KARNATAKA RADIOLOGY EDUCATION PROGRAM

CASE PRESENTATION

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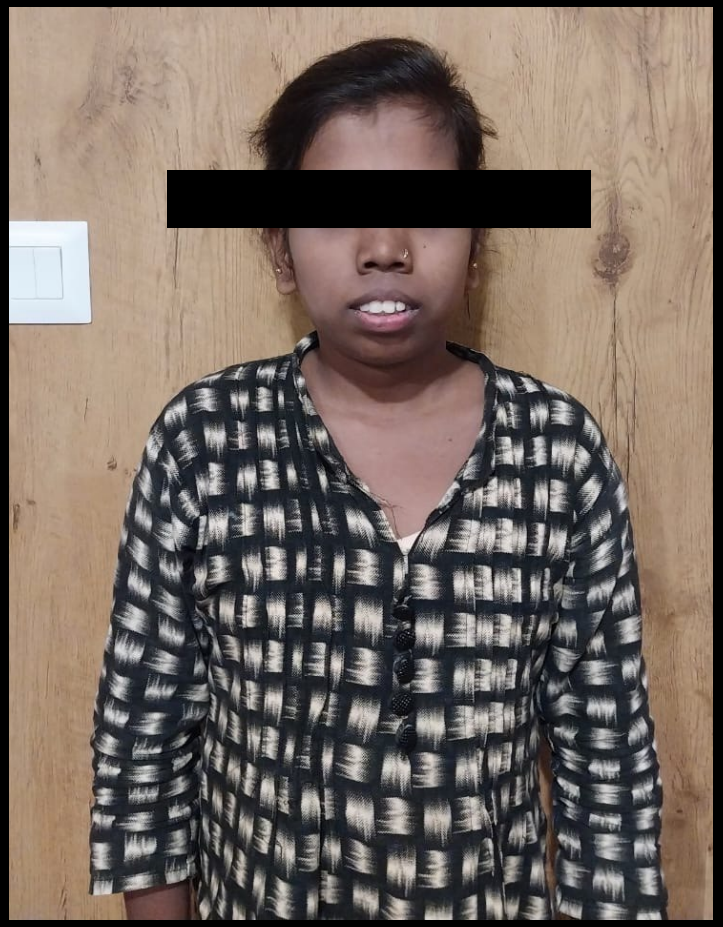
CASE 1

- A 22 year old female patient, presented with easy fatiguability and difficulty in breathing on exertion since 15 days.
- Patient is K/c/o thalassemia major since 4 month of age and on regular blood transfusion every 15 days with either 1 or 2 pint of PRBC. Patient on iron chelator since 12 year of age .
- Patient is also known case of diabetes mellitus on insulin treatment since 1 year.

- Menstruational history - Patient has also not attained menarche
- Past history - Patient underwent splenectomy on 24.10.2010
- Medication history – Patient is on iron chelator (Tab Defarisirox, Tab Defapirone and Tab folic acid) and human mixtard insulin.

ON HEAD TO TOE EXAMINATION

Patient is poorly built and under nourished
Weight -40kg , Height -143cm
Pallor is present
Face: malar prominence present .
Teeth :crowded and protruded
Short neck present
Absence of breast development,axillary and pubic hair
External genitalia is normal

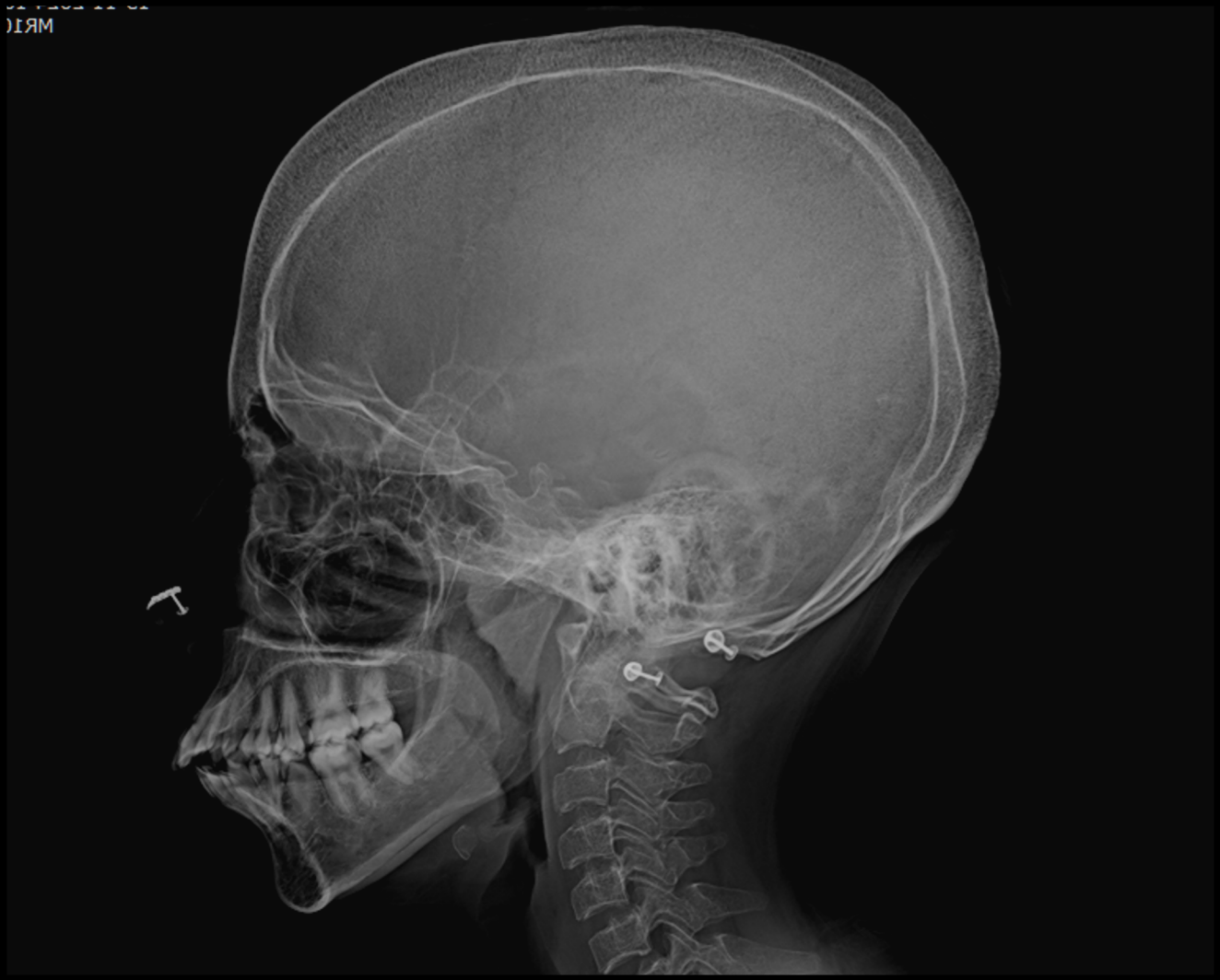


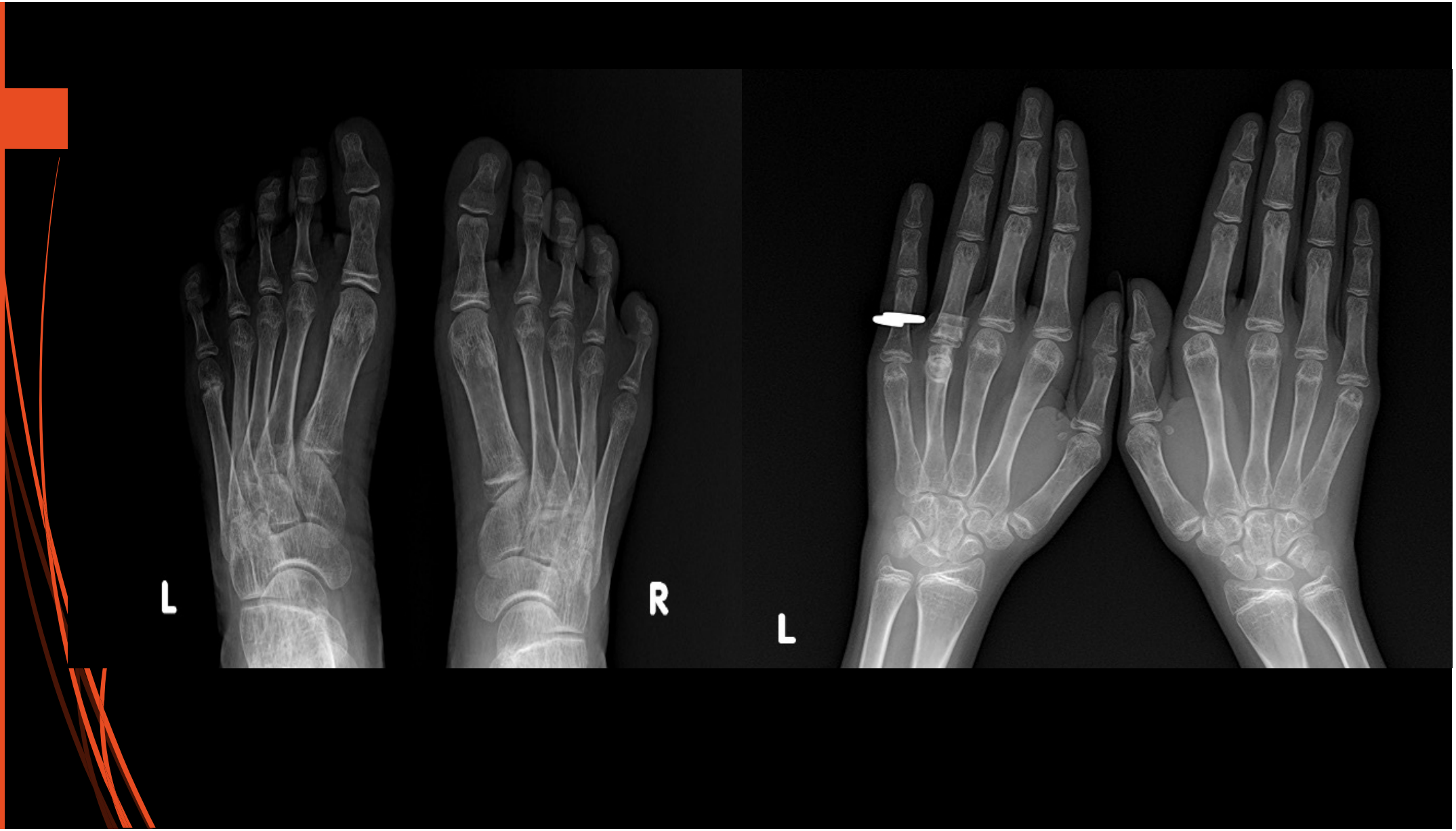
Investigations

HB MCV: PCV:34.2 WBC count: Platelet count	6.1g/dl 90.2fl 34.2 14400 cells /cumm 2.46 lakhs/cumm
HIV, HBSAG, HCV:	Non reactive
TB/DB/IB	3.11/0.57/2.5
AST/ALT/ALP	58/64/145
ALB-	3.9
BU/CR	25/0.27

IRON PROFILE SERUM IRON TIBC TF SATURATION FERRITTIN	 212.0 mg/d (60-170) 189 (250-370) 112% (15-50)' 2000 ng/ml (24-336)	**Peripheral smear**	Predominately normocytic and normochromic cells with macrocytes are seen , mild anisopoikilocytosis noted in the form of pencil shaped cells and teardrop cells . Polychromasia seen. Wbc – increased in number with left shift noted up to myelocyte stage seen
LH	0.3mIU/ml (1.2-7.8)		
FSH	0.4mIU /ml (1.4-15.4)		
Prolactin	7.7ng/ml(3-14.7)		

X-ray findings

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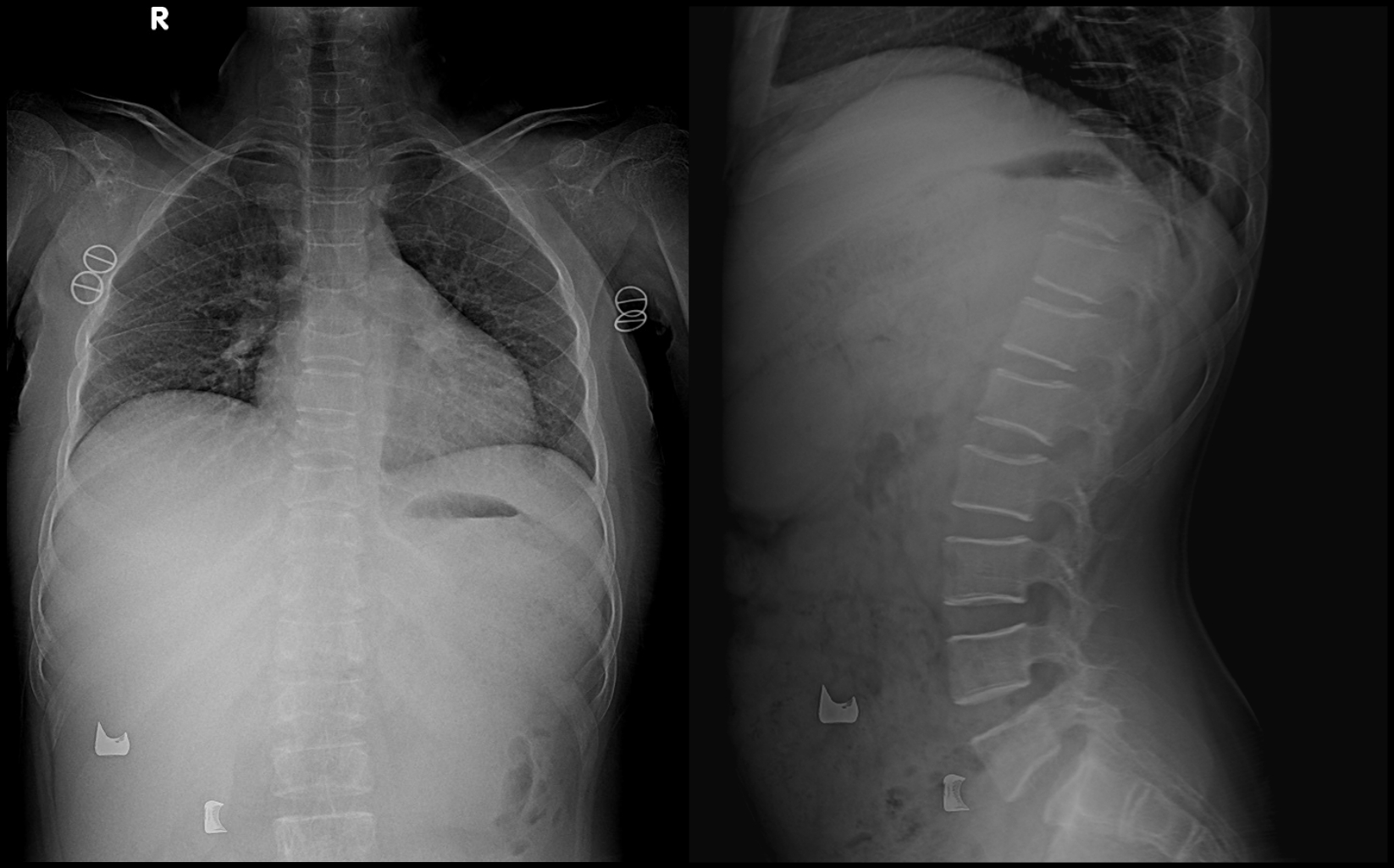
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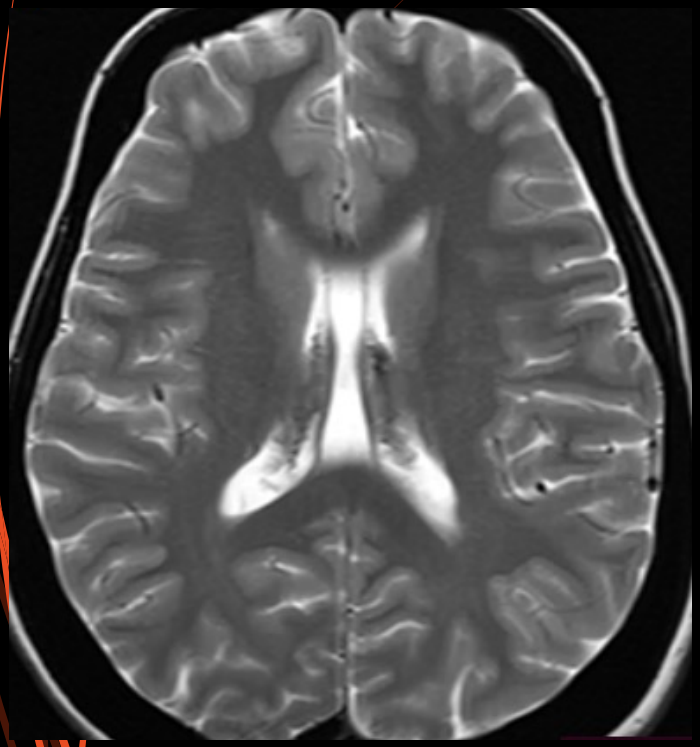

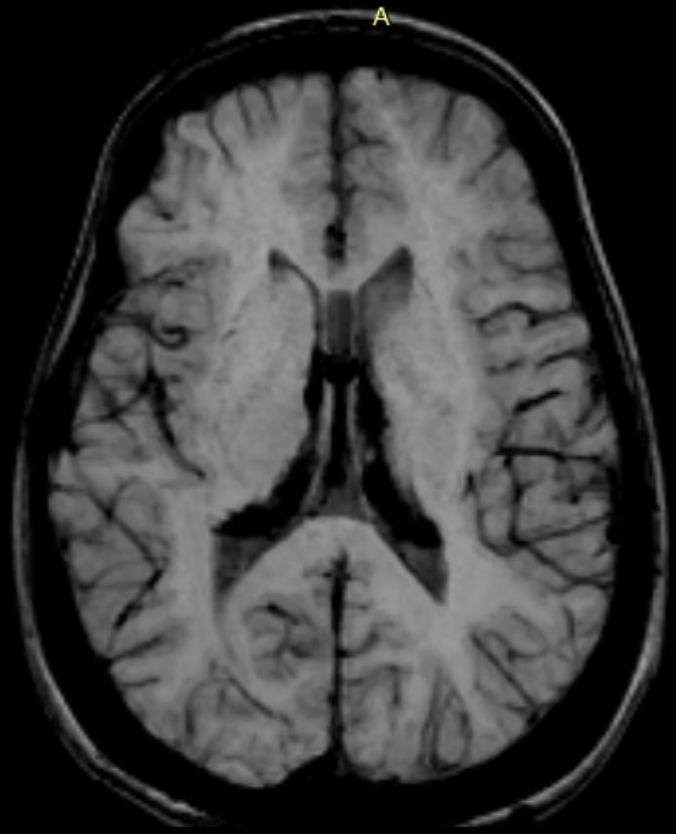
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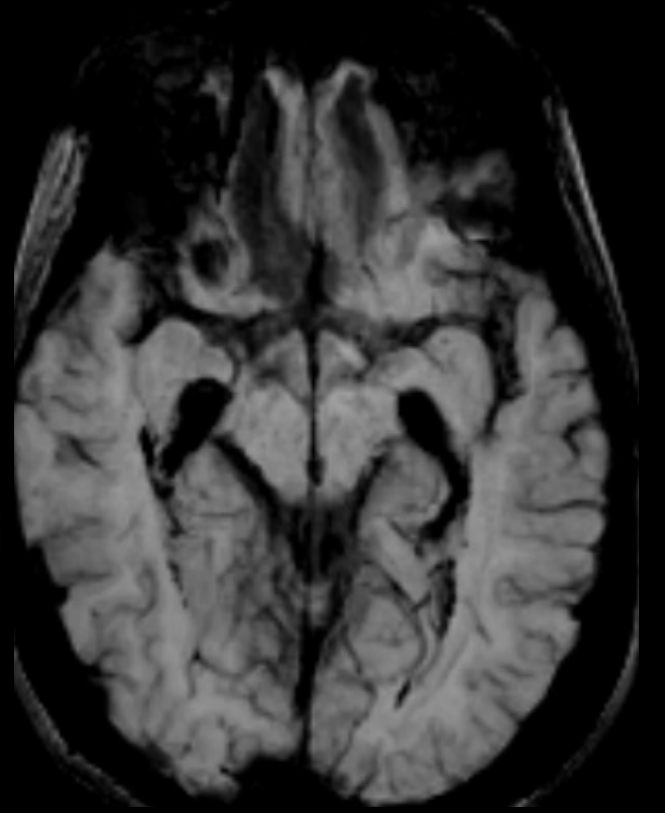

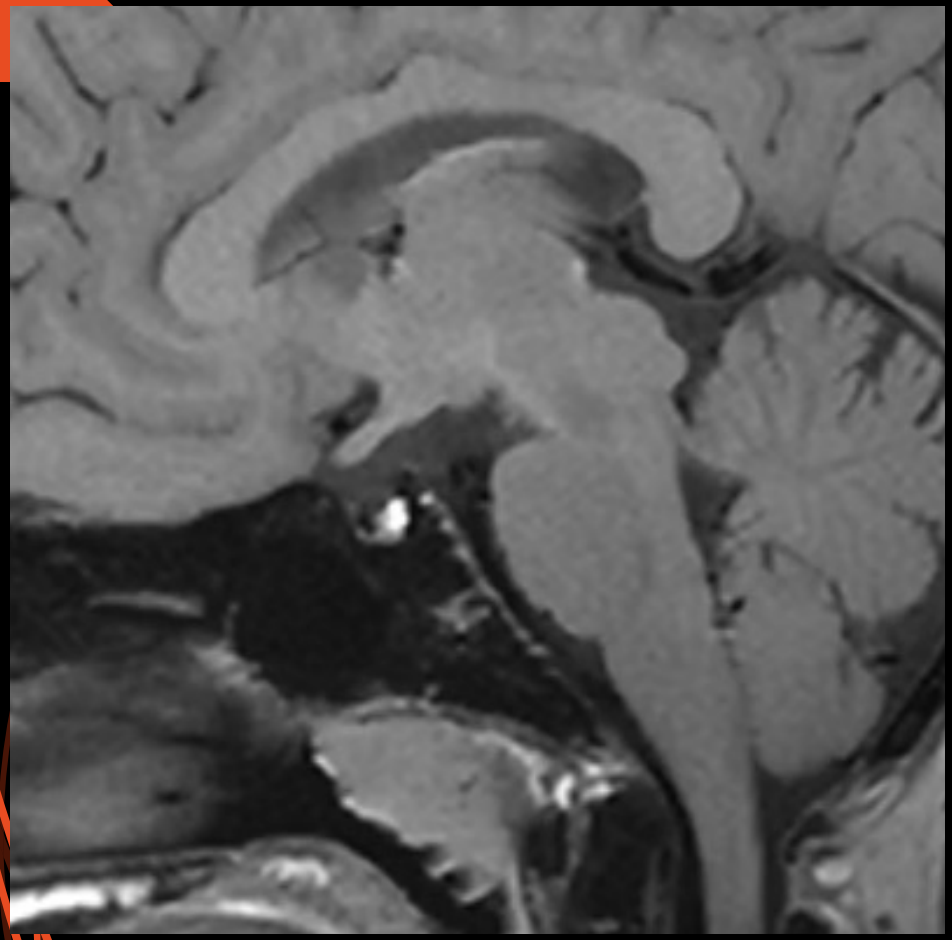

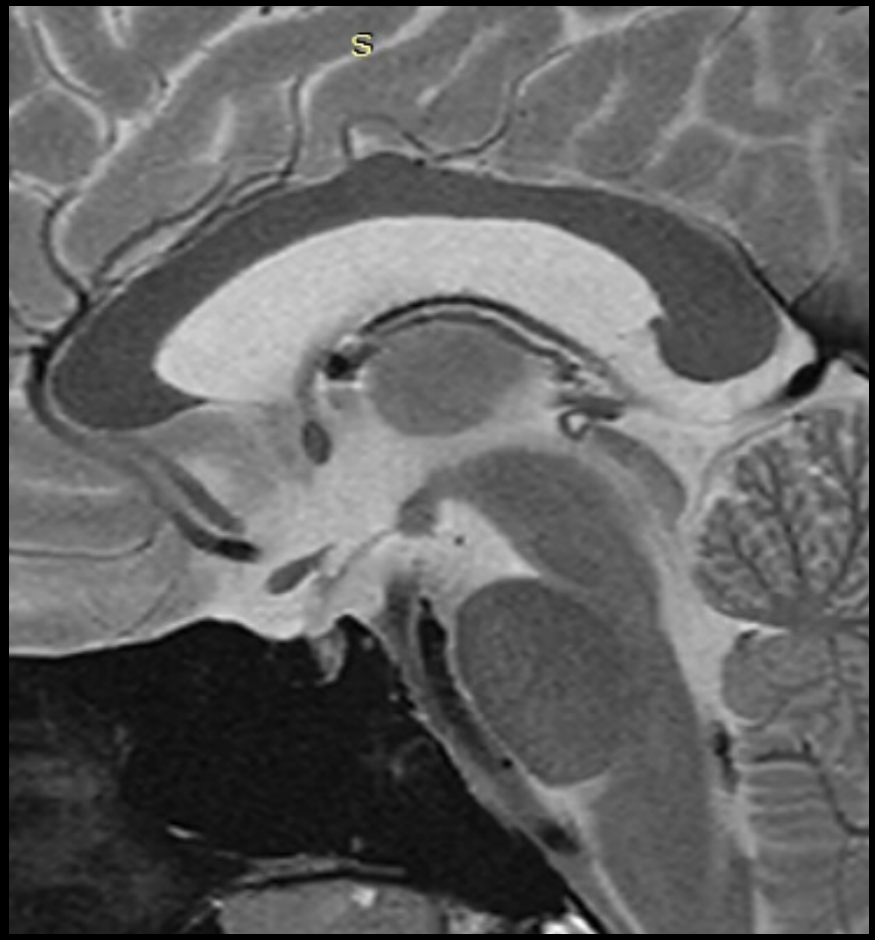
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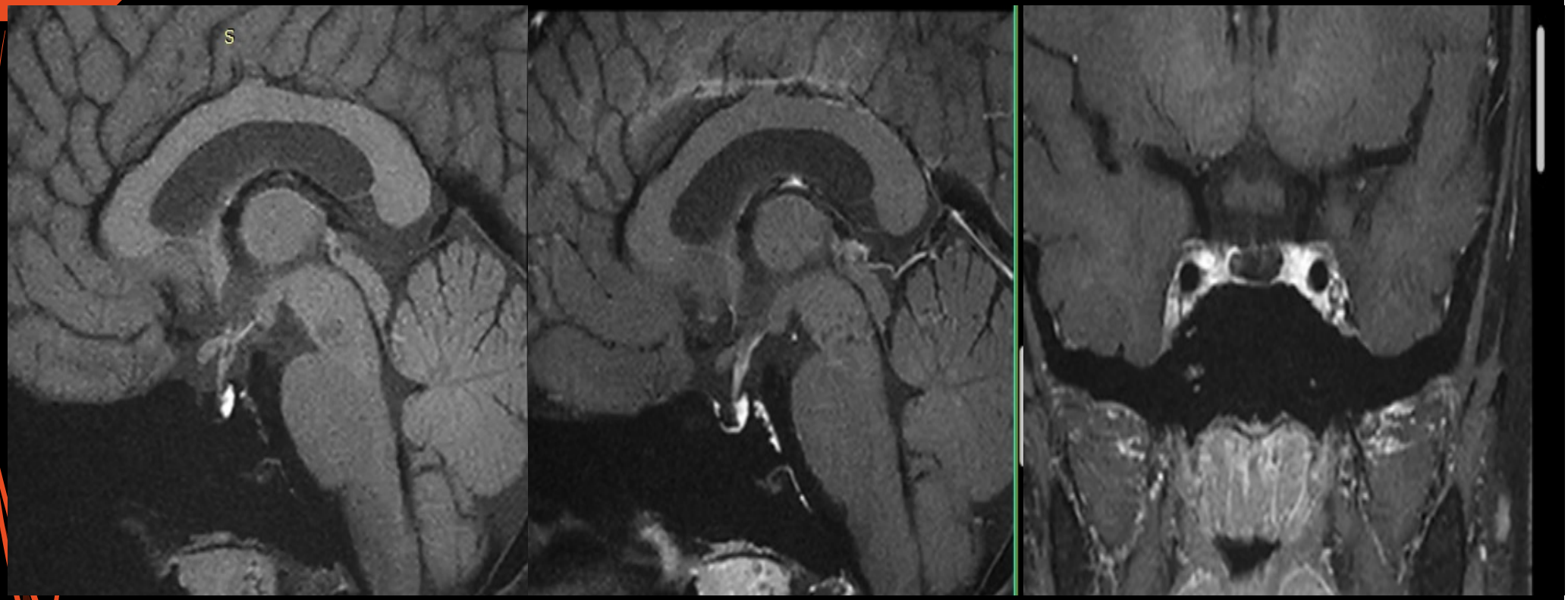
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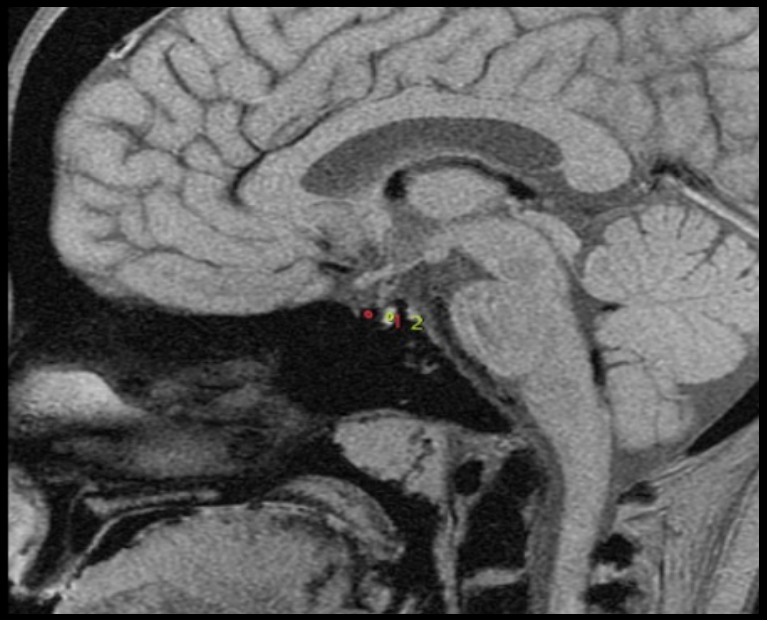
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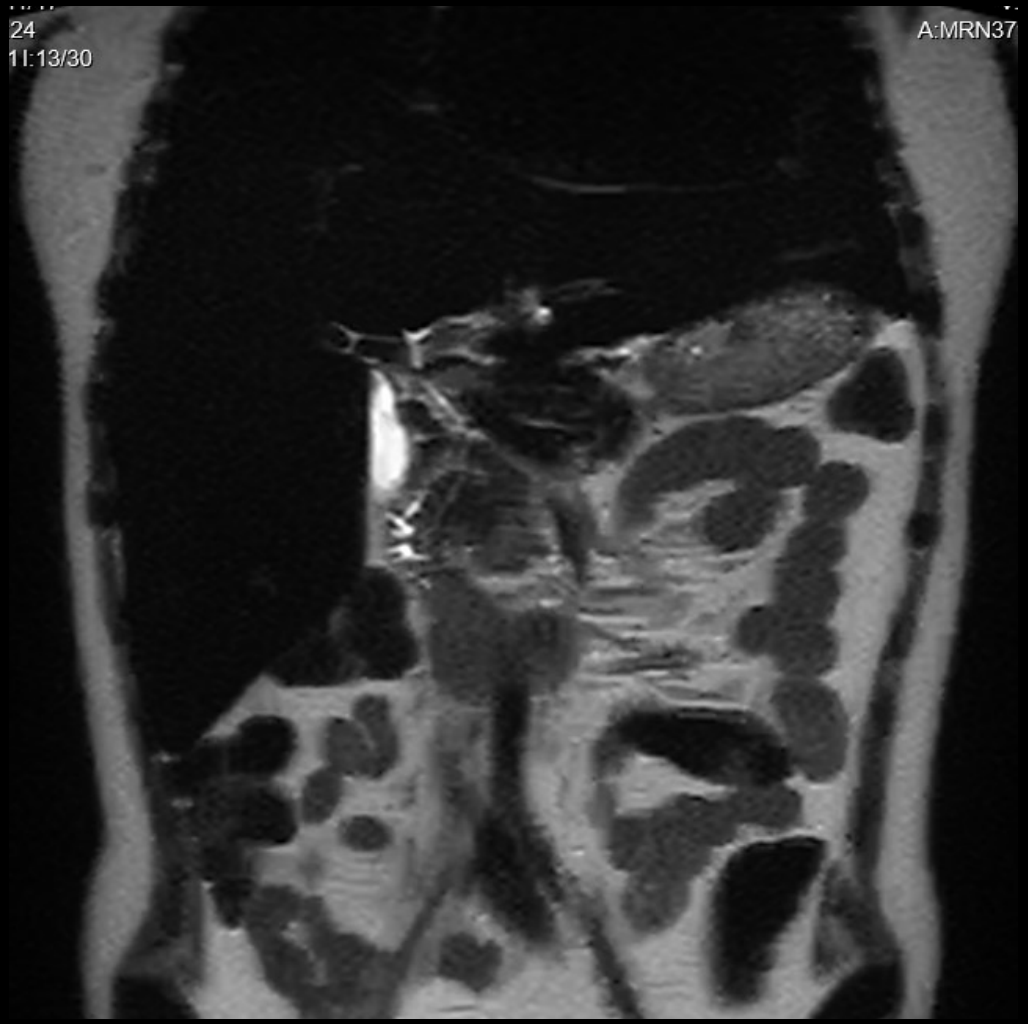
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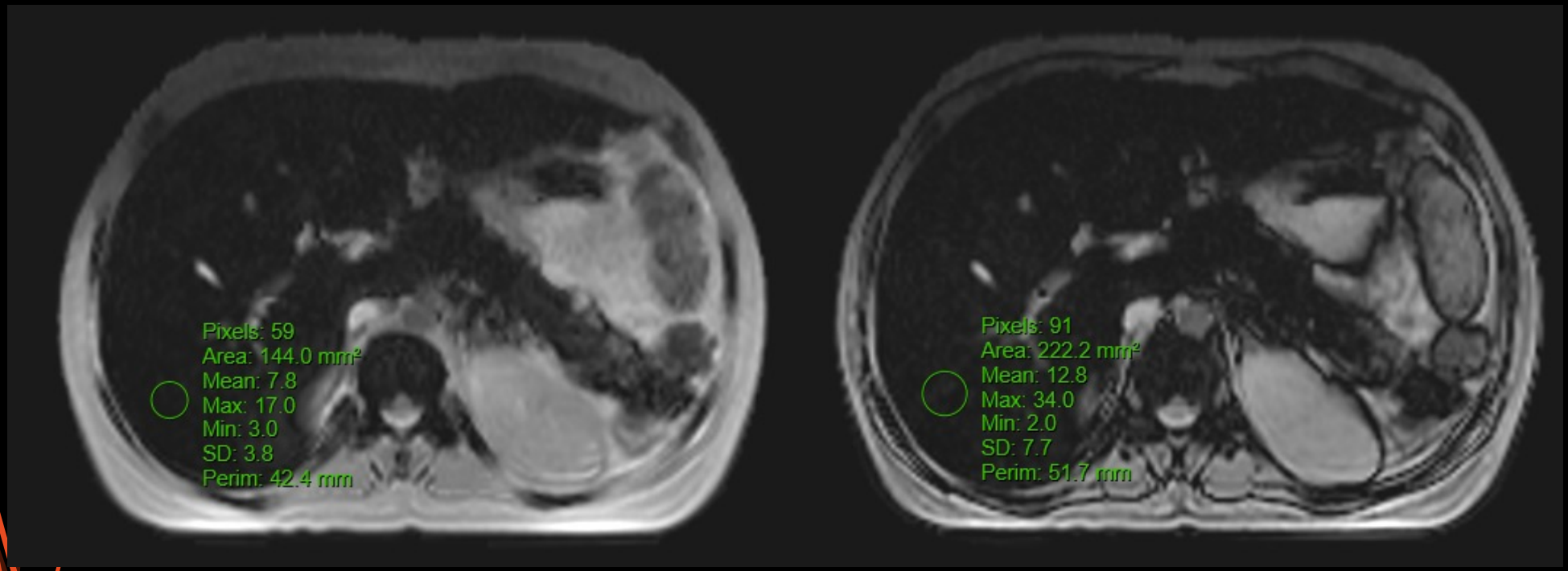
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Perim: 42.4 mm
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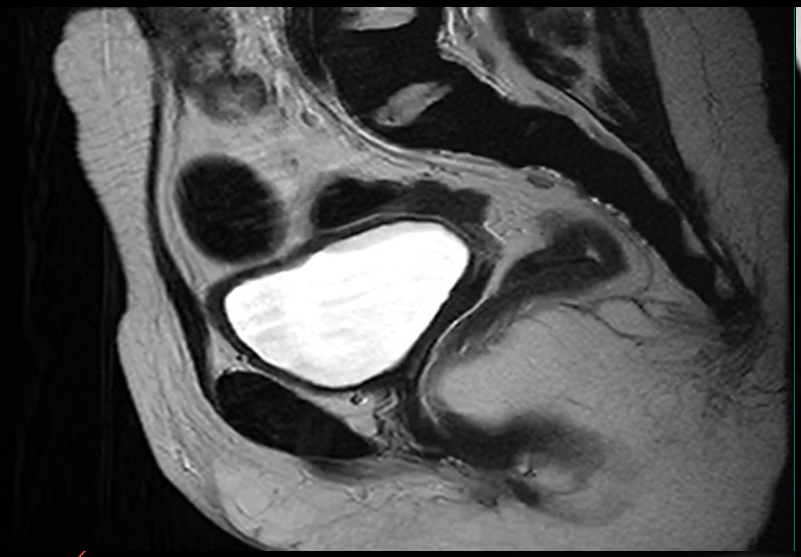

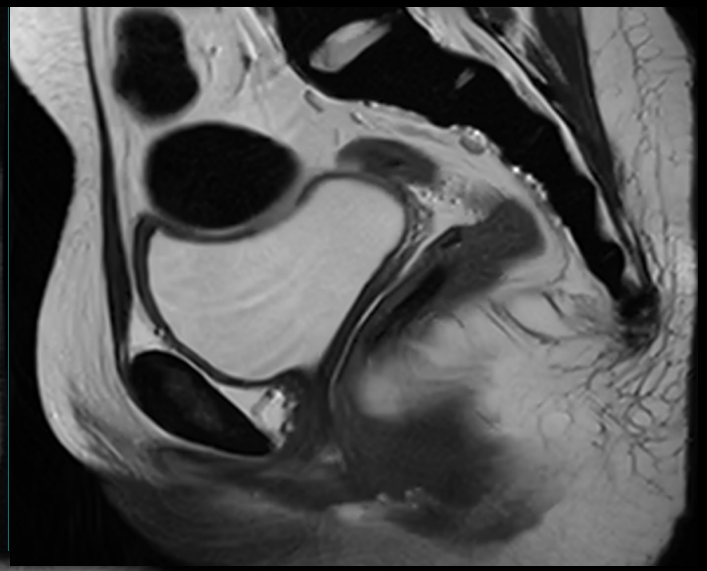

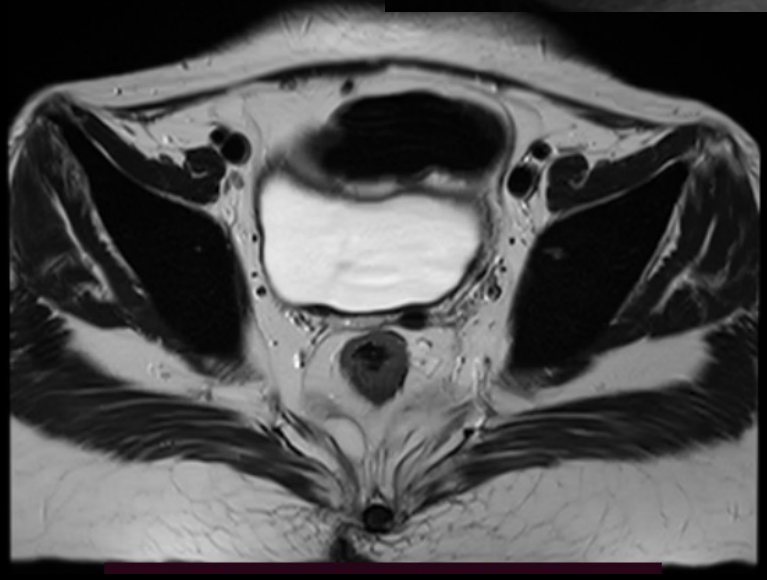

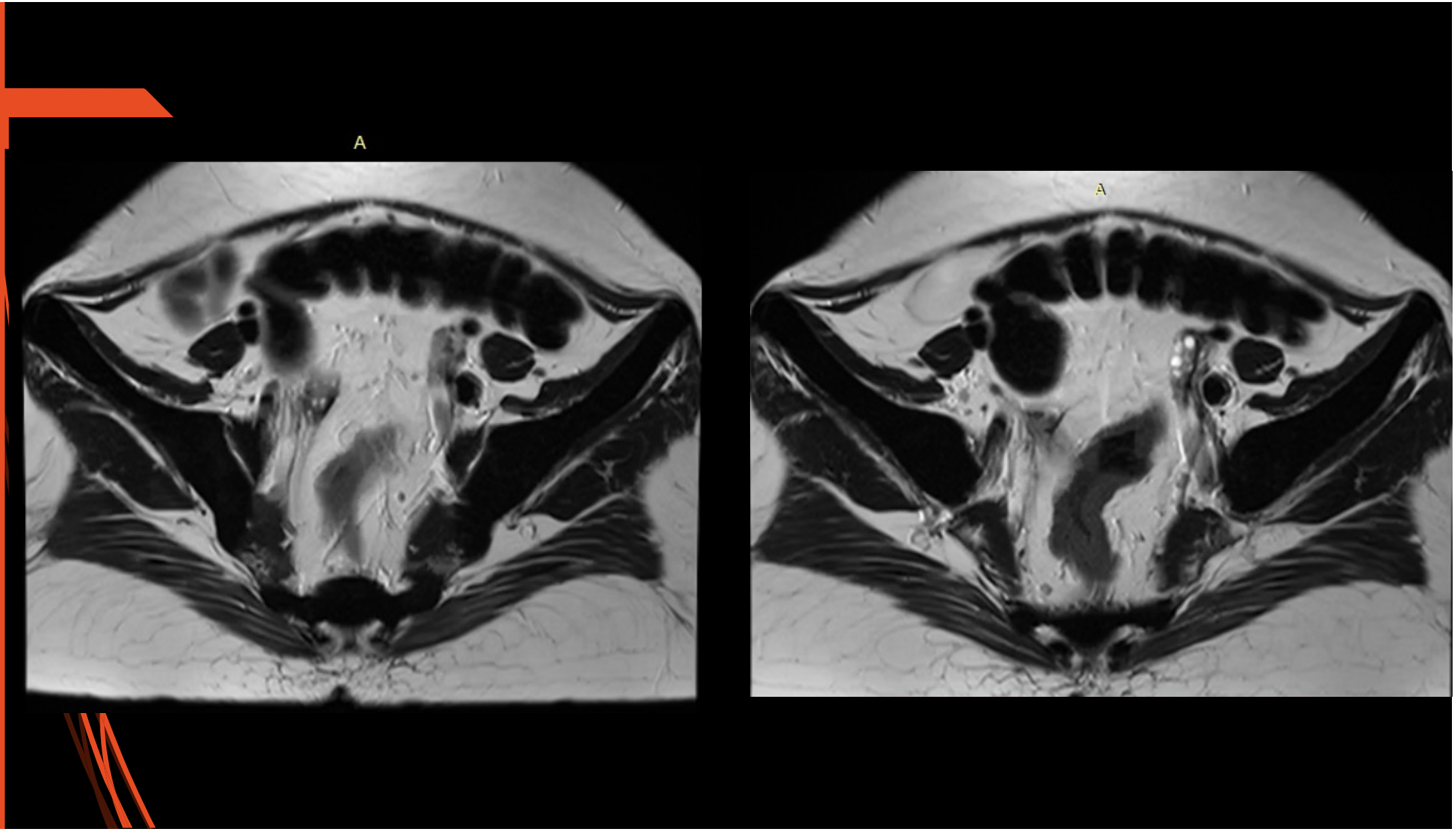
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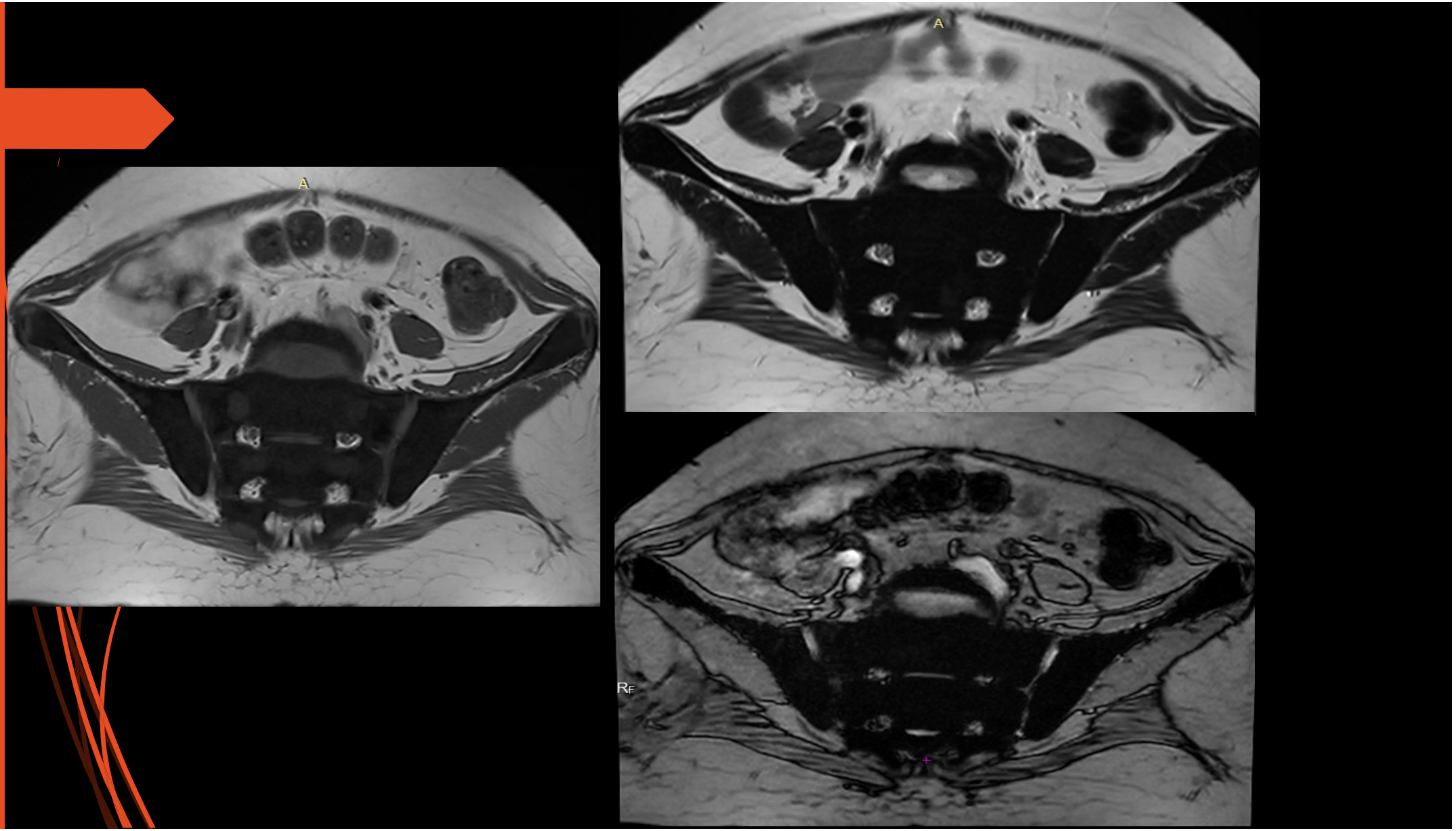
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Summary

- A 22 year female patient with k/c/o thalassemia major on regular blood transfusion since 4 month of age and iron chelator since 12 year of age, came with h/o easy fatiguability and dyspnoea on exertion since 15 days and not yet attained menarche.
- CE-MRI brain study shows T1/T2 hypointensity involving the anterior pituitary and bilateral choroid plexus showing no significant enhancement on post contrast study ***- Suggestive of hemosiderin deposition.***
- Diffuse T1/T2 hypointensity noted in visualised bones.
- Uterus appears markedly hypoplastic.
- MRI of liver and pancreas shows decrease in signal intensity on in phase imaging

Diagnosis

1.Thalassemia with Secondary Hemochromatosis .

2.Hypoplastic uterus

DDs to be considered

-Hypogonadotropic hypogonadism secondary to anterior pituitary hemochromatosis

-Mayer Rokitansky Kuster Hauser syndrome

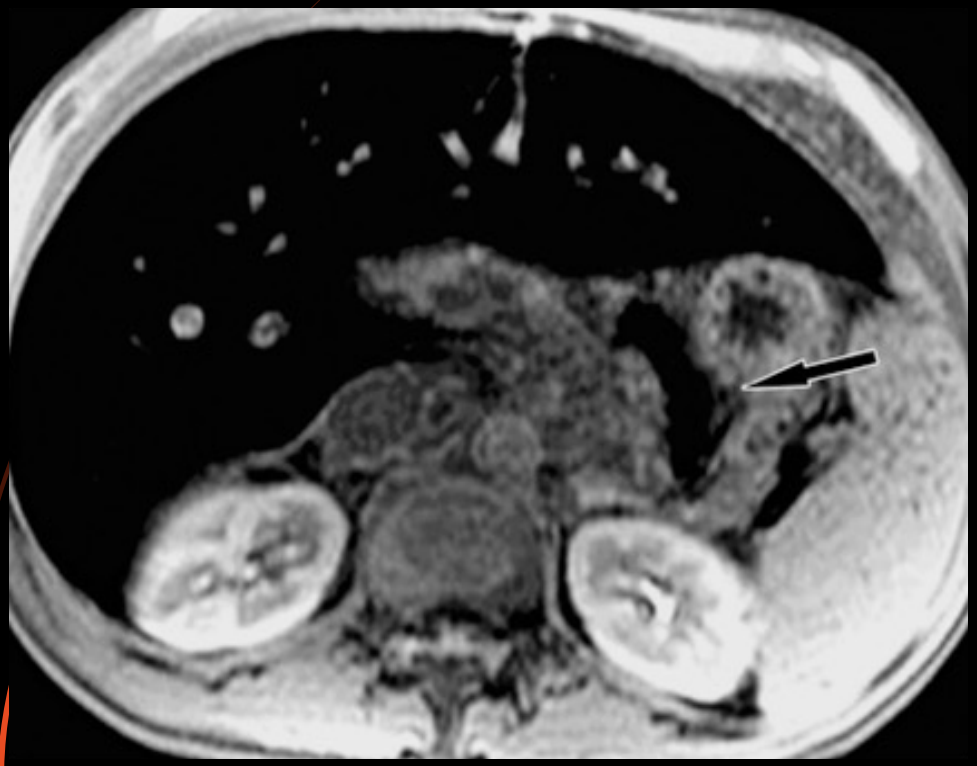
HEMOCHROMATOSIS

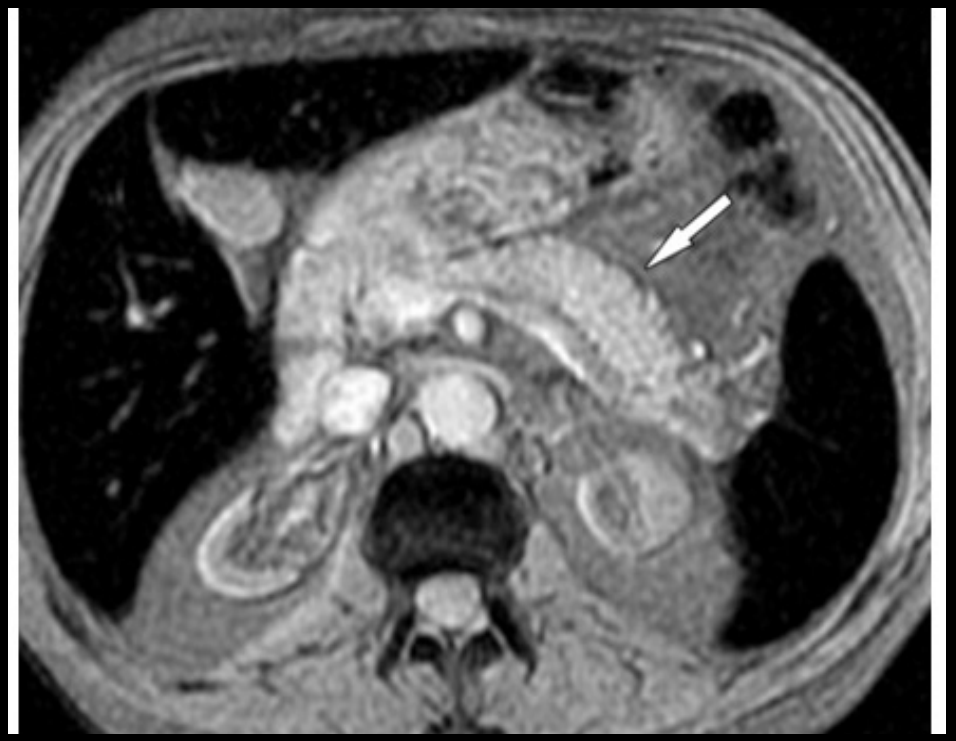
- Due to dysregulation of iron absorption
- Increase in total body iron stores and abnormal non reticuloendothelial deposition leading to organ dysfunction.
- In hemochromatosis daily iron absorption exceed 4mg/ day where as excretion remain same
- Can be classified as primary and secondary.

Primary Hemochromatosis	Secondary Hemochromatosis (Acquired)
Hereditary autosomal recessive disease (mutation in HFE gene in chromosome 6, most common gene C282Y)	Parenteral administration of iron (eg, repeated blood transfusions)
Increases intestinal absorption with normal dietary intake of iron	Dietary iron overload
Iron excess deposits in parenchymal cells, preferentially in the liver, pancreas, heart, pituitary gland, thyroid, and synovium	Iron is predominantly deposited in the reticuloendothelial system (spleen and Kupffer cells)
Leads to cellular damage, organ dysfunction, and malignancy	Less toxic
If untreated, may progress to cirrhosis, hepatocellular carcinoma, diabetes, and cardiac dysfunction	Secondary increased absorption of normal dietary iron intake: liver diseases (alcoholic hepatitis and hepatitis C), myelodysplastic syndrome, anemias, other chronic and oncologic diseases.

Four patterns of iron deposition

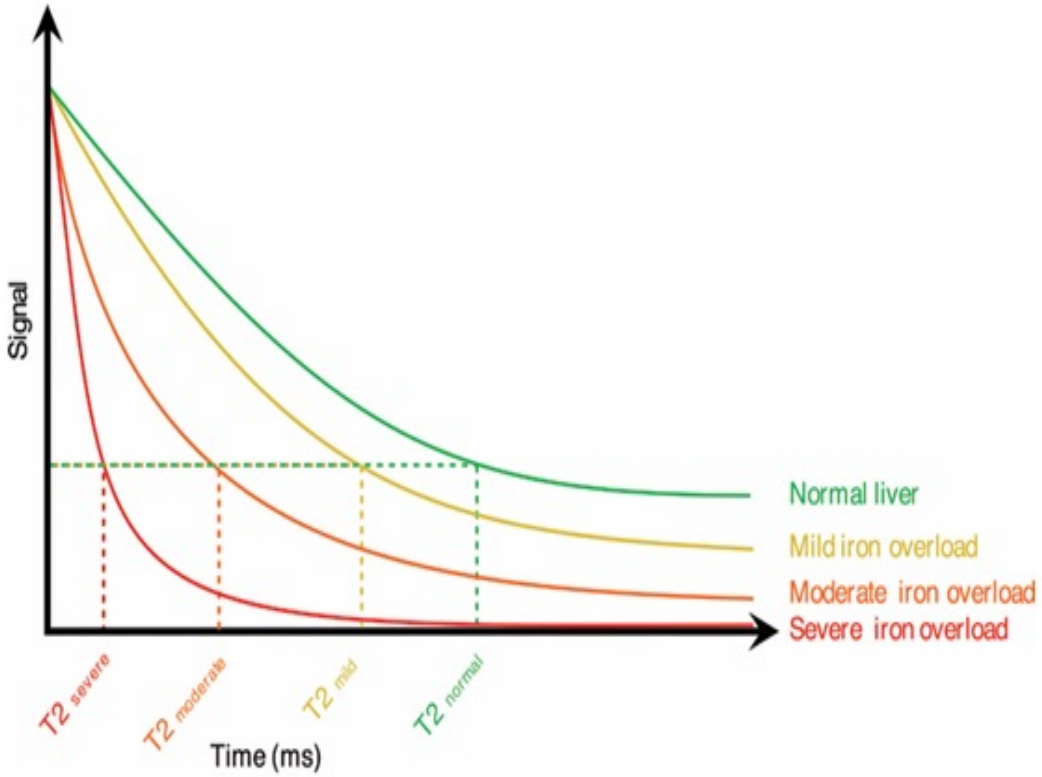
1. Reticuloendothelial Deposition Pattern.
2. Parenchymal Deposition Pattern
3. Renal Deposition Pattern
4. Mixed pattern

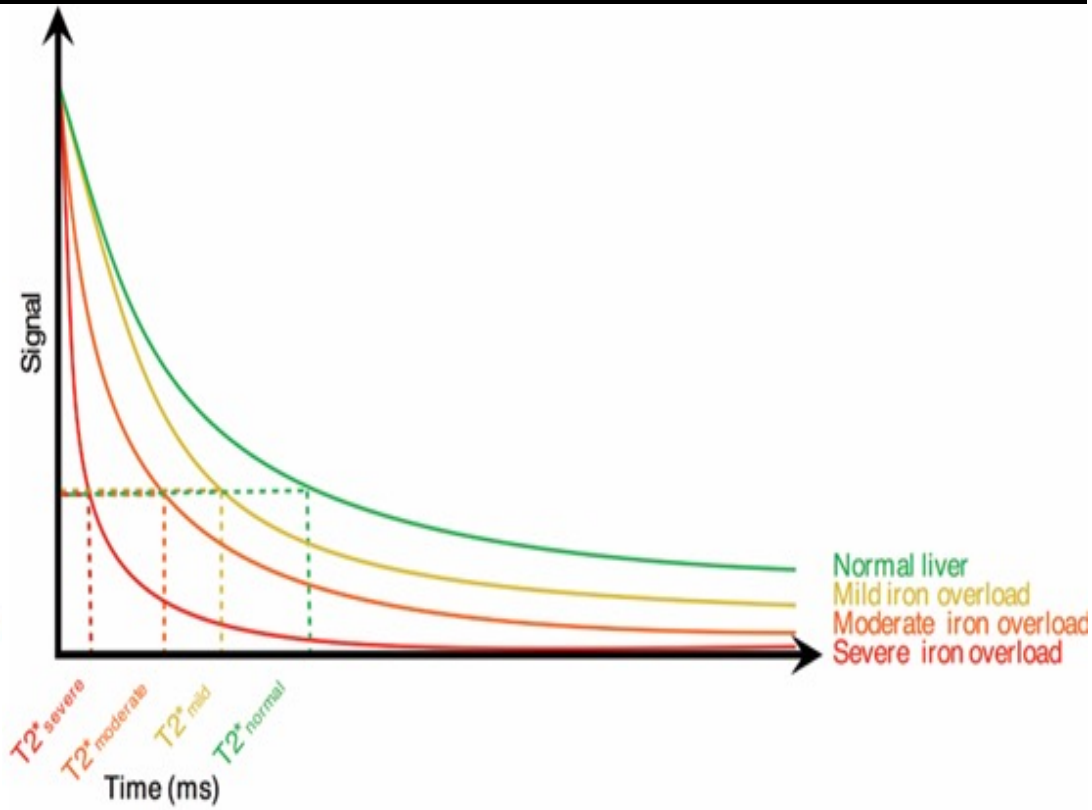




MR LIVER IRON QUANTIFICATION

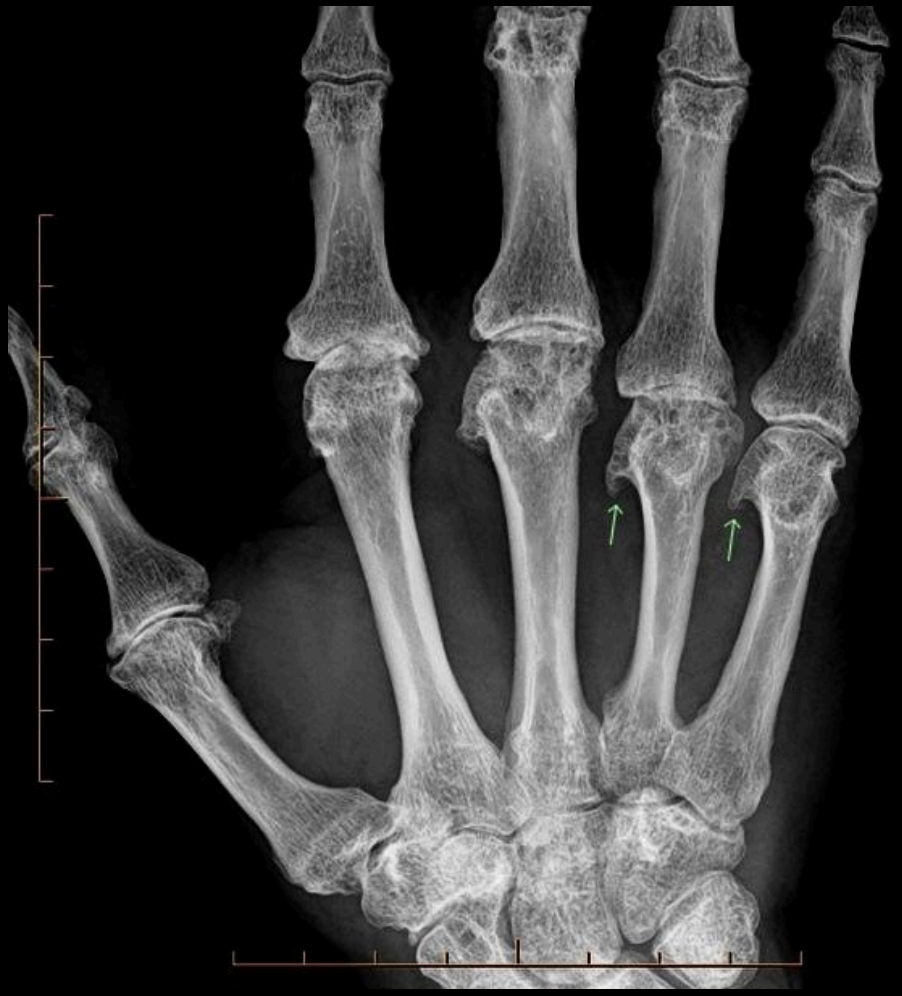
- MR imaging is the best noninvasive method for measuring the level of iron in the liver
- The accumulation of iron ions in the tissues, because of the superparamagnetic properties of the ions, causes local distortion in the magnetic fields and relaxation of the spins
- Shortening of T2 (particularly the transverse relaxation time as affected by magnetic field inhomogeneity (T2*).
- This effect causes a loss of signal intensity in the affected organs that is proportional to the iron deposition.


Signal
Normal liver
Mild iron overload
Moderate iron overload
Severe iron overload
T2 severe
T2 moderate
T2 mild
T2 normal
Time (ms)


Signal
Normal liver
Mild iron overload
Moderate iron overload
Severe iron overload
T2* severe
T2* moderate
T2* mild
T2* normal
Time (ms)

- Skeletal manifestation in hemochromatosis

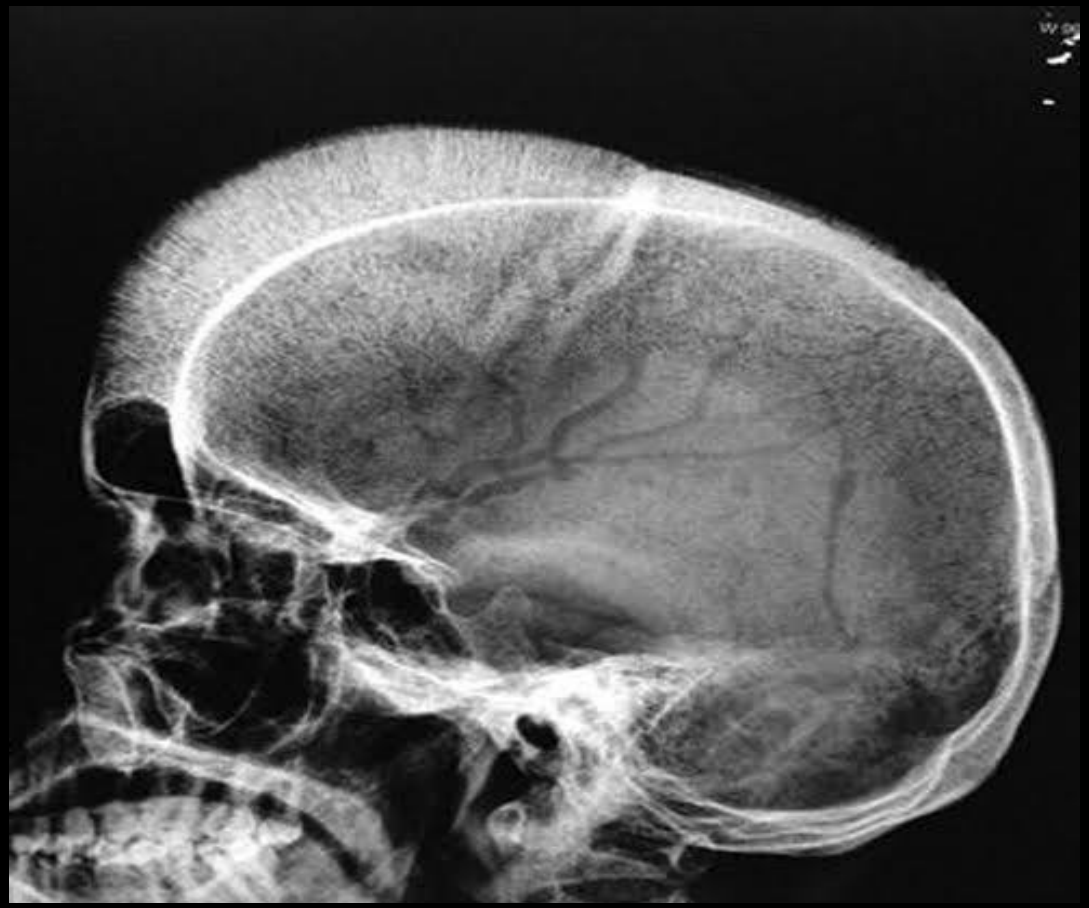
1. Arthropathy
2. Chondrocalcinosis
3. Osteopenia and osteoporosis



Skeletal manifestations in thalassemia

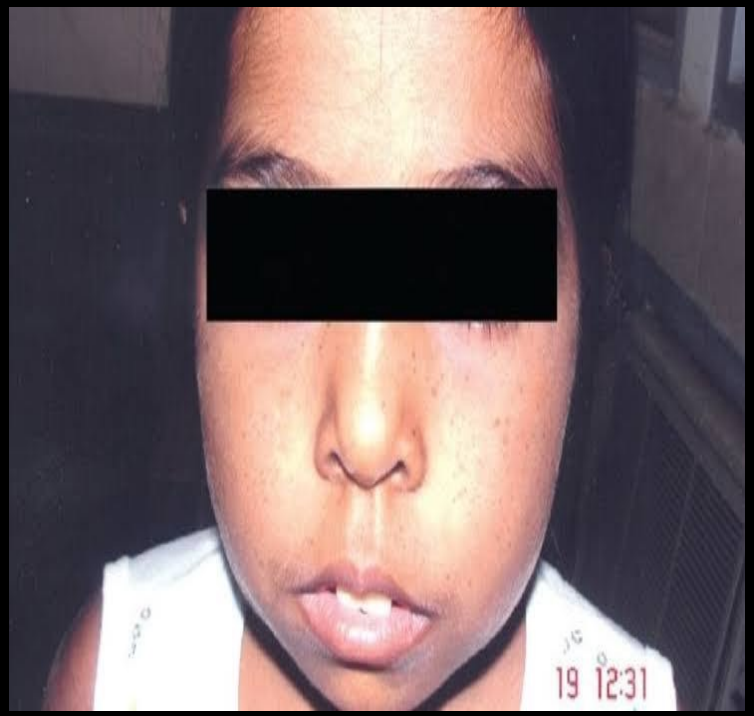
A .SKULL

- Thickening of the vault.
- Widening of the diploic space.
- Hair on end appearance



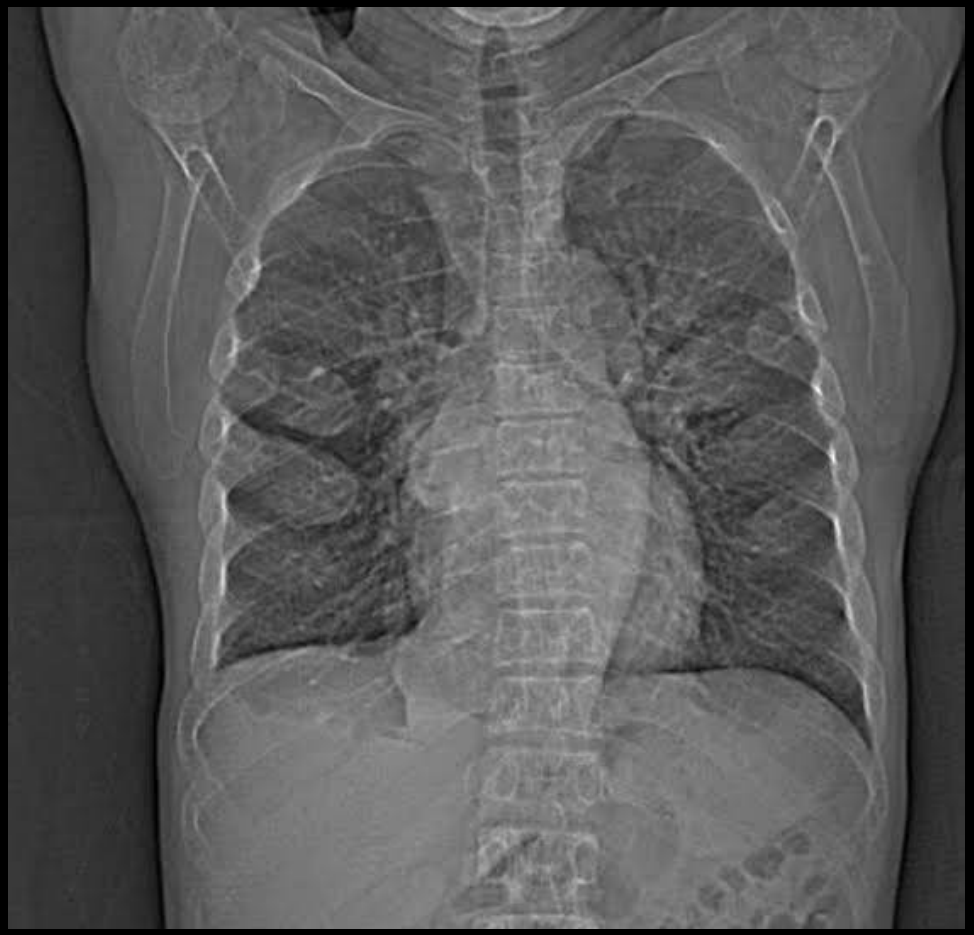
FACIAL BONES

- "Cooley face" or "mouse face" or "mongoloid" or "rodent face"
- Maxillary protrusion cause marked orbital hypertelorism, overbite of the mandible and malocclusion
- Protrusion and spacing of the upper anterior teeth



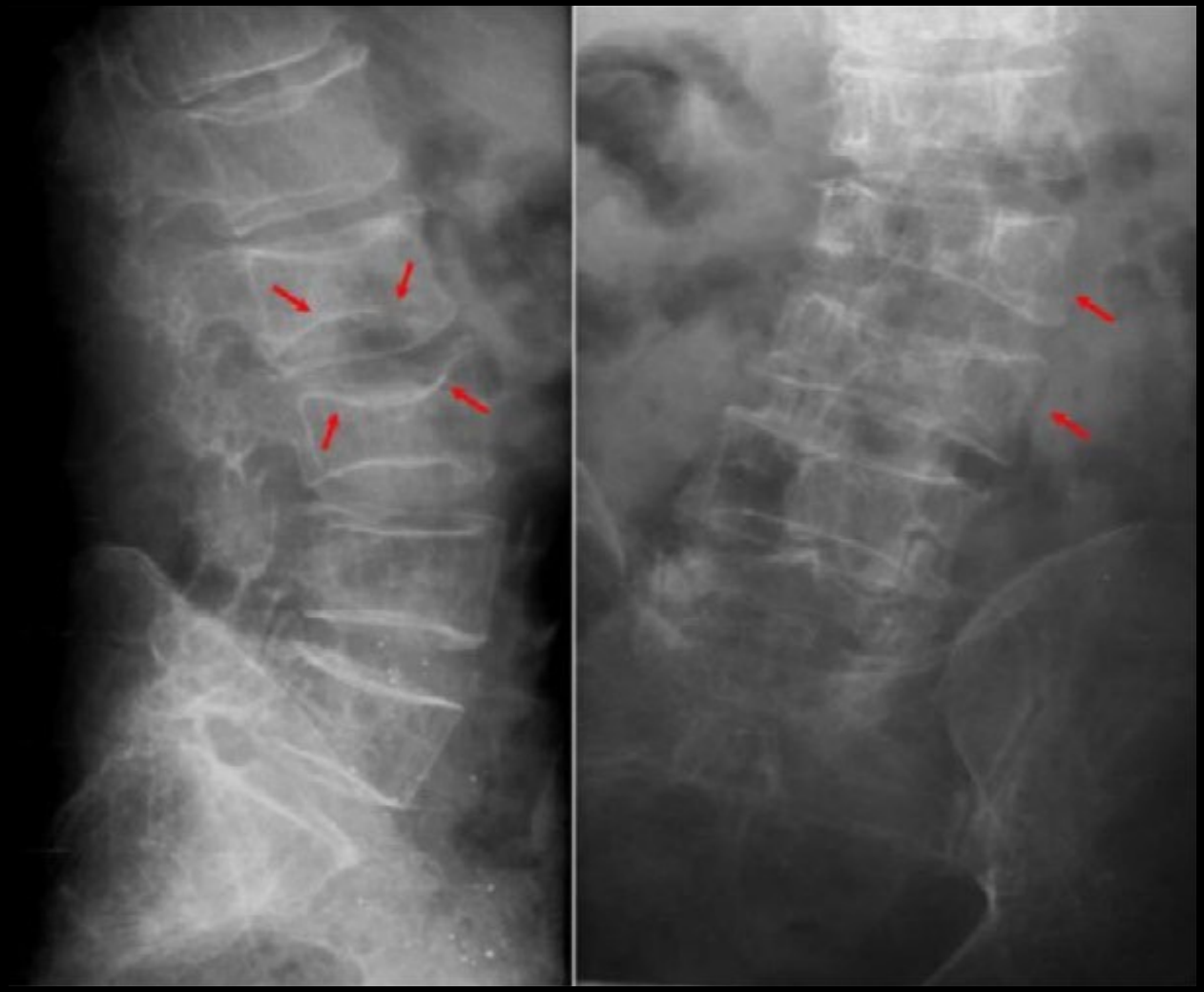
RIBS

- Widening and trabeculated pattern
- “Rib within the rib” sign.



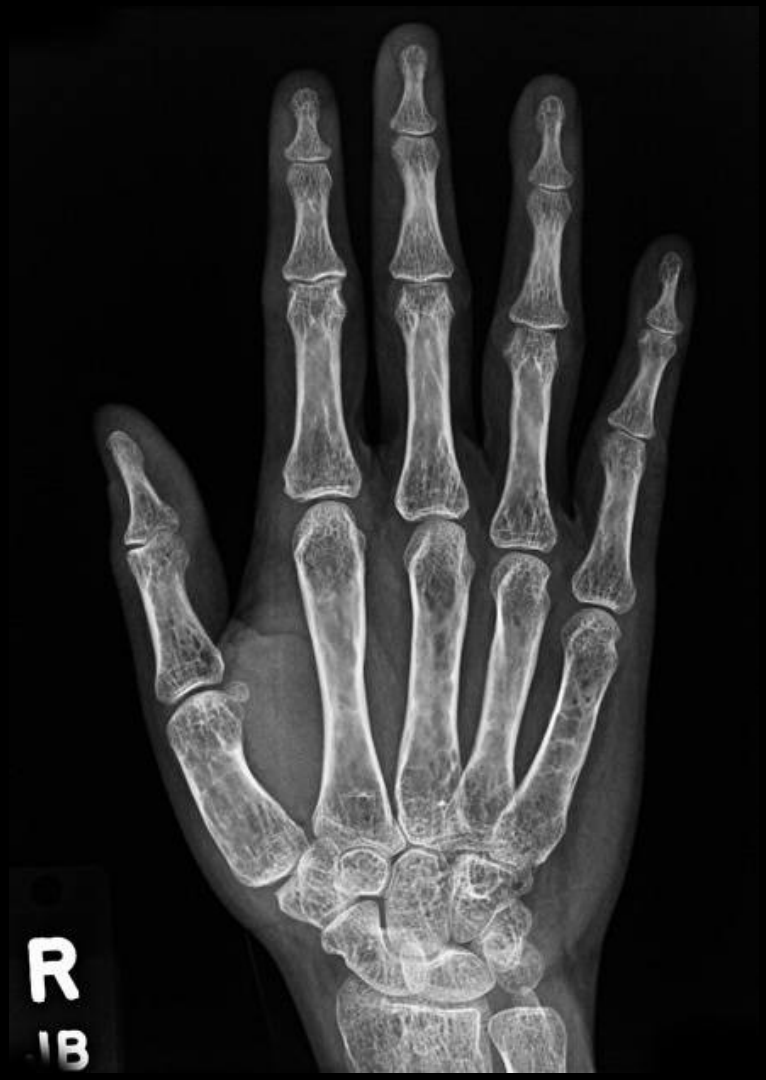
SPINE

- Spine osteoporosis
- Fish cod vertebrae
- Platyspondyly



HANDS AND FEET

- "Worm-eaten" appearance.
- Coarse trabeculation.
- Squared or sausage-shaped configuration.



CASE 2

- A male child aged 8years 1 month born to third degree consanguinity came with complaints of not gaining weight and height for his age .
- The child has normal development milestones and intellectual ability.
- The child is able to read and write.
- The child also complains of repeated episodes of pneumonia
- Family history-No similar complaints in the family
- Vaccination history –Upto date
- Birth history –Normal vaginal delivery .No ICU admission

CASE 2

On head to toe examination

The child is short statured.

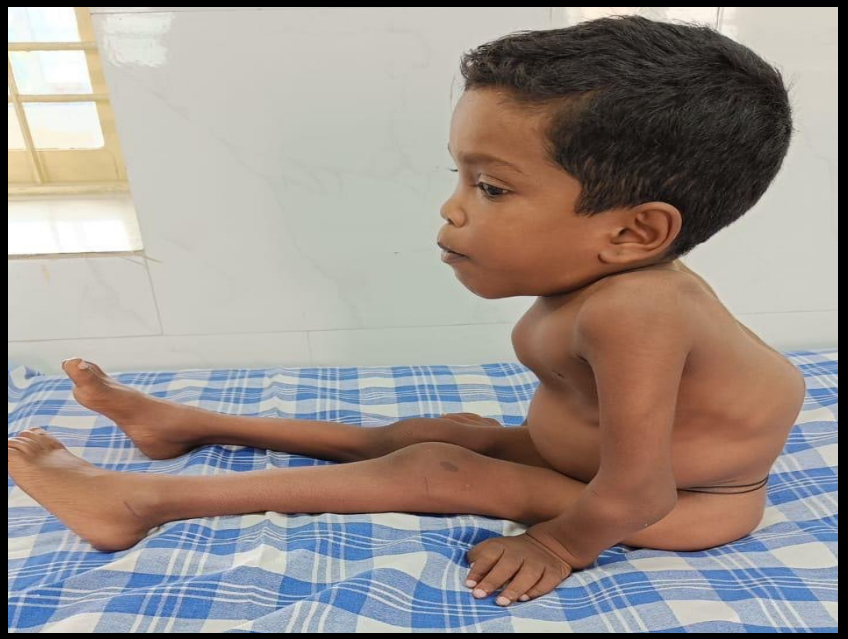
Face: Frontal bossing present .

Ears and Nose:depressed nasal bridge and low set ears .

Teeth :crowded teeth present

Neck: short neck present

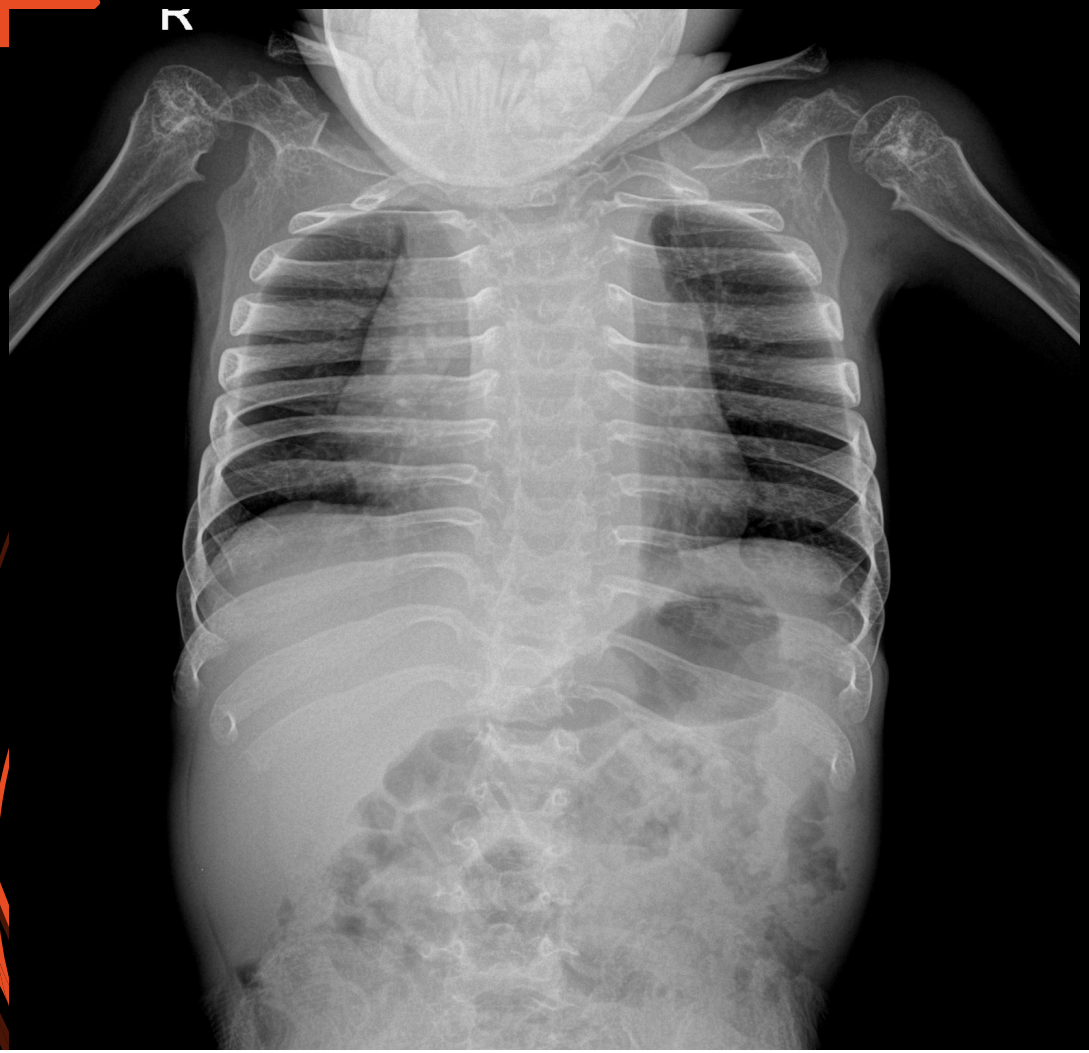
Chest- Pectum carinatum
Back –Kyphosis
Limbs –Genu valgum , widening of wrist and short limbs

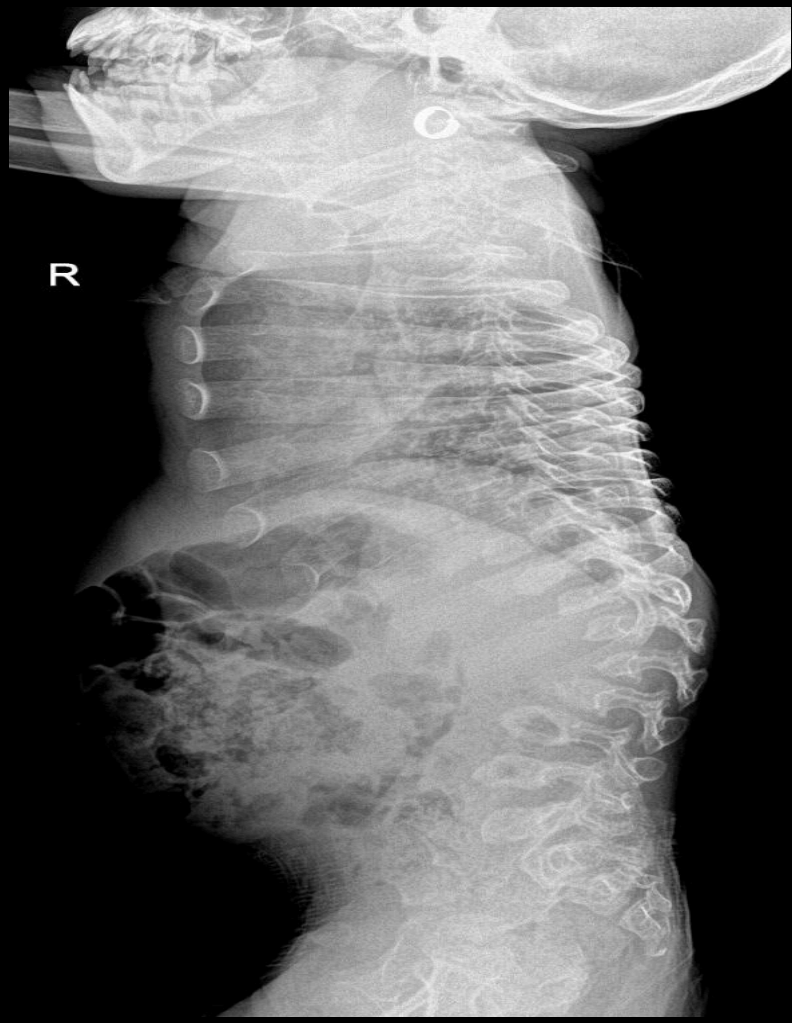


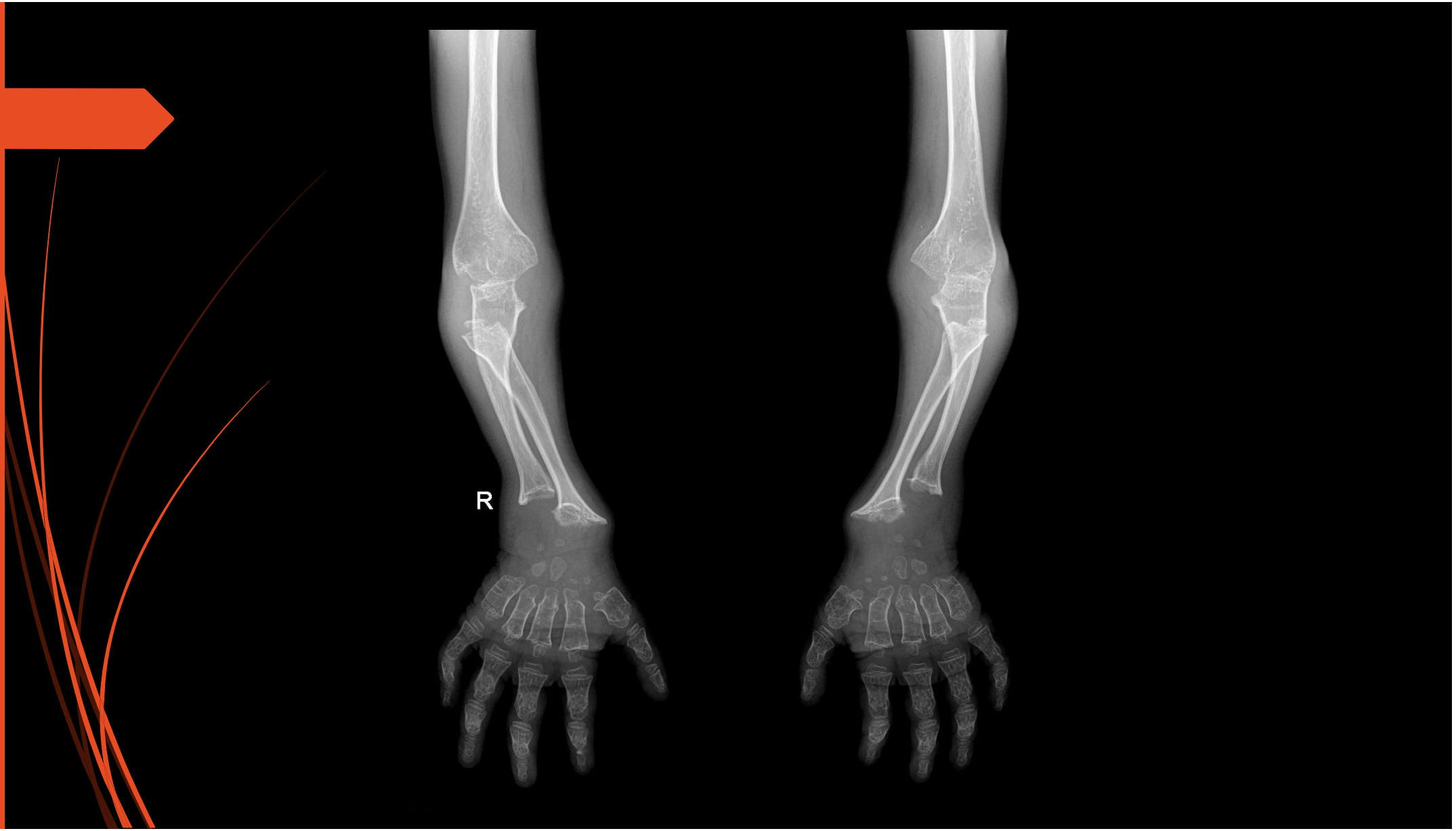
INVESTIGATION

HB WBC count: Platelet count	14g/dl 10400 cells /cumm 2.46 lakhs/cumm 3 lakhs
HIV, HBSAG, HCV:	Negative
2D echo correlation	Mild pulmonary hypertension with mild TR , Dilated RV
Calcium	8.4 mg/dl
PTH	22pg/ml
Phosphorus	4.5mg/dl

IMAGING



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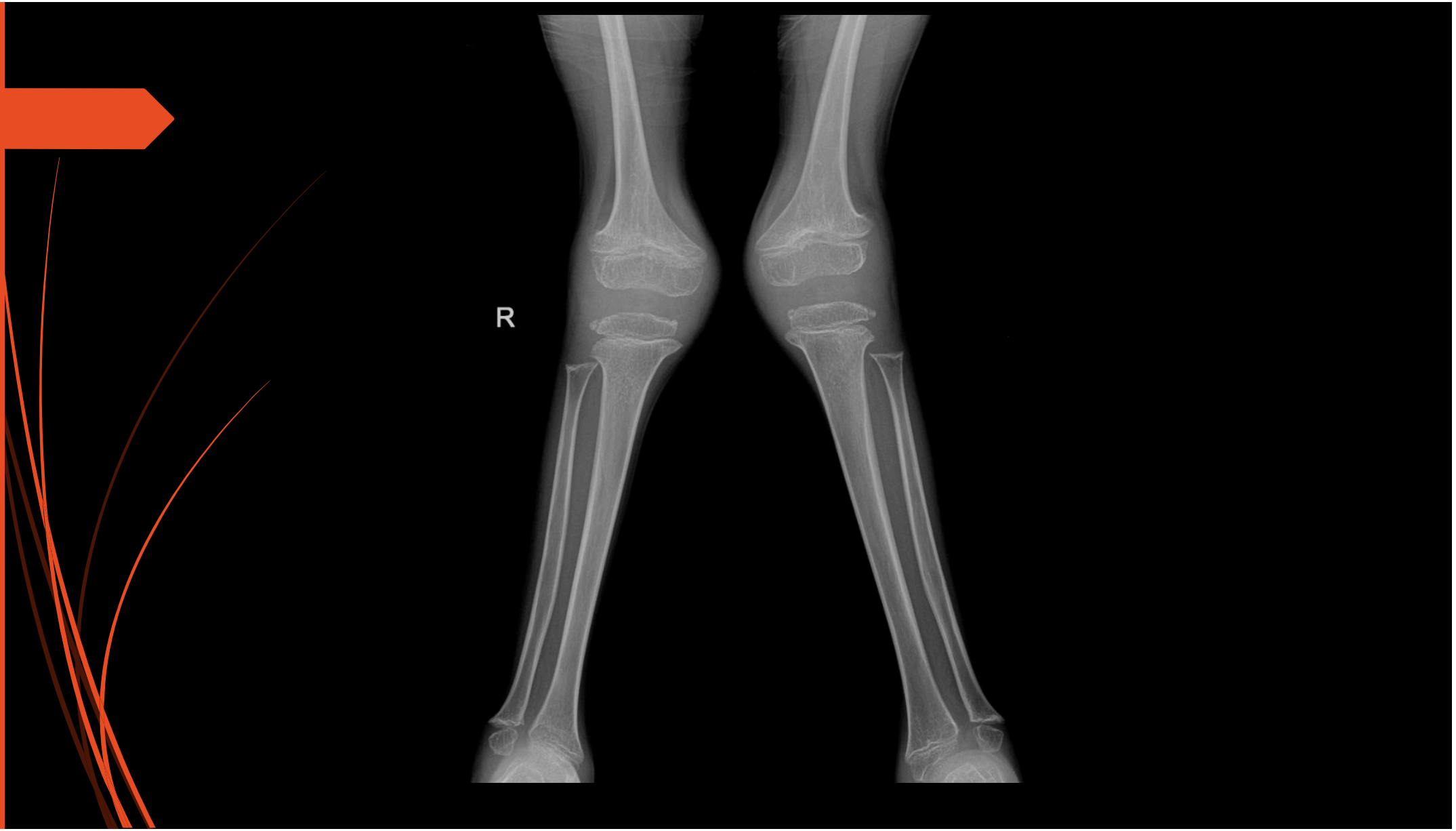
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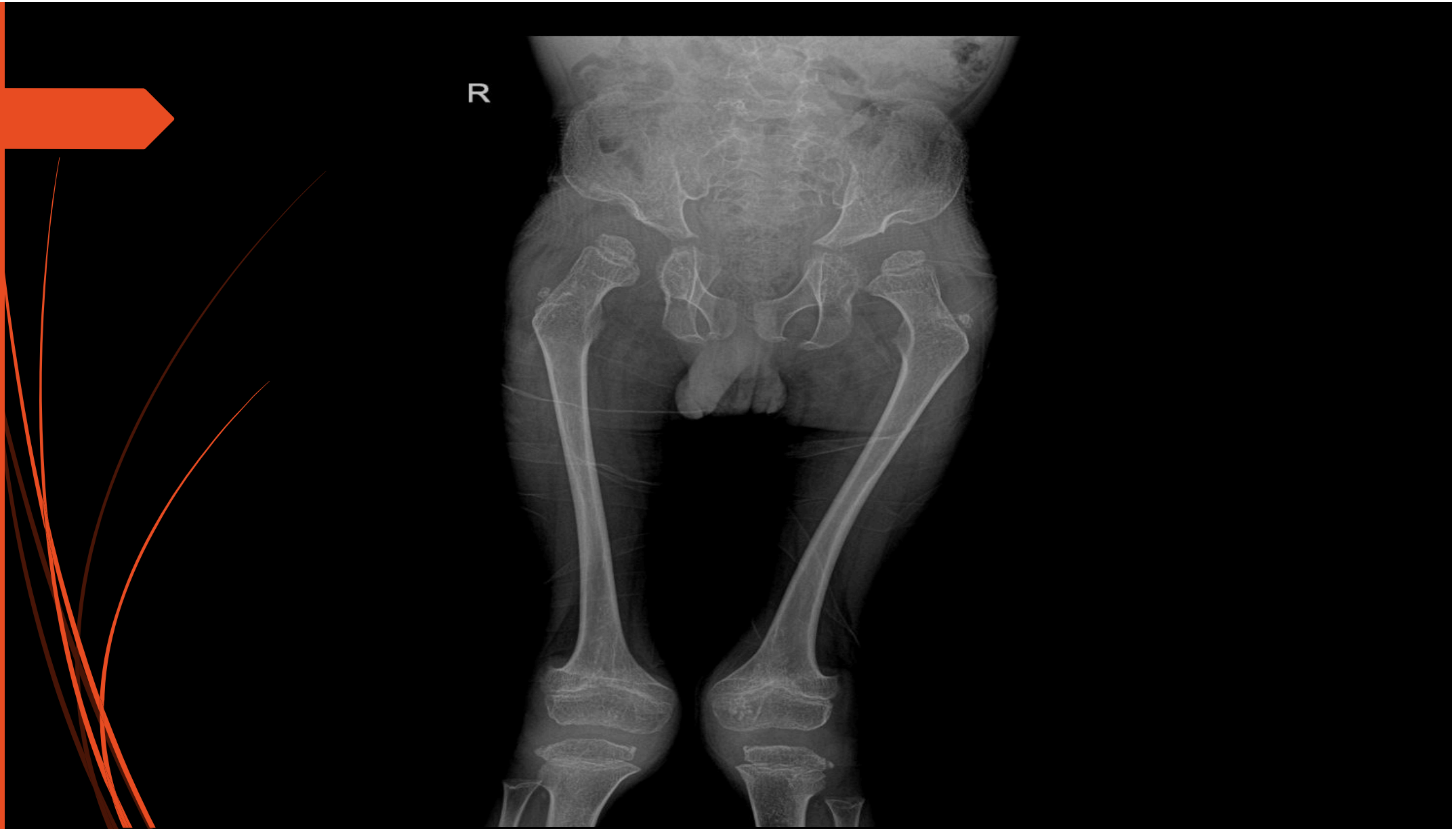
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FINDINGS

- A male child aged 8 years born to third degree consanguinity came with complaints of not gaining weight and short stature with normal development milestones and intellectual ability. Skeletal survey was done showing following findings
- Thoracolumbar kyphosis, anterior beaking of multiple lumbar vertebra.
- Hypoplastic body of L1 and L2 vertebra
- Posterior concavity in few of the vertebral bodies
- Bilateral ribs appear tapered posteriorly and broad anteriorly – S/o Oar shaped ribs
- Foreshortening of distal ulna and proximal radius with metaphyseal flaring in the distal radius and ulna.
- Broad and short proximally pointed metacarpals, Bullet shaped phalanges

- Bilateral genu valgum.
- Increased knee joint space.
- Metaphyseal flaring in proximal tibia and fibula.
- Flaring of bilateral ilium bone, shallow acetabulum.
- Coxa valga and coxa magnum.
- Widened hip joint space.

Differential Diagnosis

1. Mucopolysaccharidosis likely Morquio syndrome
2. Spondyloepiphyseal dysplasia congenita
3. Pseudoachondroplasia
4. Hypothyroidism

Mucopolysaccharidosis

- It is a group of inherited metabolic disorders that results in wide spread skeletal, mental and visceral abnormalities.
- Lysosomal storage disorder with excessive accumulation of mucopolysaccharides, secondary to deficiencies in specific enzymes
- MPS are classified into various types

TYPES

TYPES	
MPS I	HURLER'S SYNDROME
MPS II	HUNTER'S SYNDROME
MPS III	SAN FILIPPO'S SYNDROME
MPS IV	MORQUIO'S SYNDROME
MPS VI	MOROTEAUX LAMY SYNDROME
MPS VII	SLY'S SYNDROME

MPS-I: HURLER'S SYNDROME

- Autosomal recessive disorder.
- Deficiency of alpha L iduronidase with increased dermatan and heparin sulfate
- Patients are normal at birth and presents with mental deterioration , corneal clouding, cardiac disease and deafness
- Death usually occurs in the 2nd decade, often following pneumonia or cardiac failure.

MPS-IV: MORQUIO'S SYNDROME

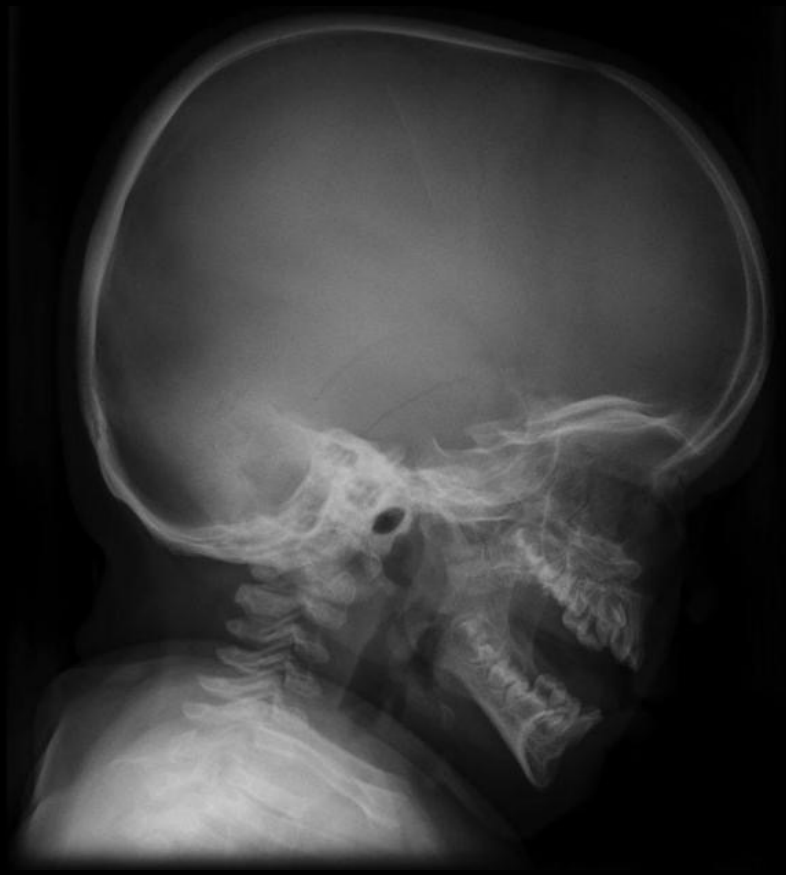
- Autosomal recessive disorder.
- Keratosulfaturia
- Normal at birth.
- During early childhood individuals develop marked dwarfism, dorsal kyphoscoliosis, weakness, and muscular hypotonia.
- Normal intelligence
- Survive into 3rd and 4th decades.

CLINICAL FEATURES

- Large head, widely set eyes (hypertelorism), a sunken nose, large lips, and a protruding tongue.
- Corneal opacification
- Hepatosplenomegaly leads a protuberant abdomen, and umbilical and inguinal hernias.
- Short stature
- Cardiomegaly with systolic and valve dysfunction
- Dorsolumbar kyphosis develops, along with multiple flexion contractures.
- The hands are trident and sometimes clawed.

Radiological features

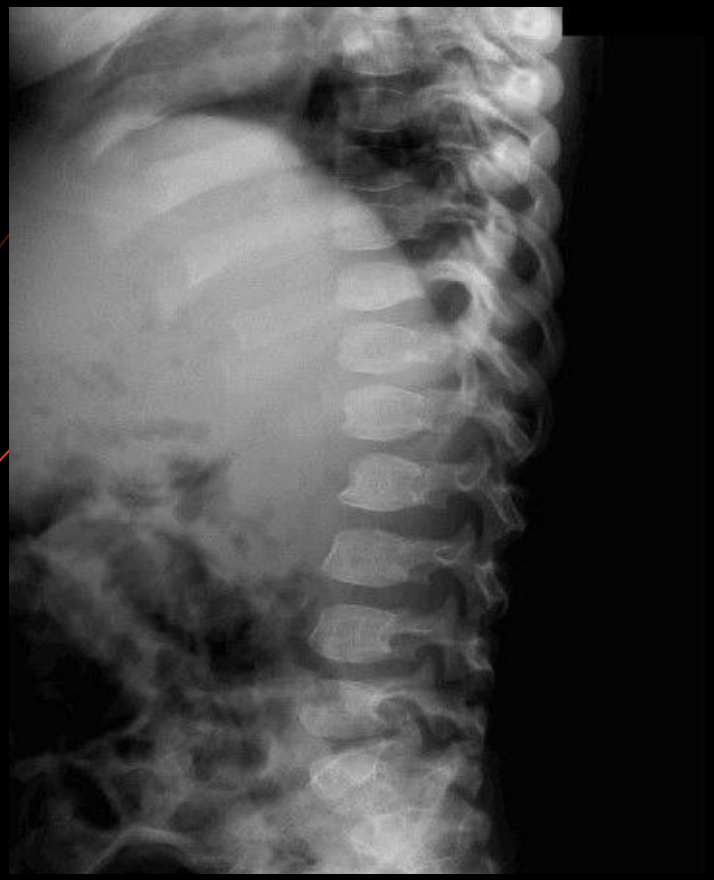
- Skull changes

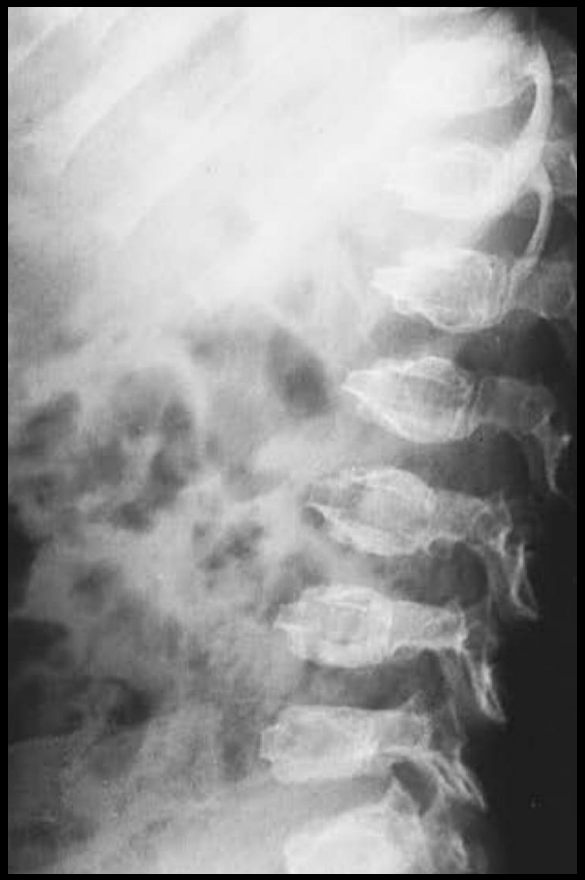


- CVJ anomalies

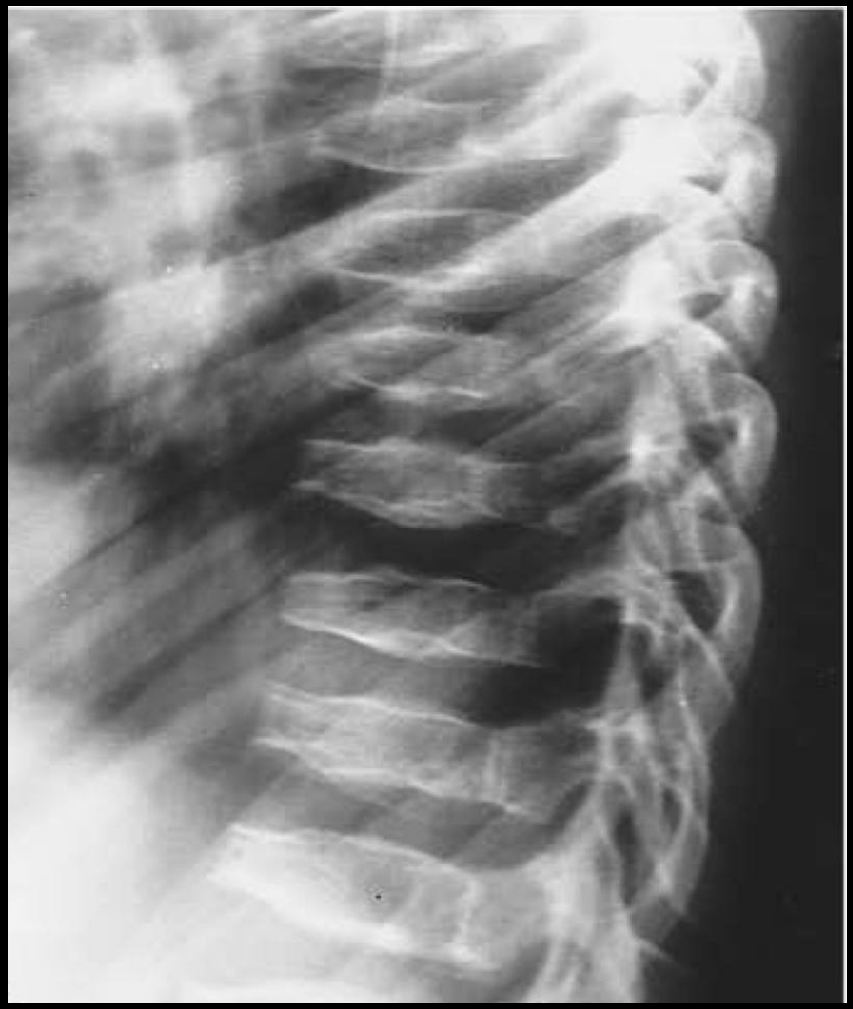
1. Dens hypoplasia resulting in atlanto-axial subluxation
2. Narrowing of foramen magnum due to short C1 arch , hypoplastic dens and thickened ligaments
3. Severe cervical canal stenosis

Spine



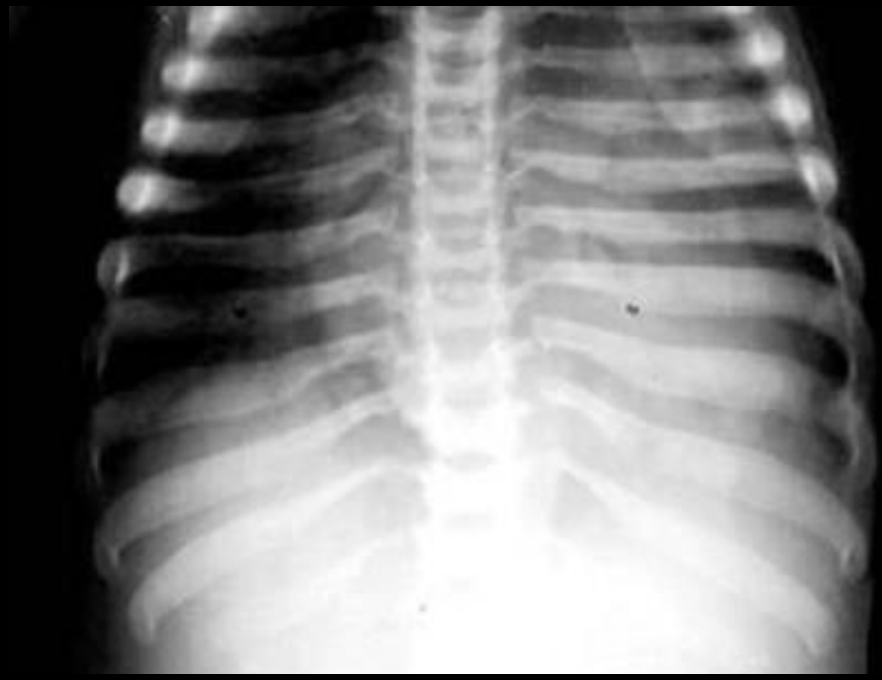


- Platyspondyly



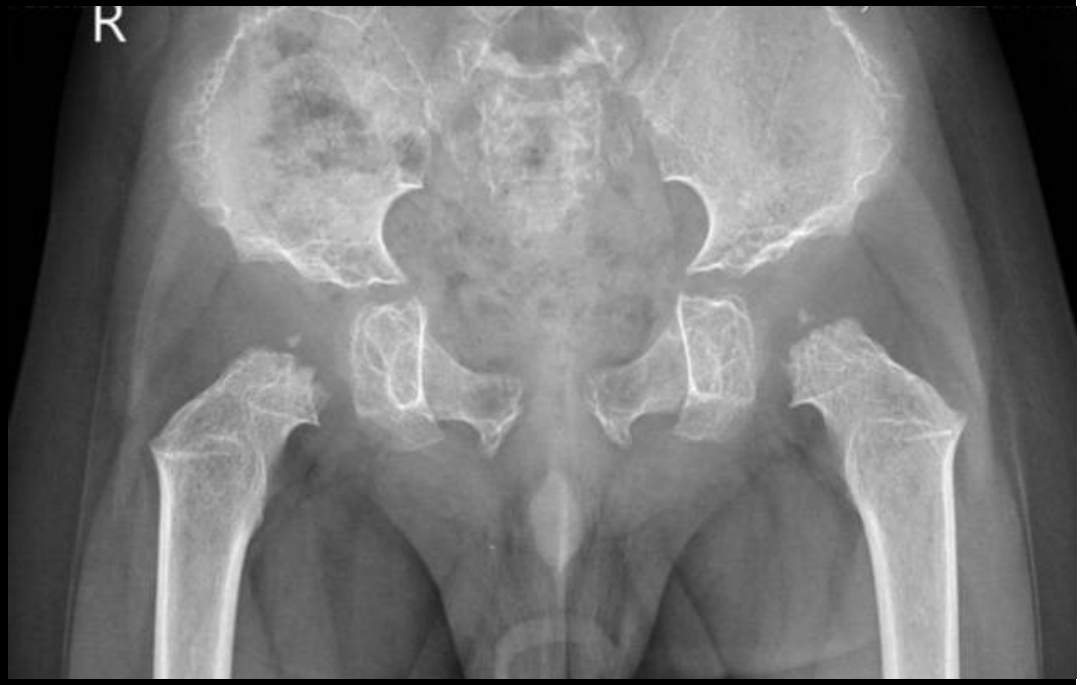
- Ribs

1. Overly wide anteriorly with posterior tapered ends- Paddle or spatulated appearance.



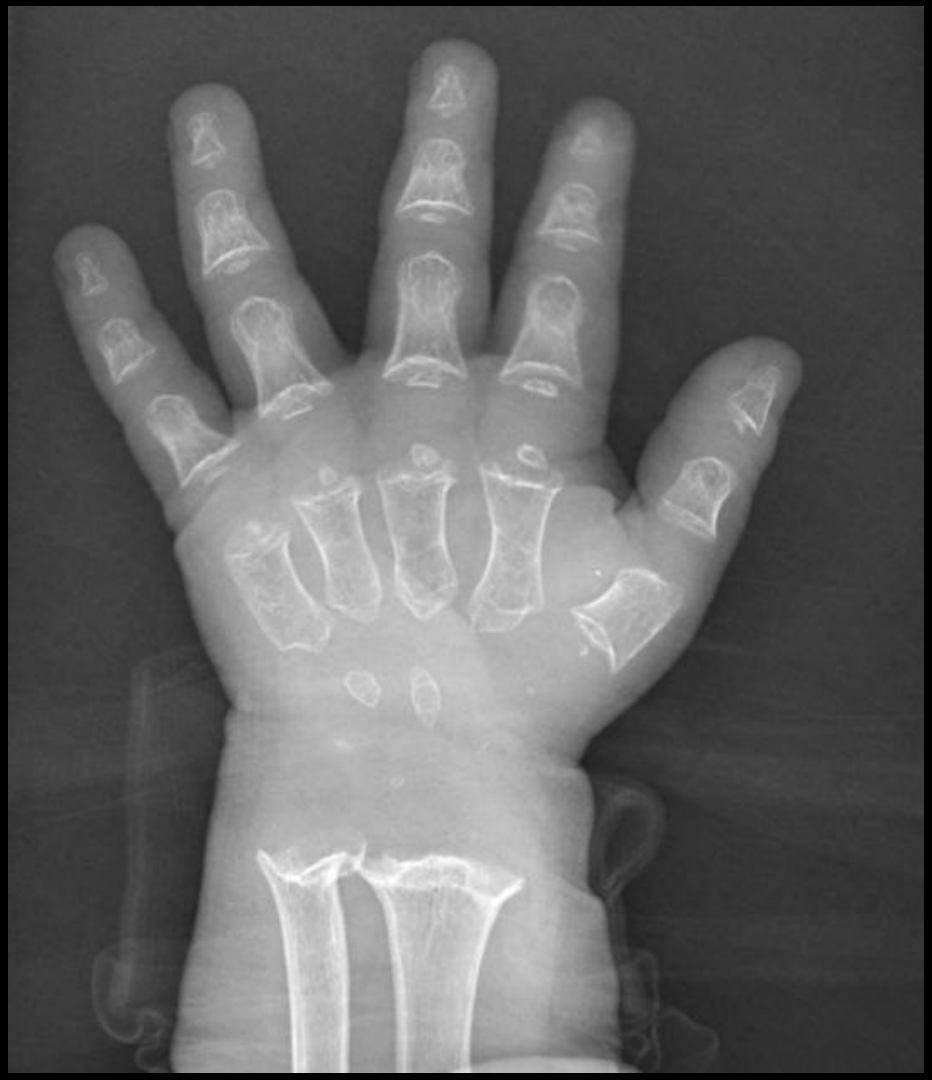
Pelvis

1. The acetabuli and capital femoral epiphyses are hypoplastic.
2. Goblet shaped flared iliac wings.
3. The femoral necks are wide and coxa valga is common.



HANDS

1. Metaphyseal flaring
2. Broad and short metacarpals with proximally pointing
3. Bullet shaped phalanges

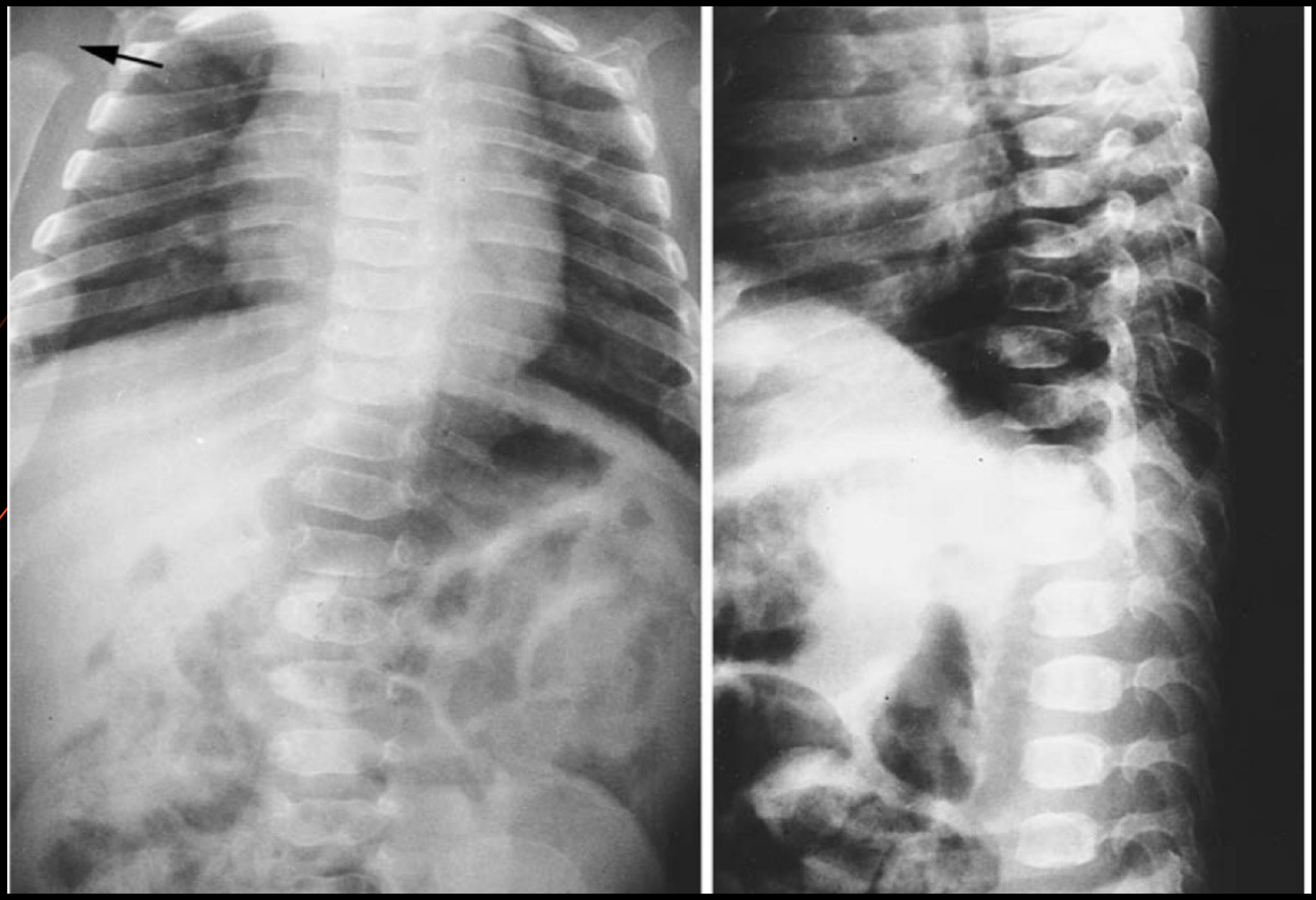


Spondyloepiphyseal dysplasia congenita

1. Autosomal dominant
2. Involves spine and epiphysis-Short Neck , Short trunk with kyphosis and short proximal limbs.

Imaging

- Pear shaped /bulbous vertebra initially
- Platyspondyly with thin disc
- Rhizomelic dwarfism with flared metaphysis
- Delayed ossification with irregular articular surface
- Marked coxa vara
- Short iliac wings with horizontal acetabulum

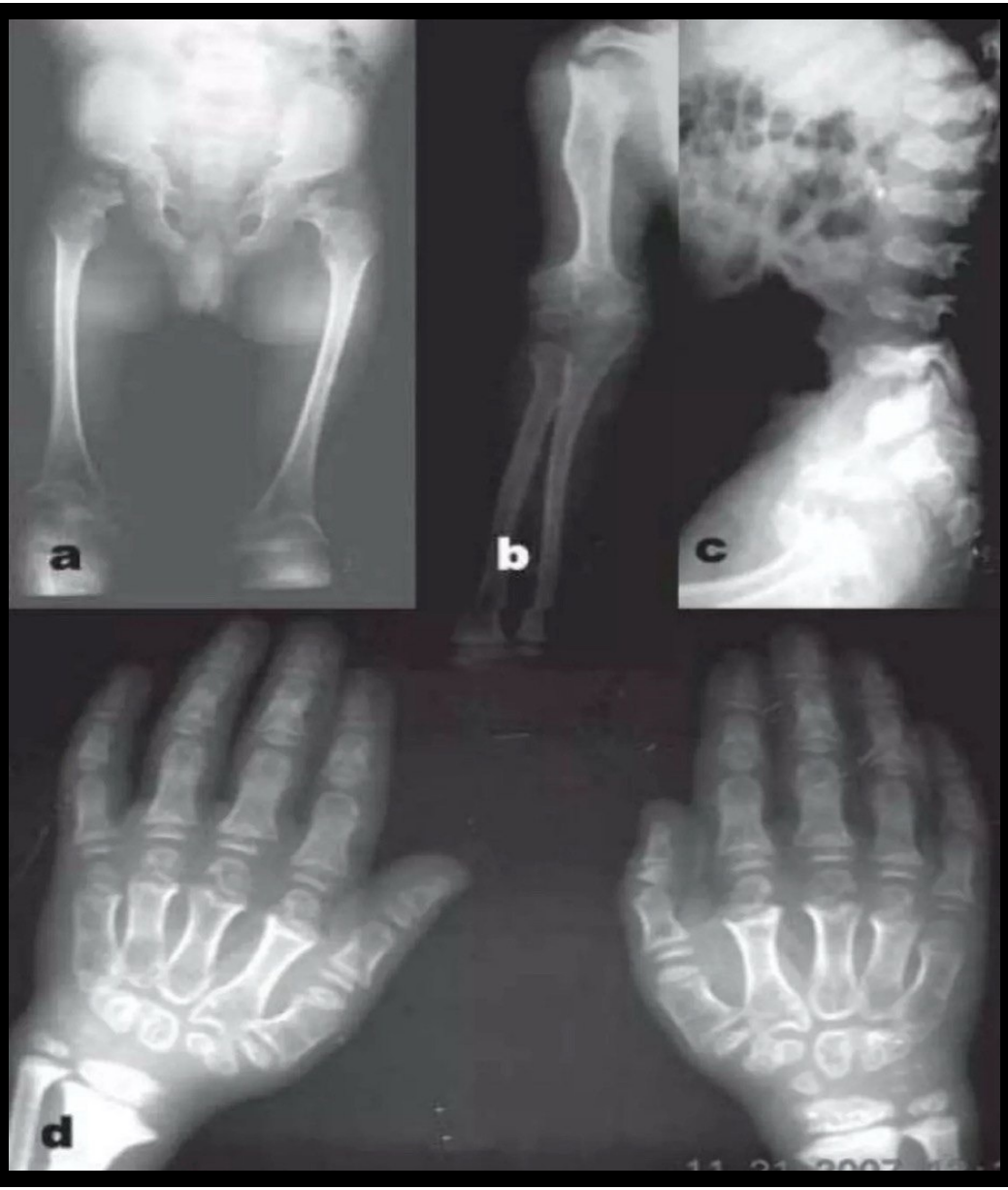


PSUEUDOACHONDROPLASIA

1. Autosomal dominant due to mutation in COMP gene
2. Involves spine and epiphysis-Short Neck , Short trunk with kyphosis and short proximal limbs.

Imaging

- Central anterior tongue appearance which is replaced by Platyspondyly later
- Rhizomelic dwarfism with flared metaphysis
- Epiphysis are small , irregular and fragmented with delayed appearance
- Pelvis is square with broad iliac wings , poorly formed acetabulum and narrow sacroiliac


a
b
c
d