
# Interhospital Conference

# Identification Data

- Female  38 year
- HN 4152988
- Occupation : ขายกาแฟ
- Address : อำเภอเสริมงาม จังหวัดลำปาง
- สิทธิการรักษา : บัตรทอง
- Source of Data : ผู้ป่วย ญาติ และเวชระเบียน

# Chief complaint

กระดูกสะโพกซ้ายหัก 7 hr PTA

# Present illness

7 hr PTA สะดุดล้มบนพื้นราบ สะโพกซ้ายกระแทกพื้น ปวดบวมสะโพกซ้าย ลุกเดินไม่ได้ ขาซ้ายผิดรูป ไม่มีศีรษะกระแทกพื้น ไม่มีวูบหน้ามืด ตรวจพบกระดูกสะโพกซ้ายหัก จึงส่งตัวต่อมายัง รพ.มหาราชนครเชียงใหม่

# Present illness

ให้ประวัติแรกเกิดคลอดครบกำหนด ไม่มีปัญหาระหว่างตั้งครรภ์ มารดาคลอดเองตามธรรมชาติ หลังคลอดนอน รพ. 2คืน หลังออก รพ. อาการปกติ ดื่มนมได้ดี พัฒนาการสมวัย เดินได้ปกติดี การมองเห็นและการได้ยินปกติ ฟันขึ้นตามปกติ ไม่มีปัญหาฟันหลุด ไม่มีปัญหาด้านการเรียน มารดาสังเกตเห็นว่าตัวเล็กกว่าเพื่อนวัยเดียวกัน เวลาเข้าแถวที่โรงเรียนจะอยู่หัวแถวตลอด

ตอนอายุ 7ขวบ สะดุดล้มแขนกระแทกพื้น มีกระดูกหักที่แขนขวาหัก ไม่ได้ผ่าตัด จากนั้นก็มีกระดูกหักที่แขนซ้าย กระดูกไหปลาร้า ต้นขาขวาและอีกหลายที่ ทั้งหมดมากกว่า 10 ครั้ง ได้รับการผ่าตัดที่ต้นขาขวาและแขนซ้าย นอกนั้นไม่ได้รับการผ่าตัดผ่าตัด (ผู้ป่วยและมารดาจำระยะเวลาที่ชัดเจนไม่ได้)

# Present illness

4 yr PTA (อายุ 34ปี) เดินสะดุดล้มต้นขาซ้ายกระแทกพื้น ตรวจพบกระดูกต้นขาซ้ายหัก ได้นอนรพ. และรับการผ่าตัด แพทย์แจ้งว่าเป็นโรคกระดูกพรุน

7 hr PTA สะดุดล้มบนพื้นราบ สะโพกซ้ายกระแทกพื้น ปวดบวมสะโพกซ้าย ลุกเดินไม่ได้ ขาซ้ายผิดรูปไม่มีศีรษะกระแทกพื้น ไม่มีวูบหน้ามืด ไม่เคยมีปวดกระดูก หรือกล้ามเนื้ออ่อนแรงมาก่อน ตรวจพบกระดูกสะโพกซ้ายหัก จึงส่งตัวต่อมายัง รพ.มหาราชนครเชียงใหม่

# Past History

- Current medication: Caltab (1500) 1*1
- Hospitalization: เคยนอน รพ. เรื่องกระดูกหัก
  ไม่เคยนอน รพ. ด้วยปัญหาเกลือแร่ผิดปกติ

# Personal History

- **Growth and development**
- She recognized she had short stature since she had first episode of fracture.
- Graduated from high school with a GPA of 2.00

- **Menstrual history:**
- Menarche: at age 10 yrs old
- Regular cycle, duration 5 days

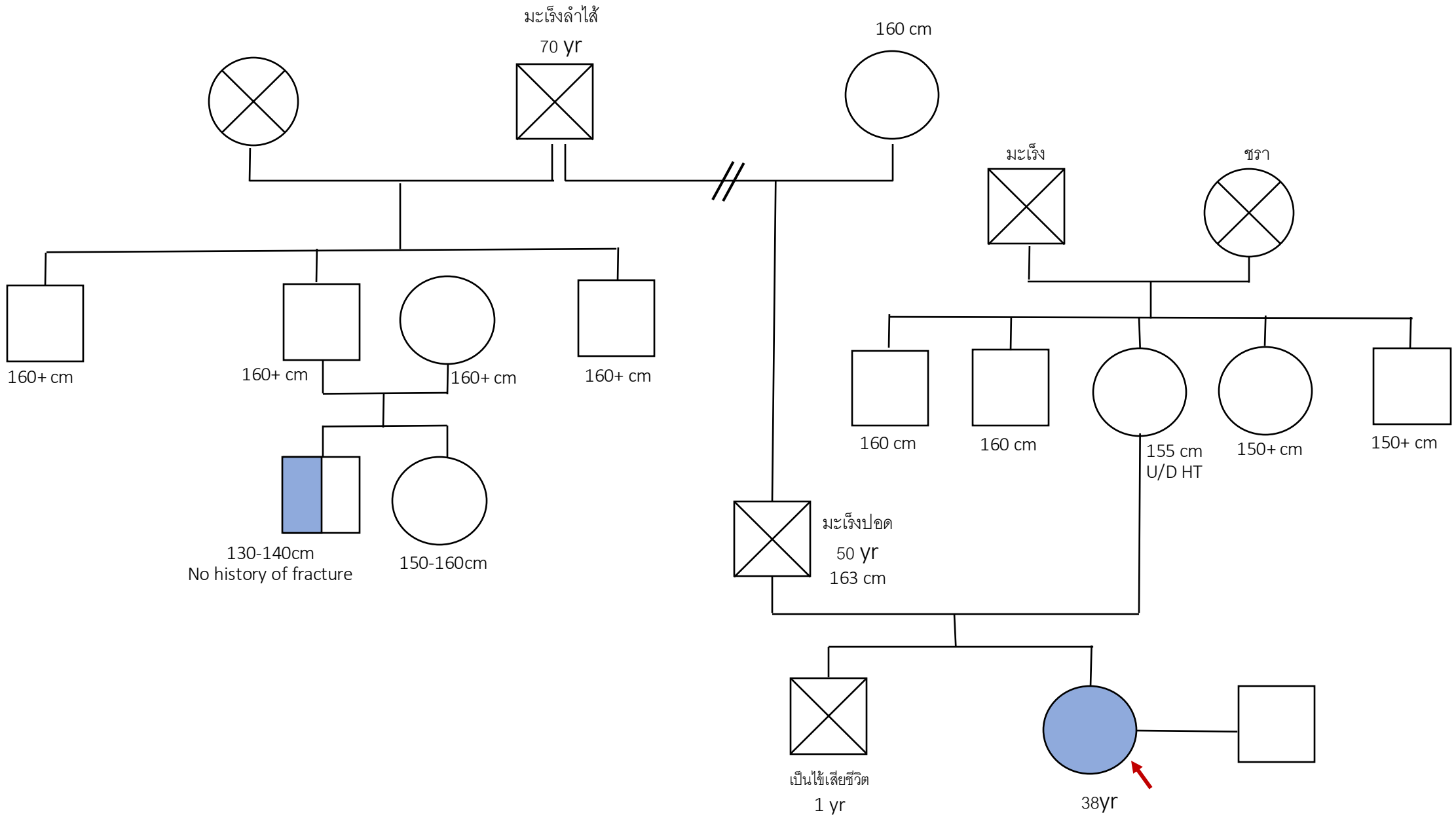
- No food/drug allergy
- No vegetarian

# Social history

- No smoking/alcohol drinking
- No illicit drug use
- No herb use

# Family history

- No family history of recurrent fracture.
- No family history of genetic disease.
- No family history of electrolyte imbalance.


มะเร็งลำไส้
70 yr
160 cm
มะเร็ง
ชรา
160+ cm
160+ cm
160+ cm
160+ cm
160 cm
160 cm
155 cm
U/D HT
150+ cm
150+ cm
130-140cm
No history of fracture
150-160cm
มะเร็งปอด
50 yr
163 cm
เป็นไข้เสียชีวิต
1 yr
38yr

# Systemic Reviews

- General appearance : **short stature**
- Respiratory system: no chronic cough, no dyspnea.
- Cardiovascular system: no palpitation, no chest pain, no orthopnea/PND
- Gastrointestinal system:, no diarrhea, normal bowel habit, no dysphagia, no ordynophagia, no jaundice, no hepatosplenomegaly.
- Skin : no rash/pigmentation/purplish striae.
- KUB : normal urine, no polyuria/nocturia.
- Endocrine : normal menstruation, **recurrent fracture.**
- Hematology: no anemia, abnormal bleeding.
- Neurology: **normal vision, no hearing loss**, no muscle weakness

# Physical Examination

- V/S: BT 37 C PR 129 bpm RR 18 /min BP 109/68 mmHg Spo2 98%

  BW 40 kg **Height 120 cm** BMI 27.78 **Arm span 118 cm  U/L ratio 1.04**

  **MPH 152.5 cm**
- GA: normal consciousness, **frontal and occipital bossing** (**Dolichocephaly**), no cushingoid appearance, no webbed neck.
- HEENT: no pale conjunctiva, no icteric sclera, no blue sclera, no down/up slanting palpebral fissure, no exophthalmos, no lid lag/retraction, no facial plethora, no moon face, no dental caries, no brittle teeth, no malocclusion, no thyroid gland enlargement, **patent fantonelle**, no low-set ears.
- LN: can not be palpate.

# Physical Examination

- Heart: normal S1 S2, no murmur.
- Lung: clear and equal breath sound both lung.
- Abdomen: normal contour, soft, not tender, normoactive bowel sound, liver and spleen cannot be palpated,  no palpable mass.
- Extremities: **bow legs both sides**, no big and lumpy joint, no syndactyly, Lt. thigh: swelling and deformity, tenderness, limit ROM due to pain.
- Chest and trunk: no barrel-shape chest, no pectus carinatum, no widely spaced nipple, no rachitic rosary, no scoliosis.

# Physical Examination

- Neuro: good orientation, normal consciousness, full EOM, normal visual field, no facial palsy, motor power grade V all limb, no muscular atrophy, normal muscle tone, no spasticity, intact sensation, normal reflex 2+, normal hearing.
- Skin: normal skin contour, no rash, no acne,  no purplish striae, no hirsutism (Modified Ferriman Gallway score 1), no hyperpigmentation, no café au lait spot, no axillary freckling, no neurofibroma, no easy bruising.
- Beast: Tanner stage V, no palpable mass.
- Perineum: normal female genitalia, pubic hair: Tanner stage V.

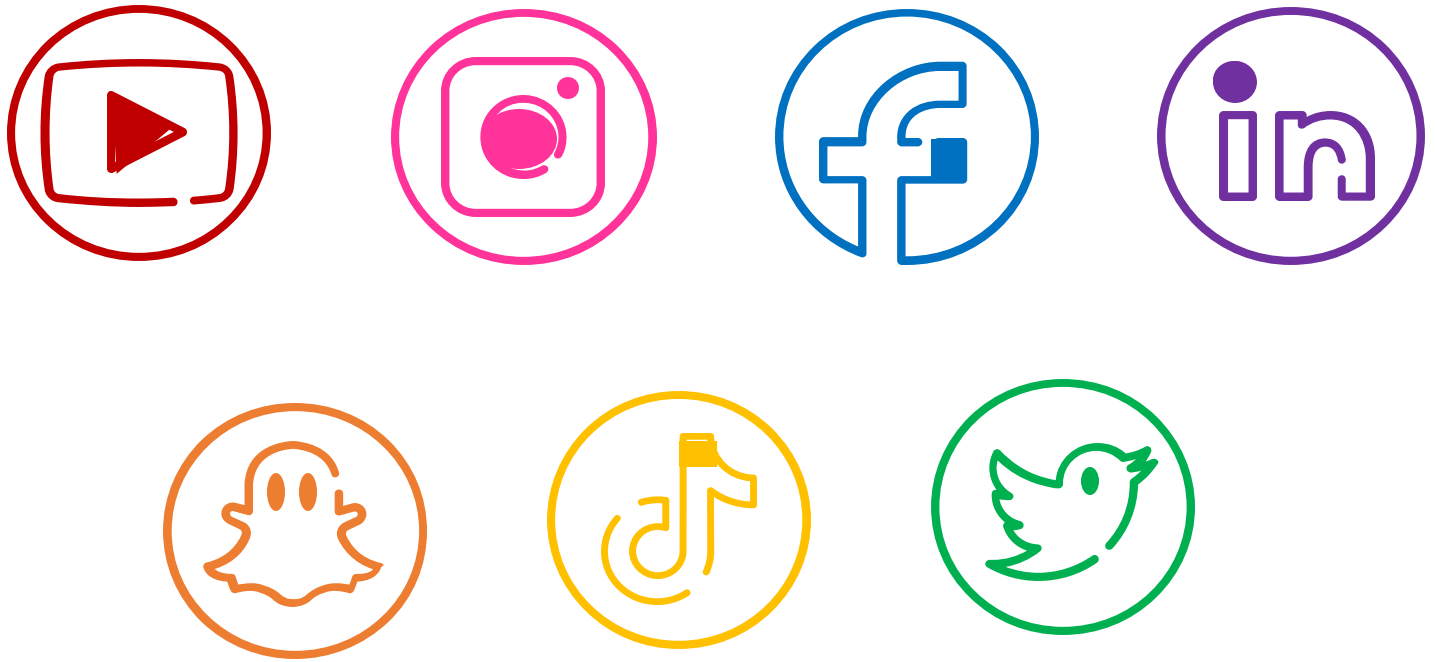
# Problem list

# Approach


# Lt. femur AP, Lateral

# Differential diagnosis

# Investigation



# CBC

| ITEM | RESULT |
|---|---|
| Hb | 13.8 g/dL (12.0 - 16.0) (<7.0, >22.0) |
| Hct | 43.3 % (36.0 - 48.0) (<21.0, >66.0) |
| WBC | 13980 cells/cu.mm. (5000 - 10000) (High) |
| Neutrophil (%) | 84.1 % (40.0 - 74.0) (High) |
| Eosinophil (%) | 0.0 % (0.0 - 7.0) |
| Basophil (%) | 0.4 % (0.0 - 2.0) |
| Lymphocyte (%) | 12.4 % (19.0 - 48.0) (Low) |
| Monocyte (%) | 3.1 % (3.0 - 9.0) |
| Platelet per cu.mm. | 307000 cells/cu.mm. (140000 - 450000) (<30000, >1000000) |
| RBC | 5.51 x1000000 cells/cu.mm. (4.00 - 5.50) (High) |
| MCV | 78.6 fl. (80.0 - 99.0) (Low) |
| MCH | 25.0 pg. (27.0 - 31.0) (Low) |
| MCHC | 31.9 g/dL |
| MPV | 9.2 fL. (7.2 - 11.1) |
| PDW | 9.6 fL. (9.6 - 15.2) |
| @Comment:- | (see bottom of this page) |
| Absolute Neutrophil Count | 11760 cells/cu.mm. |
| Absolute Lymphocyte Count | 1740 cells/cu.mm. |
| NRBC | 0.0 /100 WBC (<=0.0) |
| RDW | 14.3 % (11.5 - 14.5) |
| Platelet large cell ratio | 19.3 % (19.7 - 42.4) (Low) |

# Kidney function and electrolyte

| ITEM | RESULT |
|---|---|
| BUN | 10 mg/dl (6 - 20) |
| Creatinine | 0.39 mg/dl (0.51 - 0.95) (Low) |
| @Note eGFR | 136.51 |
| Na | 139 mmol/L (136 - 145) |
| K | 3.5 mmol/L (3.4 - 4.5) (<2.8, >6.2) |
| Cl | 102 mmol/L (98 - 107) |
| Total CO2 | 22 mmol/L (22 - 29) |
| Ca | 9.3 mg/dl (8.6 - 10.2) |
| P | 4.3 mg/dl (2.5 - 4.5) |
| Mg | 1.57 mEq/L (1.32 - 2.14) |

## Vitamin D level

| ITEM | RESULT |
| --- | --- |
| Vitamin D(ECLIA technique) | 25.63 ng/ml (>=30) (Low) |

## Parathyroid hormone

| ITEM | RESULT |
| --- | --- |
| Parathyroid Hormone(PTH) | 54.60 pg/mL (15.00 - 65.00) pg/ml |

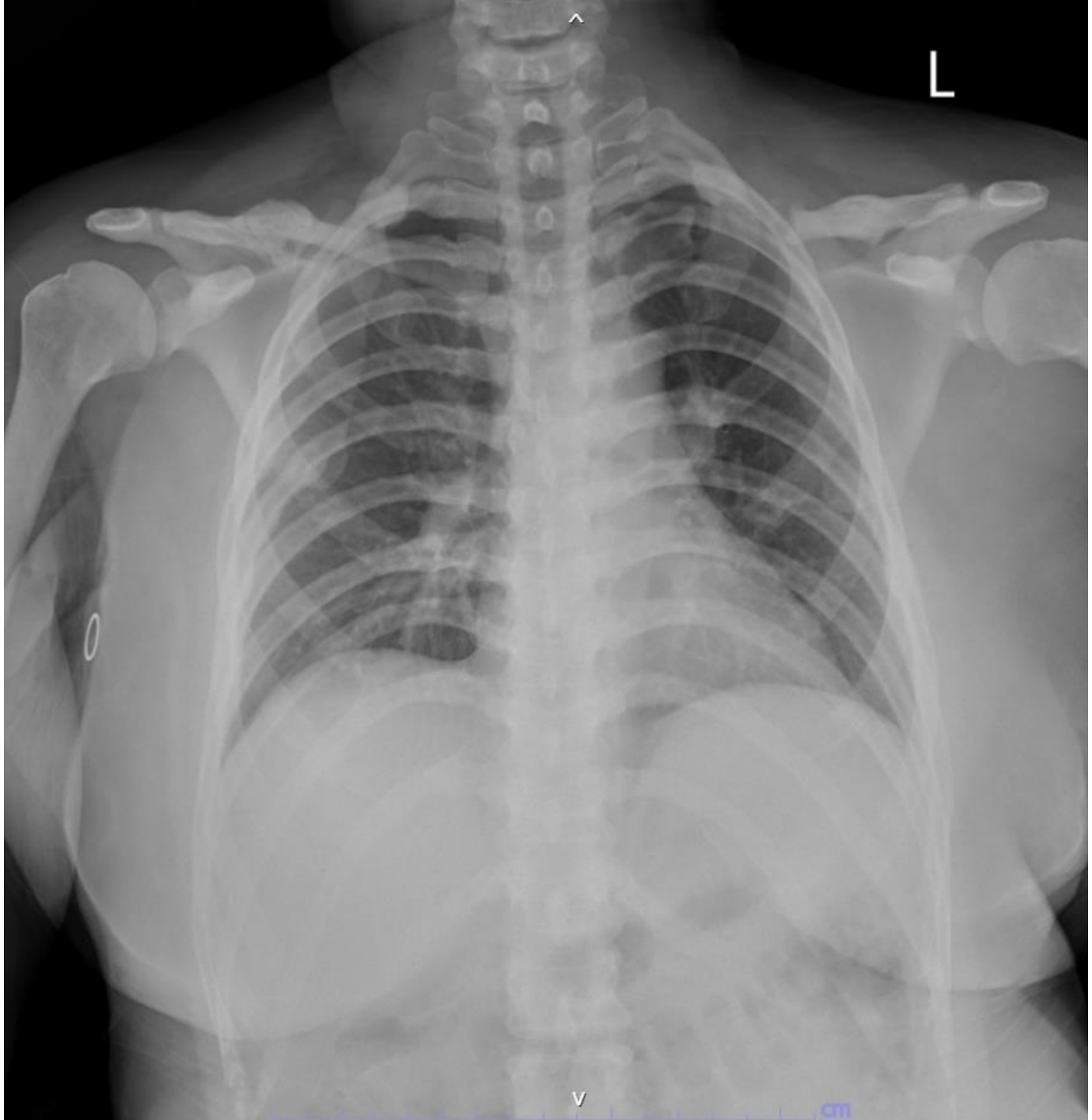
# Thyroid function test

| | |
|---|---|
| TSH | 0.806 uIU/ml (0.270 - 4.200) uU/ml |
| Free T4 (FT4) | 1.36 ng / dl (0.93 - 1.71) ng/dl |
| Free T3 (FT3) | 3.00 pg / ml (2.04 - 4.40) pg/ml |

# Liver function test

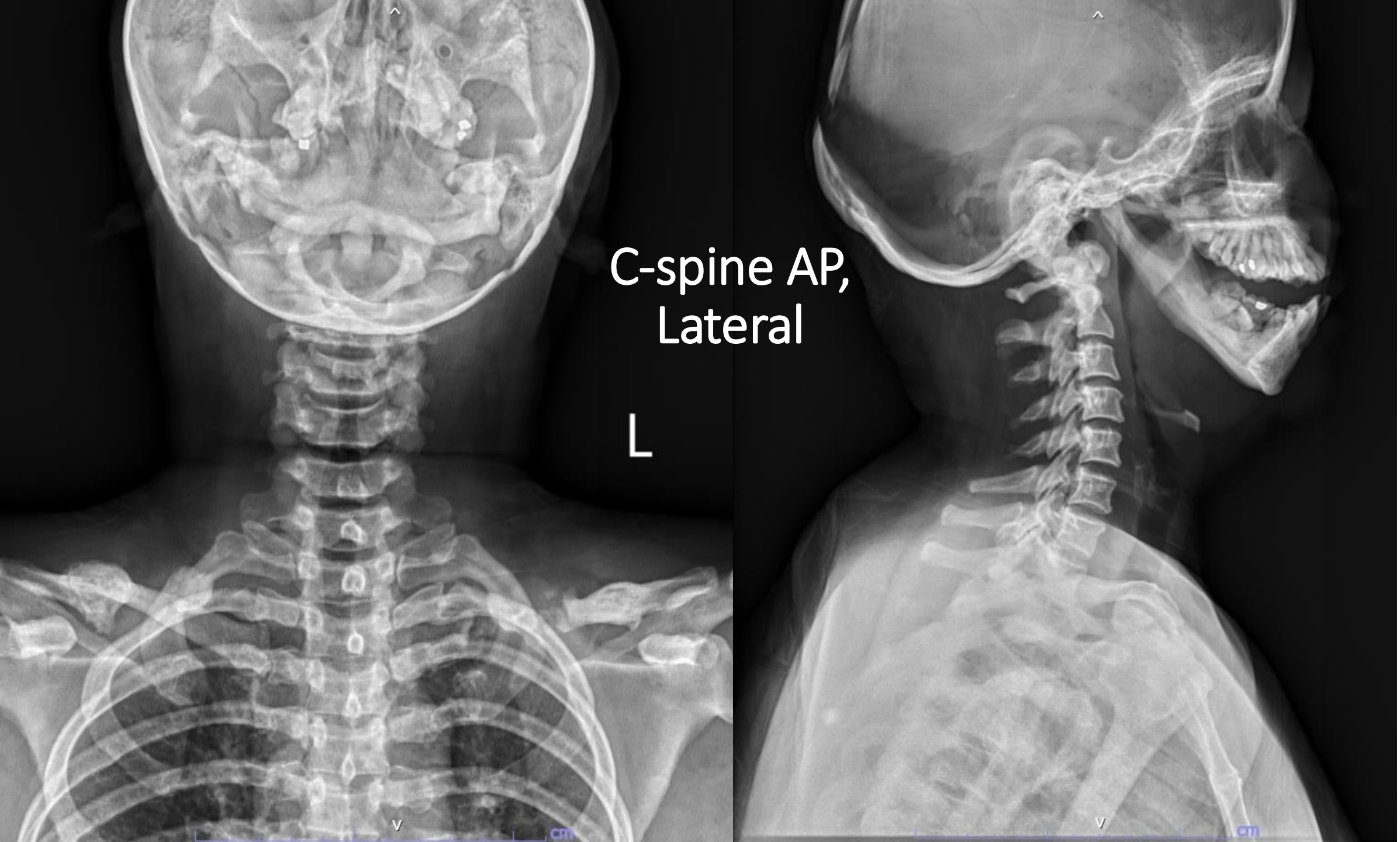
| | |
|---|---|
| Total Protein | 8.2 g/dl (6.6 - 8.7) |
| Albumin | 4.4 g/dl (3.5 - 5.2) |
| Globulin(cal) | 3.9 g/dl (3.1 - 3.5) (High) |
| Alkaline Phosphatase | 81 U/L (35 - 104) |
| Cholesterol | 205 mg / dl (0 - 200) (High) mg/dl |
| AST (GOT) | 18 U/L (0 - 32) |
| ALT (GPT) | 11 U/L (0 - 33) |
| Total Bilirubin | 0.60 mg/dl (0.00 - 1.20) |
| Direct Bilirubin | 0.21 mg/dl (<=0.30) |

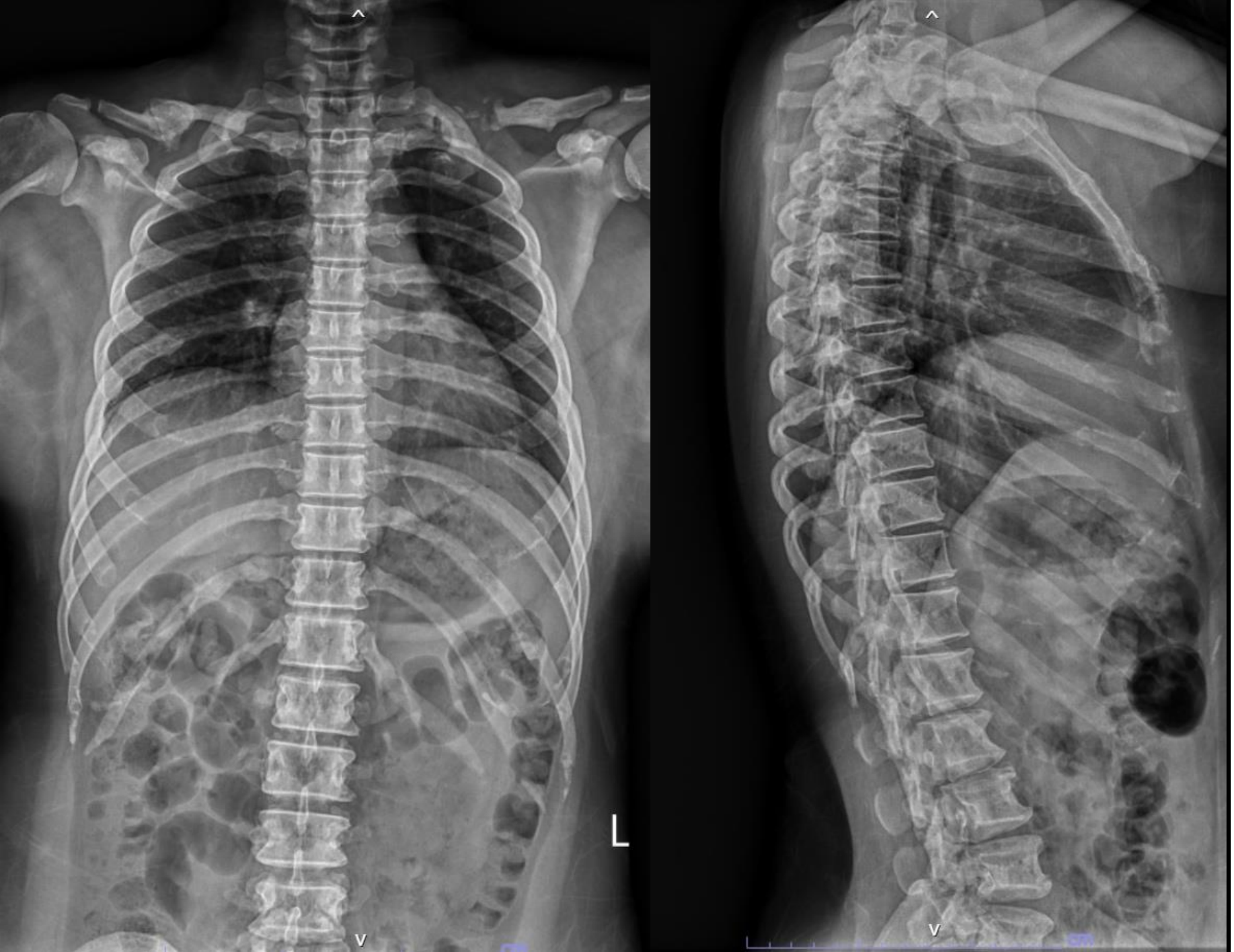

# Film skull Lateral



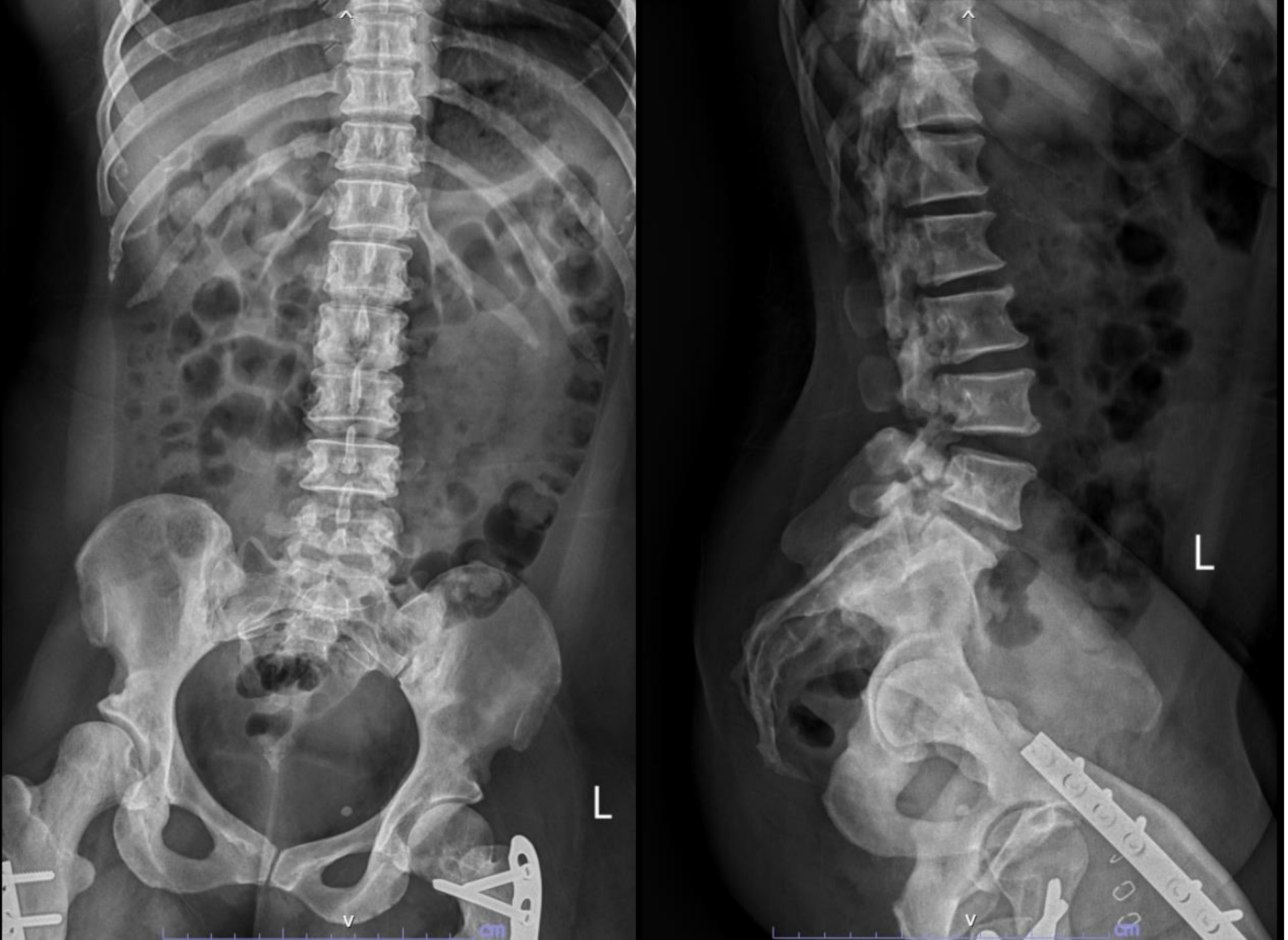

CXR PA

# Film Both clavicles AP


C-spine AP,
Lateral
L

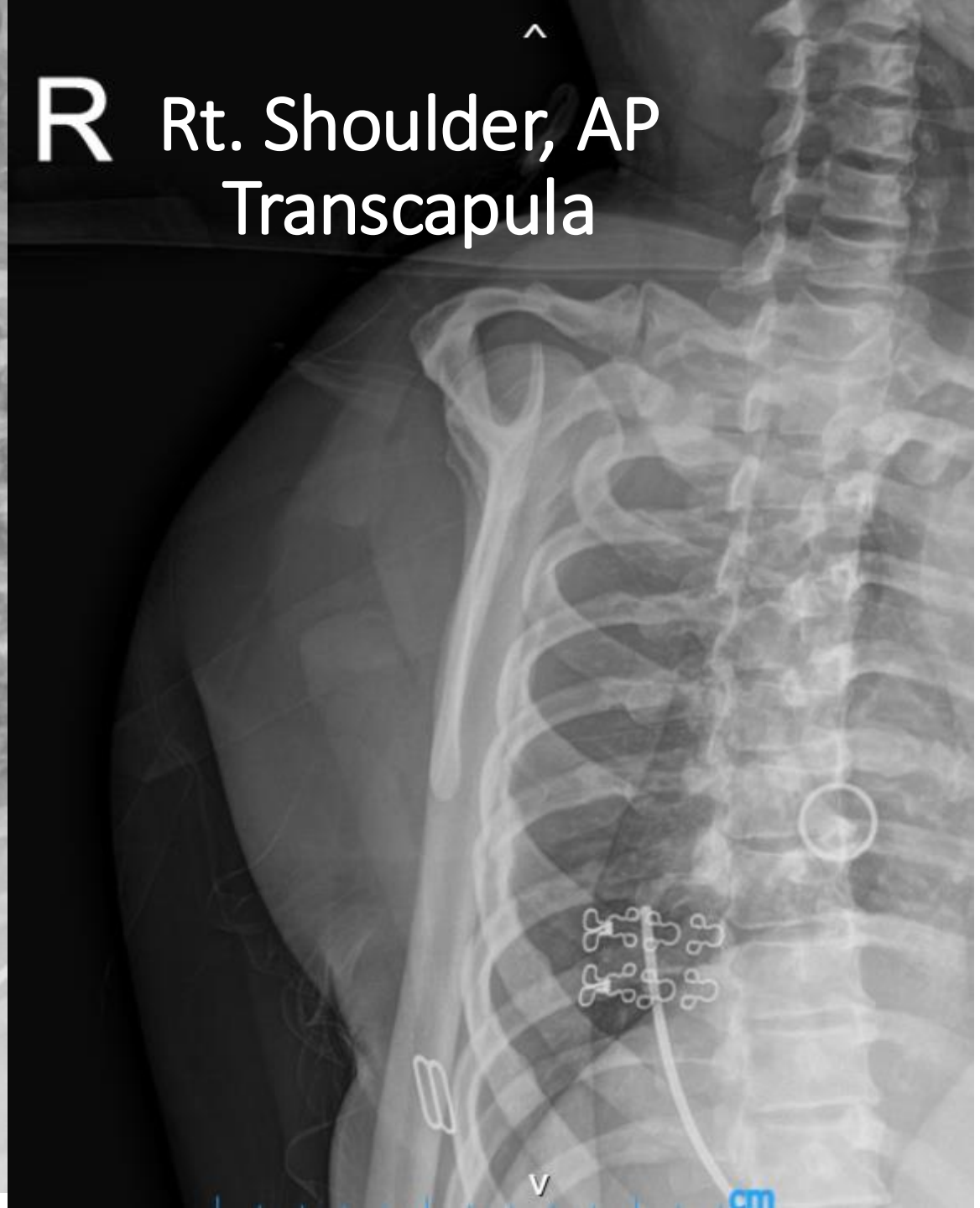


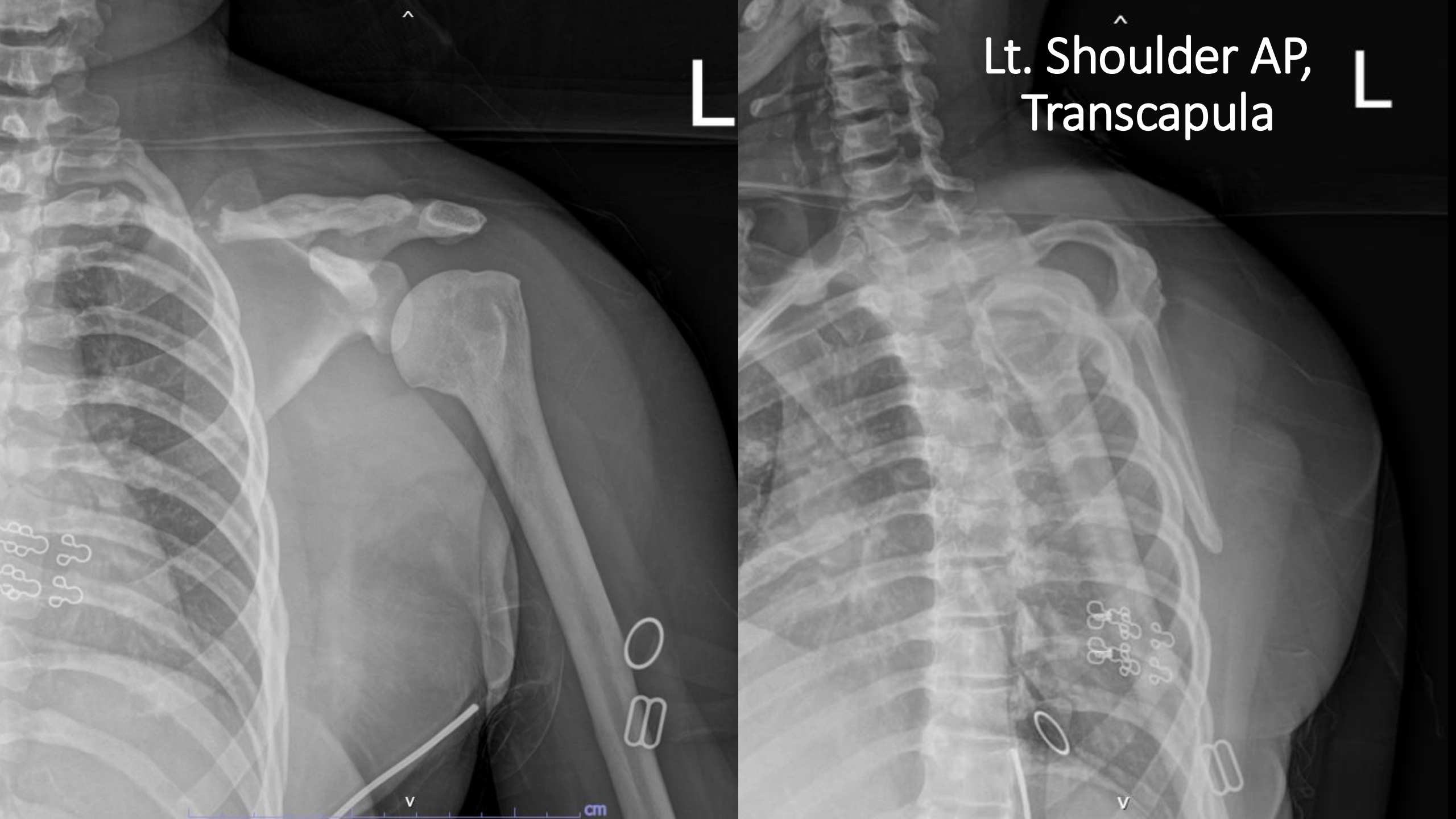

# T-spine AP, Lateral

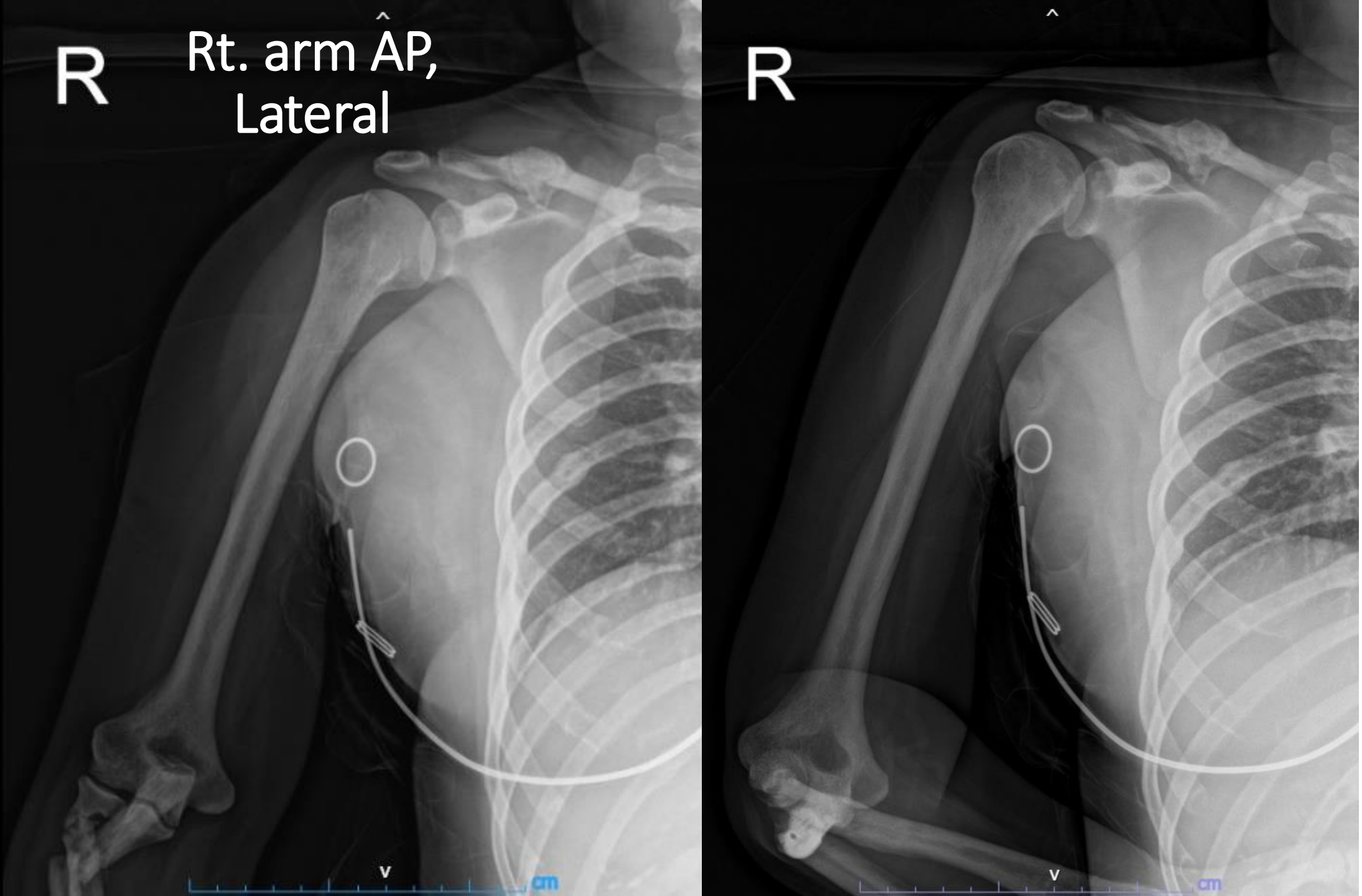


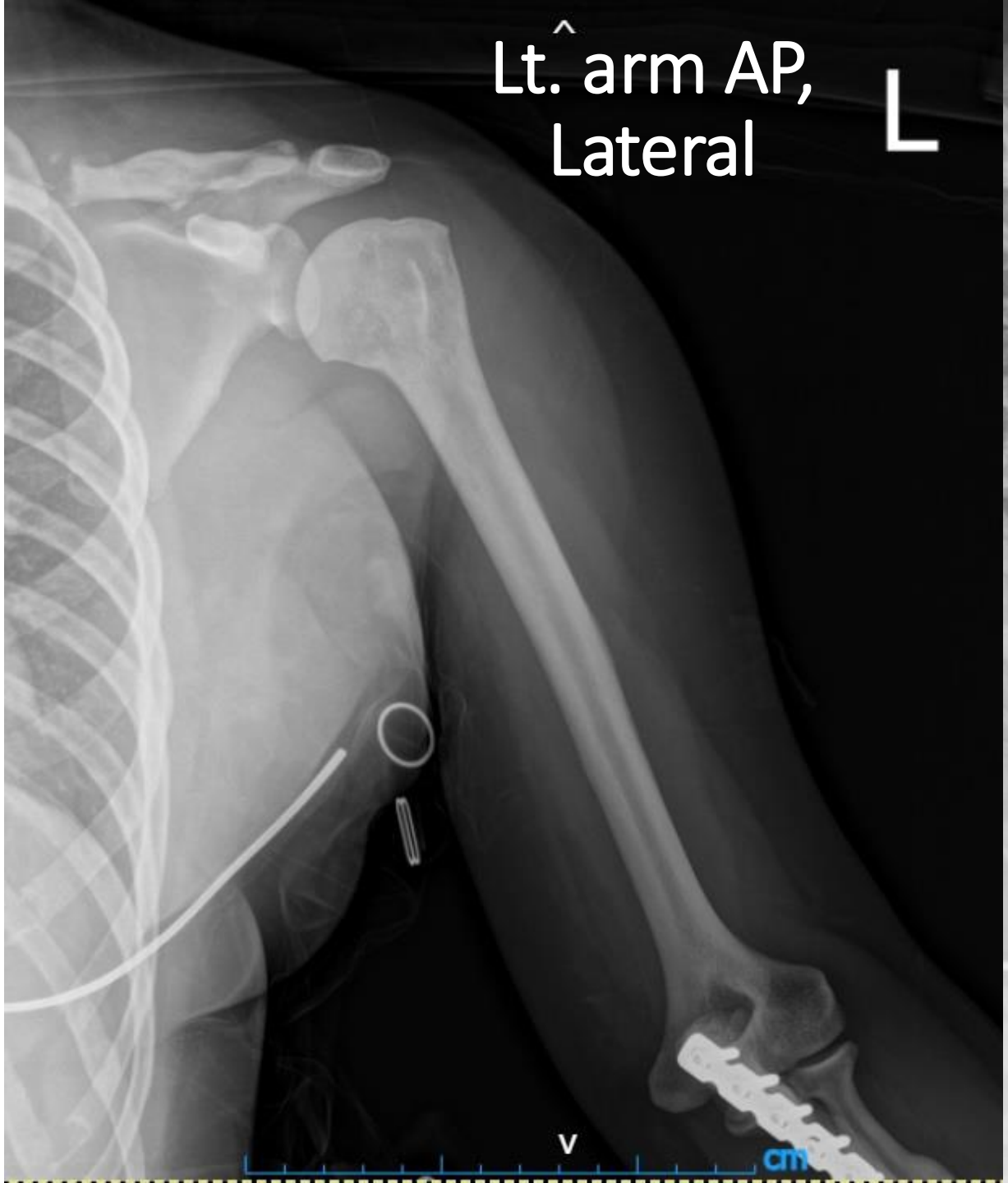

# L-spine AP, Lateral

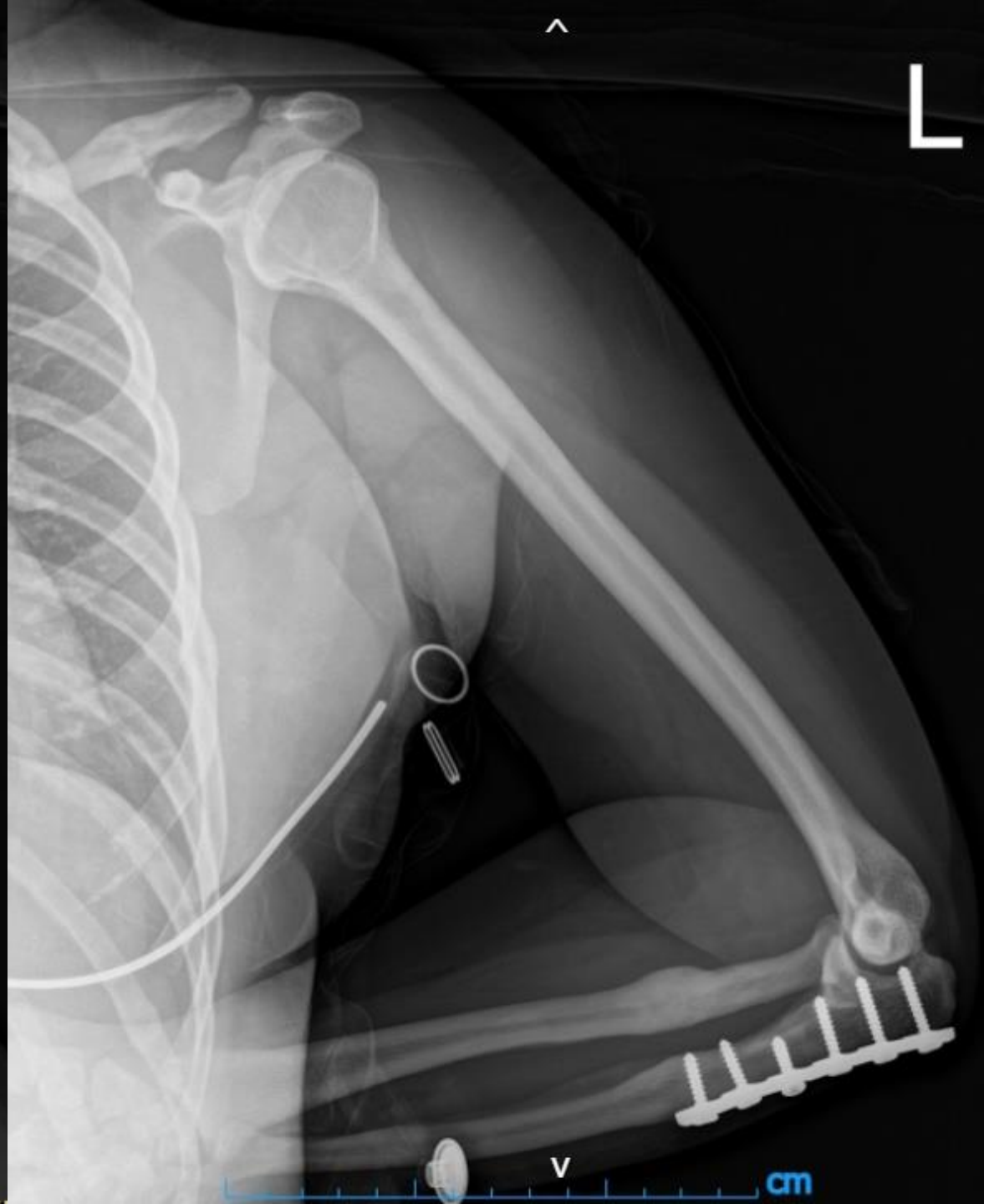

R
^
v
cm

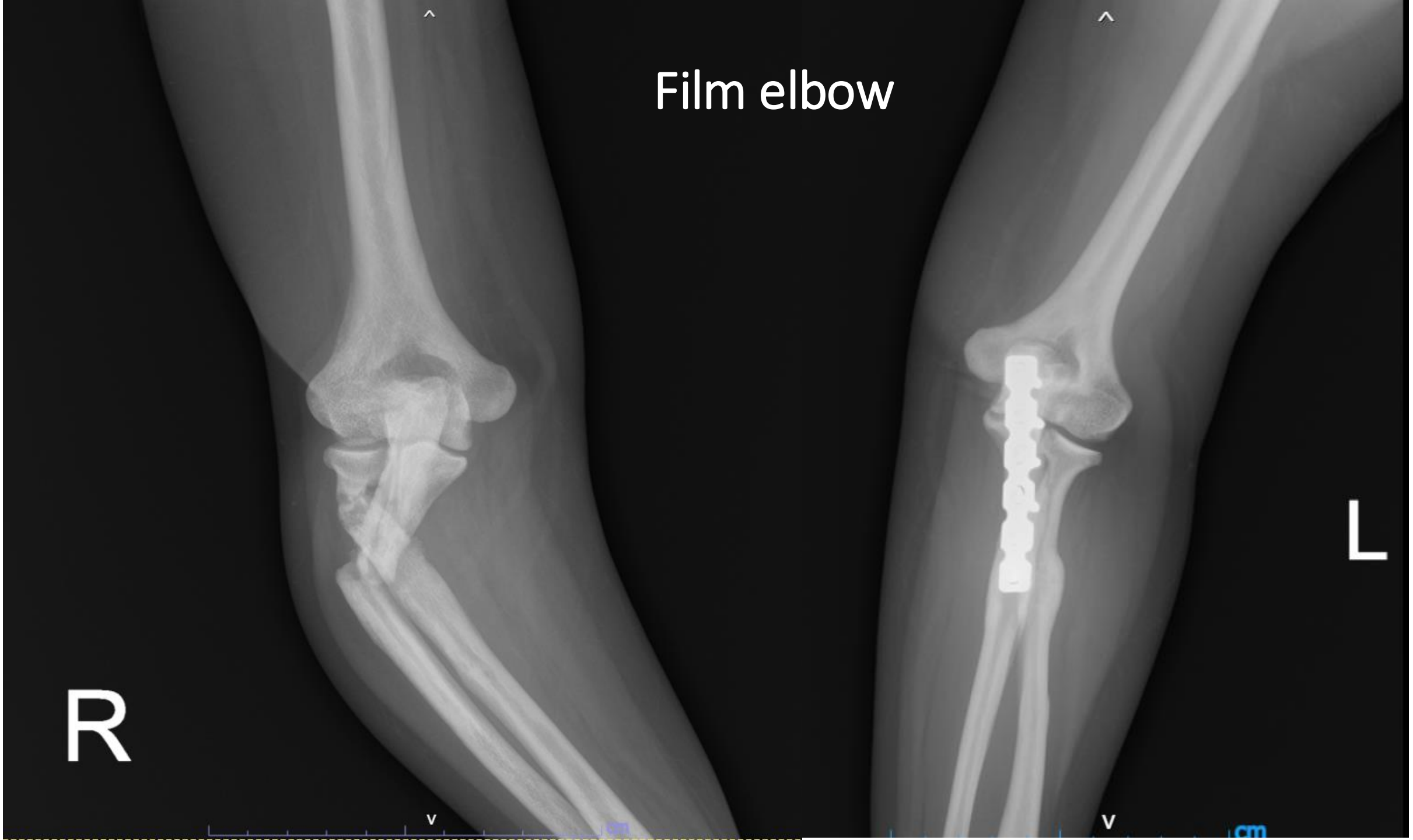

R
Rt. Shoulder, AP
Transcapula
^
v
cm


L
Lt. Shoulder AP,
Transcapula
L

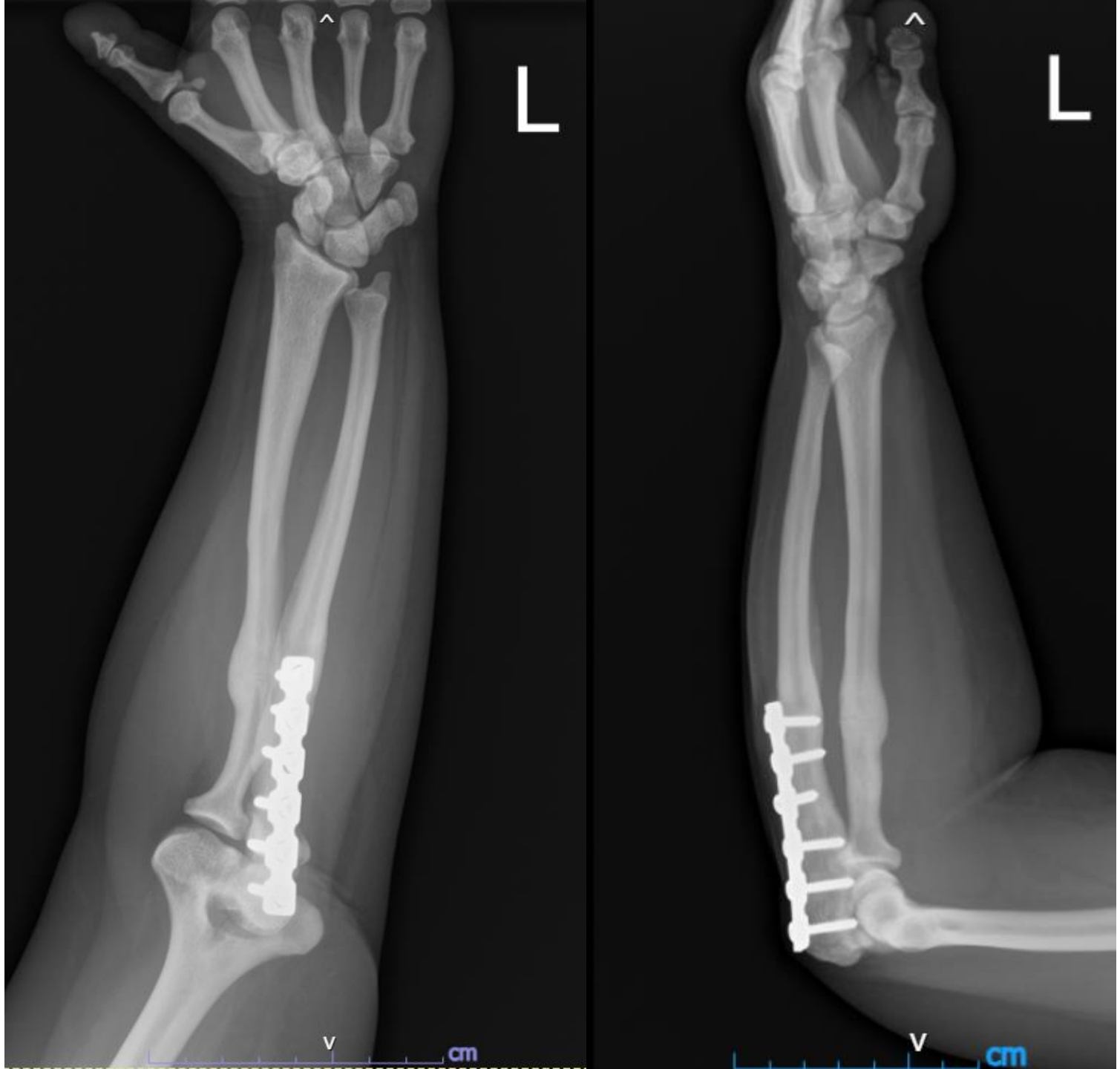

R
Rt. arm AP,
Lateral
R


Lt. arm AP,
Lateral
L


L

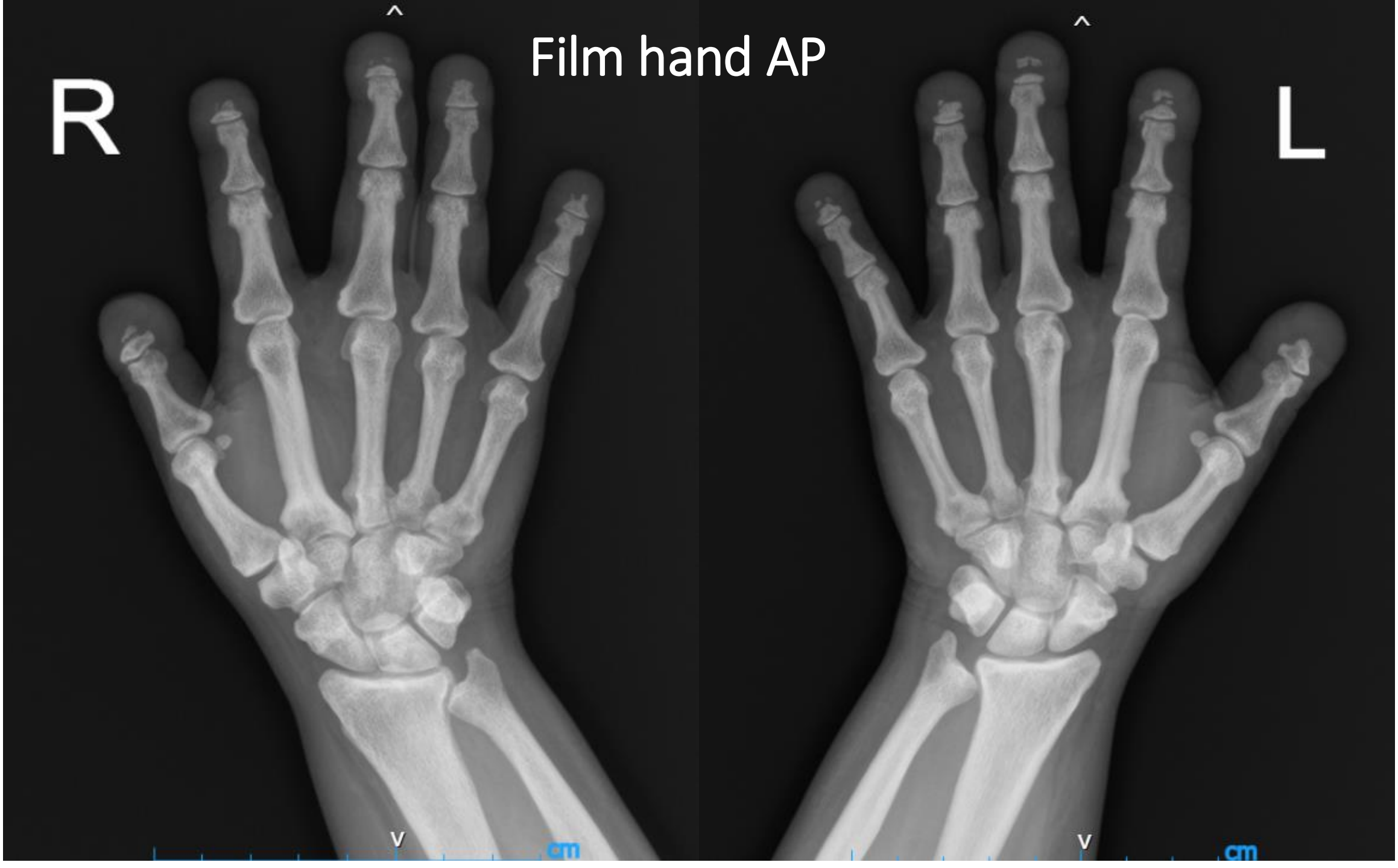

Film elbow
R
L


# Rt. forearm AP, Lateral

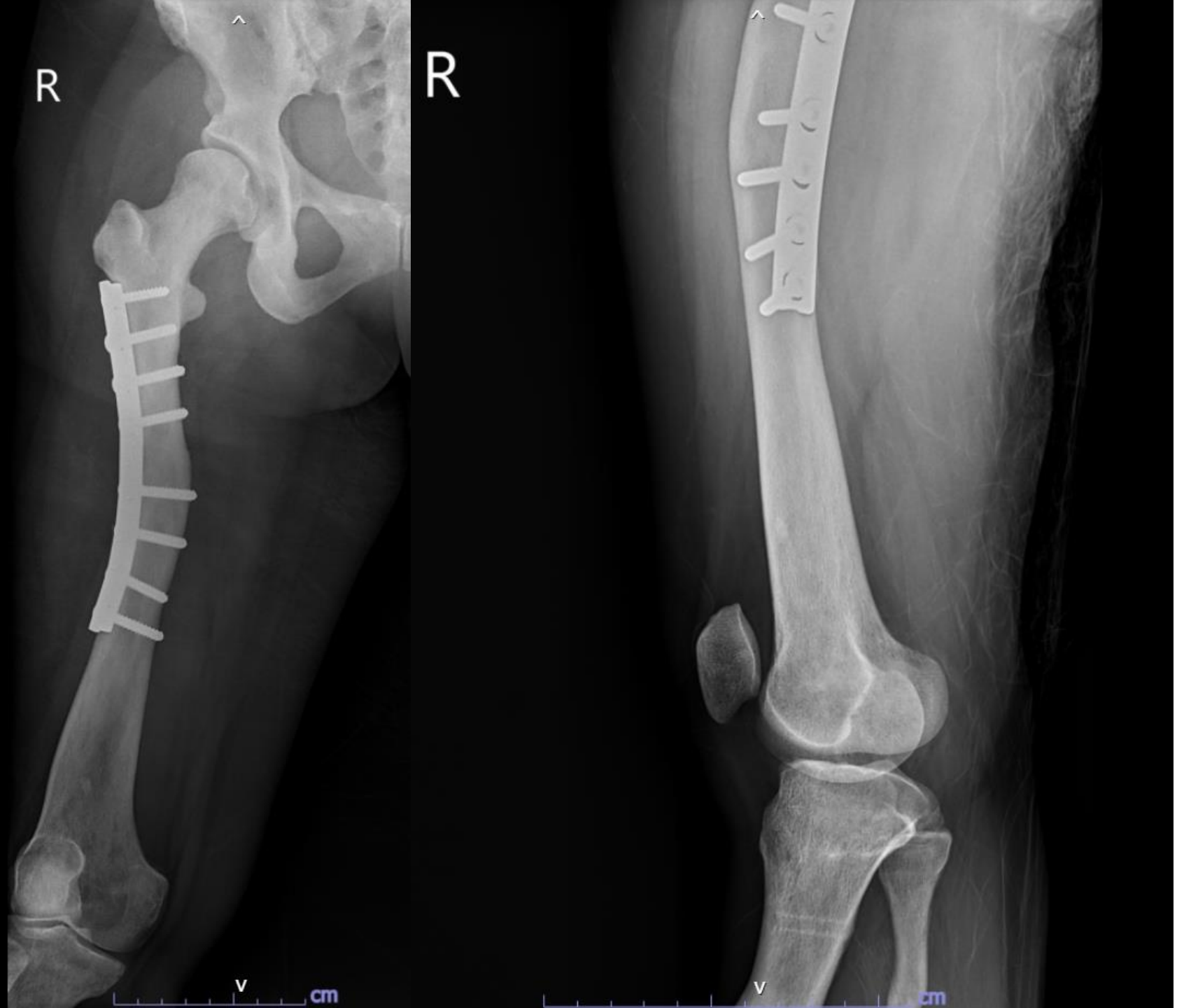



# Lt. forearm AP, Lateral

# Film hand AP



# Film hand oblique




# Rt. femur AP, Lateral


# Both hip AP


# Pelvis AP

# Skeletal survey

- Skull lateral:
- Frontooccipital bossing (dolicocephaly)
- Widening sutures, presence of Wormian bones.
- Thickened of inner and outer tables of frontal and occipital bones, sclerosis of the parietal bone.
- Obtuse angle of the mandible, platybasia (flattening skull base) angle=144).
- Clavicles and chest:
- Transverse fractures with shortening clavicles. Thickened cortical bones of clavicles.
- Fracture right 1st rib with callus formation
- Normal heart size. The lungs are clear.
- No pectus excavatum or carinatum.
- Spine: Normal alignment. Normal bone density. No failure of segmentation.

# Skeletal survey

- Upper extremities:
- Narrowing of medullary cavities of long bones.
- Diffuse osteosclerosis and thickened cortical bones.
- Post fixation of the left olecranon process by a reconstruction plate.
- Deformed right elbow due to malunion transverse fracture radial neck and proximal ulna with varus angulation of the elbow.
- Acro-osteolysis of terminal phalanges in all digits.
- Pelvis, hips and bilateral femurs:
- Diffuse osteosclerosis.
- Bowing femurs due to multiple transverse fractures.
- The femurs are fixed by plates. Under coverage of bilateral acetabular roofs.

IMPRESSION: Skeletal dysplasia with diffuse bone sclerosis but preserved medullary cavity, acro-osteolysis, wide-angled mandible, and characteristic skull features. These findings are compatible with pycnodysostosis.

# Diagnosis

- Closed fracture subtrochanteric of Lt femur
- Pycnodysostosis

# Management

- Closed fracture subtrochanteric of Lt femur

S/P ORIF with narrow LCP Lt. femur 27/12/65

- Pycnodysostosis

Caltab(1500) 1*1 po

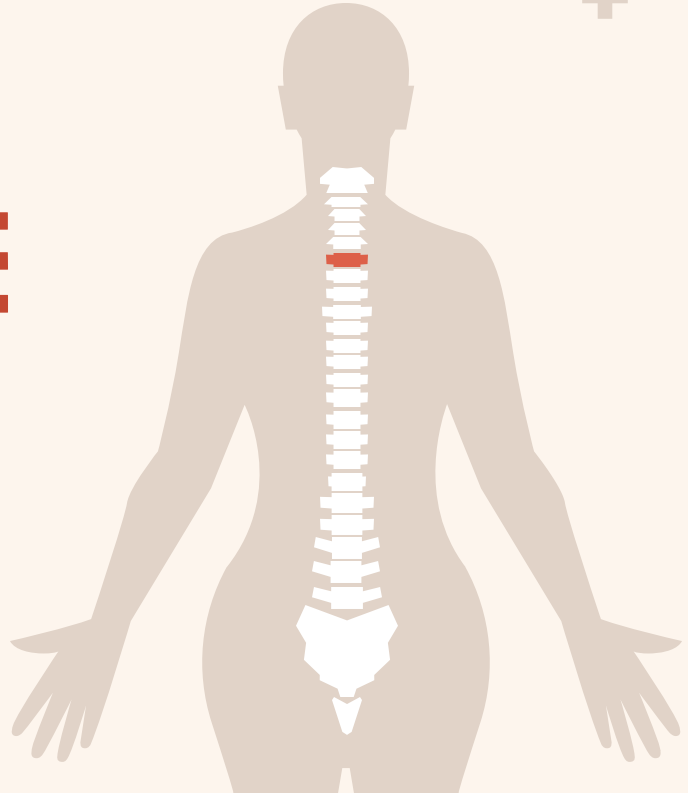
Vitamin D2 1cap weekly


L
cm


L
cm

# RECURRENT FRAGILITY FRACTURE

INTERHOSPITAL CONFERENCEC



# FRAGILITY FRACTURE IN YOUNG ADULT

- Osteomalacia/Rickets
- Osteoporosis
- Disorder of calcium/parathyroid disease
- Osteogenesis imperfecta
- Paget’s disease of bone
- Fibrous dysplasia/McCune
- Sclerotic bone disorder

# FRAGILITY FRACTURE IN YOUNG ADULT WITH DYSMORPHIC FEATURE WITH BONE SCLEROSIS

- Osteomalacia/Rickets
- Osteoporosis
- Disorder of calcium/parathyroid disease
- Osteogenesis imperfecta
- Paget's disease of bone
- Fibrous dysplasia/McCune
- **Sclerotic bone disorder**

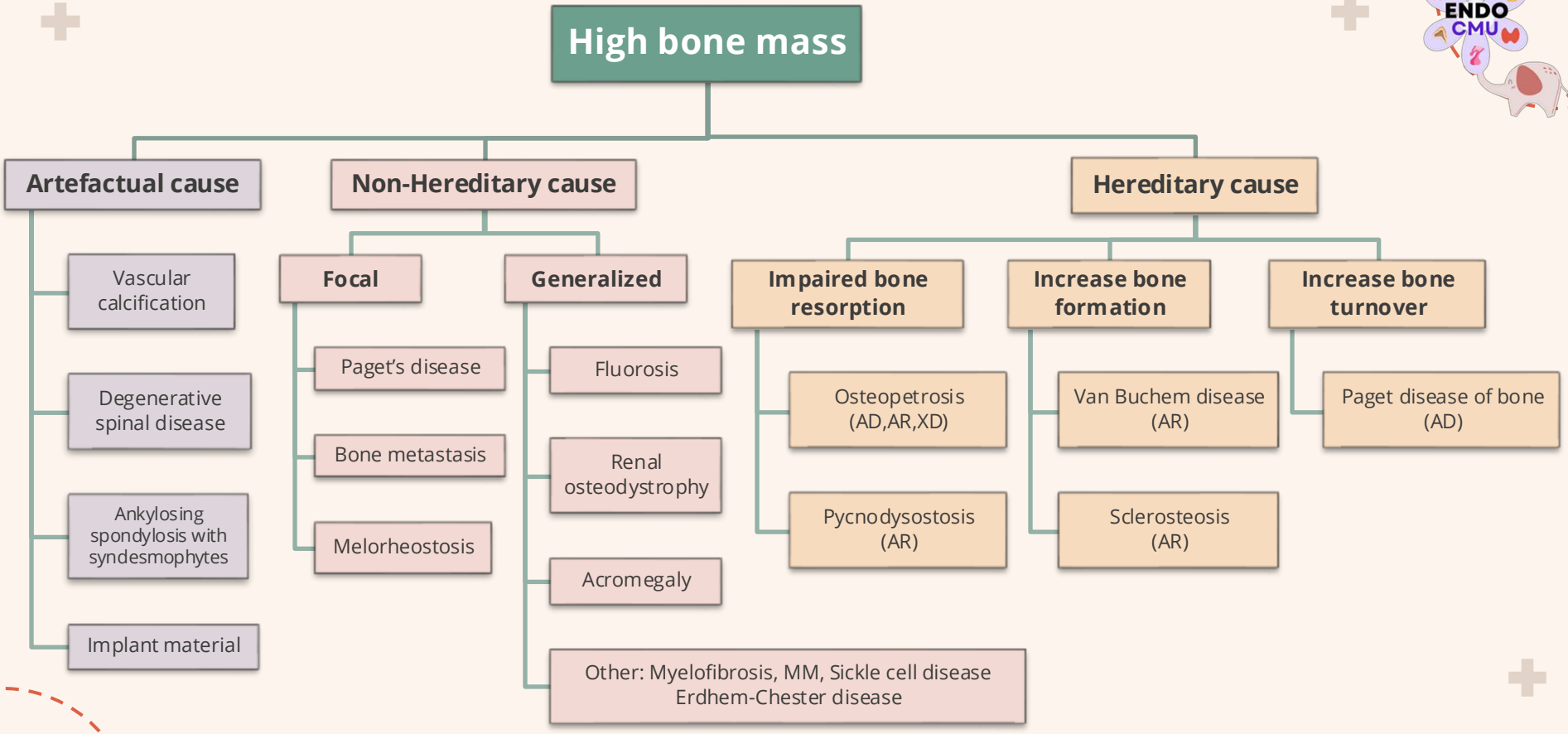
# BONE SCLEROSIS

- Definition: focal, multifocal, or diffuse increase in the density of bone matrix on radiographs or CT imaging.
- No consensus for definition of high bone mass
- Variable cut-off used of Z score

  Z-score ≥ +2.0 at LS and hip

  Z-score ≥ +2.5

  Z-score ≥ 1.2 at LS and +3.2 at TH


High bone mass
Artefactual cause
Vascular calcification
Degenerative spinal disease
Ankylosing spondylosis with syndesmophytes
Implant material
Non-Hereditary cause
Focal
Paget's disease
Bone metastasis
Melorheostosis
Generalized
Fluorosis
Renal osteodystrophy
Acromegaly
Other: Myelofibrosis, MM, Sickle cell disease
Erdhem-Chester disease
Hereditary cause
Impaired bone resorption
Osteopetrosis (AD,AR,XD)
Pycnodysostosis (AR)
Increase bone formation
Van Buchem disease (AR)
Sclerosteosis (AR)
Increase bone turnover
Paget disease of bone (AD)

# High bone mass

- **Artefactual cause**
  - Vascular calcification
  - Degenerative spinal disease
  - Ankylosing spondylosis with syndesmophytes
  - Implant material
- **Non-Hereditary cause**
  - **Focal**
    - Paget's disease
    - Bone metastasis
    - Melorheostosis
  - **Generalized**
    - Fluorosis
    - Renal osteodystrophy
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    - Pycnodysostosis (AR)
  - **Increase bone formation**
    - Van Buchem disease (AR)
    - Sclerosteosis (AR)
  - **Increase bone turnover**
    - Paget disease of bone (AD)

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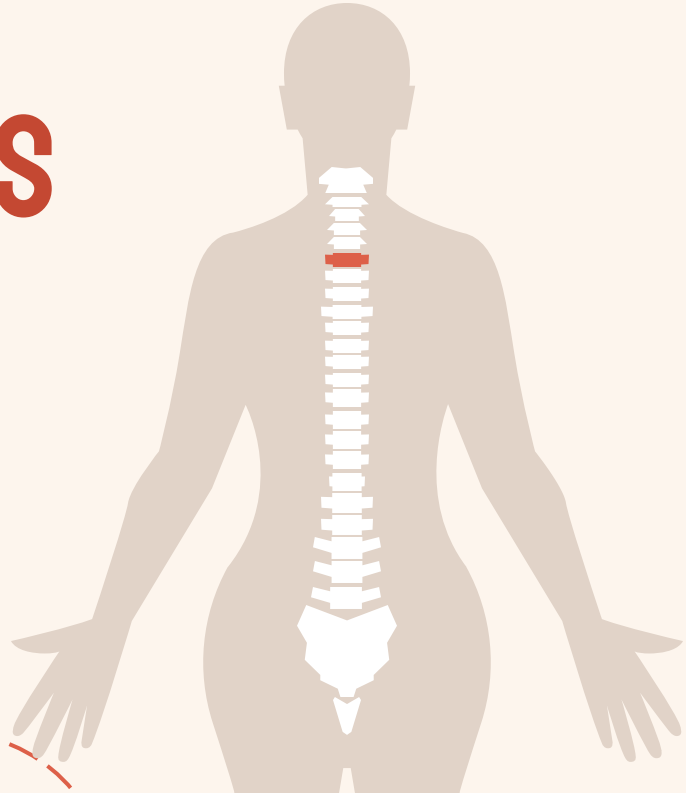
    - Paget disease of bone (AD)

# PYCNODYSOSTOSIS



# PYCNODYSOSTOSIS

- Mutation of cathepsin K (CTSK) → defect of collagen degradation
- Inheritance, AR
- Prevalence: 1-1.7 individuals per million, equal sex distribution
- **Key clinical features**: Dwarfism, multiple fracture, osteosclerosis

# CLINICAL MANIFESTATION

| Feature | | % of Persons w/Feature |
|---|---|---|
| **Clinical** | **Short limb, short stature** | **~100%** |
| | **Brachydactyly** | **>90%** |
| | Frontal bossing | >80% |
| | Persistently open anterior fontanelle | 80% |
| | Convex nasal ridge | ~70% |
| | Small jaw | >70% |
| | Midface retrusion | 60% |
| | Proptosis | 60% |
| | Blueish sclerae | 30%-40% |
| | Obstructive sleep apnea | >65% |
| | Increased incidence of fractures | 70% |
| | Nail anomalies | >50% |
| | Dental anomalies | 30-40% |

# INVESTIGATION

| Feature | | % of Persons w/Feature |
|---|---|---|
| **Radiographic** | **Osteosclerosis** | **~100%** |
| | **Acro-osteolysis of the terminal phalanges** | **>90%** |
| | Non-pneumatized mastoids | 80% |
| | Delayed fusion of cranial sutures | 67% |
| | Obtuse mandibular angle | 65% |
| | Clavicular dysplasia | 25% |

**Laboratory findings**

- Normal serum calcium, phosphate, vitamin D, and alkaline phosphatase
- Growth hormone deficiency
- No abnormalities of other pituitary hormones

# RADIOGRAPHIC FEATURES



A. **Marked acro-osteolysis of the terminal phalanges** and **generalized increase in bone density.**
B. **The mandible: hypoplastic and sclerotic with loss of the gonial angle.**
C. Tibia and fibula: diffuse sclerosis and a transverse midshaft tibial fracture

# DIAGNOSIS

- Formal diagnostic criteria for pycnodysostosis have *not* been established.
- **The diagnosis of pycnodysostosis** can be established in a proband with characteristic **clinical and radiographic features** *and/or* biallelic pathogenic variants in **CTSK identified by molecular genetic testing.**

# DIFFERENTIAL DIAGNOSIS

- Osteopetrosis
- Juvenile Paget disease of bone
- Van Buchem disease and sclerostosis

# Osteopetrosis

- Impaired osteoclast development/impaired osteoclast function
- AD,AR
- Clinical presentation: vary depend on causative genes abnormality
    - Failure to thrive
    - Skull abnormality (macrocephaly, frontal bossing, choanal stenosis)
    - hypocalcemia
    - hematologic failure
    - Primary neurodegeneration: cerebral atrophy, spasticity, axial hypotonia and peripheral hypertonia

**Diagnosis**

- Classic radiographic feature: **bone-within-bone**, **Erlenmeyer flask bone deformity, sandwich vertebrae or rugger-jersey**
- **Genetic testing**

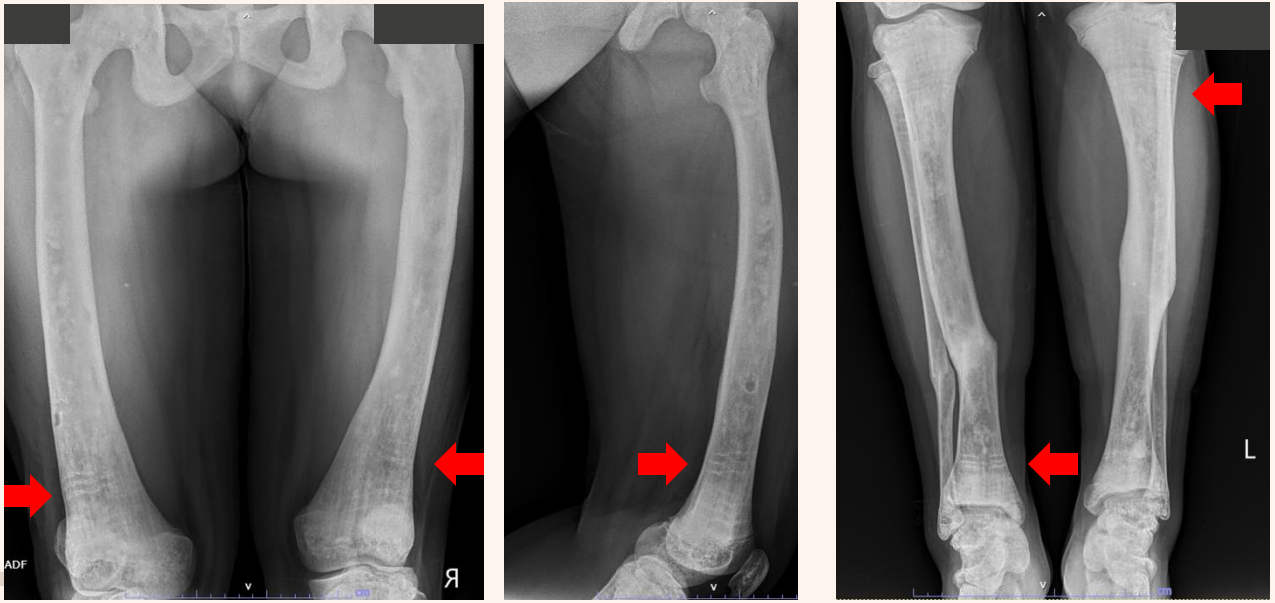
# Osteopetrosis

Diffuse bone sclerosis with Sandwich vertebrae or Rugger-Jersy spine

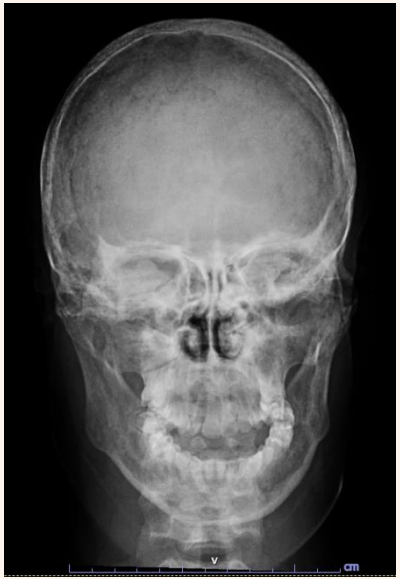

Bone-within-bone

# Juvenile Paget disease of bone

- Mutation of TNFRSF11B → loss of OPG function → extremely rapid bone turnover
- Clinical manifestations: skeletal deformity, bone expansion, low-energy fracture, Hearing loss, retinopathy, elevated ALP, markedly increased bone turnover marker



# Juvenile Paget disease of bone

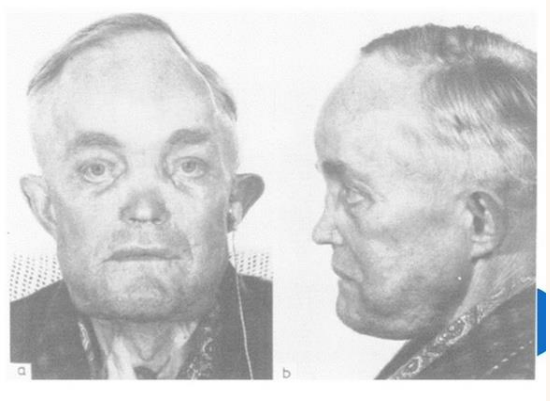



# Van Buchem disease and Sclerosteosis

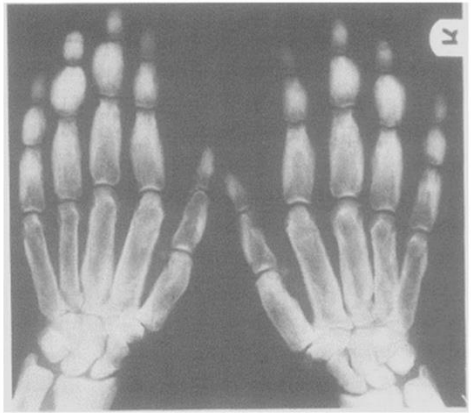
- Hyperostosis severely affected of skull
- Clinical presentation:

  - Cranial nerve compression (hearing loss, facial palsy)

  - Increase intracranial pressure (visual impairment, dizziness, sudden death)
- **Sclerosteosis:** generalized bone sclerosis like **Van Buchem disease,** But tall stature and syndactyly are seen in sclerosteosis



**Protruding shin, high forehead**
**Enlarged of mandible**



**Diffuse sclerosis of skull and phalanges**

# PYCNODYSOSTOSIS: TREATMENT

- Growth hormone therapy
- Orthopedic management of fractures and scoliosis
- Craniofacial and neurosurgical management (craniosynostosis, maxillary and mandibular hypoplasia)
- Pulmonology and sleep medicine specialist management of obstruction sleep apnea
- Dental and orthodontic care for dental anomalies
- Standard management per ophthalmologist for vision concerns
- Environmental or occupational modifications as needed

# THANK YOU