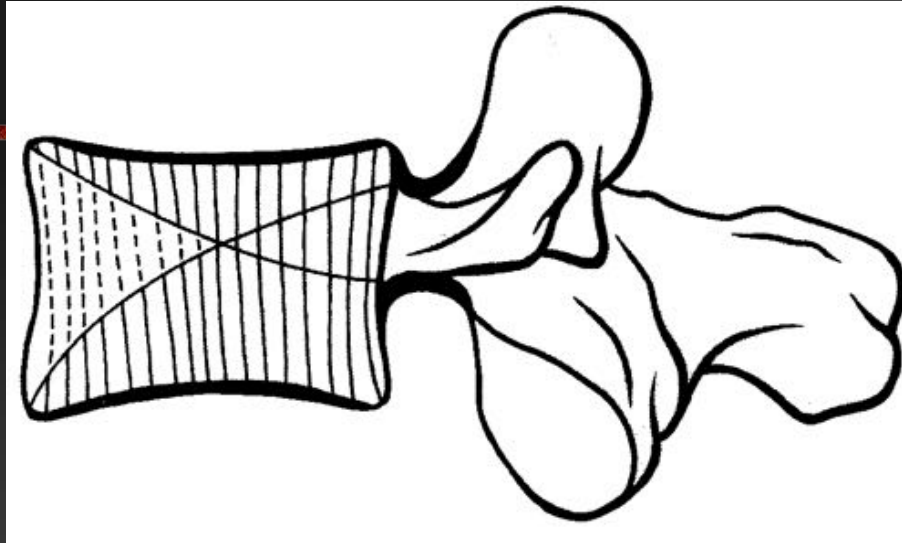




COMPRESSION FRACTURES



COMPRESSION FRACTURES



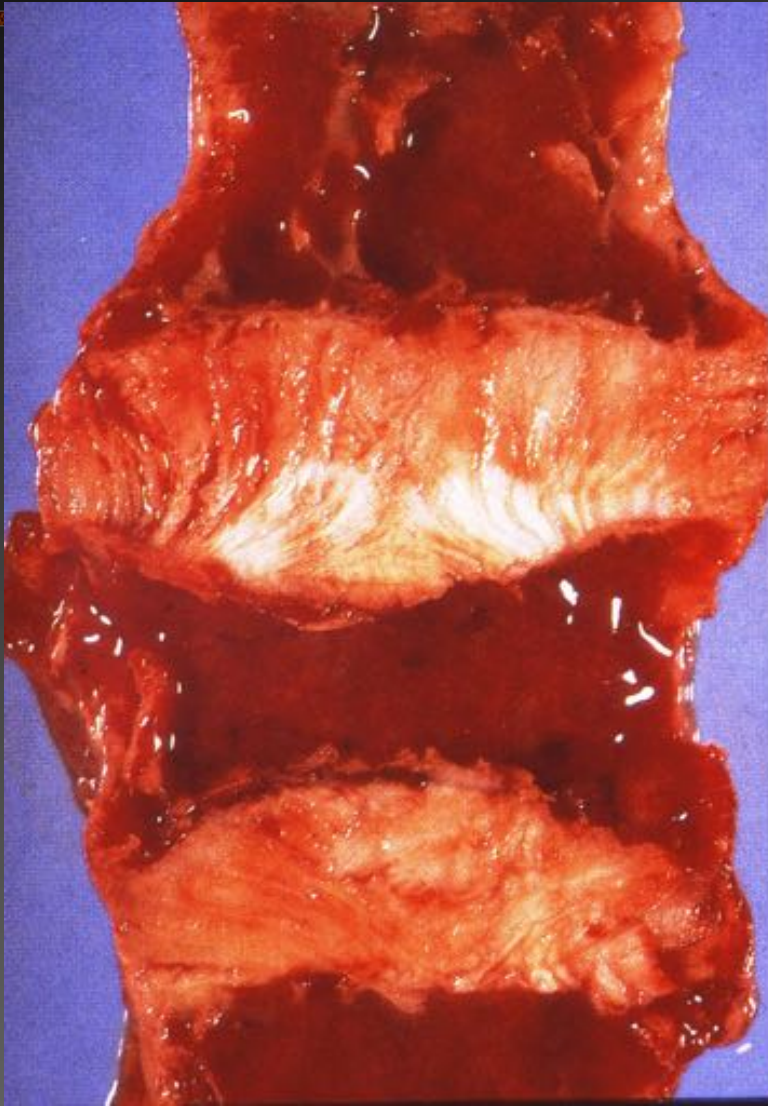


PATHOLOGICAL COMPRESSION FRACTURE

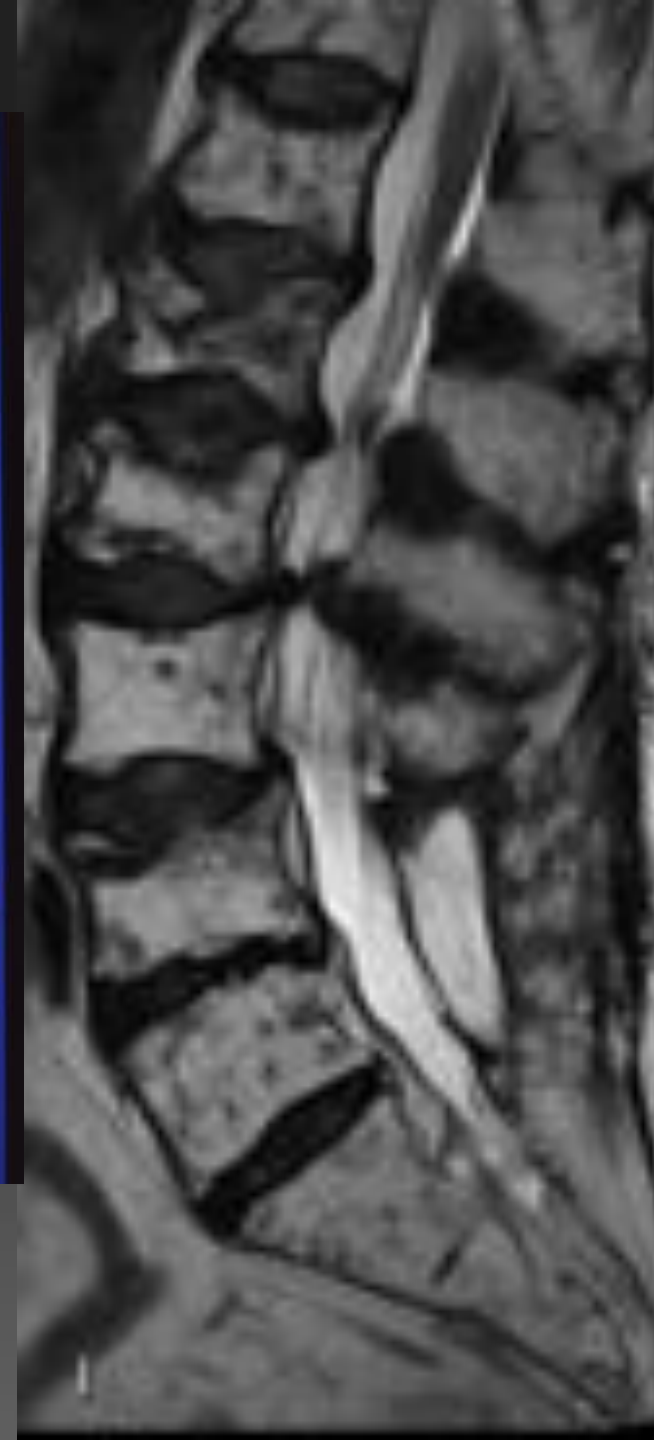
- OSTEOPOROSIS
- METASTATIC CARCINOMA
- MULTIPLE MYELOMA

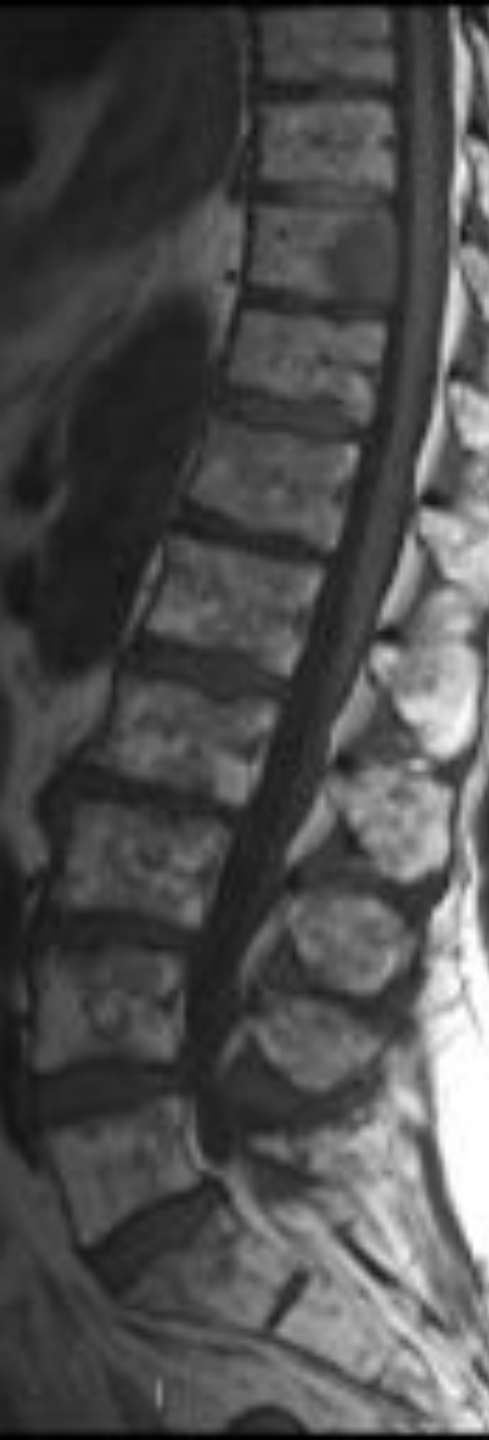


MALIGNANT



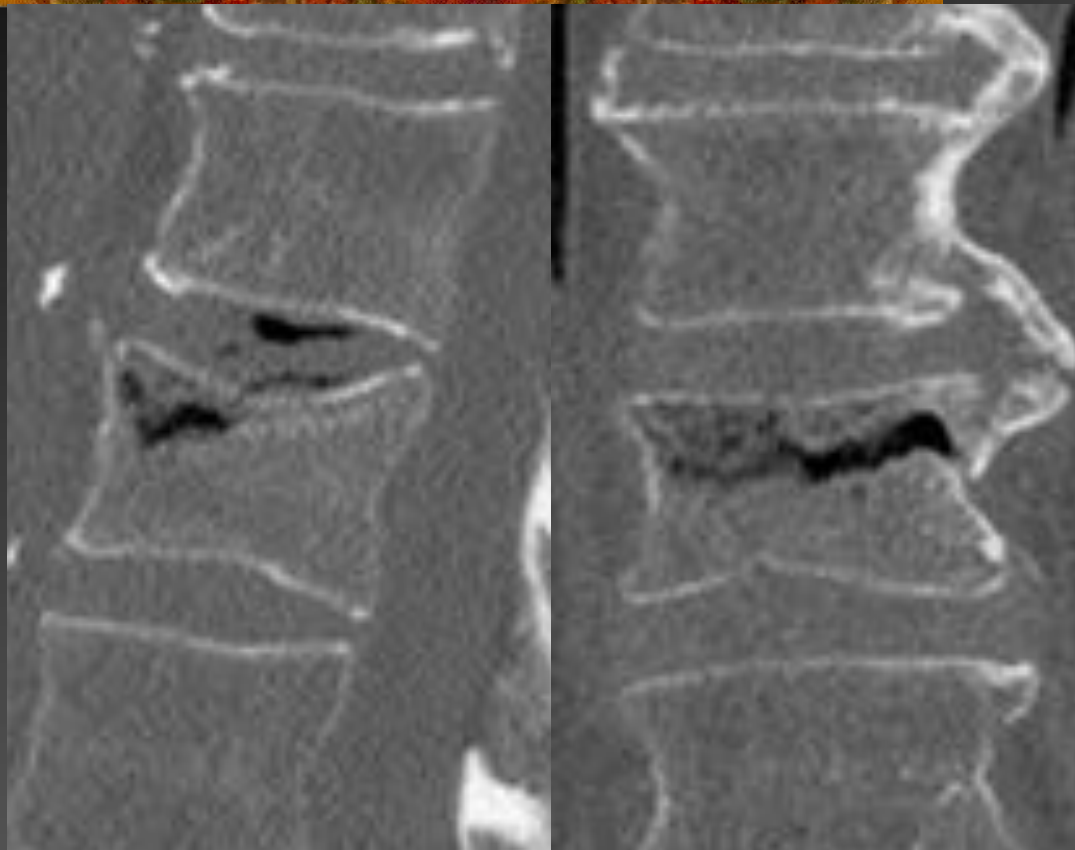








INTRAVERTEBRAL VACUUM CLEFT SIGN



NUCLEAR IMPRESSION

End plate variation

Lumbar spine most common

No clinical significance

IMAGING FEATURES

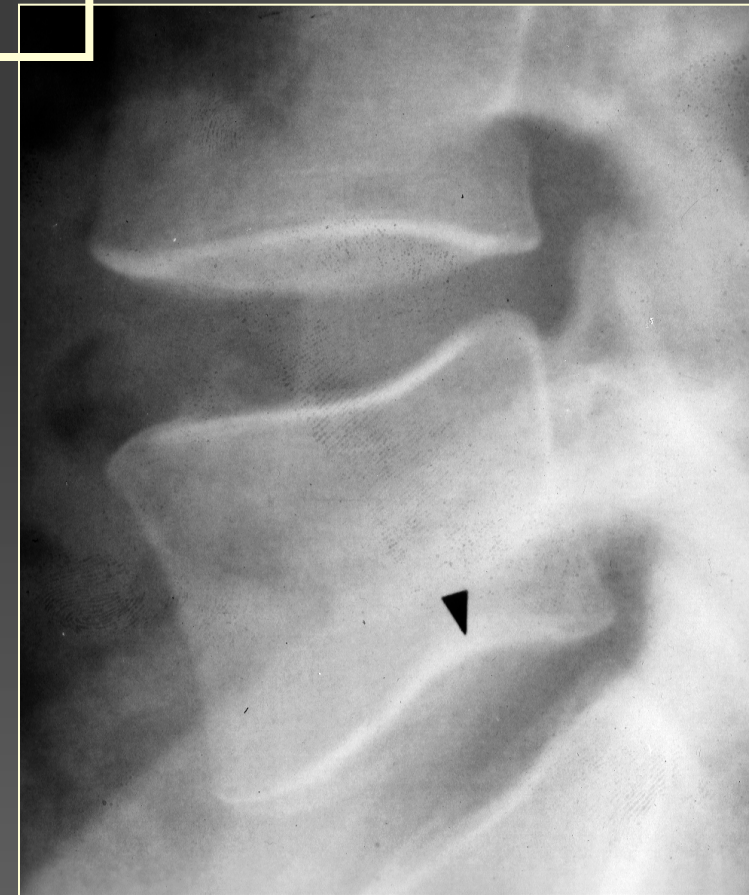
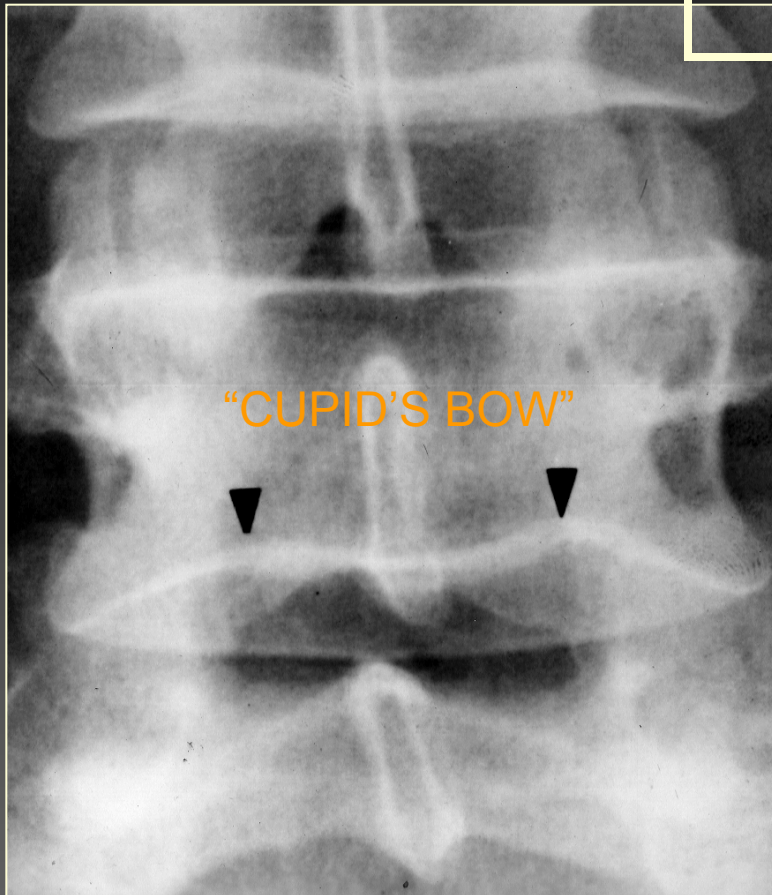
“Cupid’s bow” on AP

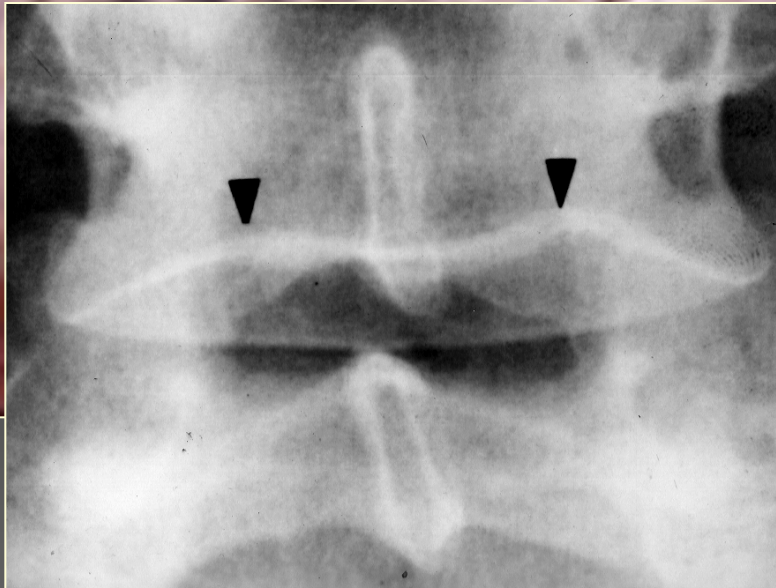
Broad sweep on lateral

Differentiate from pathology

Schmorl’s nodes

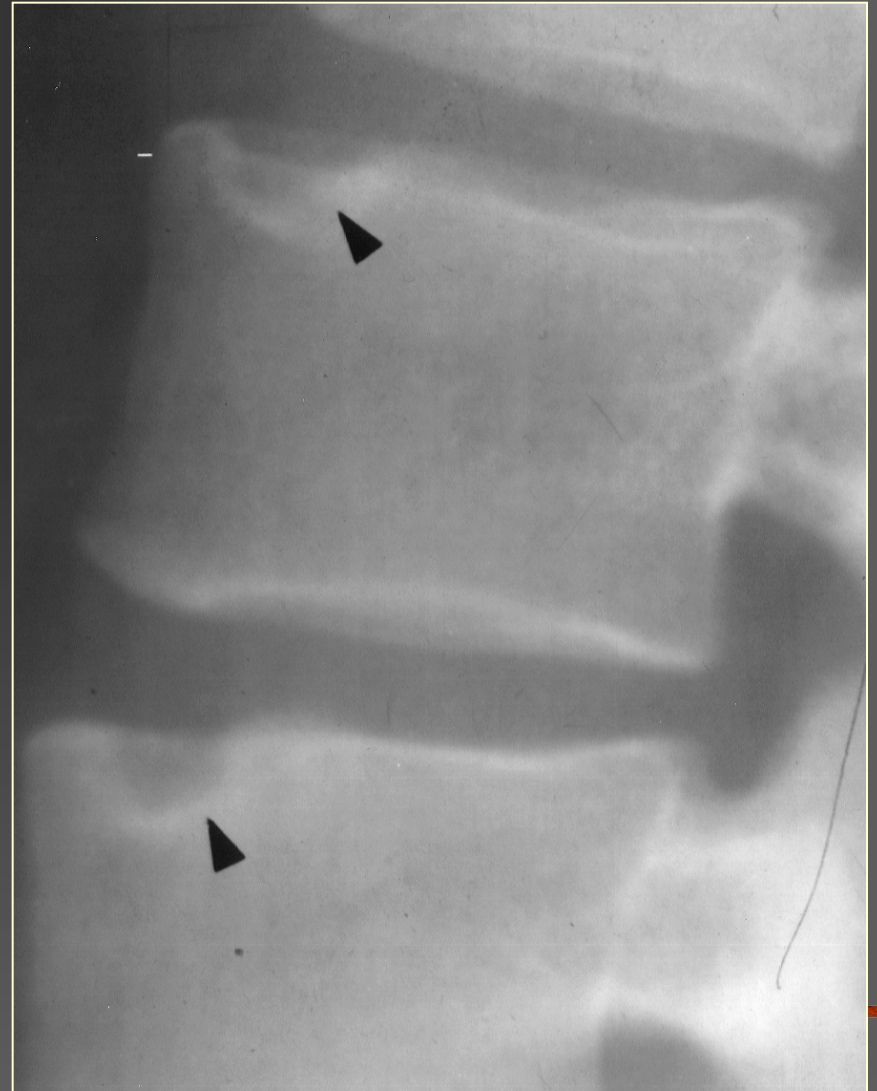
Osteoporosis





SCHMORL'S NODES

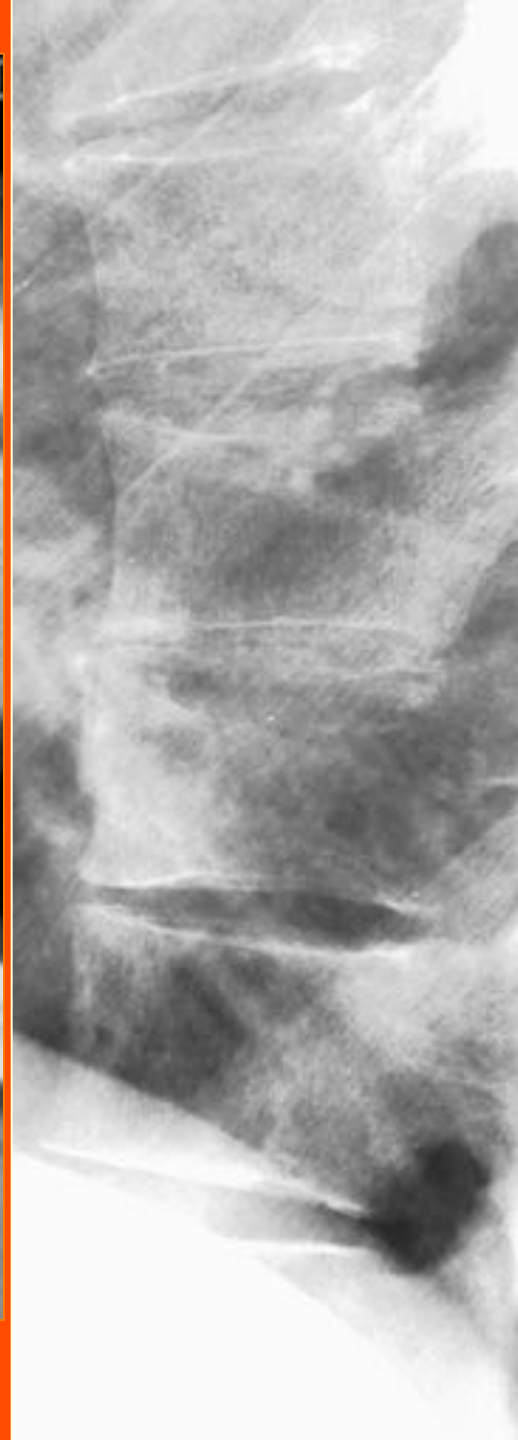
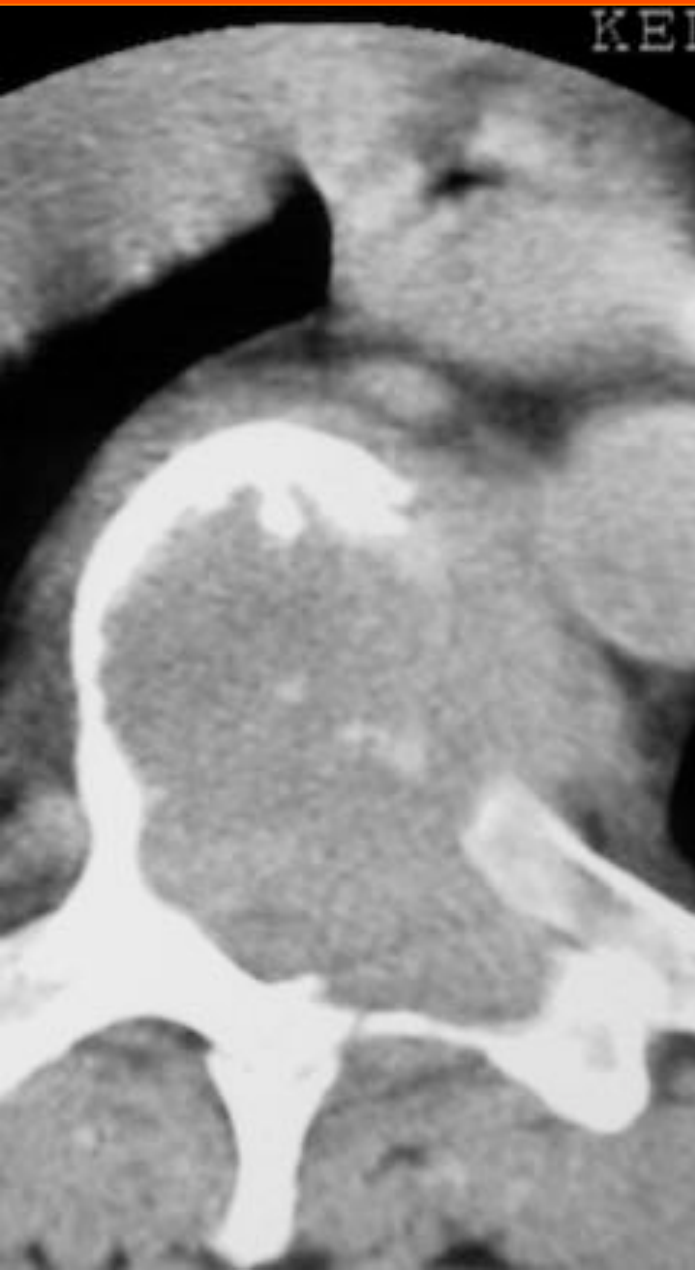
- Focal intrabody disc herniation
- May be symptomatic
adolescence
“hot” bone scan
edema on MRI
- Altered body shape
elongated
flattened
irregular plates

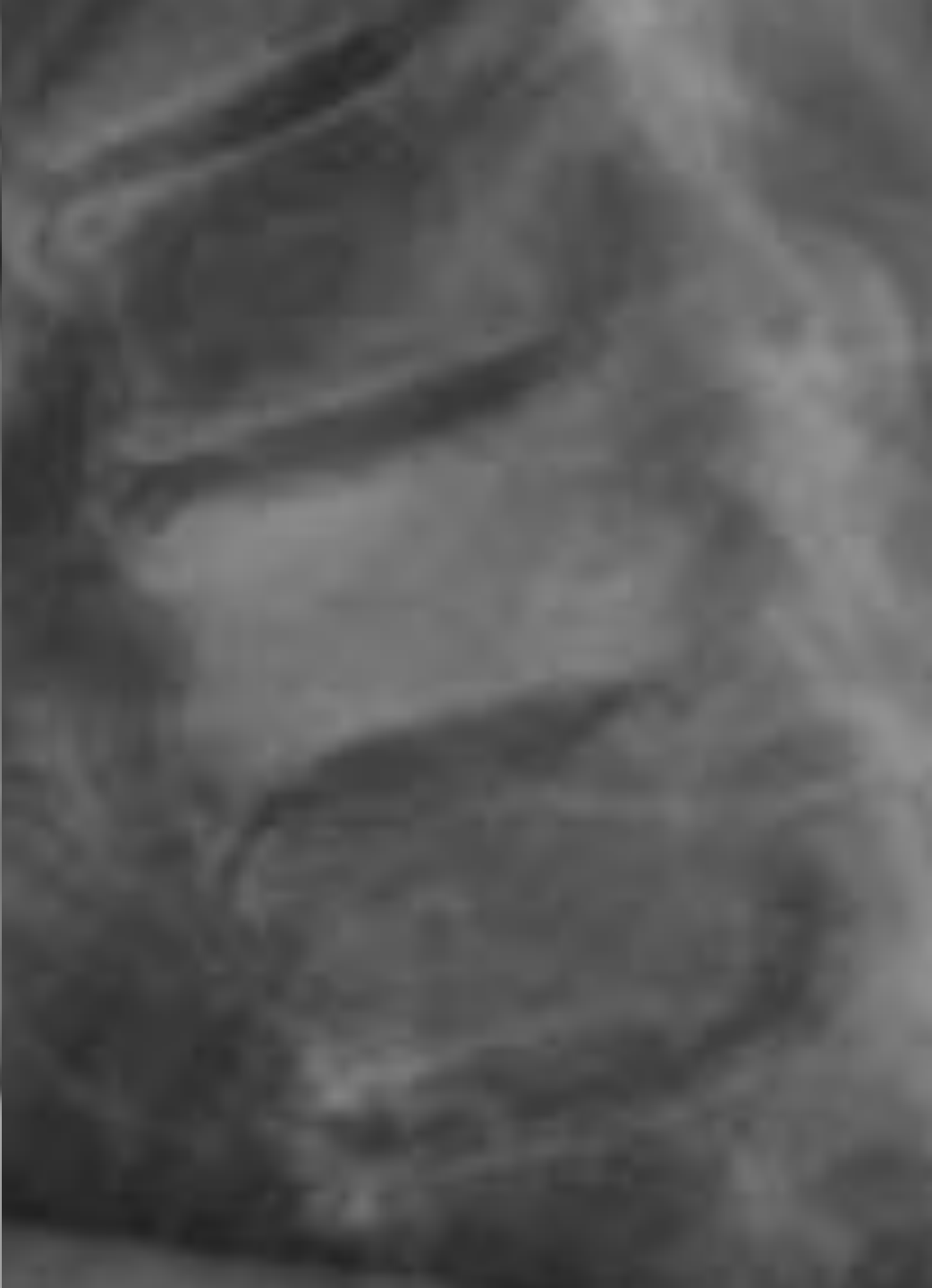




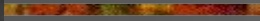
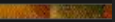


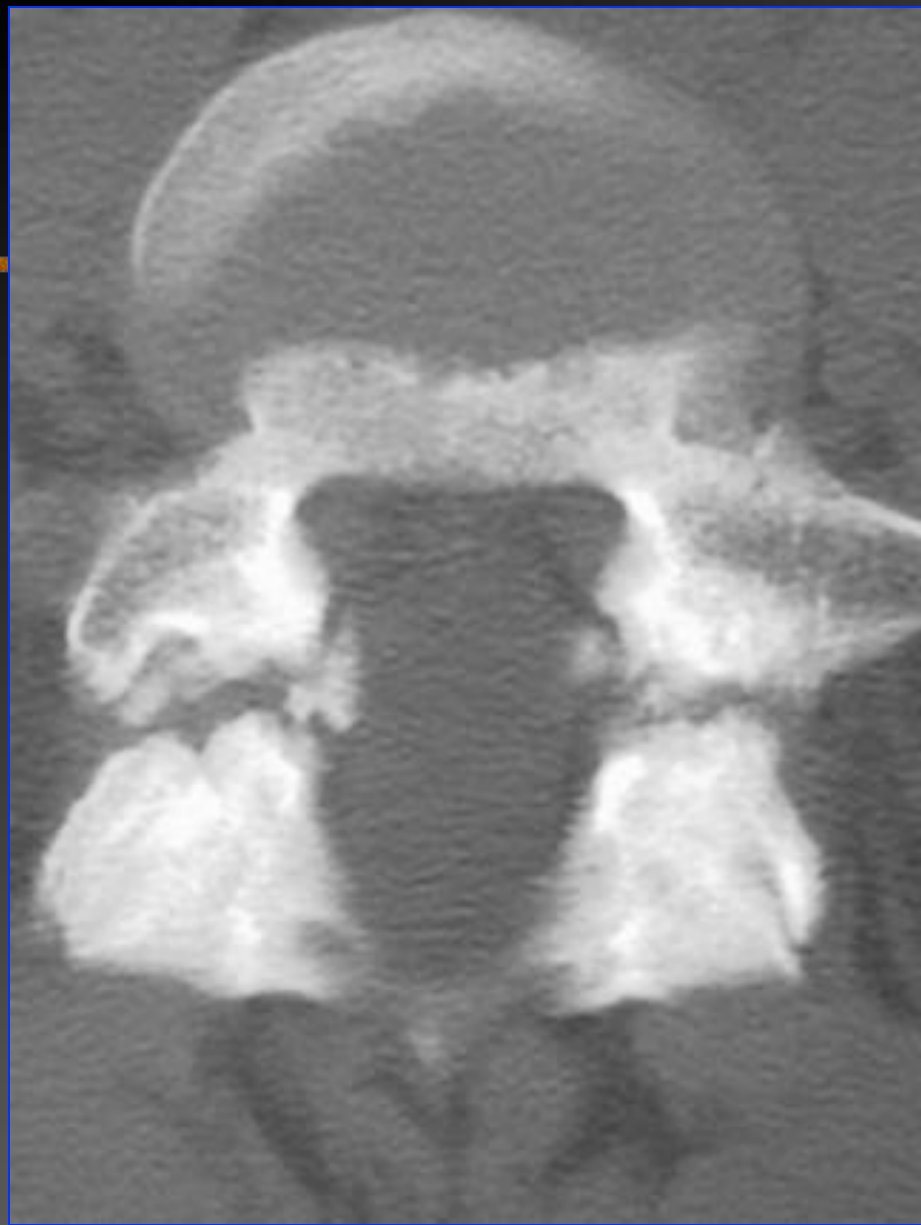






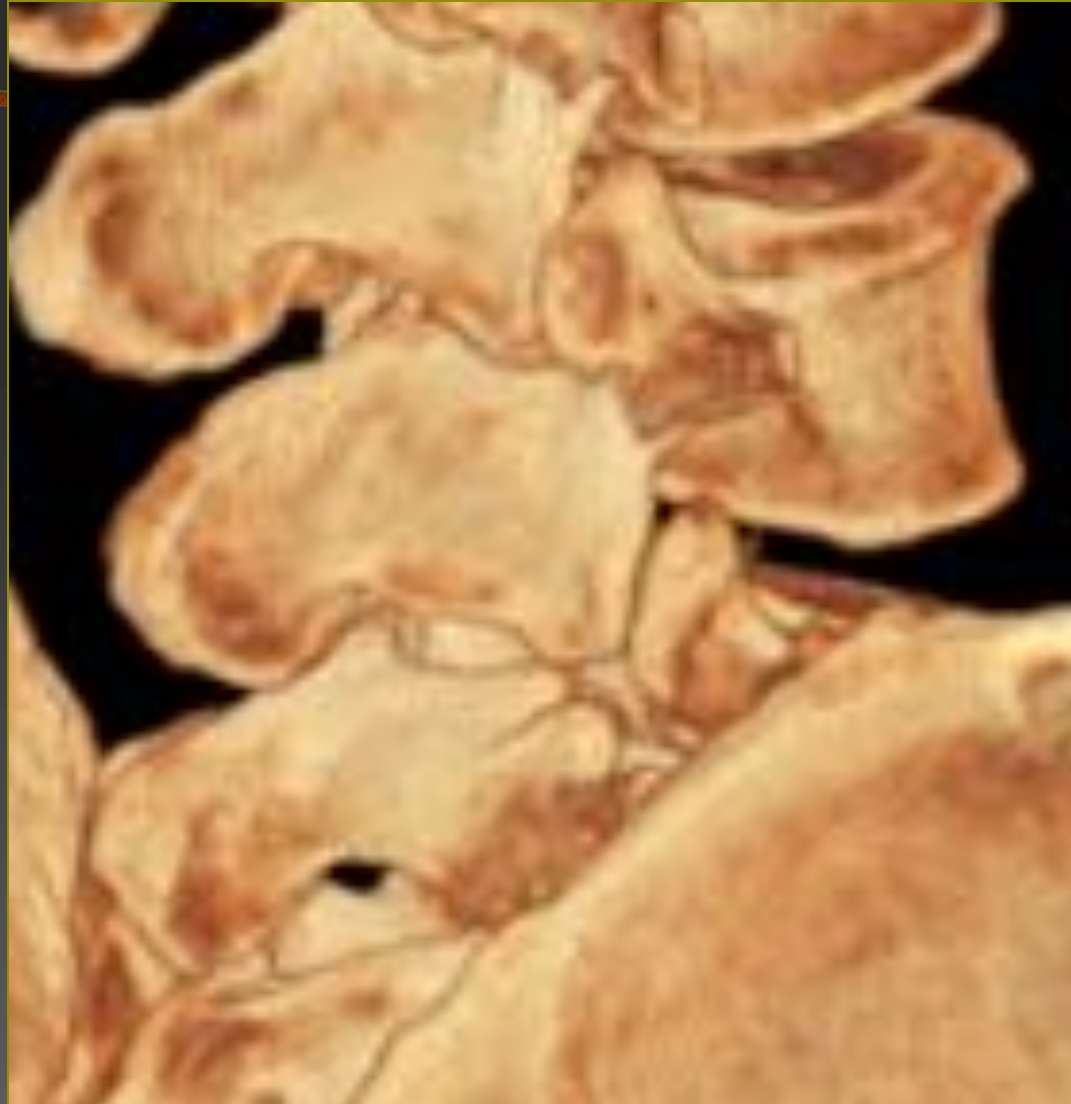






NEWMAN CLASSIFICATION

- I: DYSPLASTIC
- II: ISTHMIC
- III: DEGENERATIVE
- IV: TRAUMATIC
- V: PATHOLOGICAL
- (VI: ACQUISISTA)



I. DYSPLASTIC

■ DEFINITION

- Congenital absence / hypoplasia of posterior elements

■ EPIDEMIOLOGY

- <1% of spondylolisthesis
- Females 5:1
- Characteristic posture / gait
- May develop “Spondylolisthetic crisis”

■ IMAGING

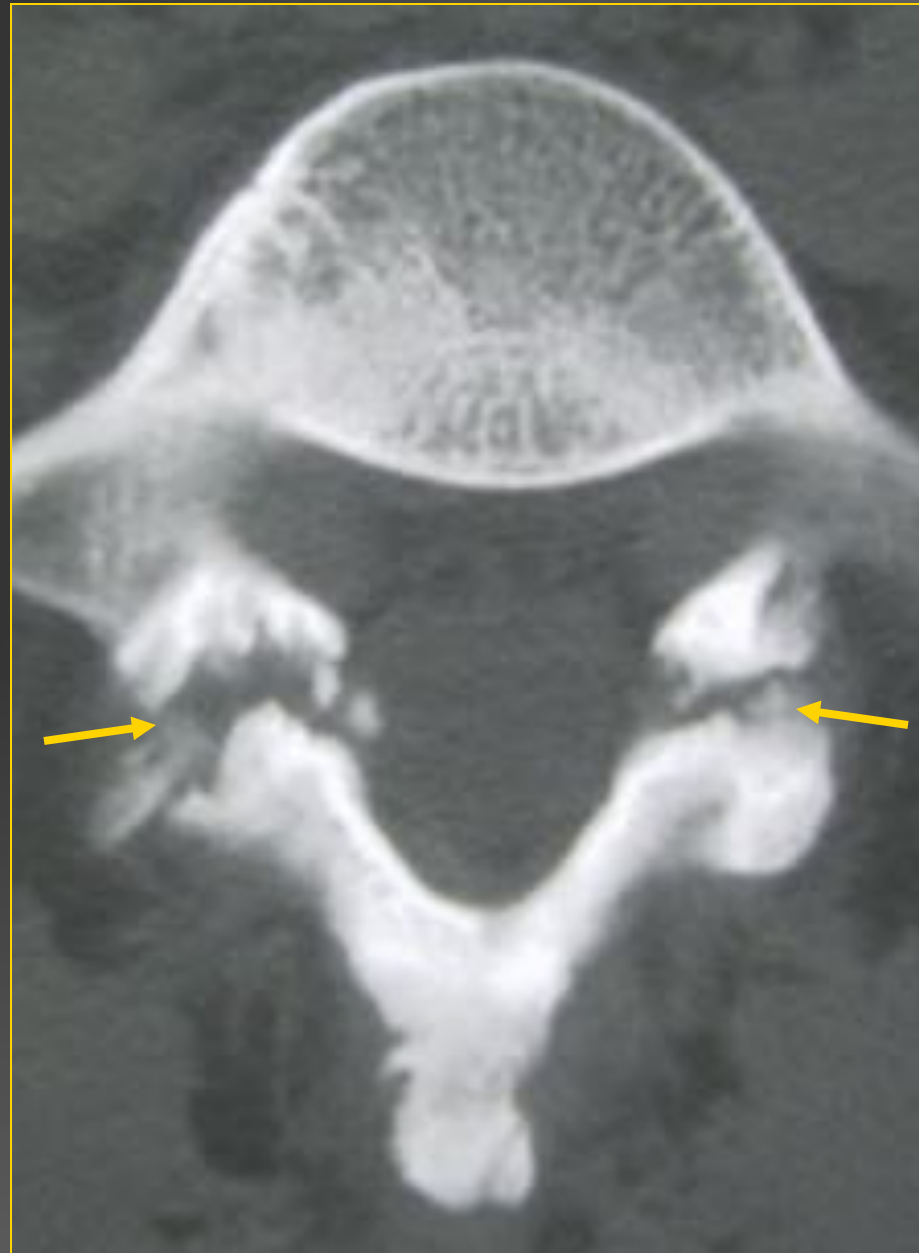
- Vertical sacrum
- “Domed” sacral base
- Trapezoid L5
- L5 Arch dysplasia
- Grade 3 or greater
- Wide range of motion (excessive—



IIA. ISTHMIC

■ DEFINITION

- Defect in the pars interarticularis
 - Type A: unhealed stress fracture
 - Type B: healed elongated pars
 - Type C: acute traumatic fracture



III. DEGENERATIVE

■ DEFINITION

- Facet arthrosis with remodelling of the joint surfaces and articular processes

■ EPIDEMIOLOGY

- L4
- Over 40 years
- Females 4:1

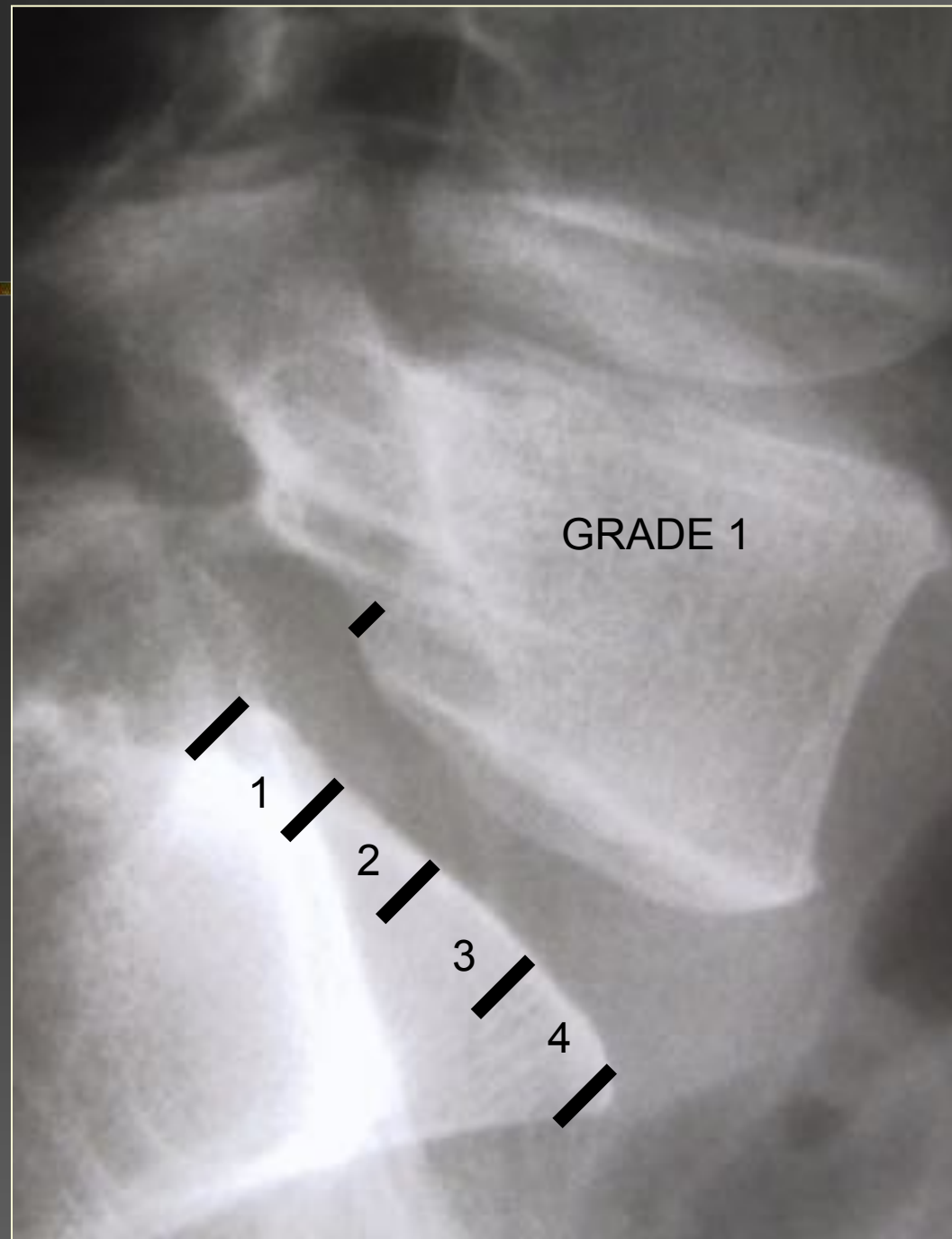


MYERDING CLASSIFICATION

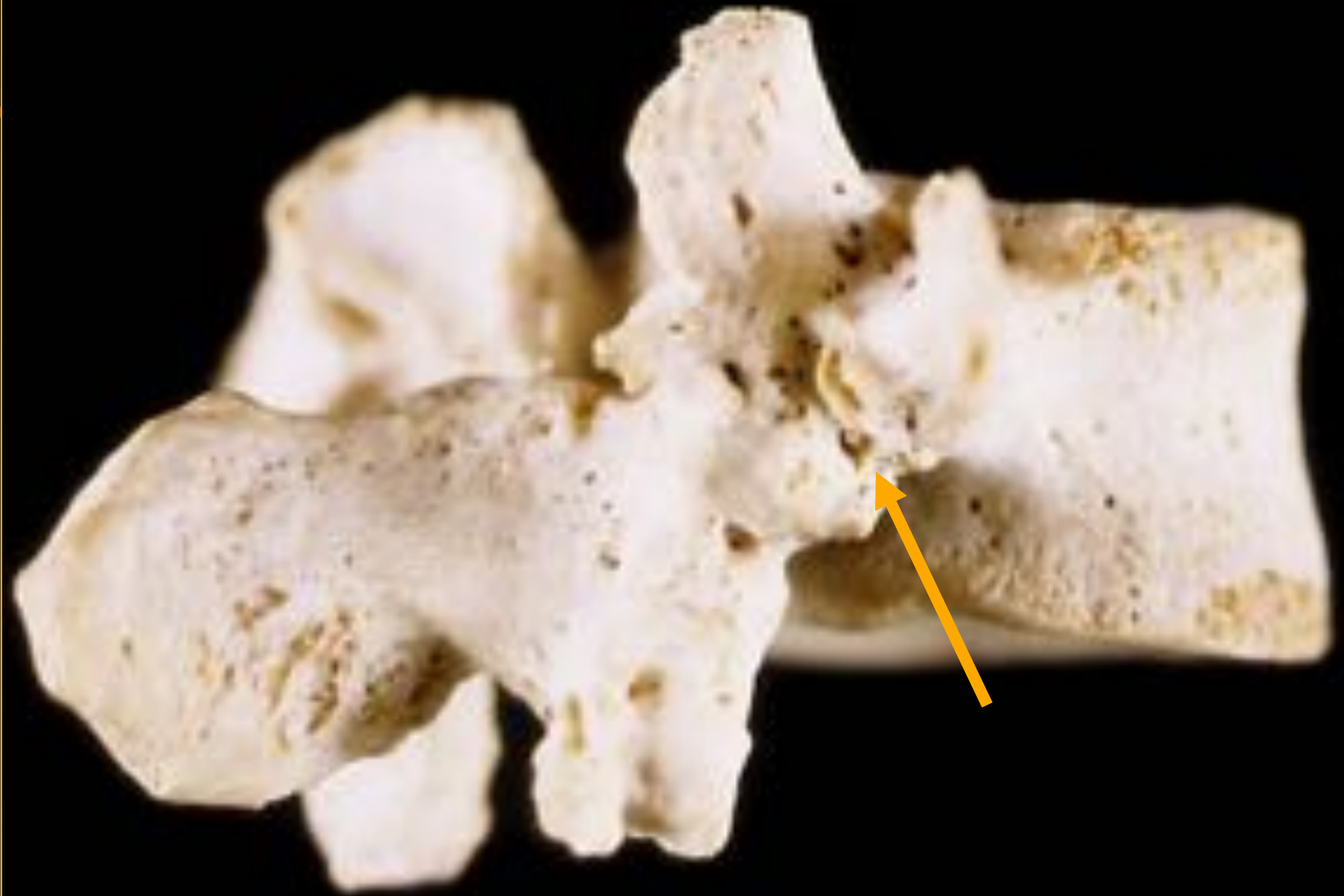
Graded 1-4

Divide the sacral base into 4

Relate the L5 posterior body

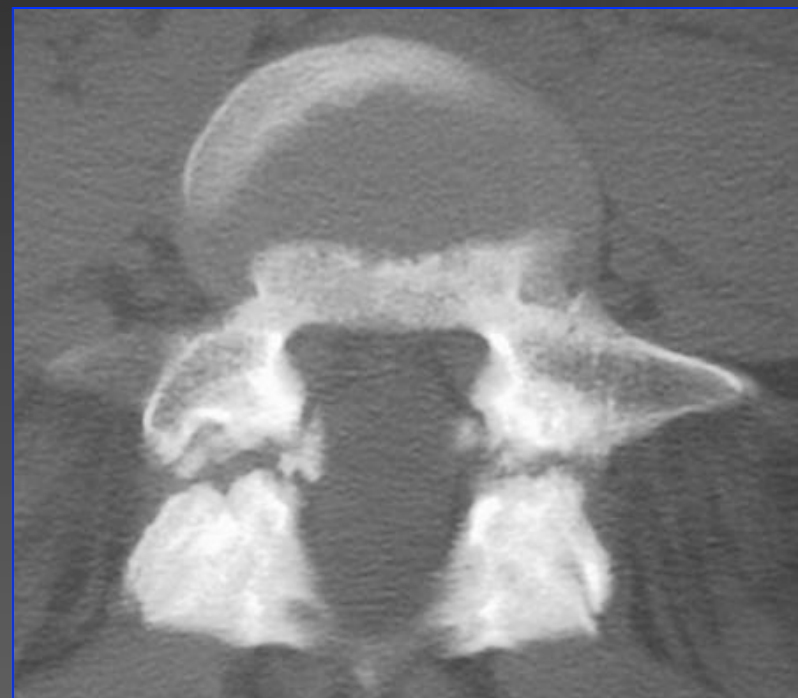
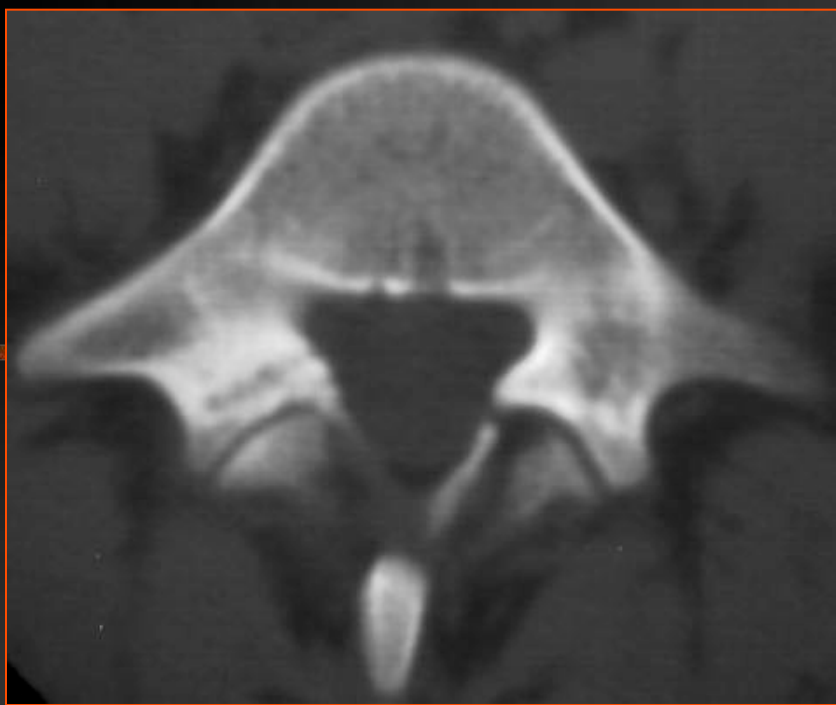


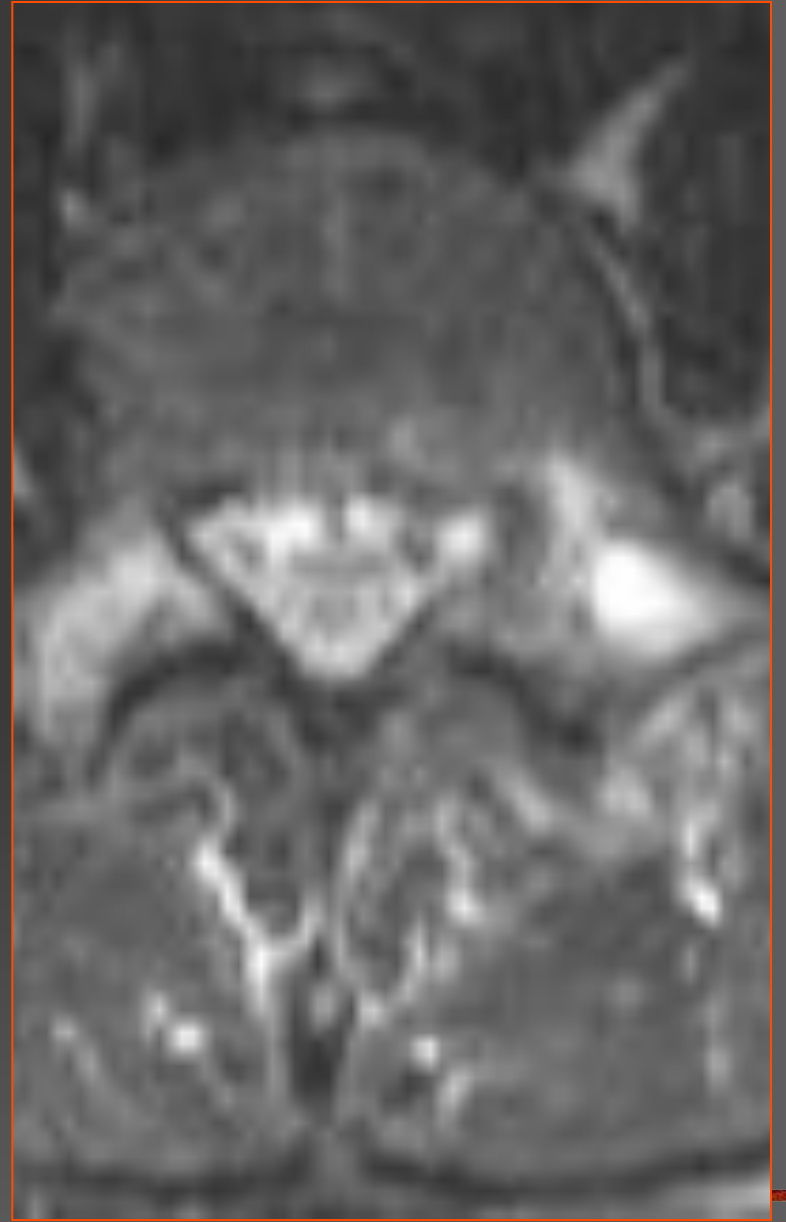
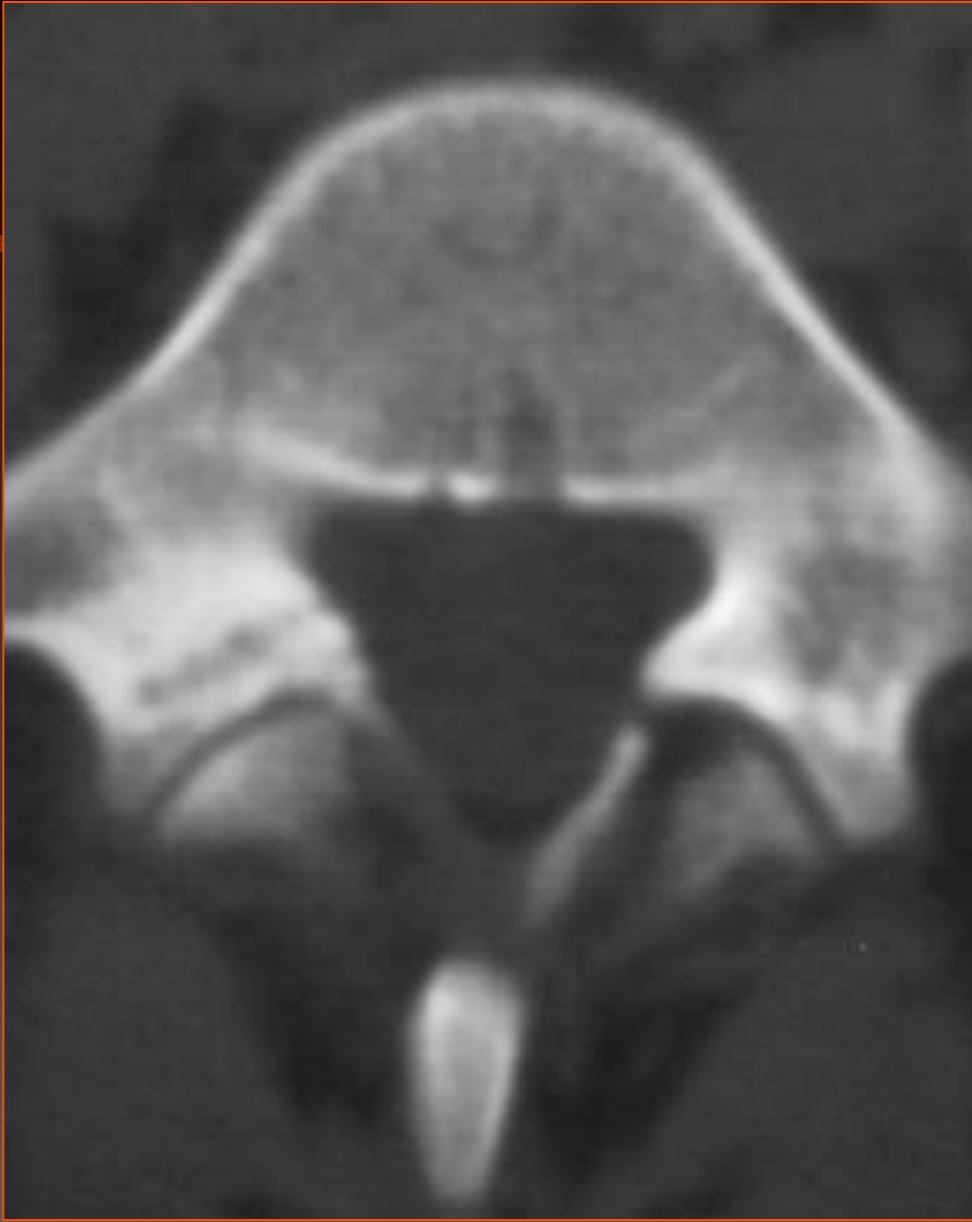
THE DEFECT - SPONDYLOLYSIS

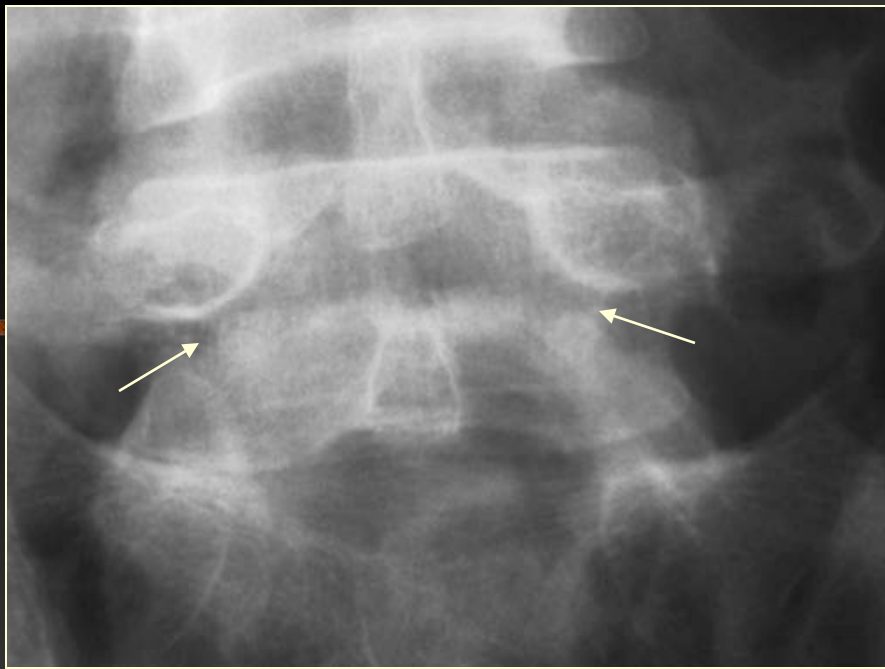


A 110
I 12

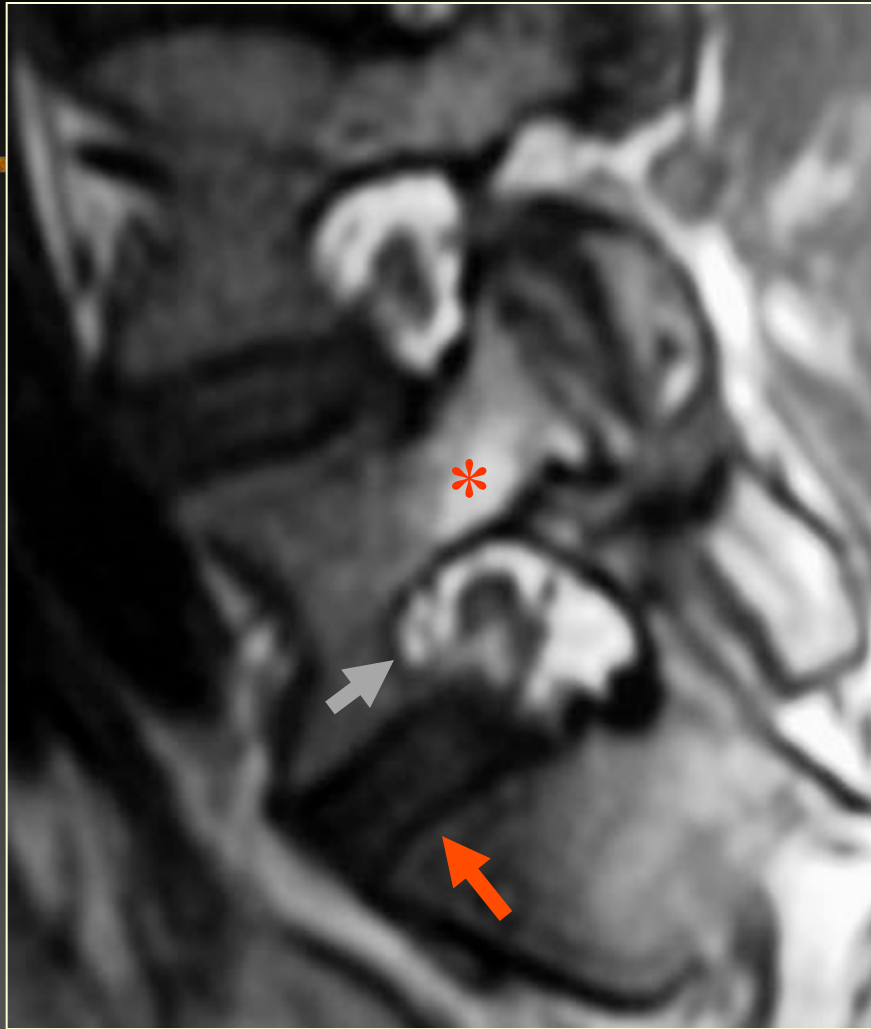
V 140
A 223
I 1.50







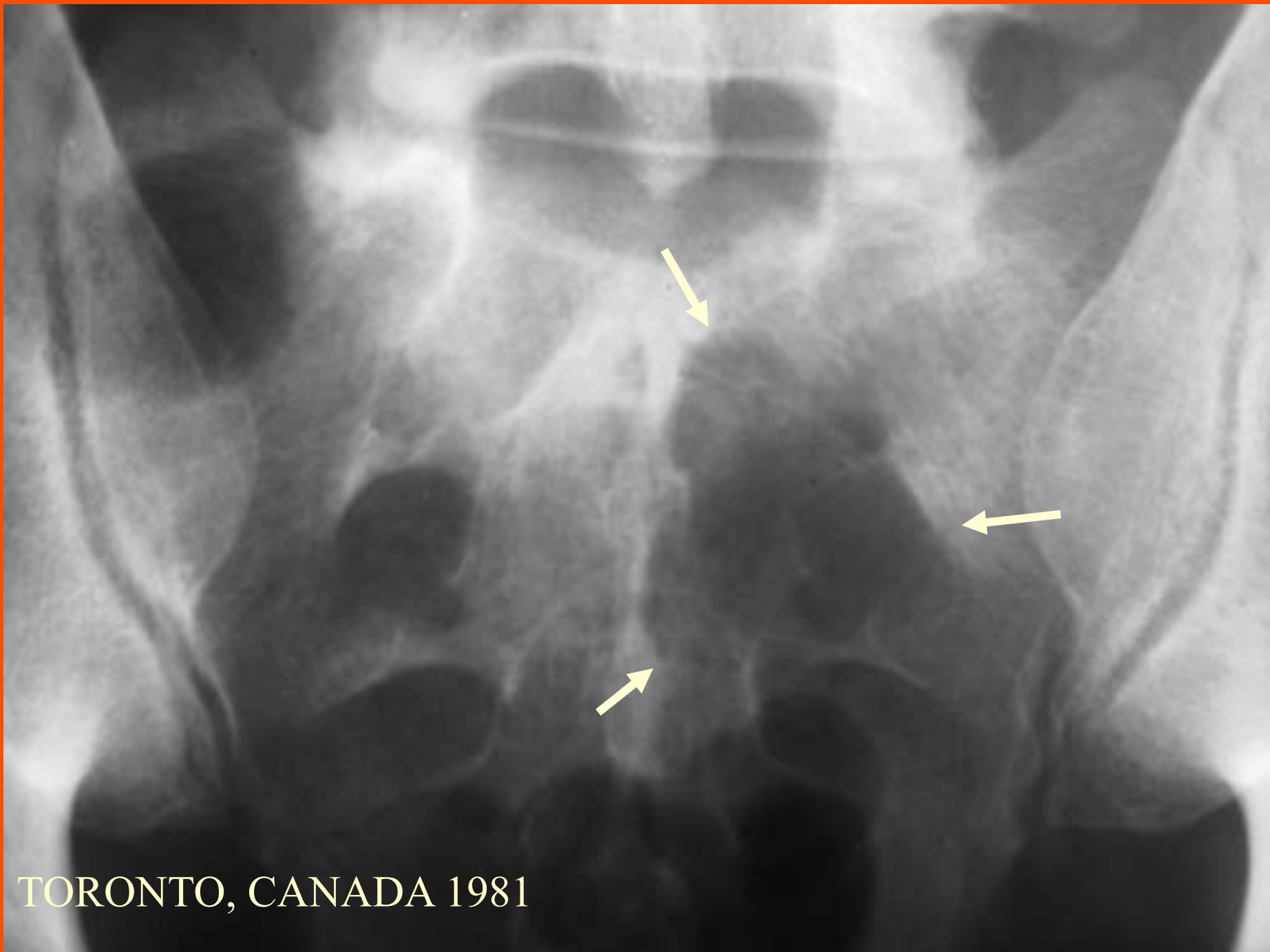




L5 DISC NORMAL



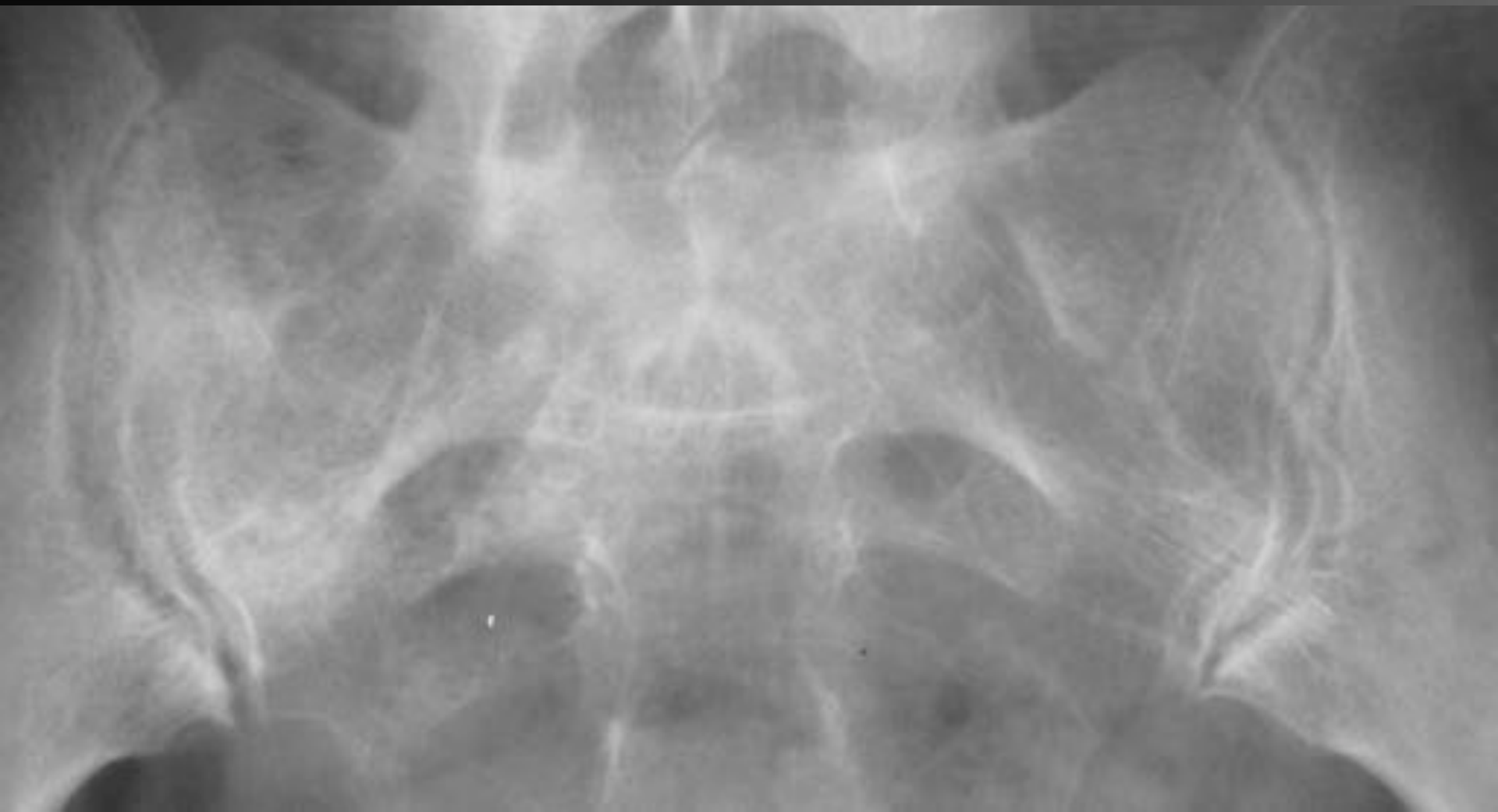
L5 DISC COLLAPSED

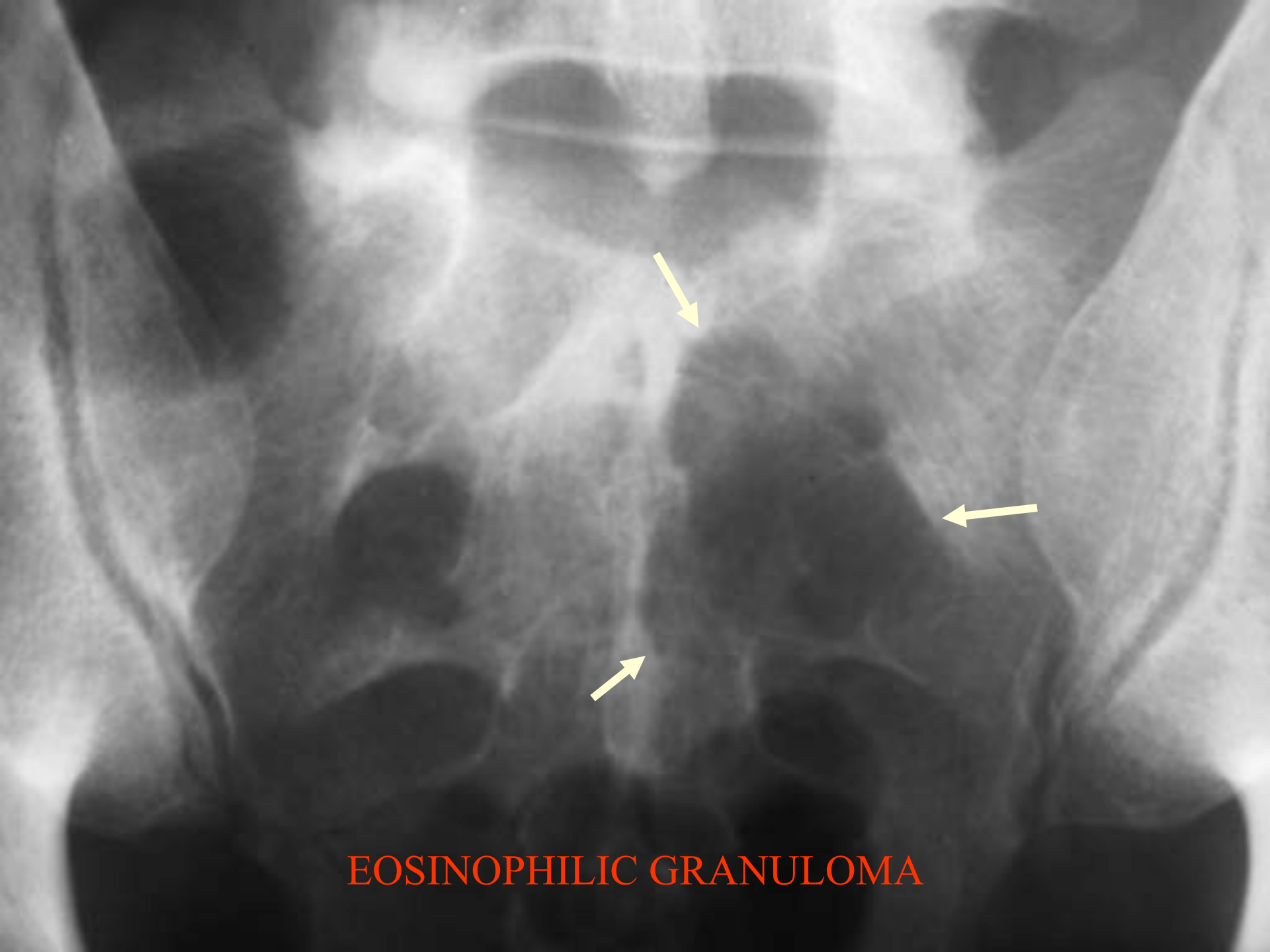


TORONTO, CANADA 1981

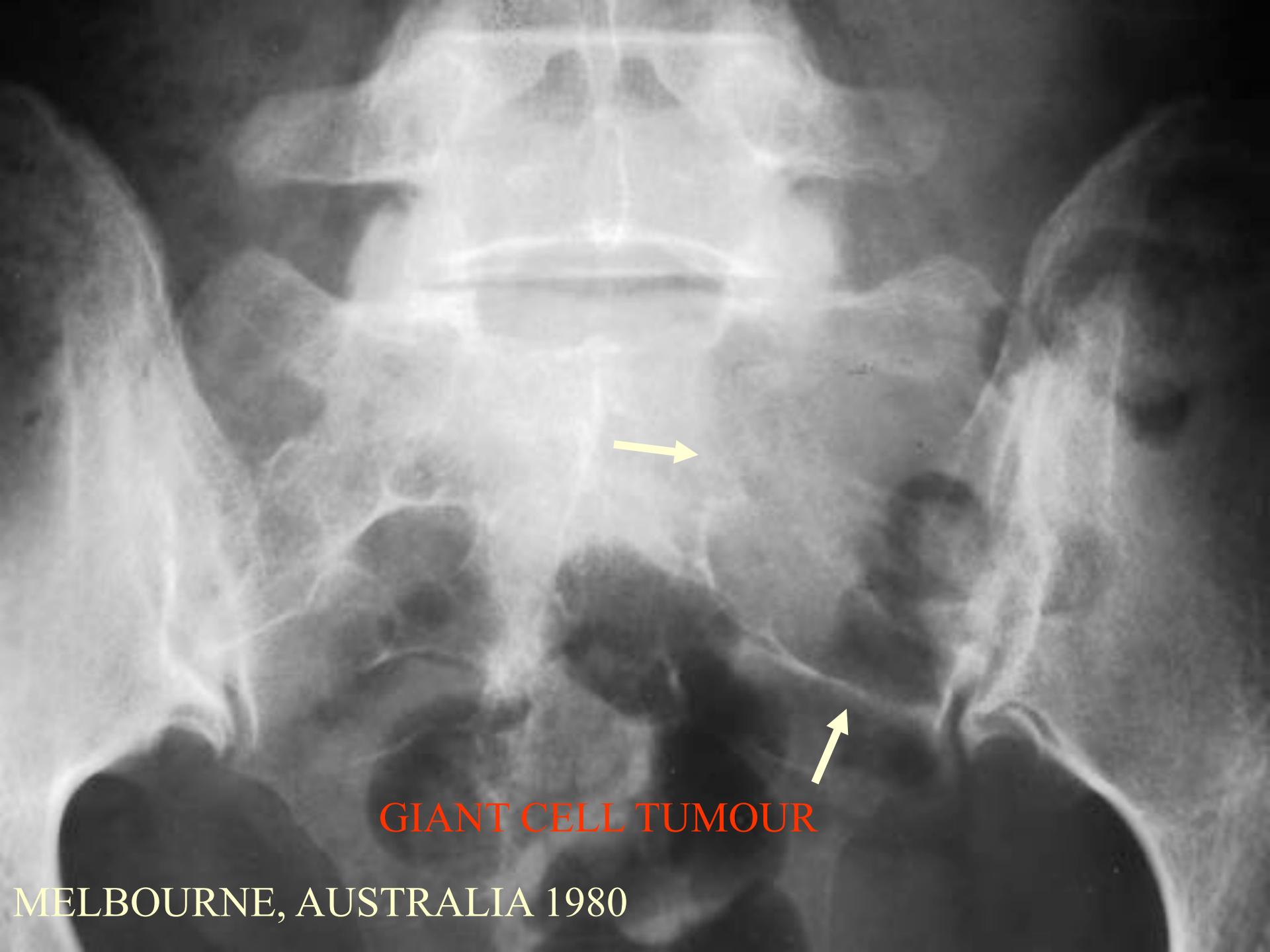
FORAMINAL LINES







EOSINOPHILIC GRANULOMA



GIANT CELL TUMOUR

MELBOURNE, AUSTRALIA 1980



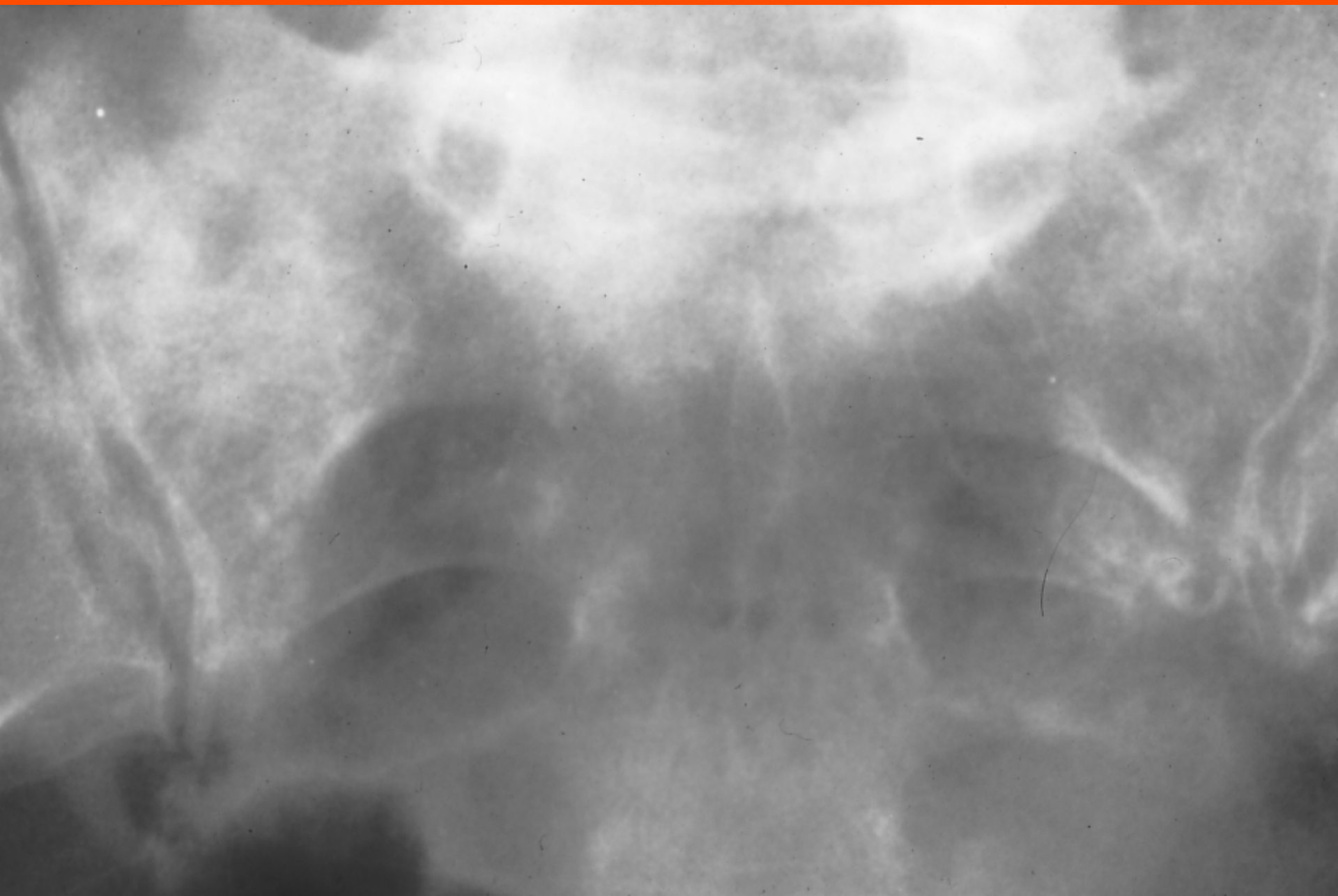
SAN DIEGO, USA 1999

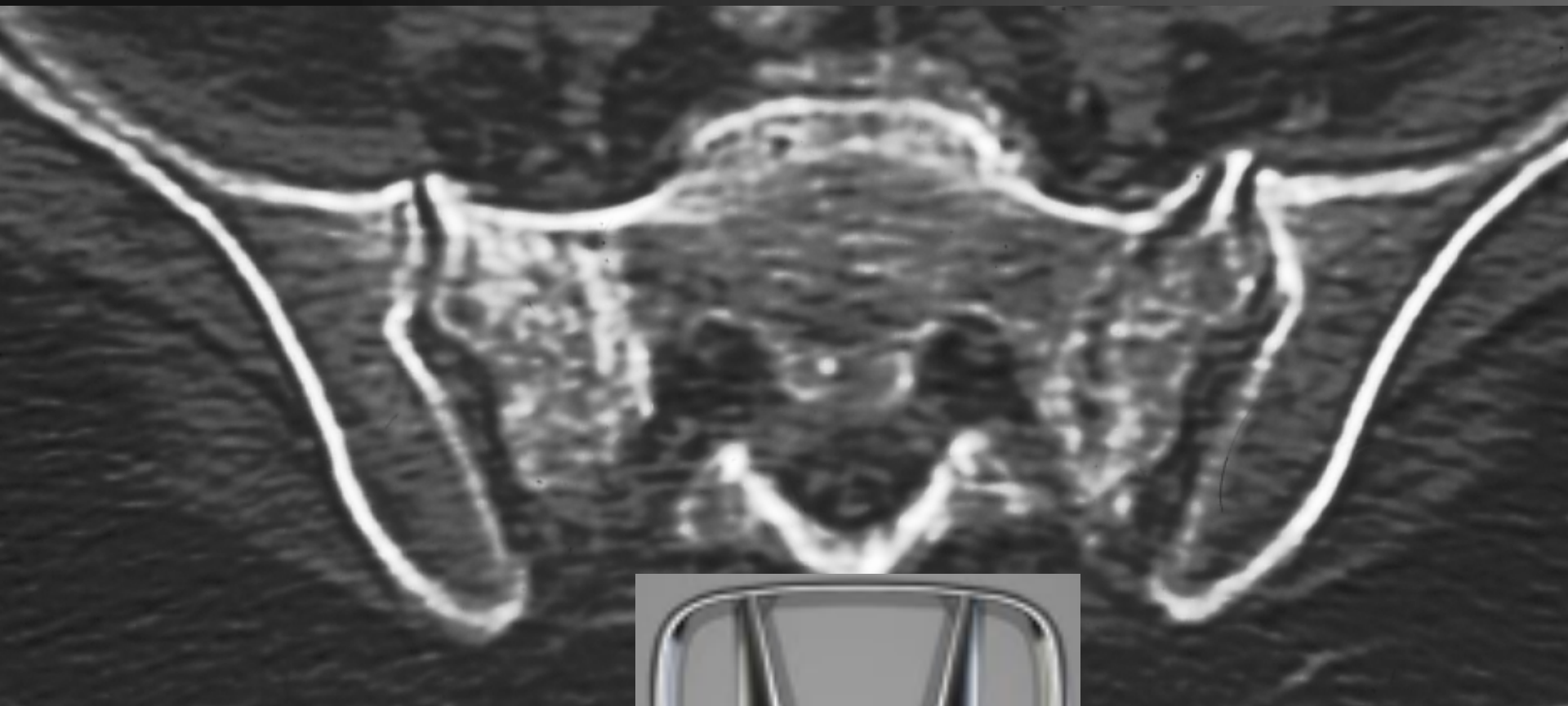


SACROILIITIS

- **ARTICULAR CORTEX**
 - BLURRED TO COMPLETE LOSS
 - MARKED EROSIONS
- **JOINT SPACE**
 - WIDENED TO NARROWED
 - SOME ANKYLOSIS
- **SUBCHONDRAL BONE DENSITY**
 - PROMINENT SCLEROSIS









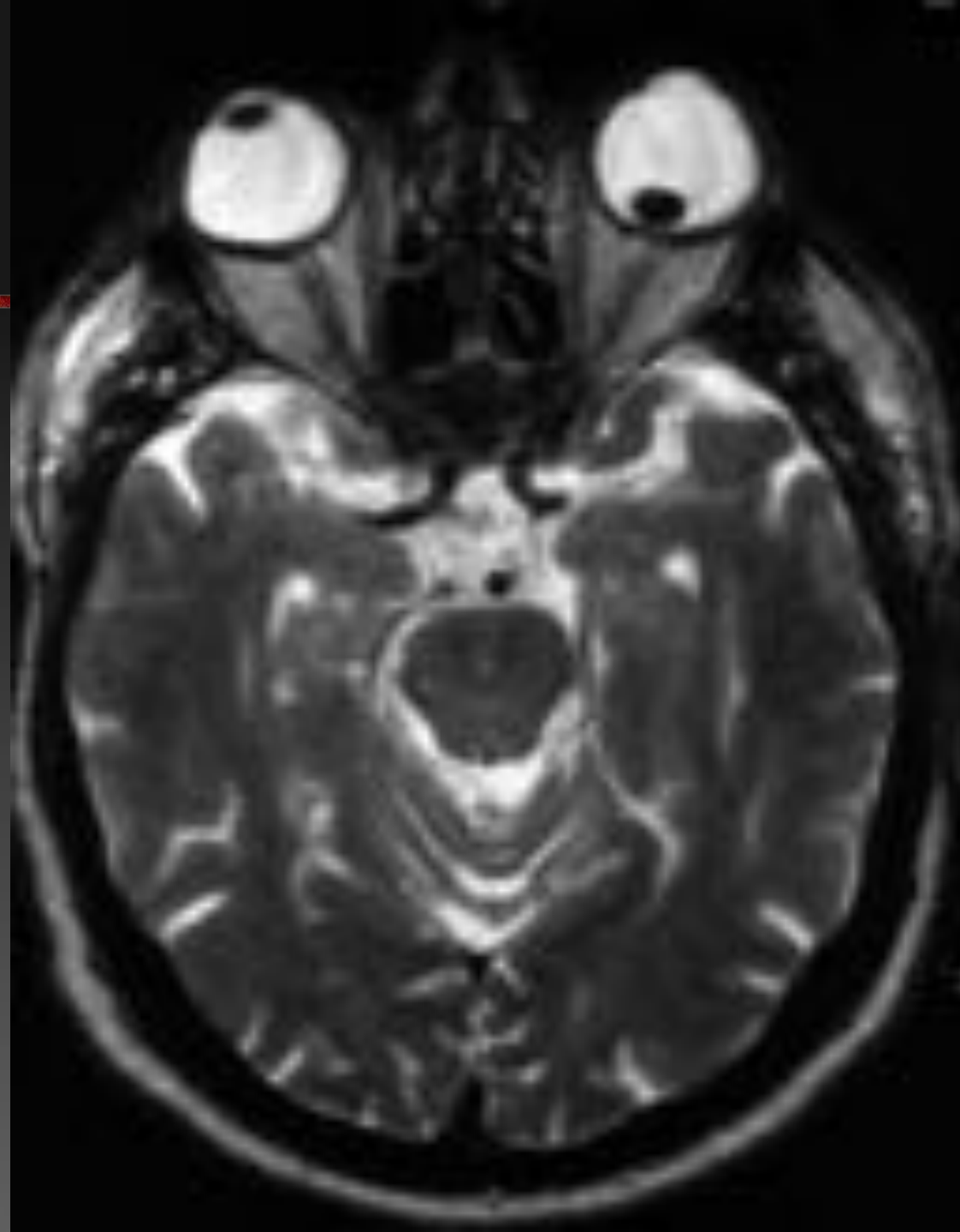
INSUFFICIENCY FRACTURES

IMAGING FEATURES

■ MR

- T1
 - Marrow intermediate
 - Low signal fracture line
- T2
 - Marrow intermediate to high
 - Low signal fracture line
 - High signal in fracture zone
- T2 FS
 - High marrow signal
- STIR
 - High marrow signal
- - Enhancement
 - Often “flare” enhancement





THE RADIOLOGIST.....

The goal of imaging is to provide a picture that makes a diagnosis and impacts on therapy without saying a word.

THE CLINICIAN.....

Imaging is like a partner – sometimes helpful sometimes not!

PROF BILL KIRKALDY-WILLIS 1982

ORTHOPEDIC SURGEON

