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AVASCULAR NECROSIS IN SICKLE CELL DISEASE PATIENTS

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LEARNING OBJECTIVES:

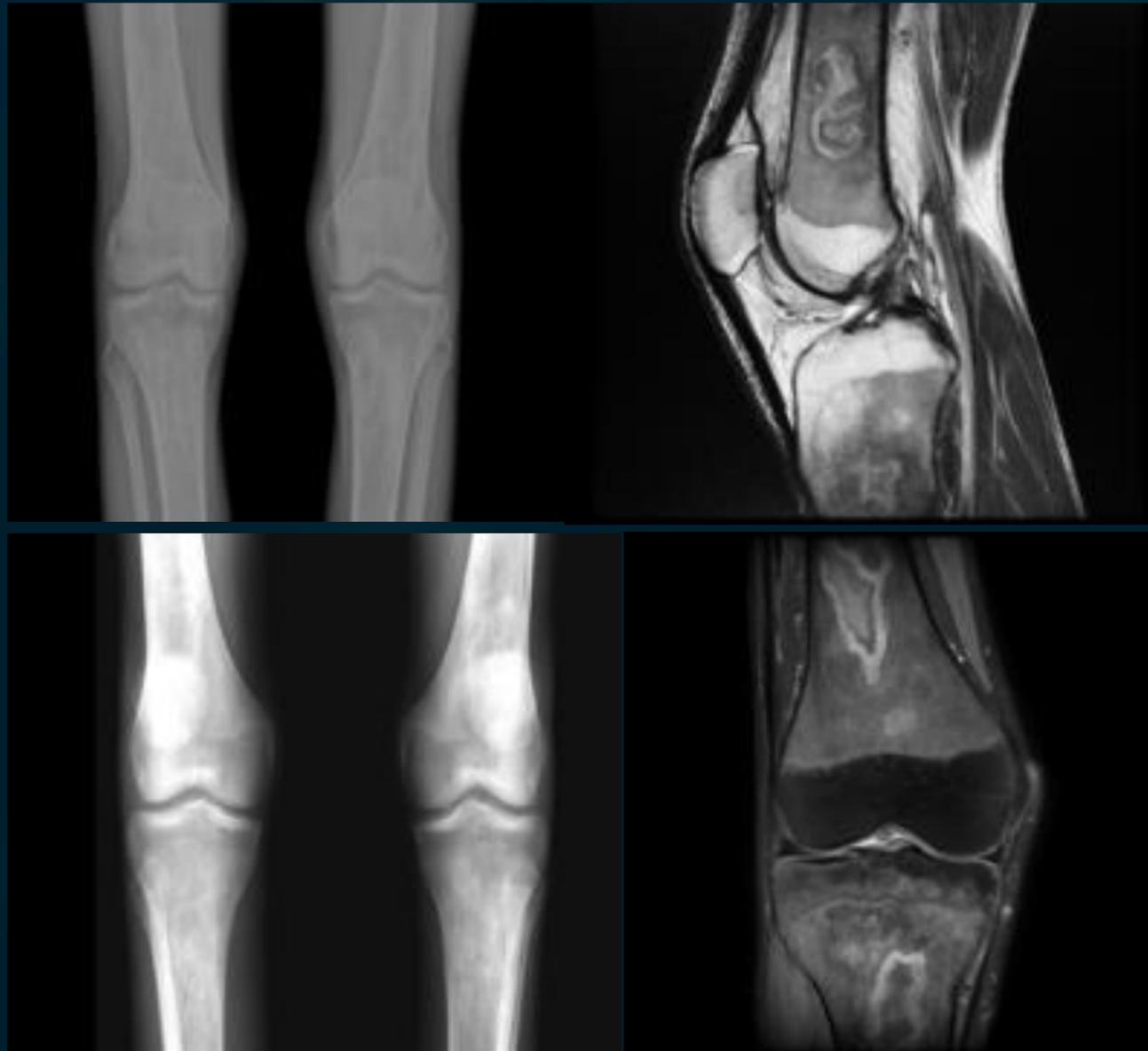
- Review of avascular necrosis (AVN) radiological findings in different modalities as MRI, CT and conventional radiology in patient with sickle cell disease.
- Illustrating the radiological features of AVN in the selected cases in two different hospital admissions.

BACKGROUND:

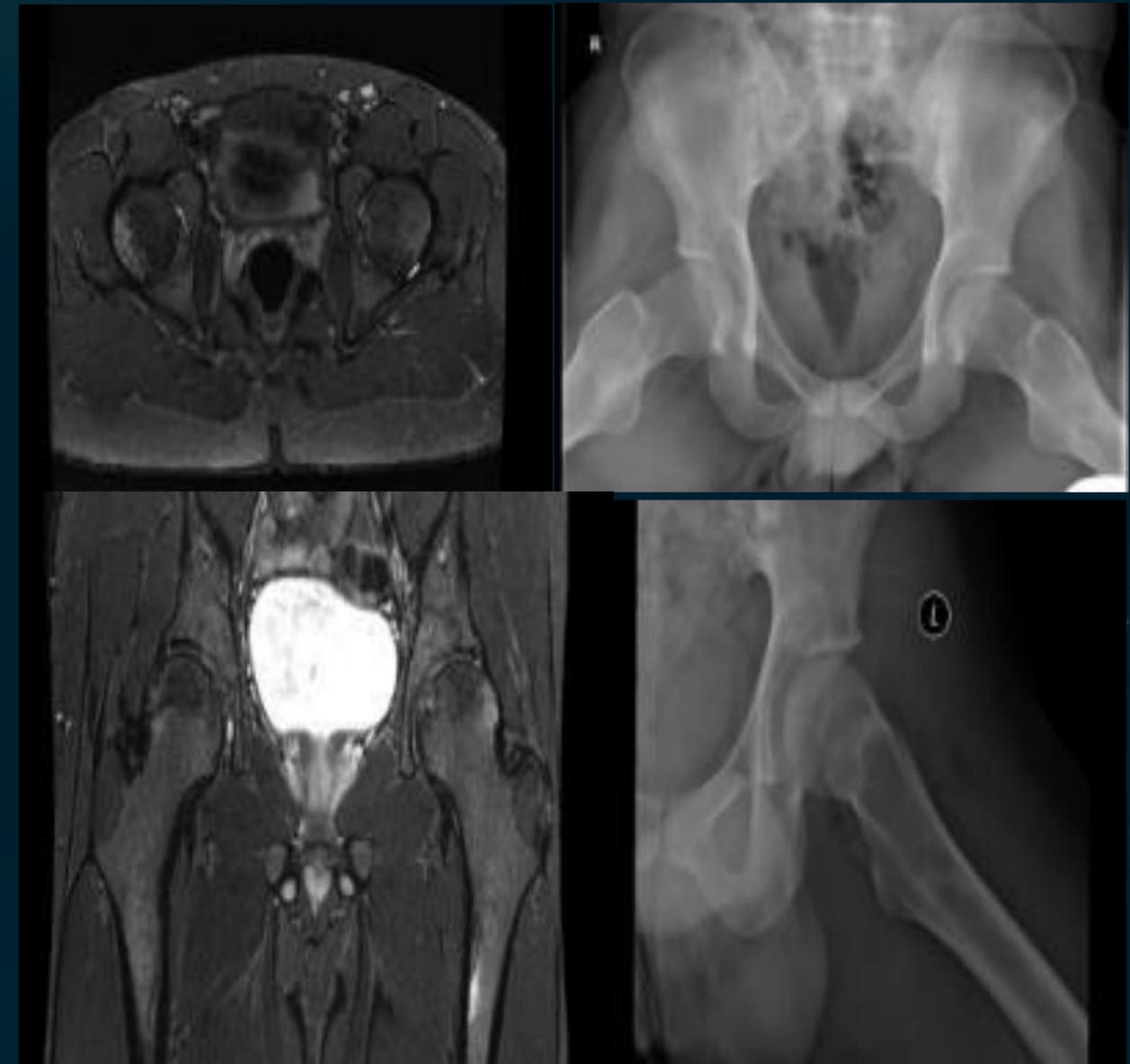
- Sickle cell disease is an autosomal recessive defect in the beta chain of hemoglobin. Red cells are sickle-shaped and cause microvascular occlusion. Sickle cell bone infarcts and avascular necrosis are caused by microvascular occlusion from the sickled red cells. Common locations for infarction include the femoral heads and the diaphysis and metaphysis of long bones. ⁽¹⁾
- Avascular necrosis (AVN) is focal ischemia of the epiphyseal region or subchondral bone. AVN leads to trabecular necrosis, which increases susceptibility to subchondral collapse and secondary osteoarthritis if untreated. The more general term osteonecrosis indicates necrosis of bone and marrow elements. ⁽²⁾

FINDINGS AND PROCEDURE DETAILS:

- A review in cases presented with AVN of sickle cell patients was performed. Cases with different AVN bone locations as proximal tibia (figure:1), femoral head (figure: 2) humeral head (figure 3) and thoracic vertebra (figure:4) were selected for a comprehensive illustration in different modalities as radiography, CT and MRI.
- Radiography findings range from normal, minor/ mixed osteopenia /+ sclerosis or subchondral cyst to subchondral fractures with collapse. ⁽³⁾
- MRI is the modality of choice to diagnose AVN and is considered the gold-standard technique due to its high specificity, high sensitivity and for its capability to detect abnormalities earlier than the previous modalities. ⁽⁴⁾ Early MRI findings include bone marrow edema in epiphyses and diaphysis regions; later findings comprise the geographic pattern, that consists of a serpentine rim of low signal intensity on T1W and T2W images and the characteristic but not always present double-line sign, that represents a high signal intensity line just inside to the low signal intensity serpentine line. ⁽⁵⁾



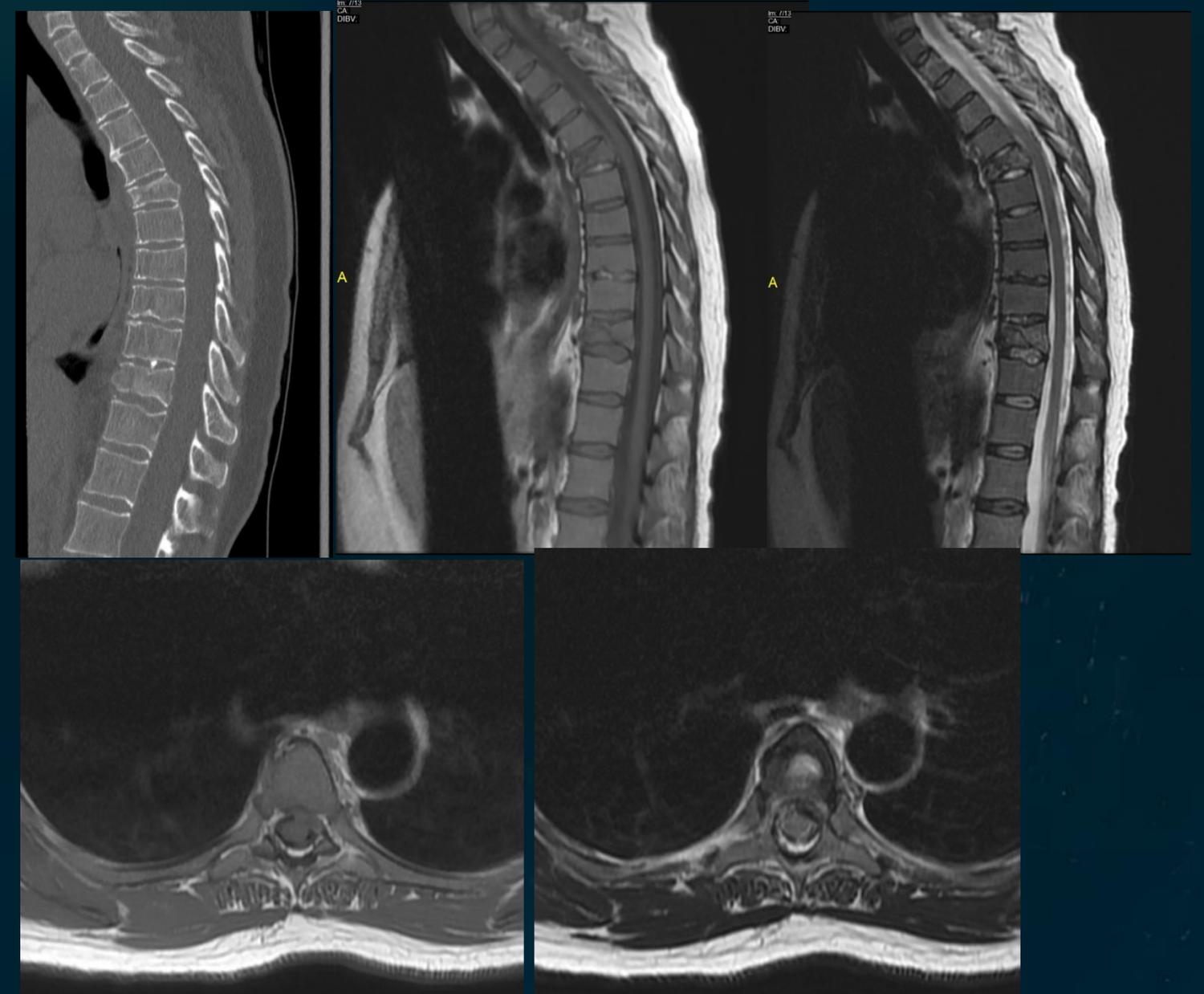
(FIG:1) 24 y/o SCD patient with lower limb pain, above images in November 2021 visit while the images below in January 2024. Subchondral low signal intensity areas of osteonecrosis with progressive course in the later visit involving the distal femur and proximal tibia.



(FIG:2) 25 y/o SCD patient with bilateral hip pain. Above images in September 2023, with abnormal signal intensity of the right femoral head suggestive of AVN. while, images below in May 2024 shows abnormal signal intensity of the left femoral head represent early AVN and chronological changes of the previous right femoral head lesion.



(FIG:3) 37 y/o SCD patient with left shoulder and back pain. Above images in 2018 with bone marrow signal intensity of the left humeral head and proximal humeral shaft suggestive of AVN. While images below in 2021 shows low T1 and high T2 signal intensity suggestive of chronic bone infarcts of humeral shaft and head.



(FIG:4) 40 y/o SCD patient with back pain. Prior visit CT scan sagittal bone window image of the thoracic vertebra shows multiple H-shaped vertebrae bodies, a characteristic central endplate depressions of the vertebral bodies representing avascular necrosis. the latter visit the patient did MRI which shows an epidural hematoma between the spinal dura and the vertebral bodies and the H-shaped vertebral body deformity with heterogeneous marrow signal indicating chronic marrow infarction.

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