Musculoskeletal Block – Practical Sessions

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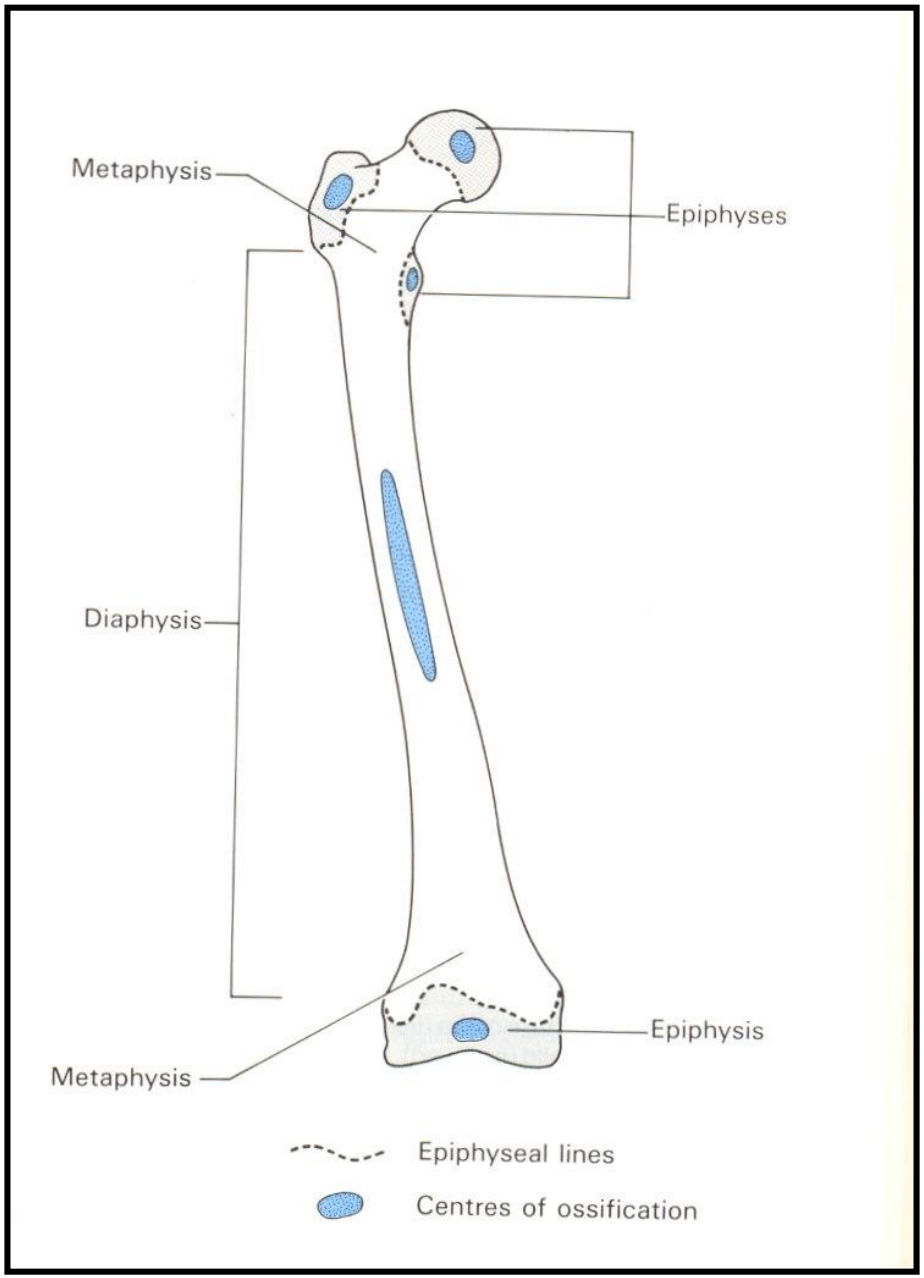
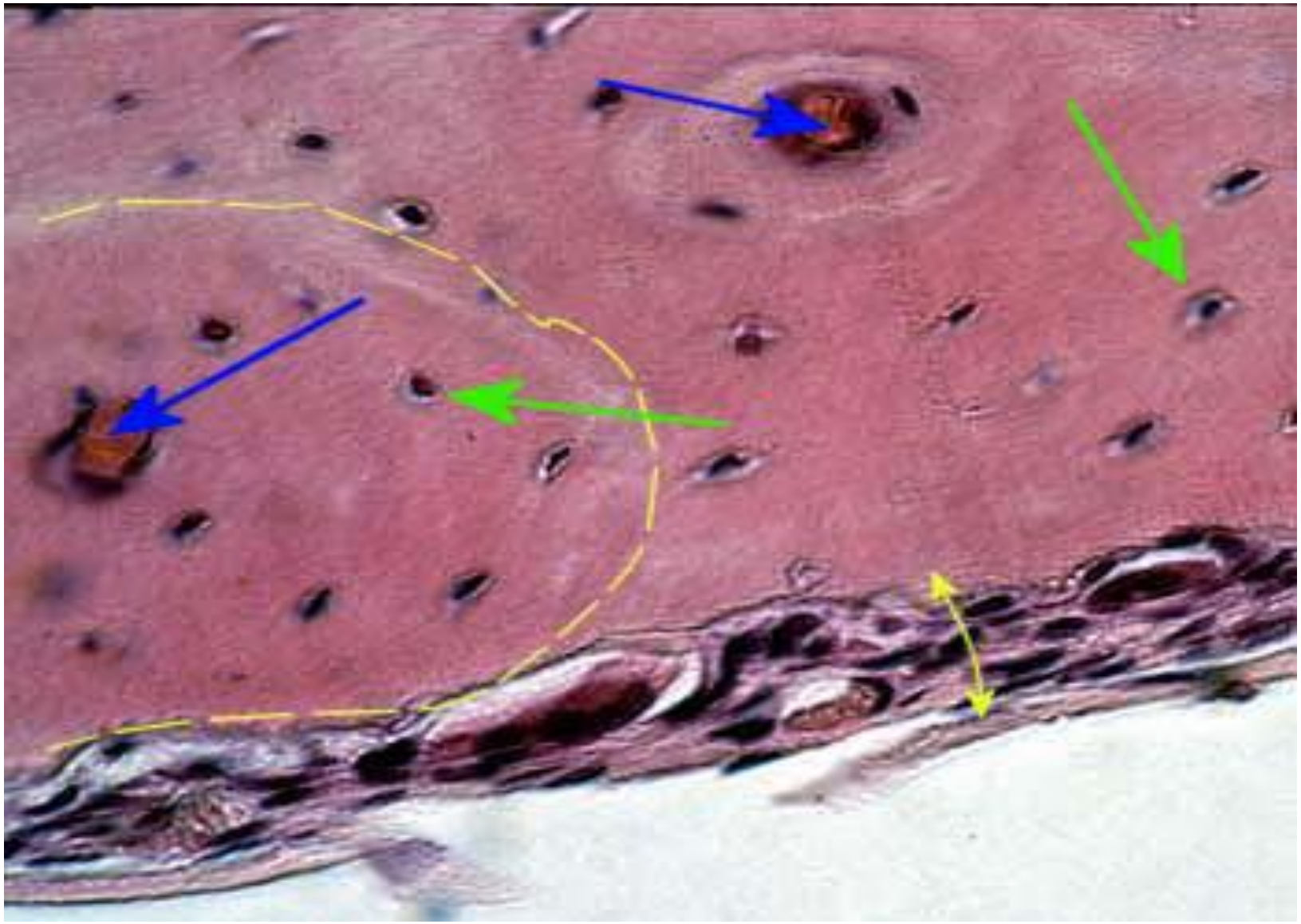
Normal anatomy and histology



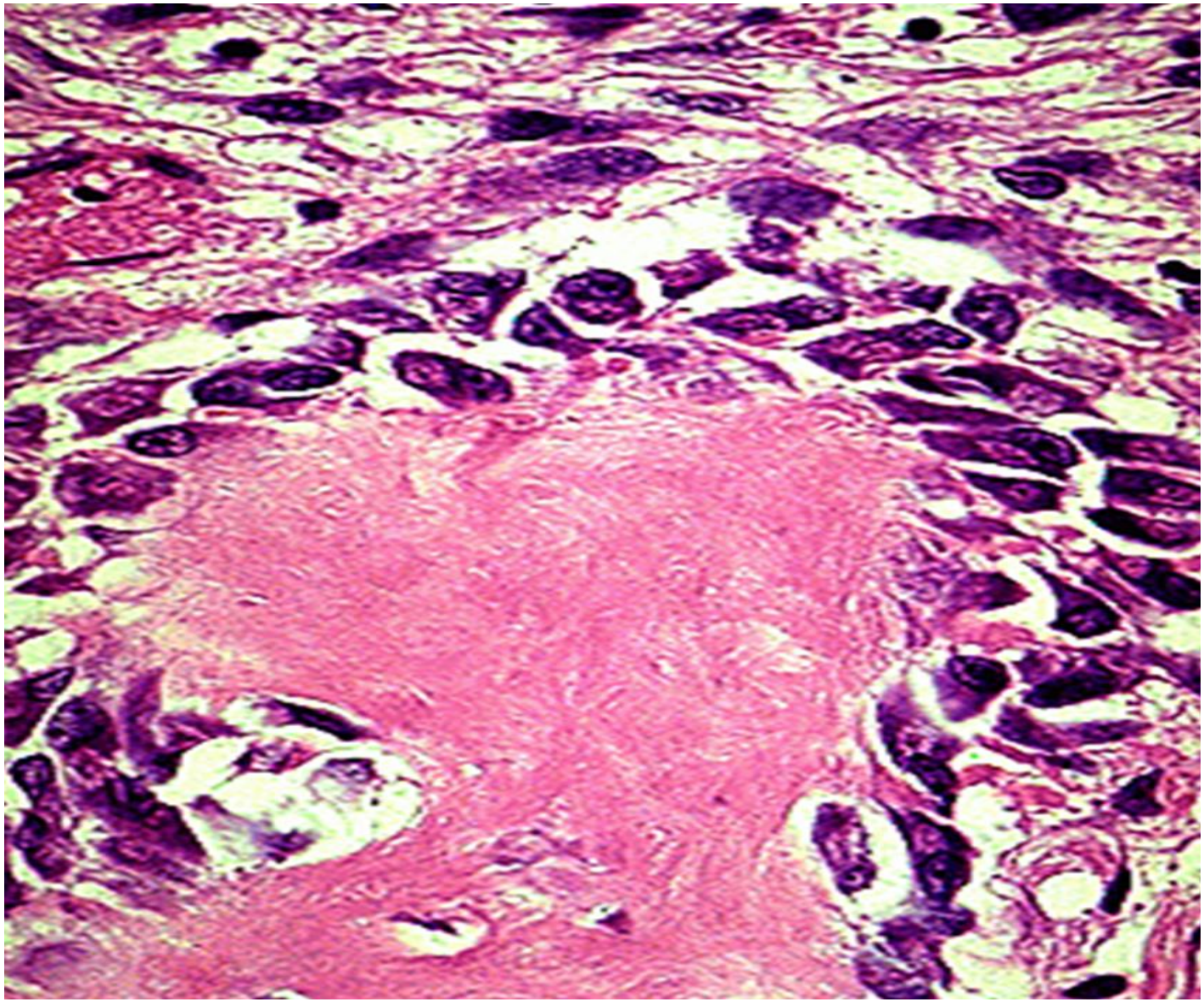
The overall structure of a long bone



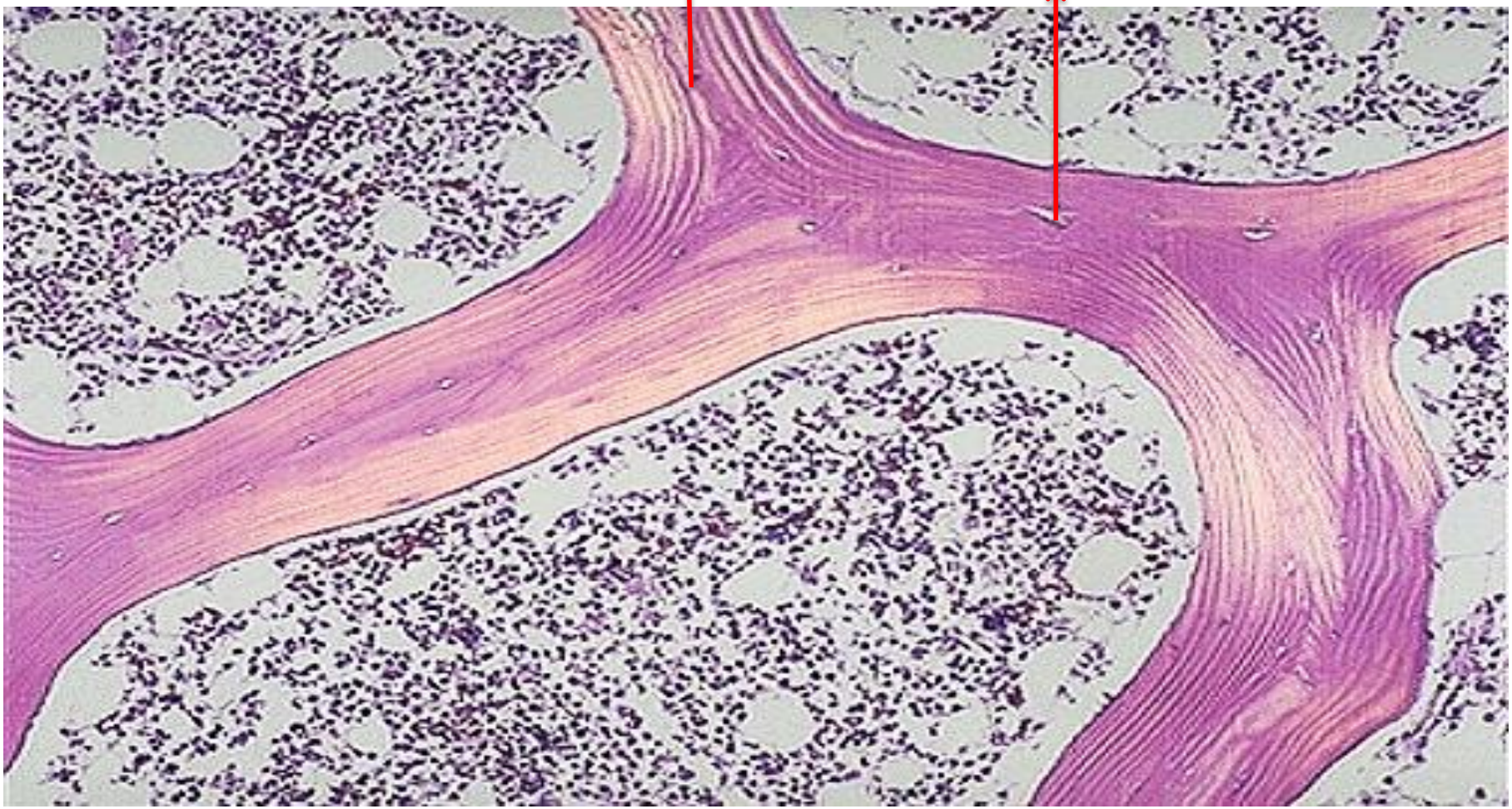
Blue arrows: Haversian canals

Green arrows: Osteocytes

Yellow arrow: Osteoclasts and osteoclastic giant cells.



Active osteoblasts synthesizing bone matrix. The surrounding spindle cells represent osteoprogenitor cells.

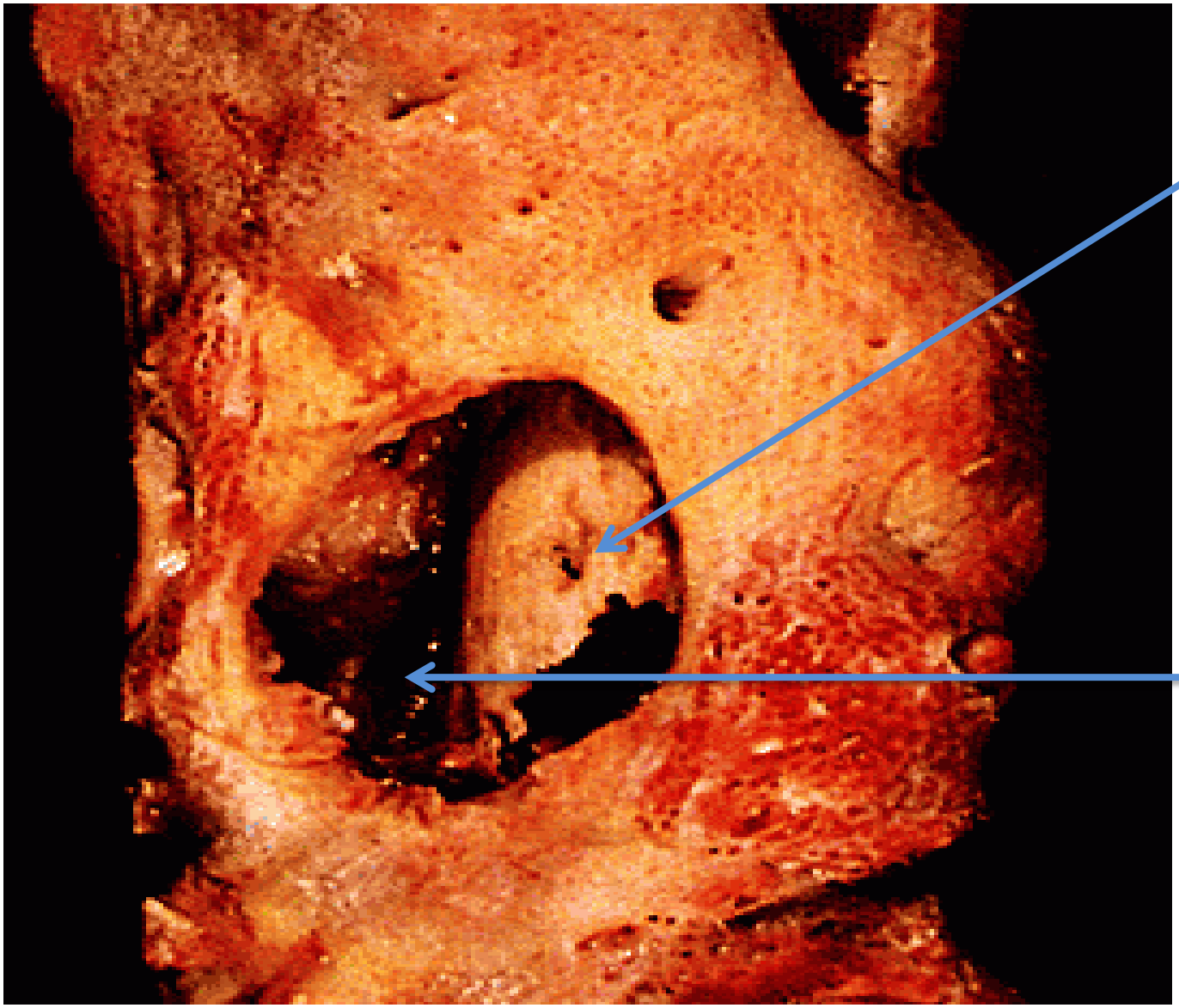


Normal cancellous bone as seen under polarized light microscopy, which highlights the lamellar structure. The bony spicules are even, with occasional lacunae containing osteocytes. Cellular marrow is seen between the spicules of bone.

Gross pathology and histopathology

Case no. 1

A 22 years old male presented with localized pain above his right knee joint with recurrent fever. Later on, he developed discharging sinuses from the skin overlying the right knee. What is the most likely diagnosis?

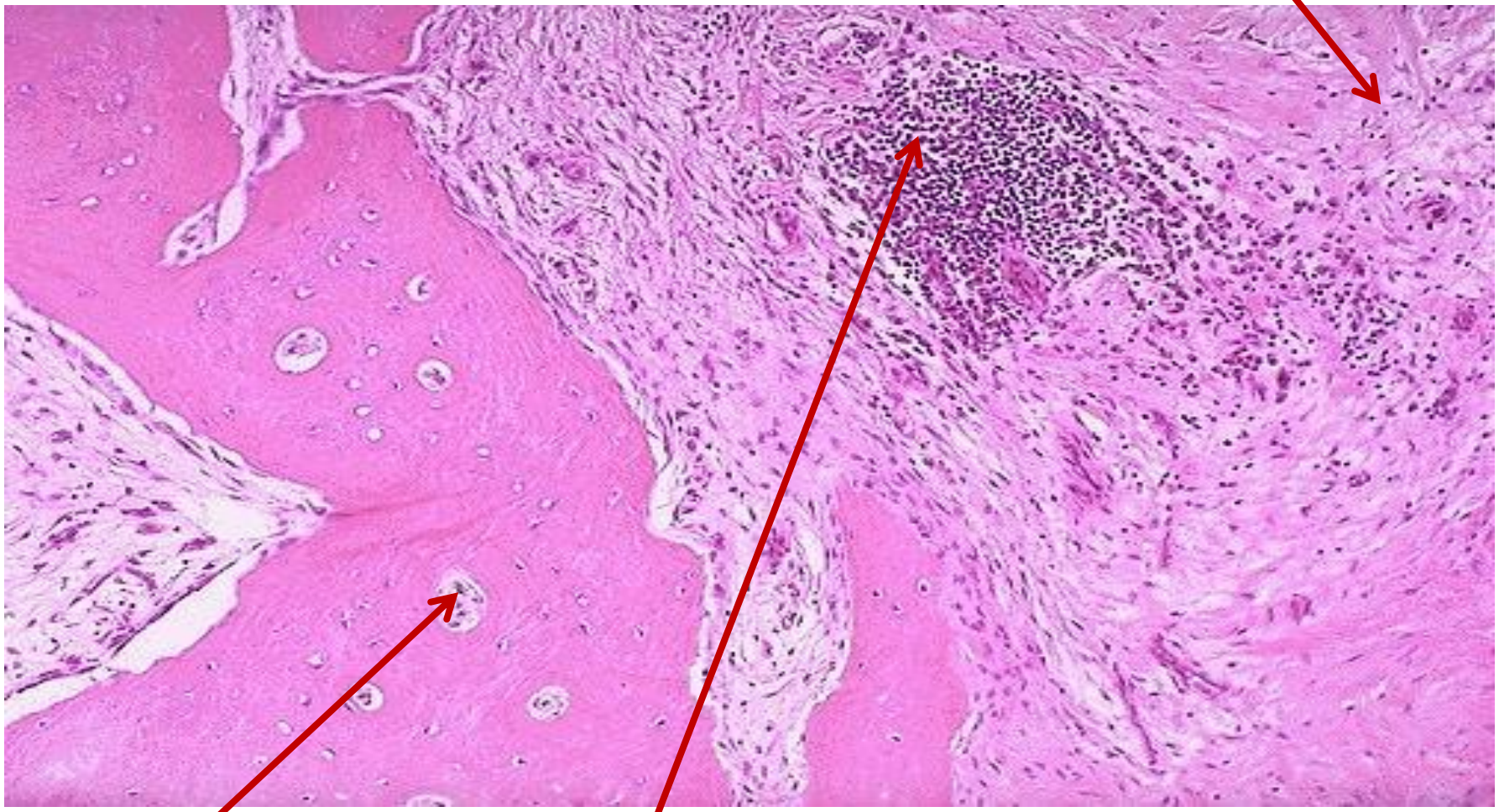


area of reactive new bone formation (involucrum).

area of necrotic bone **(sequestrum)** surrounded by hemorrhage

Advanced chronic osteomyelitis of the femur bone.
with discharging sinuses on the surface of the skin which were draining pus from the diseased bone.

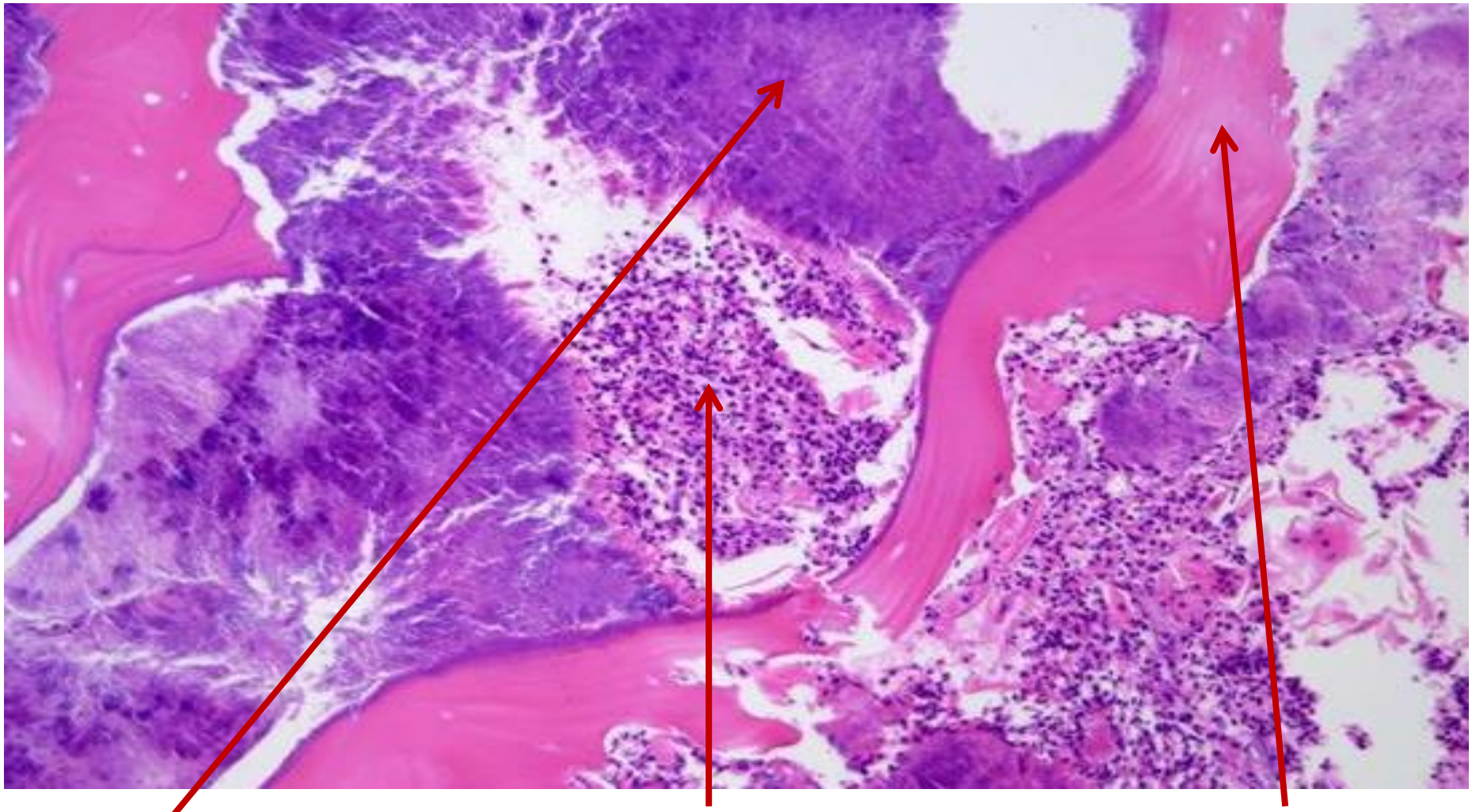
Chronic osteomyelitis



Chronic osteomyelitis can be complicated by amyloidosis.

Acute pyogenic osteomyelitis

this type of diseased bone is called **sequestrum.**



colonies of Gram positive bacteria

clusters of neutrophils admixed with fibrin (acute fibrinous inflammatory exudate).

trabeculae of dead bone (note the presence of empty lacunae).

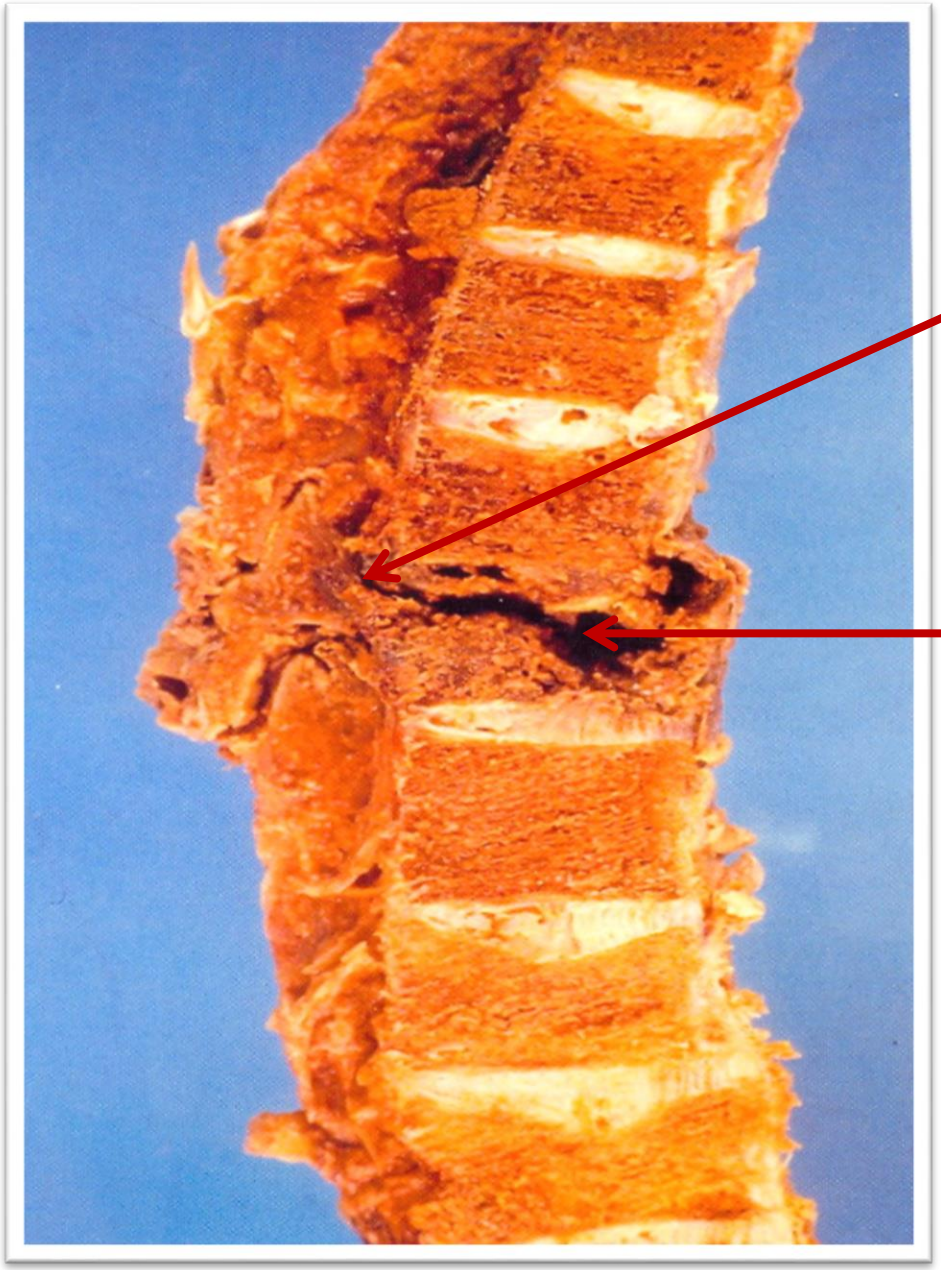
Answer for Case 1:

Osteomyelitis

Histopathological picture for ..	
Chronic osteomyelitis	Acute osteomyelitis
1. New bone formation 2. Fibrosis 3. Chronic inflammatory cells	1. Sequestrum area 2. Neutrophils 3. Bacteria

Case no. 2

A 35 years old debilitated man presented to the orthopedic clinic with back pain, low grade fever, marked elevation of sedimentation rate and recent kyphosis with mild scoliosis . The patient has a history of coughing up blood, mild fever, chills and night sweats. He told his doctor that he also has a tendency to get tired very easily.

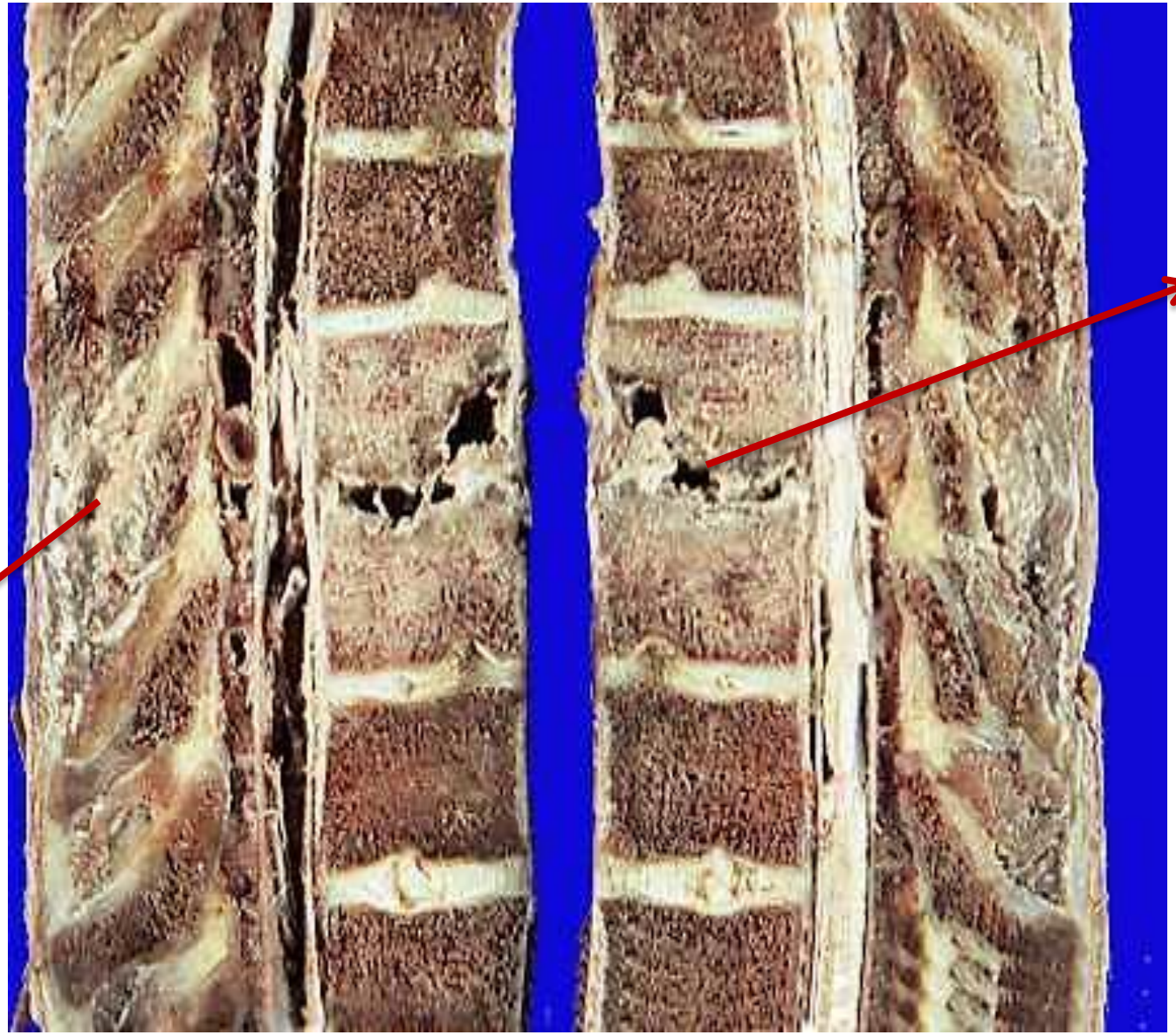


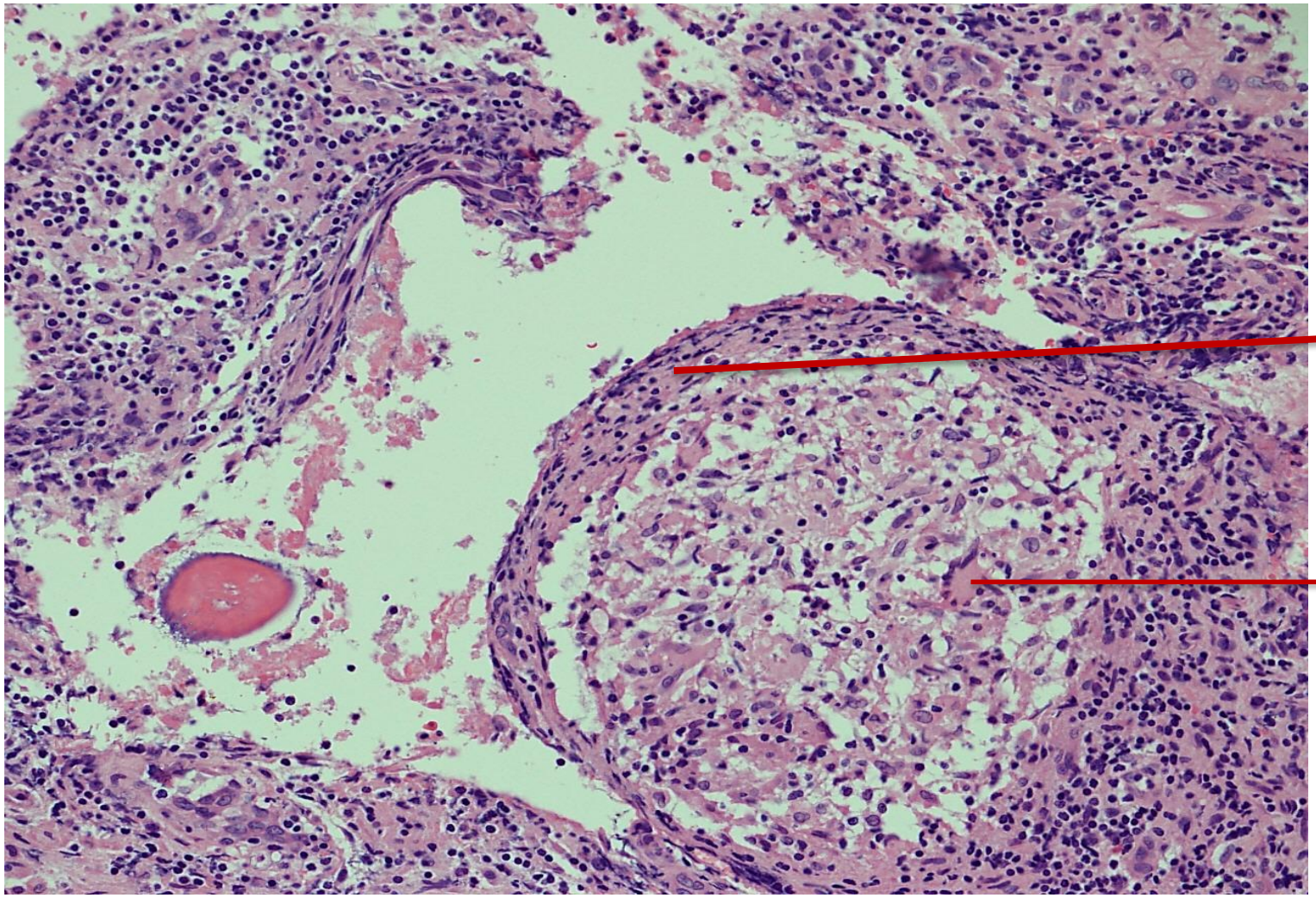
A fractured vertebrae (with an abscess and fibrosis in the surrounding tissues).

A biopsy from this lesion showed evidence of tuberculous osteomyelitis of the spine (Pott's disease).

The vertebrae shows:

1. a lytic lesion with cavitation 2. areas of necrosis.





Section of bone shows:

1. granuloma formation with epithelioid like cells
2. langhans-type giant cells
3. a rim of lymphocytes.

The features are consistent with granulomatous inflammation secondary to tuberculosis

Answer on Case 2:

Spinal TB - Potts Disease (Tuberculous osteomyelitis)

Case no. 3

For important characteristics of rheumatoid arthritis:

1-Hyperplastic synovial lining

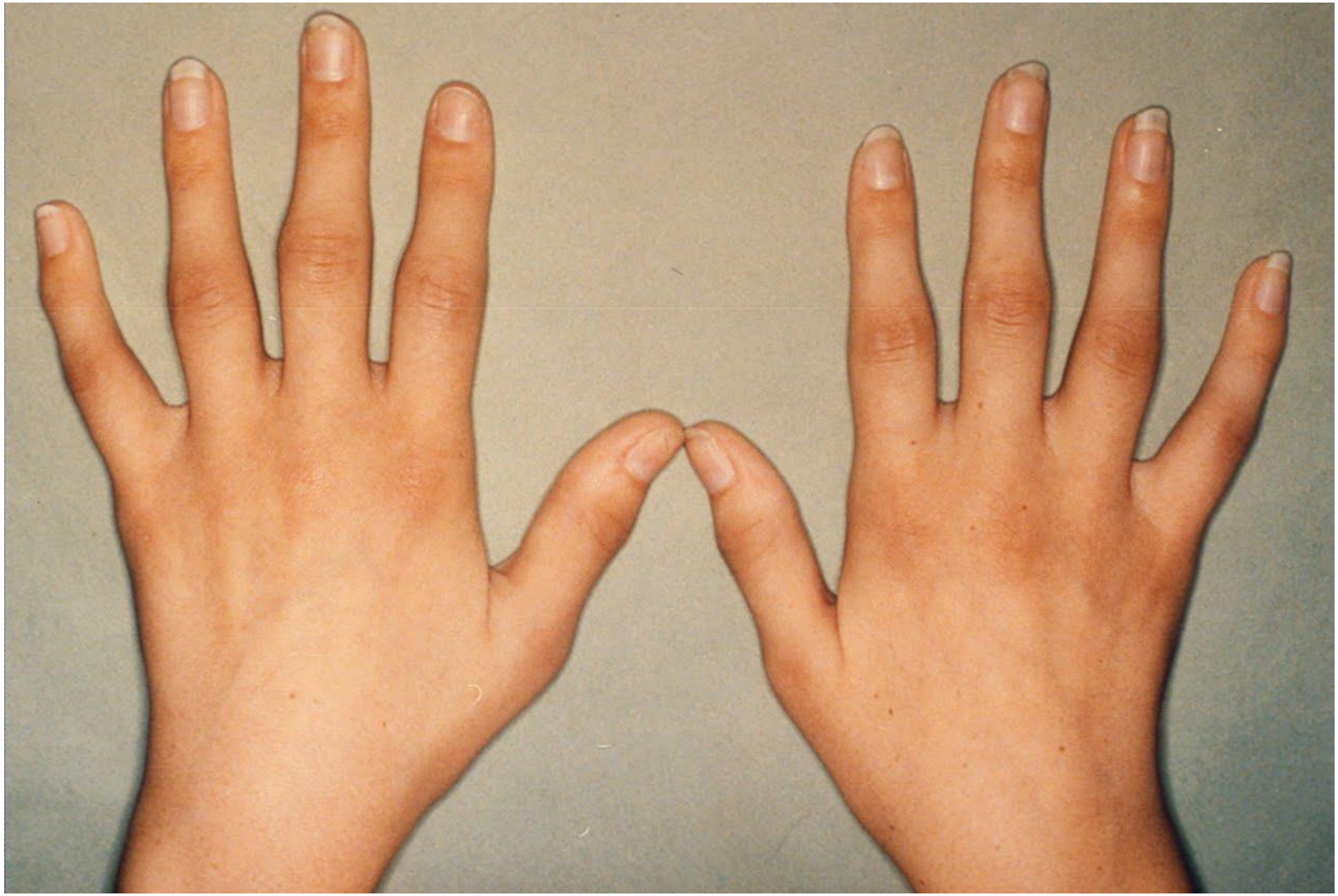
2-Extreme vascular congestion

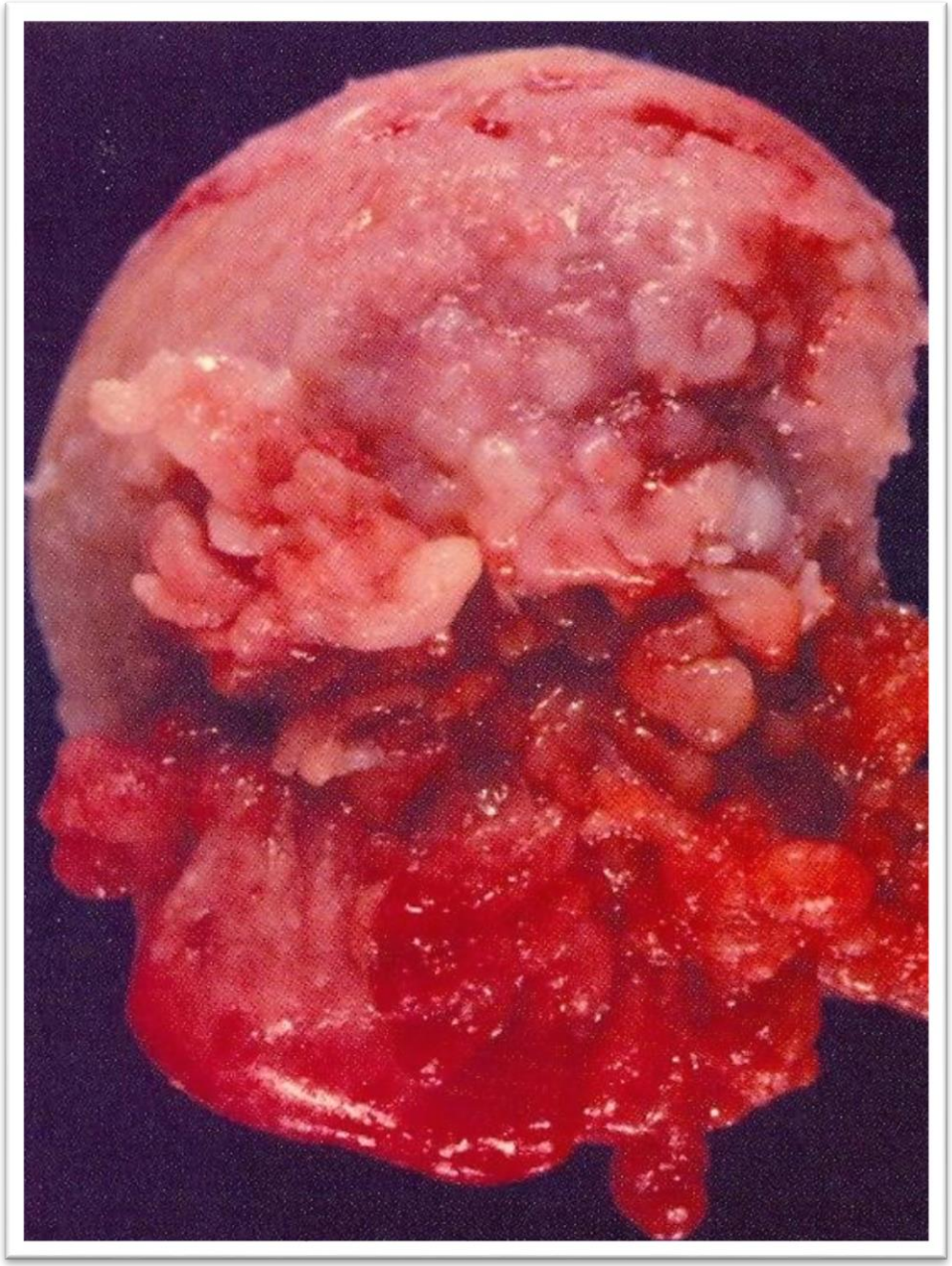
3-Chronic inflammatory cells

pannus

A 40 years old woman complains of low grade fever , malaise and stiffness in her joints each morning .

Clinical picture of early rheumatoid arthritis



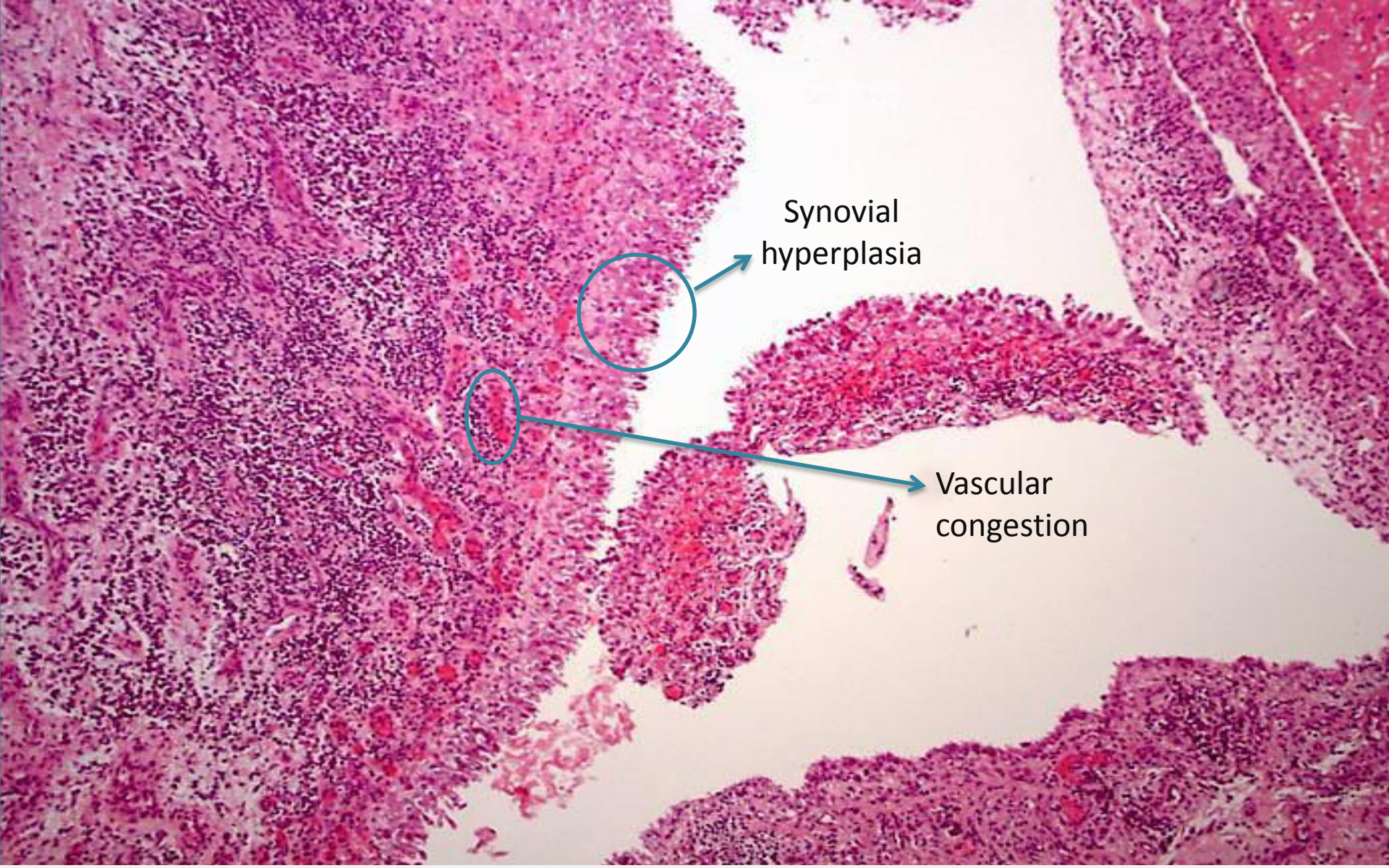


Rheumatoid arthritis affecting the head of femur.

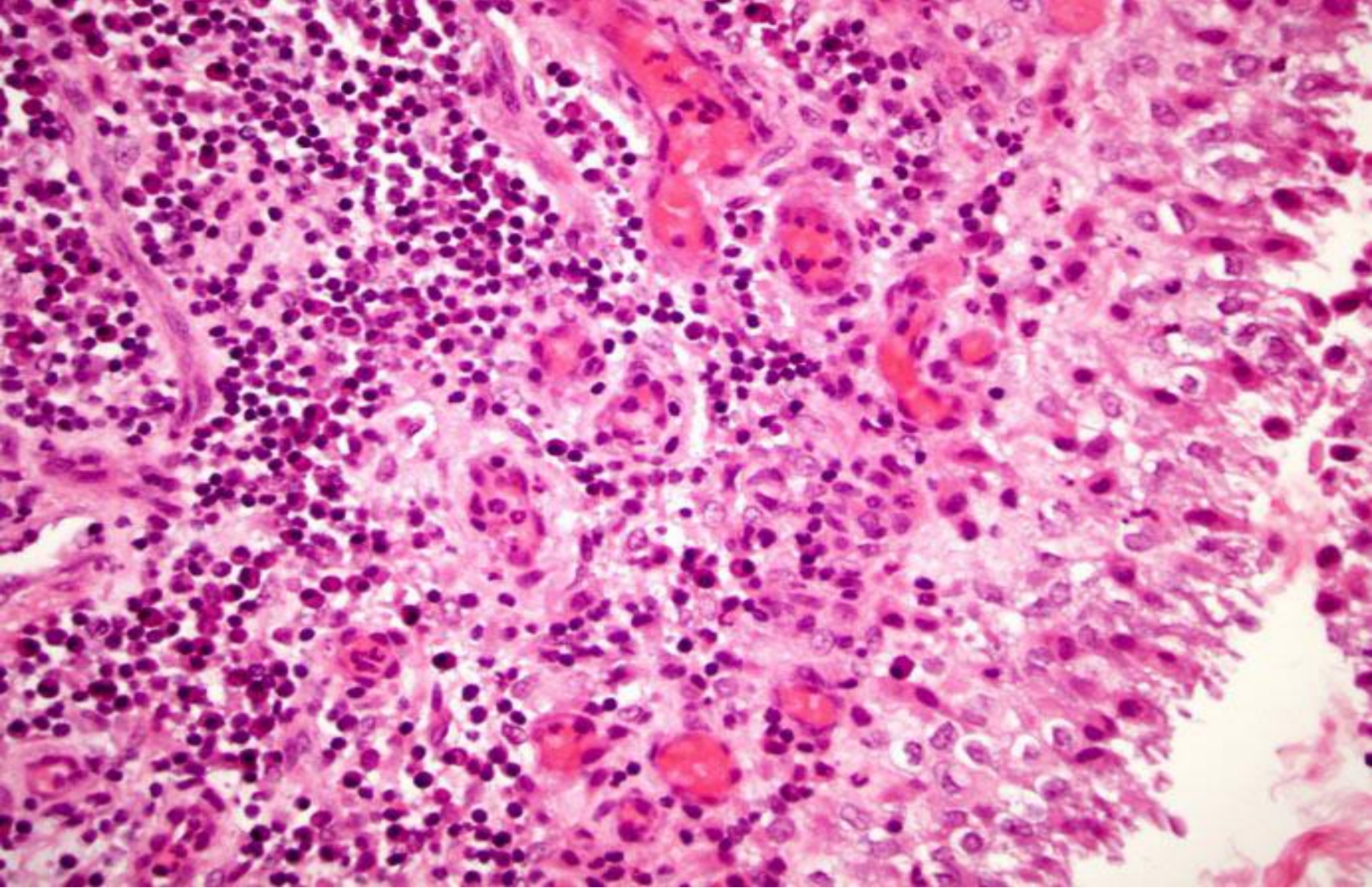
The synovium becomes:

1. **edematous,**
2. **thickened,**
3. **Hyperplastic**
4. **transforming its smooth contour to one covered by delicate and bulbous fronds.**

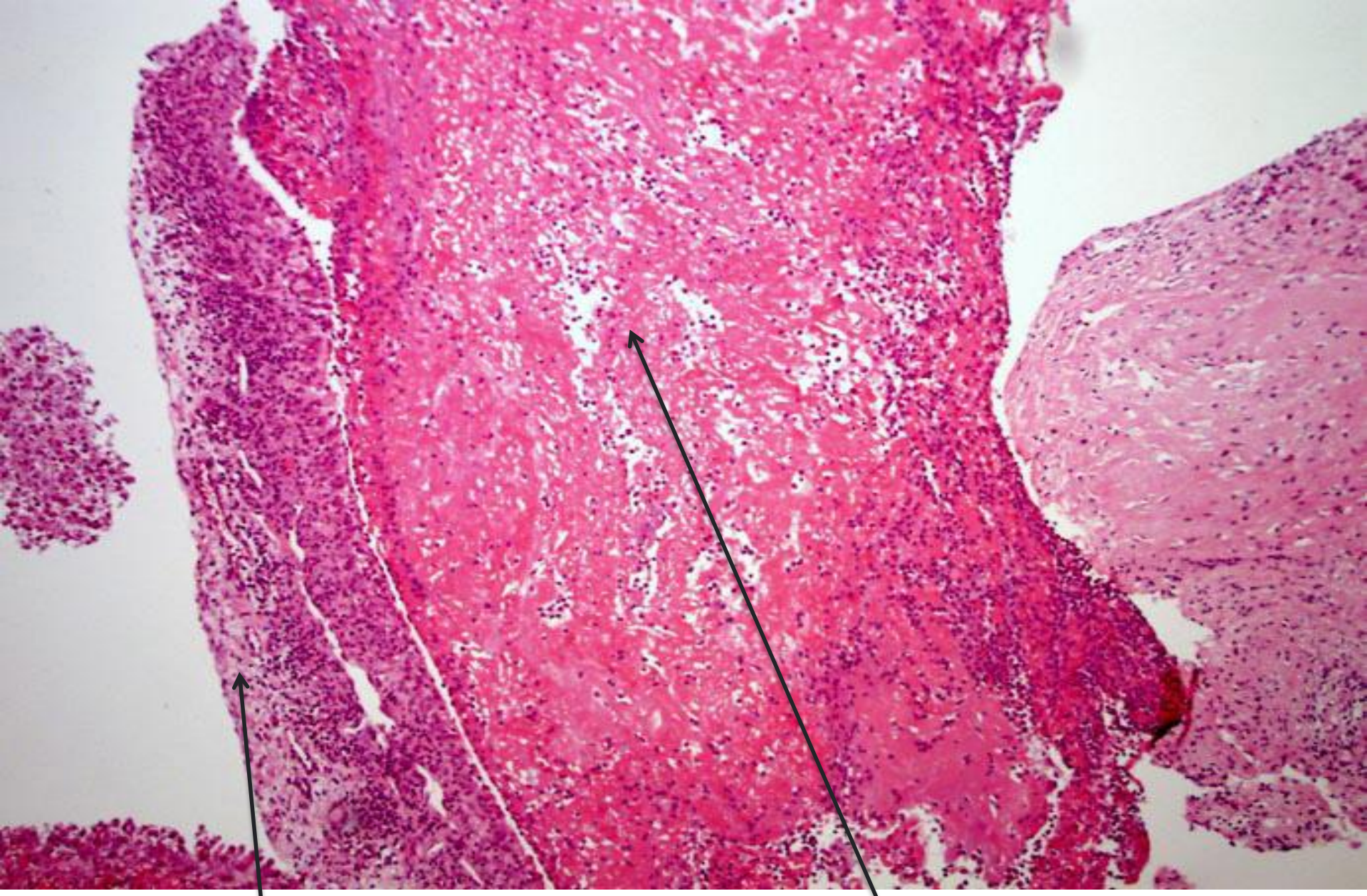
note the presence of: inflammatory protrusions on the synovial surface.



Hyperplastic synovial lining with villous like projections: note the presence of dense lymphoplasmacytic infiltration and extreme vascular congestion. This biopsy was taken from a classical case of active rheumatoid arthritis.



Hyperplastic synovial lining associated with plasma cells and lymphocytic infiltration with vascular congestion.



inflamed synovium in a case of advanced rheumatoid arthritis.

pannus (fibrinous inflammatory exudates)

Later on, the pannus may fill the joint space and undergo fibrosis, calcification and causes permanent ankylosis

What is a definition of pannus? What are the serological test that we can do in cases of rheumatoid arthritis?

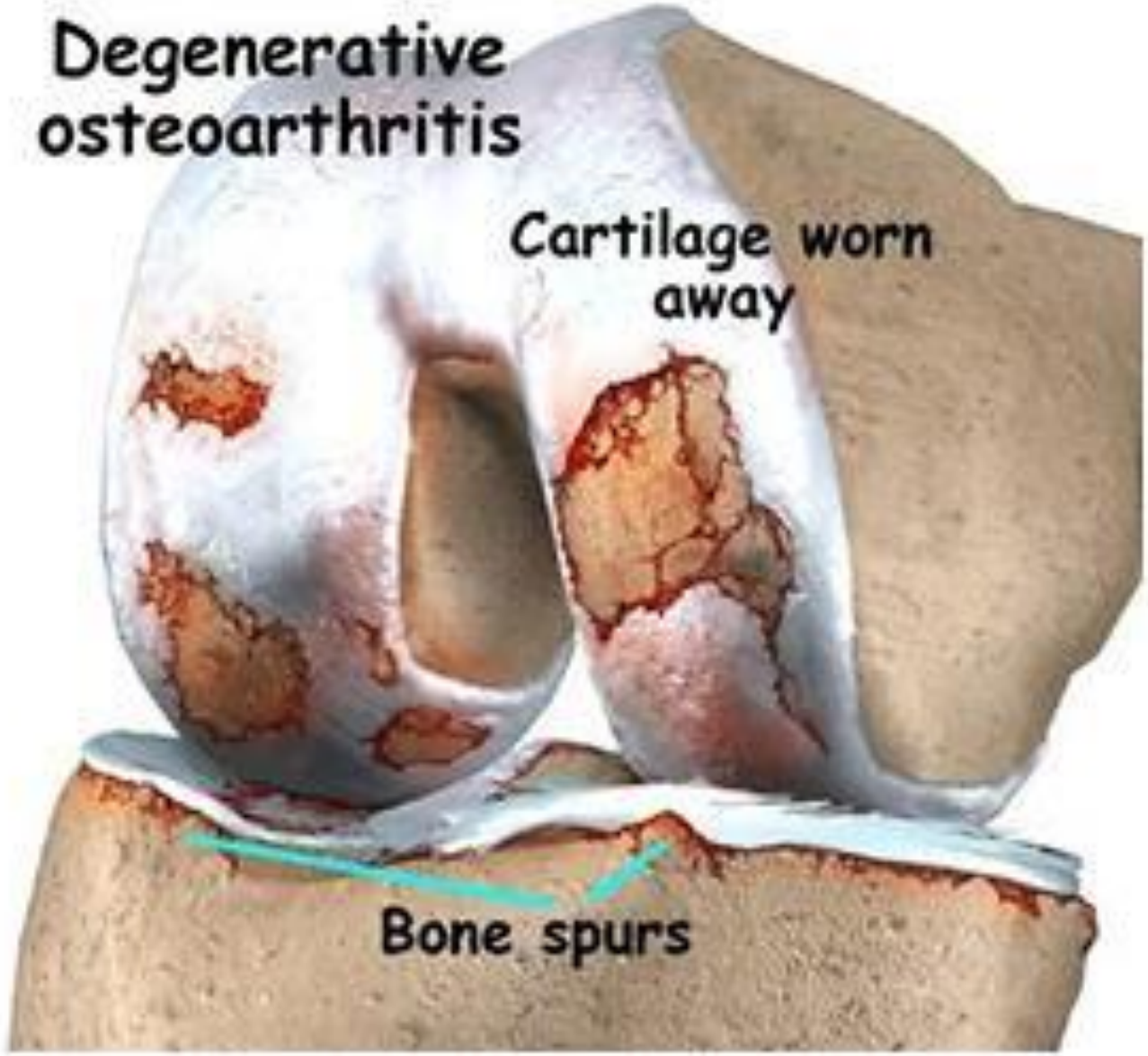
The pannus consisting of fibrinous inflammatory exudates and later on, the pannus may fill the joint space and undergo fibrosis , calcification and causes permanent ankylosis (adhesions).

The serological tests that can be done to diagnose this disease are:

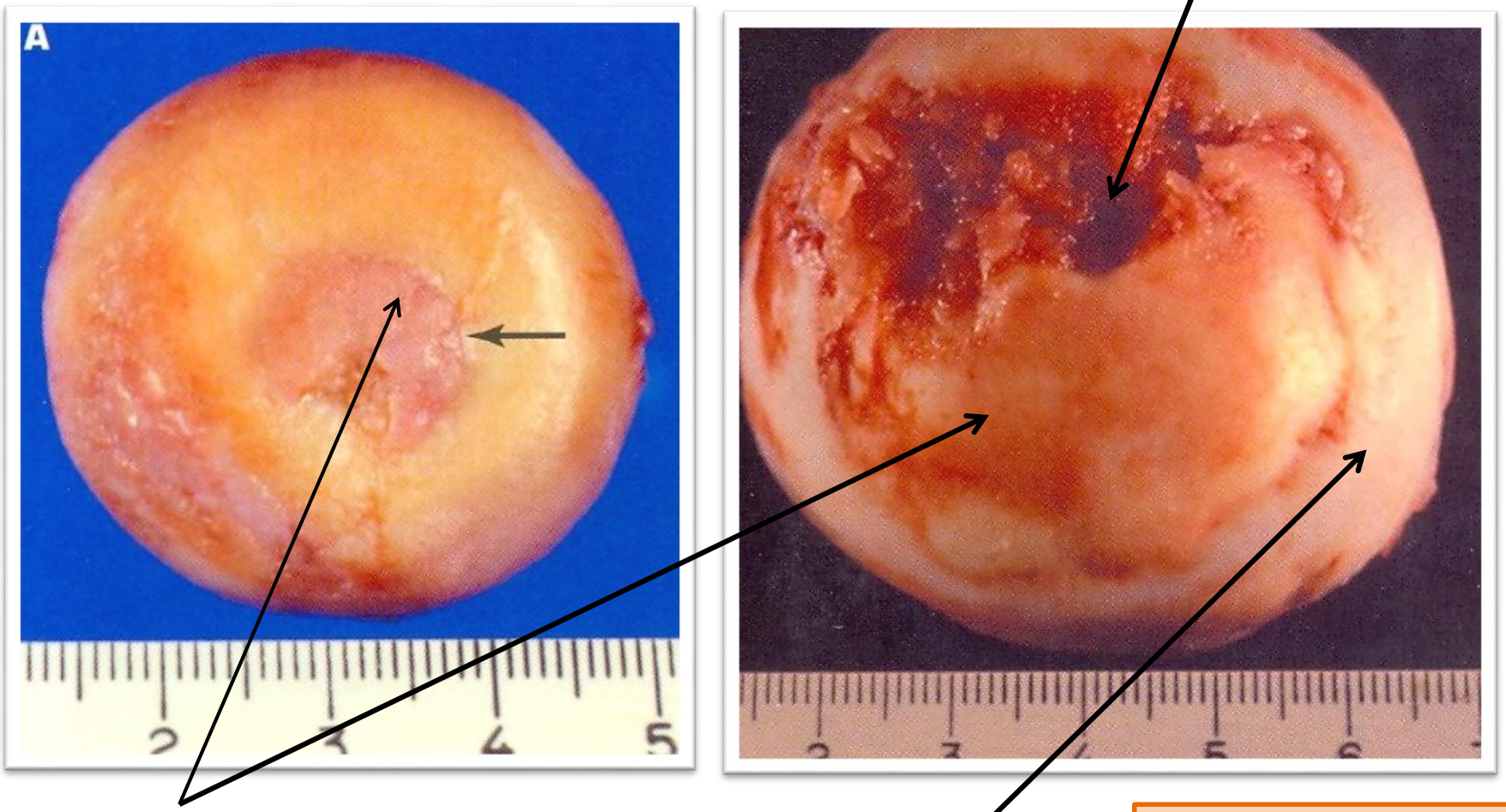
- Rhematoid factor.
- Cyclic citrullinated peptides

Case no. 4

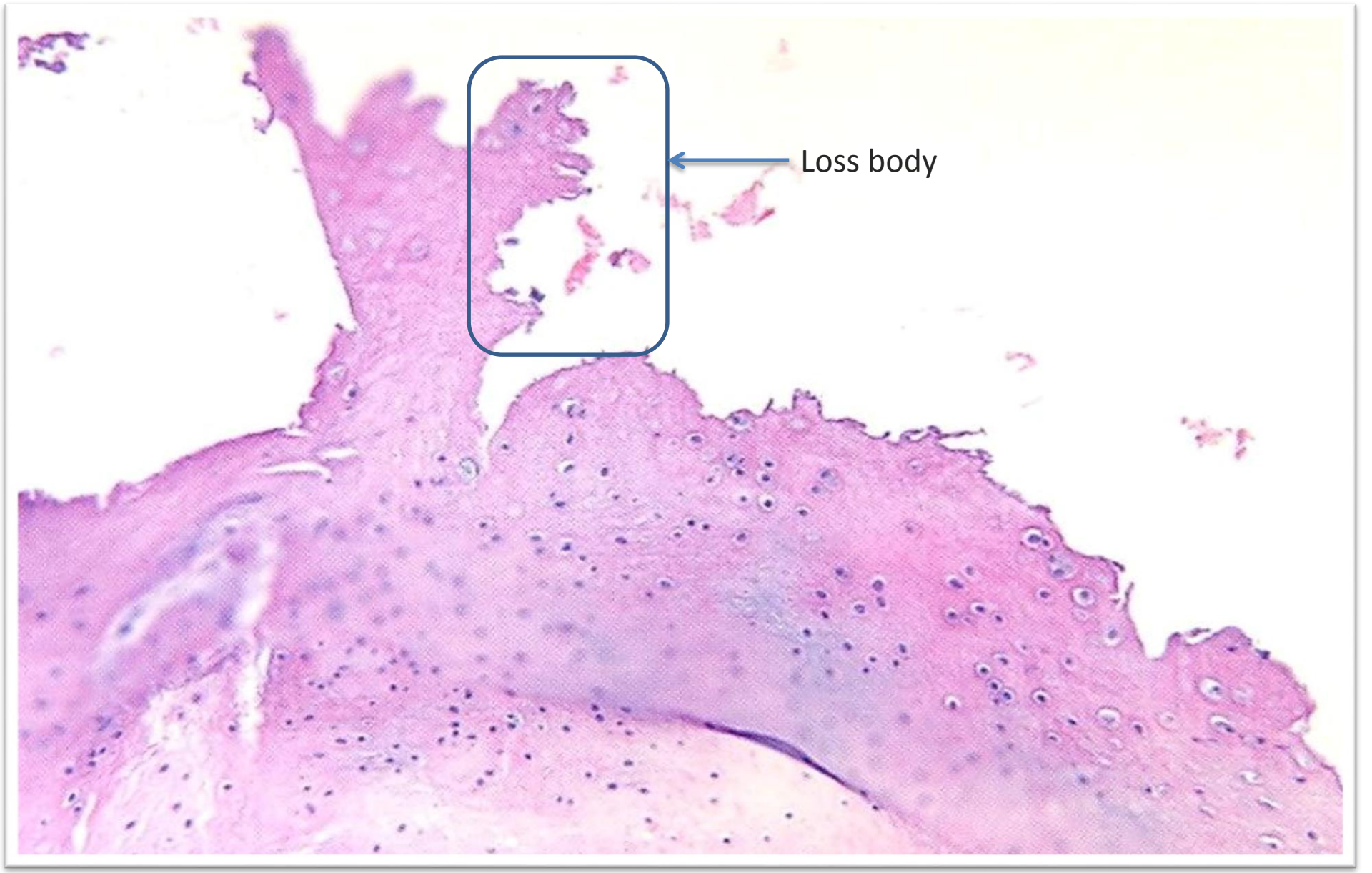
An obese 56 years old woman presented with bilateral localized pain in her knees and hands, associated with difficulty in walking. The patient mentions that her pain gets worse after movements.


Degenerative osteoarthritis
Cartilage worn away
Bone spurs

Progressive erosion of articular cartilage.



The features are consistent with classical osteoarthritis (degenerative joint disease).



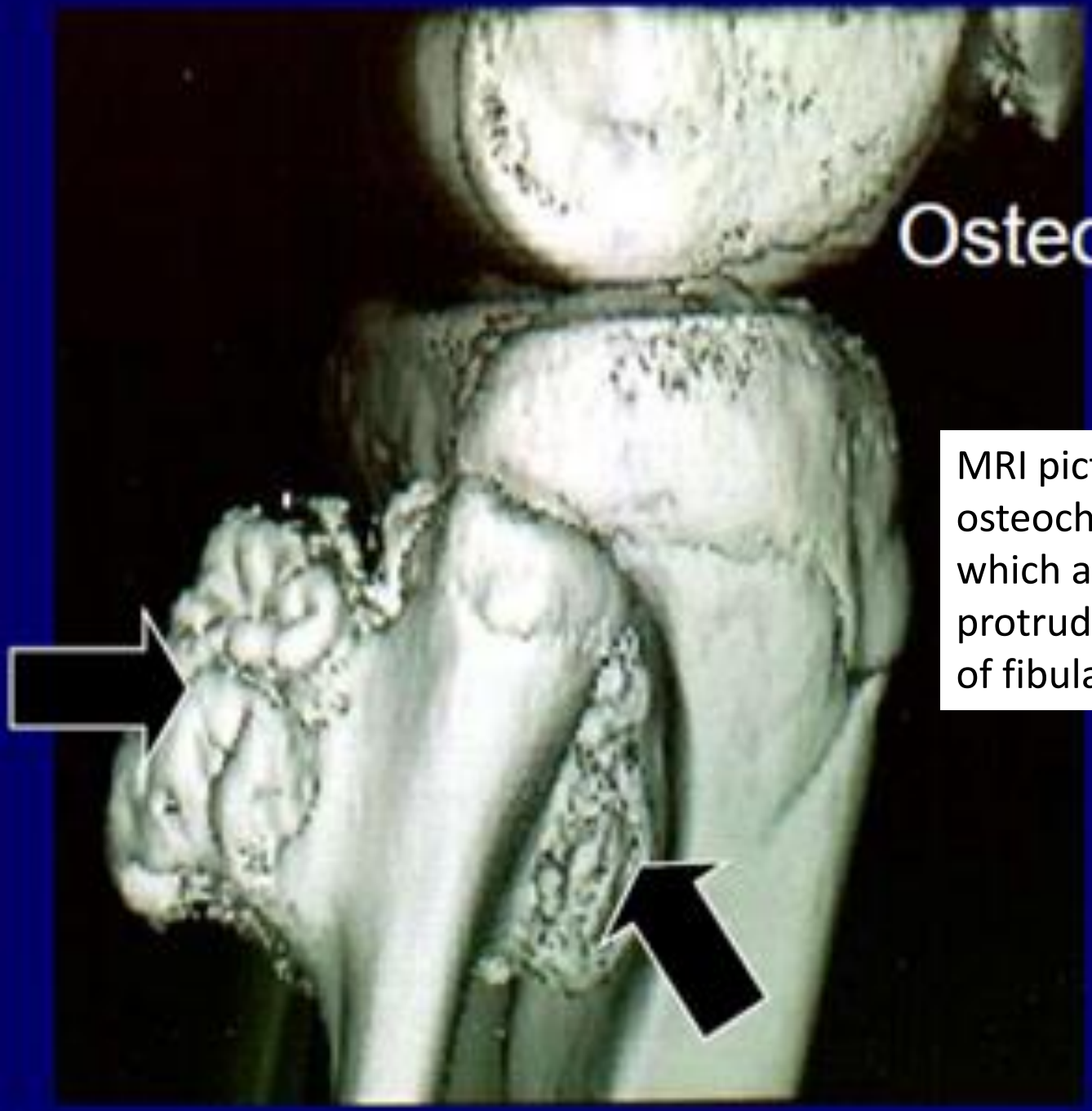
Histopathological section of articular cartilage from a case of advanced osteoarthritis. Note the fibrillation and irregularities in the articular surface which are caused by the degenerative changes. Mushroom-shaped osteophytes (bony outgrowths) develop at the margins of the articular surface and are capped by fibrocartilage and hyaline cartilage that gradually ossify. Note the absence of inflammation.

Answer to Case 4:

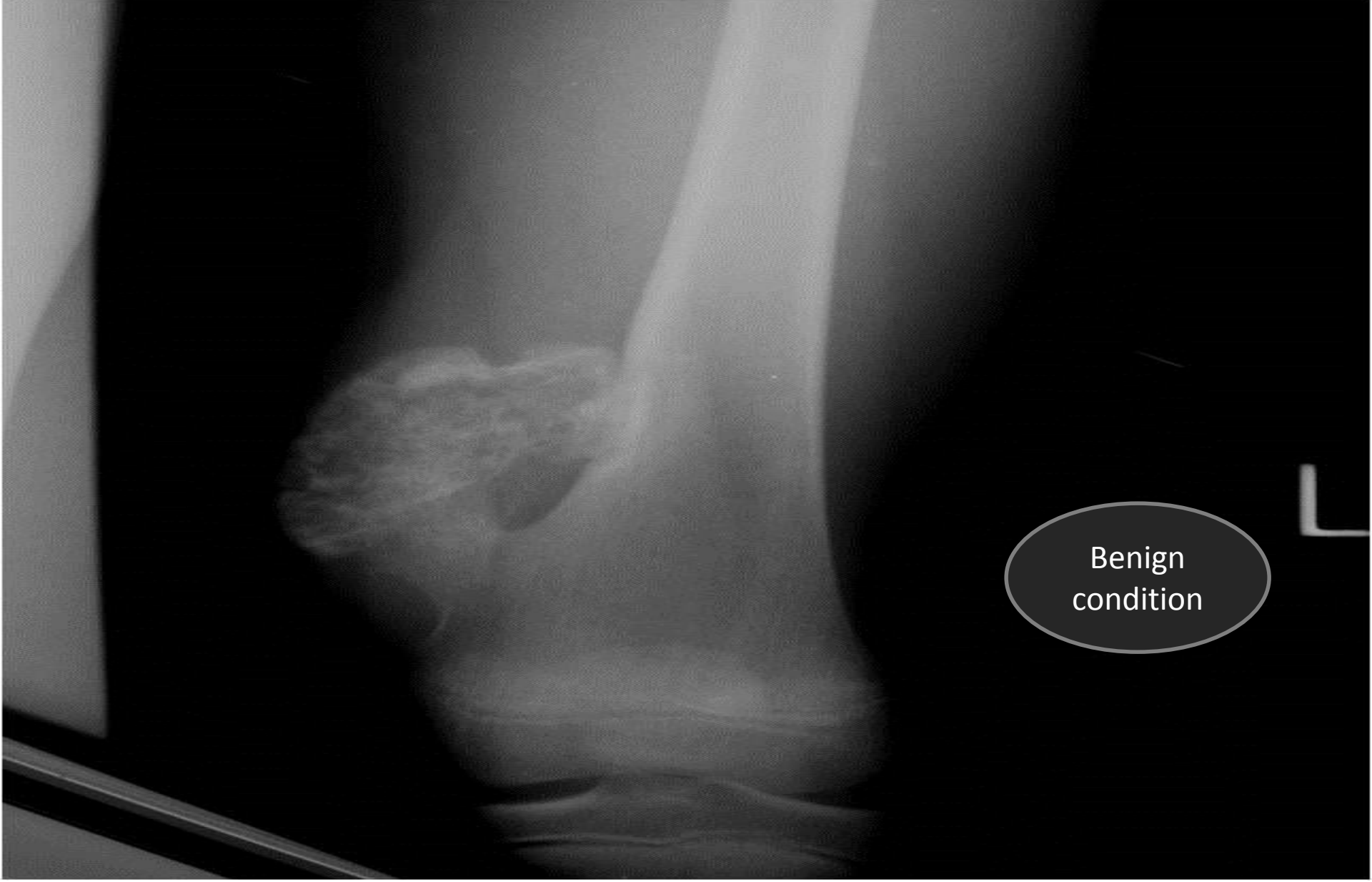
Osteoarthritis

Case no. 5

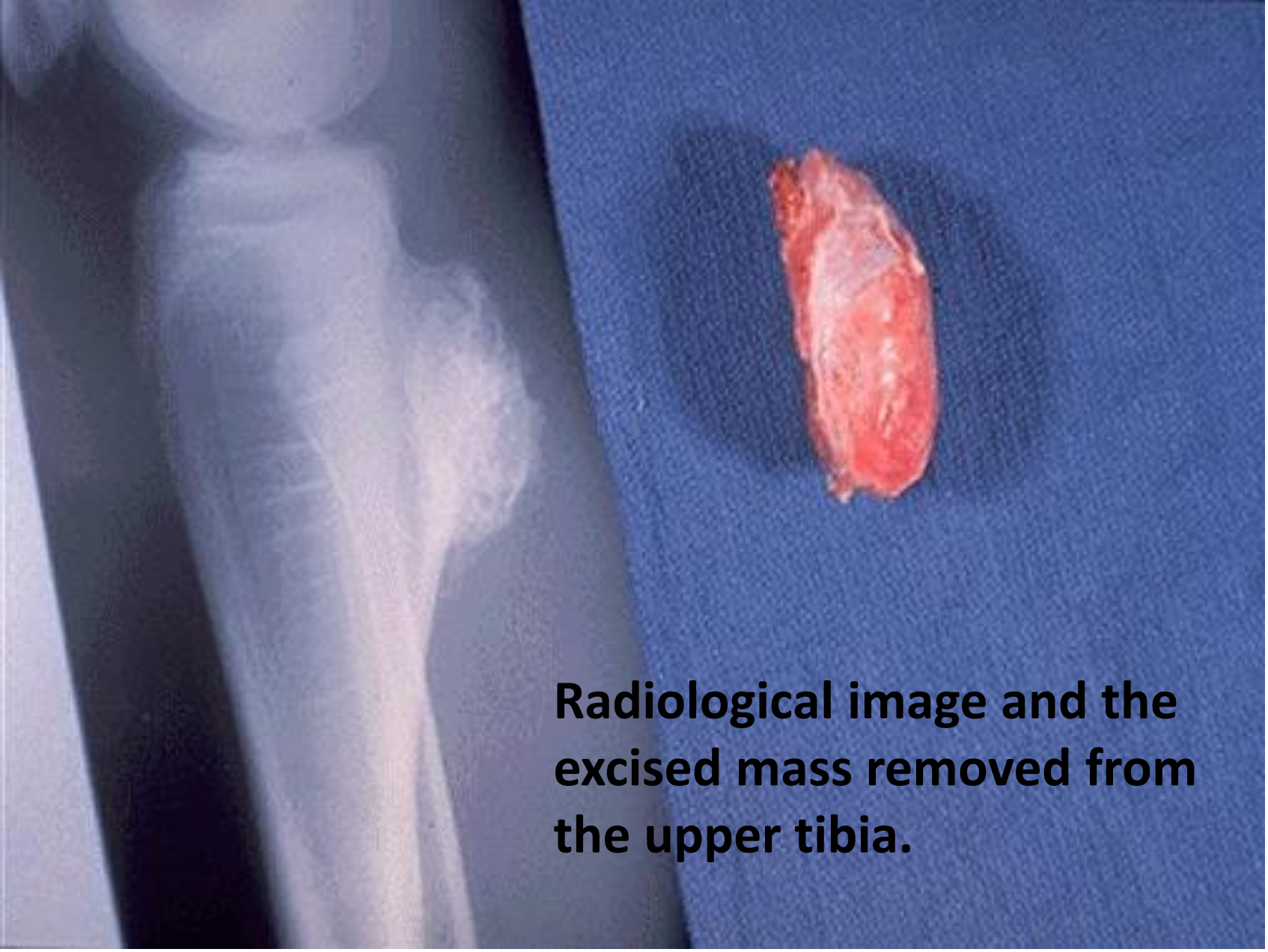
A 16 years old male was found to have a small swelling protruding from the upper part of his leg associated with mild tenderness.



MRI picture showing two osteochondromatous exostosis which are arising and protruding from the upper third of fibula.

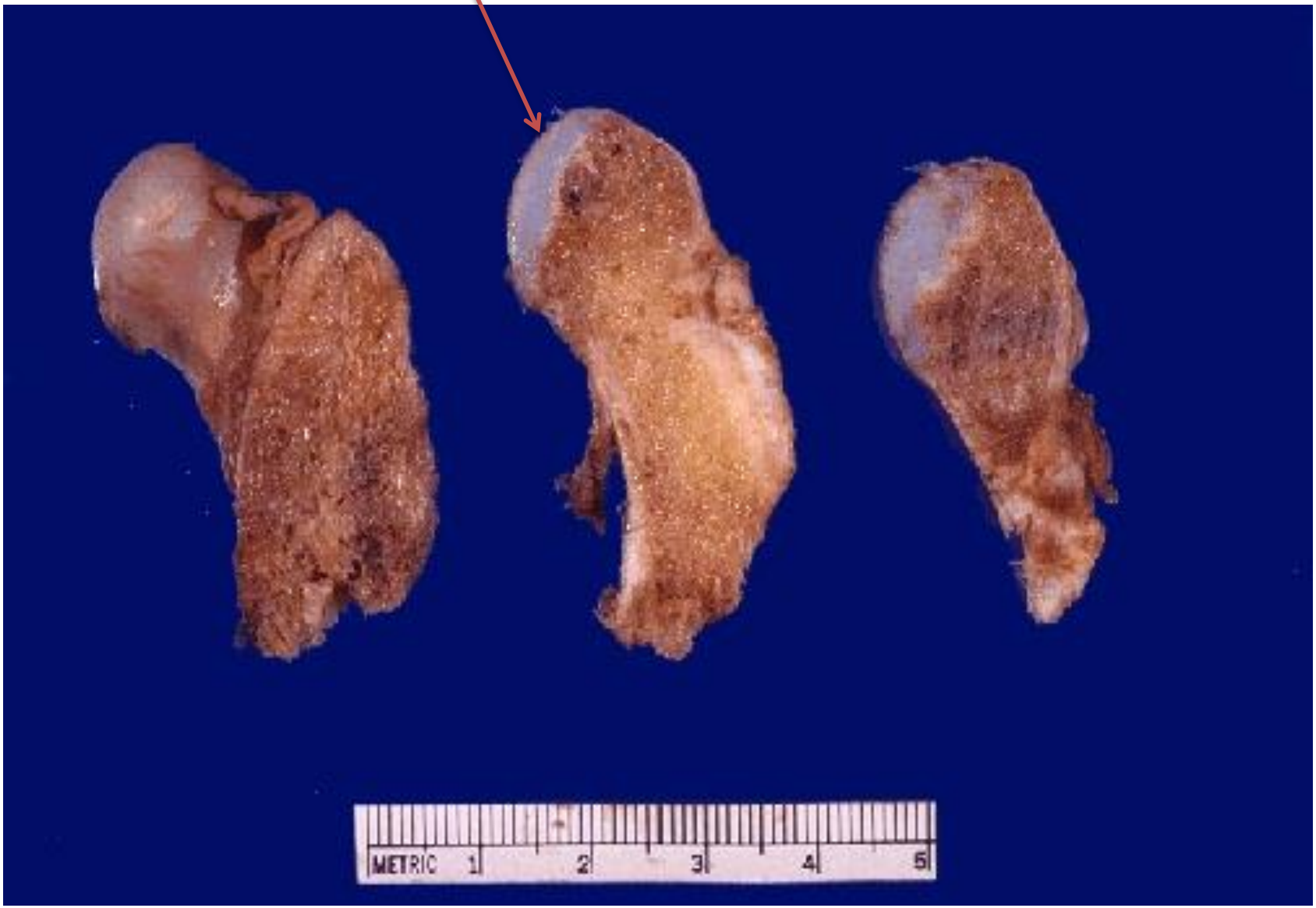


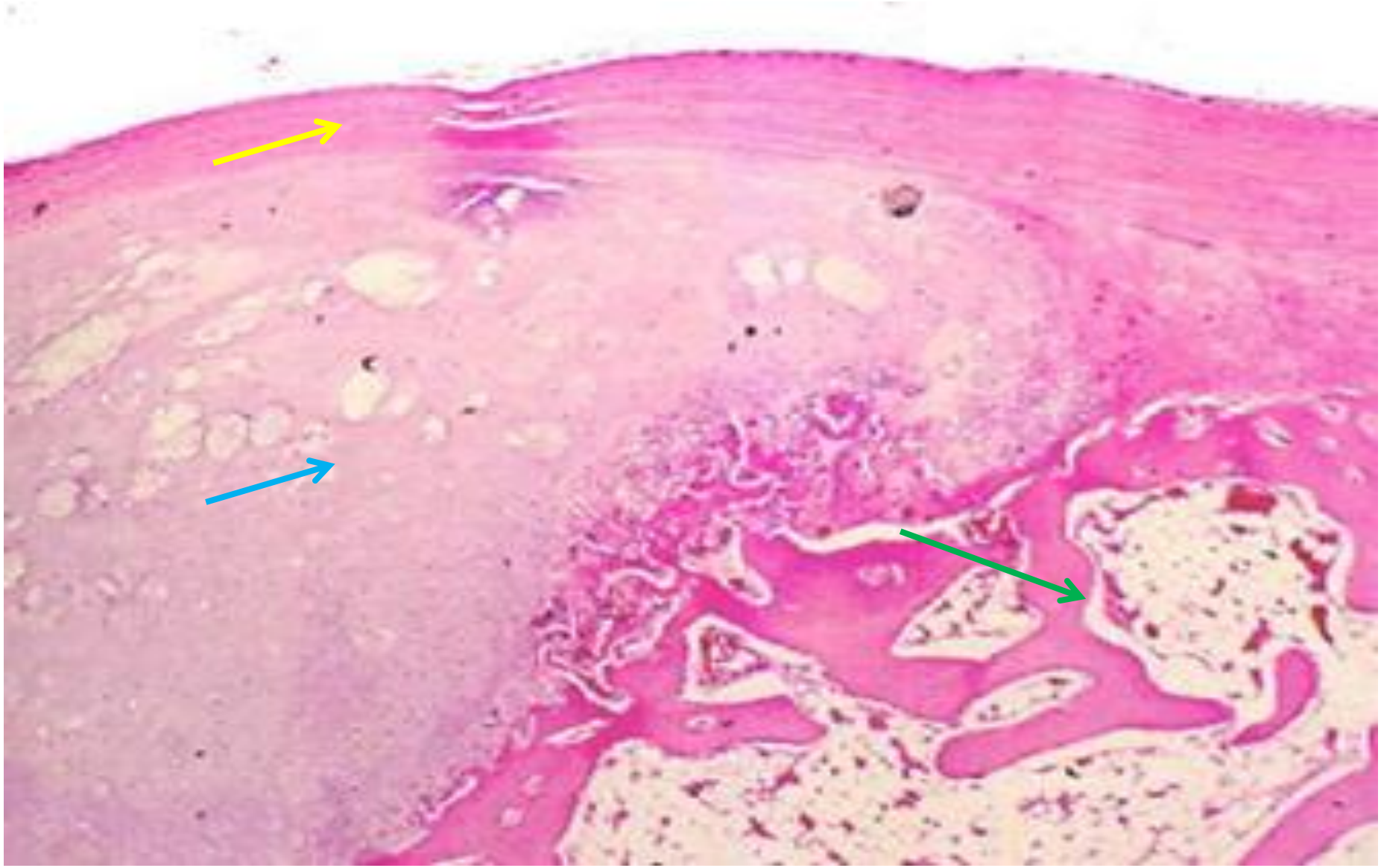
The radiologic image: Cauliflower-like neoplastic lesion protruding from the periosteum of the lower femur.



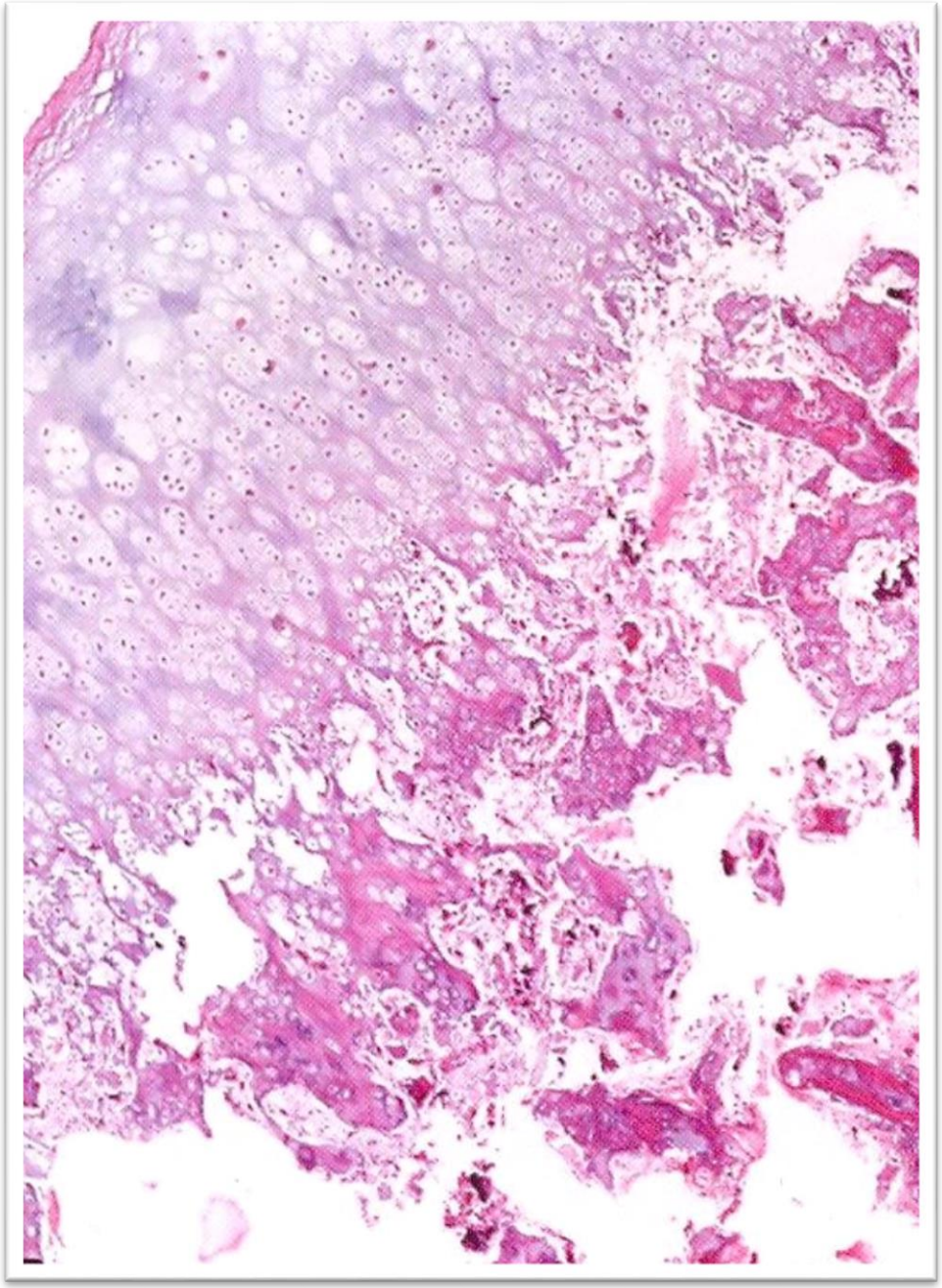
This is an osteochondroma of bone. This benign lesion appears as a bony projection (exostosis). Most are solitary, incidental lesions that may be excised if they cause local pain. There is a rare condition of multiple osteochondromatosis marked by bone deformity and by a greater propensity for development of chondrosarcoma.

A bluish-white cartilagenous cap overlies the bony tissue in a case of osteochondromatous exostosis. These are probably not true neoplasms, but they are a mass lesion that extends outward from the metaphyseal region of a long bone.





Histological section of an osteochondroma showing the three layers which form this lesion: yellow arrow – fibrous cap, blue arrow – degenerate cartilage, green arrow – underlying bone.



The microscopic appearance of an osteochondroma displays the benign cartilagenous cap at the left upper and the bony cortex at the right lower. This bone growth, though benign, can sometimes cause pain and irritation that leads to the patient asking for its removal.

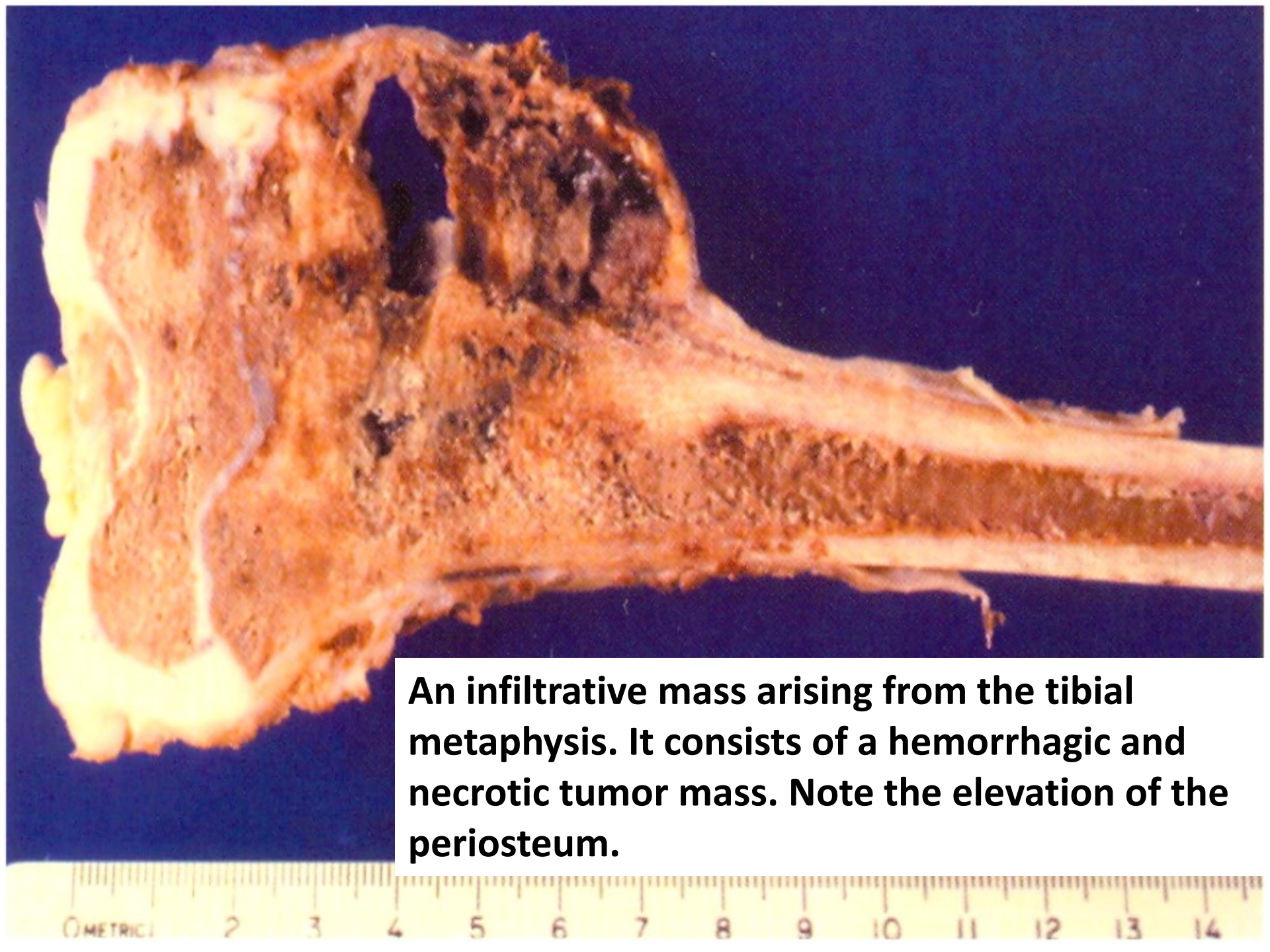
Osteochondroma (osteochondroma exostosis)

- **This is an osteochondroma of bone. This benign tumor appears as a bony projection (exostosis) and excision is curative .**

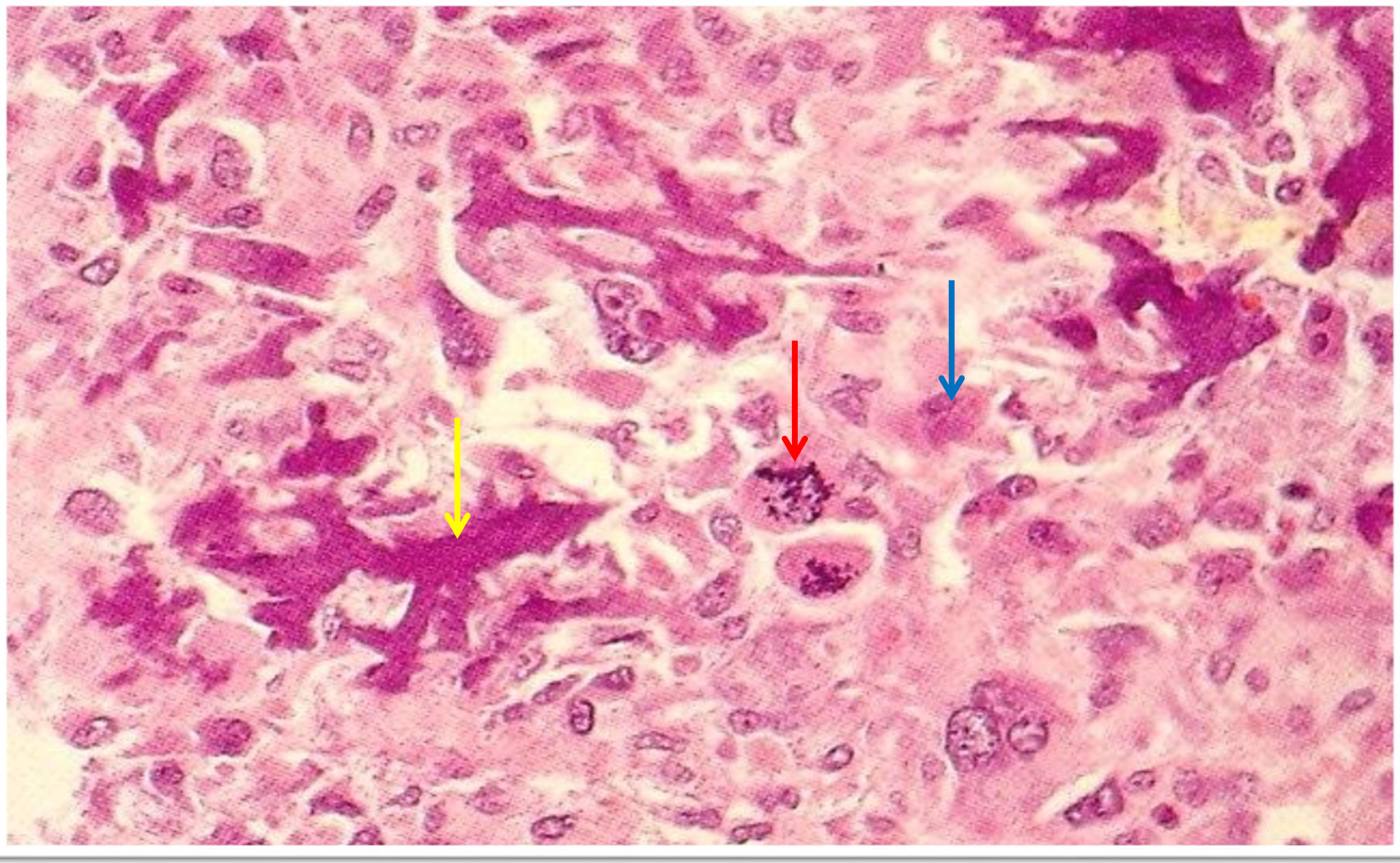
- **Most are solitary, incidental lesions that may be excised if they cause local pain. There is a rare condition of multiple osteochondromatosis marked by bone deformity and by a greater propensity for development of chondrosarcoma**

Case no. 6

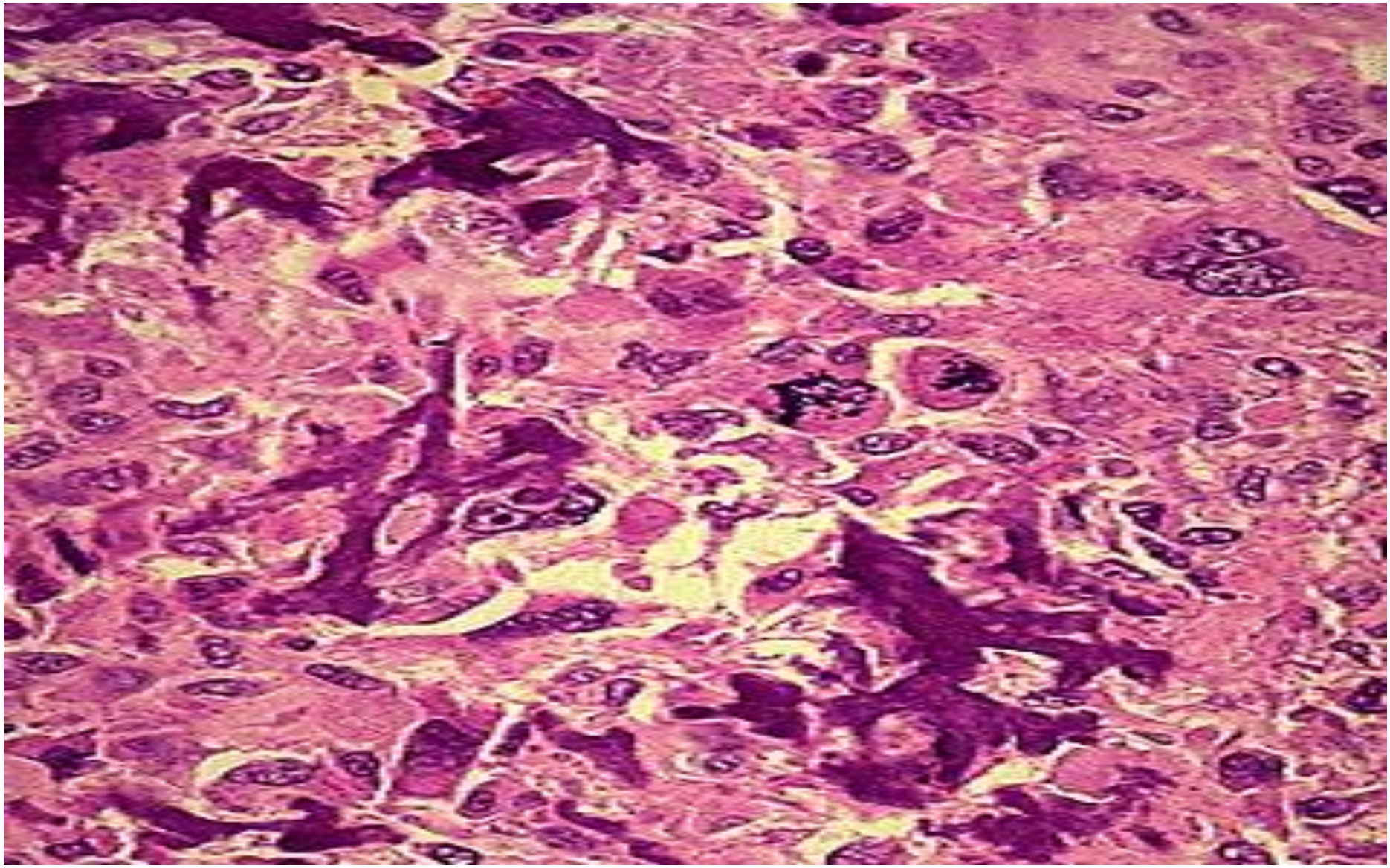
An 18 years old female presented to the rheumatology clinic with 2 months history of pain and swelling in her knee. This was associated with **weight loss** → malignant and difficulties in walking.



An infiltrative mass arising from the tibial metaphysis. It consists of a hemorrhagic and necrotic tumor mass. Note the elevation of the periosteum.



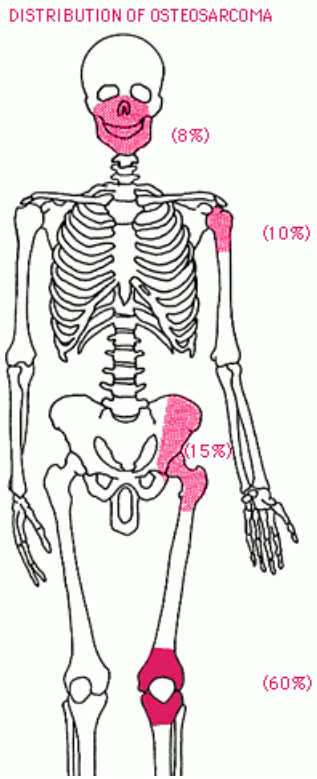
- Pleomorphic malignant cells (blue arrow)
- Malignant osteoid formation(yellow arrow)
- Abnormal mitoses (red arrow)



- **The microscopic features of osteosarcoma are large Pleomorphic cells, malignant osteoid and abnormal mitosis.**
- **The predisposing factors are Paget's disease, irradiation, and bone infarcts.**
- **It is a malignant neoplasm with bad prognosis**

Figure 27.22

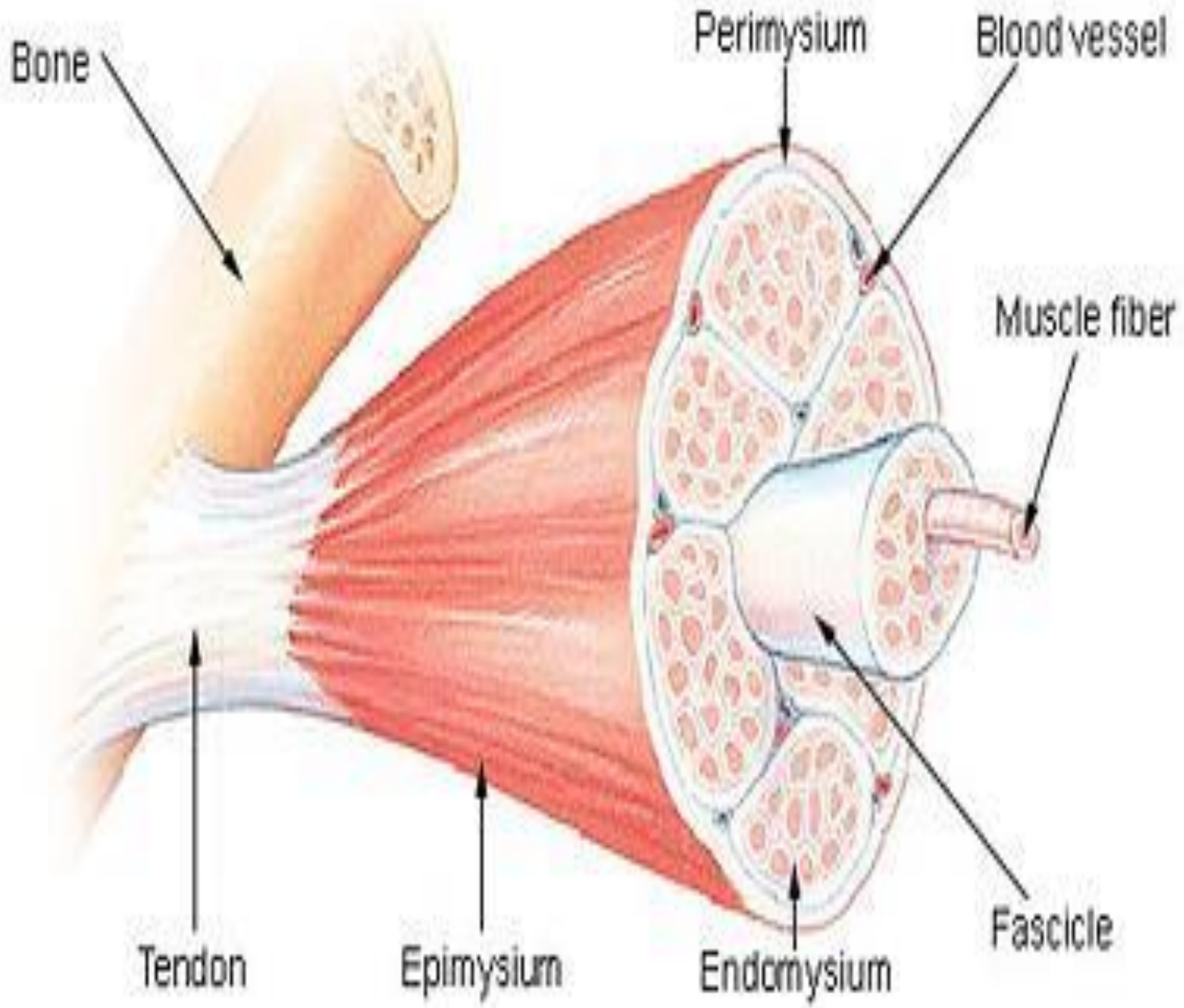
The major sites of origin of osteosarcomas. Numbers in parentheses are approximate percentages.



Answer to Case 6:

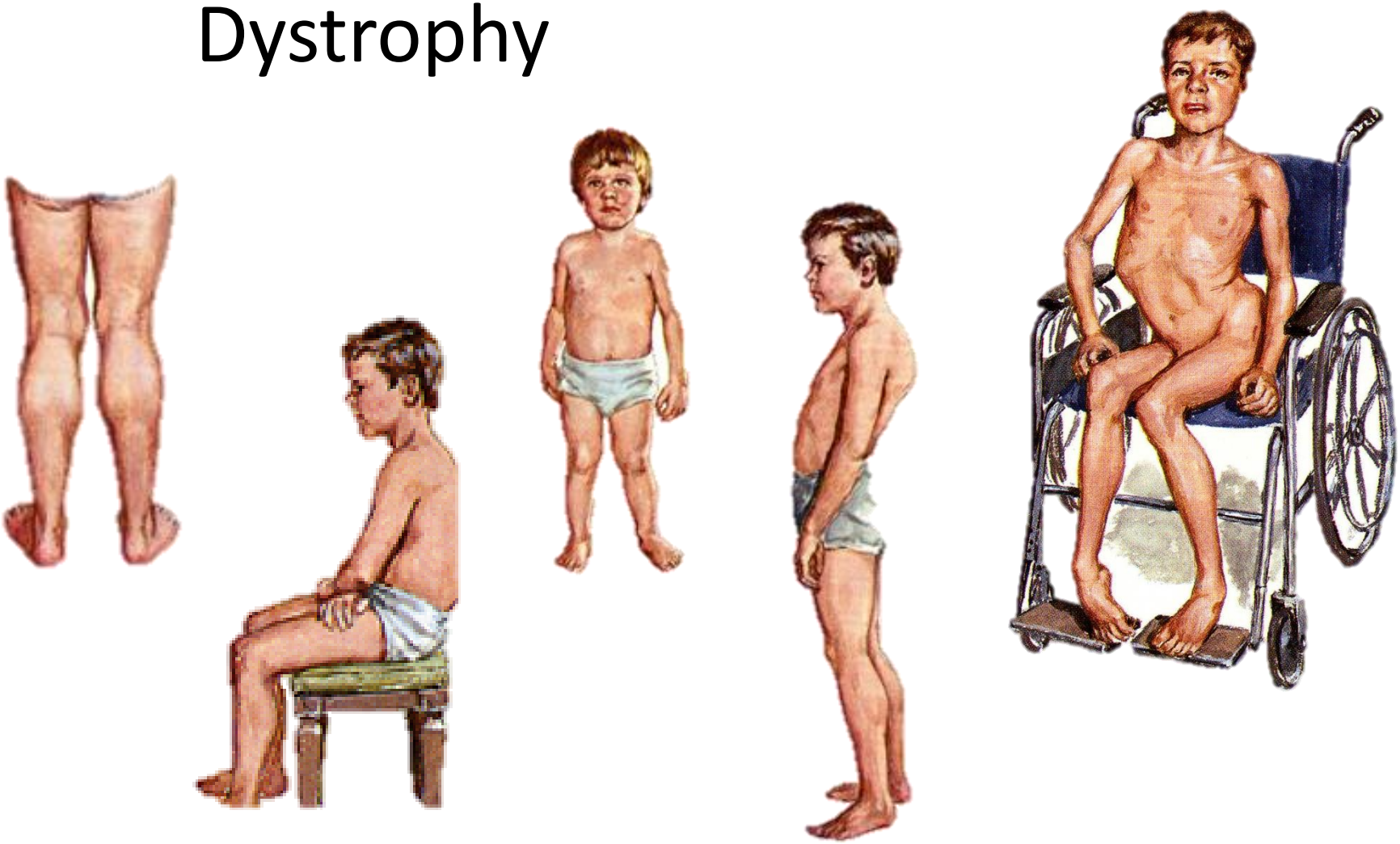
Osteosarcoma

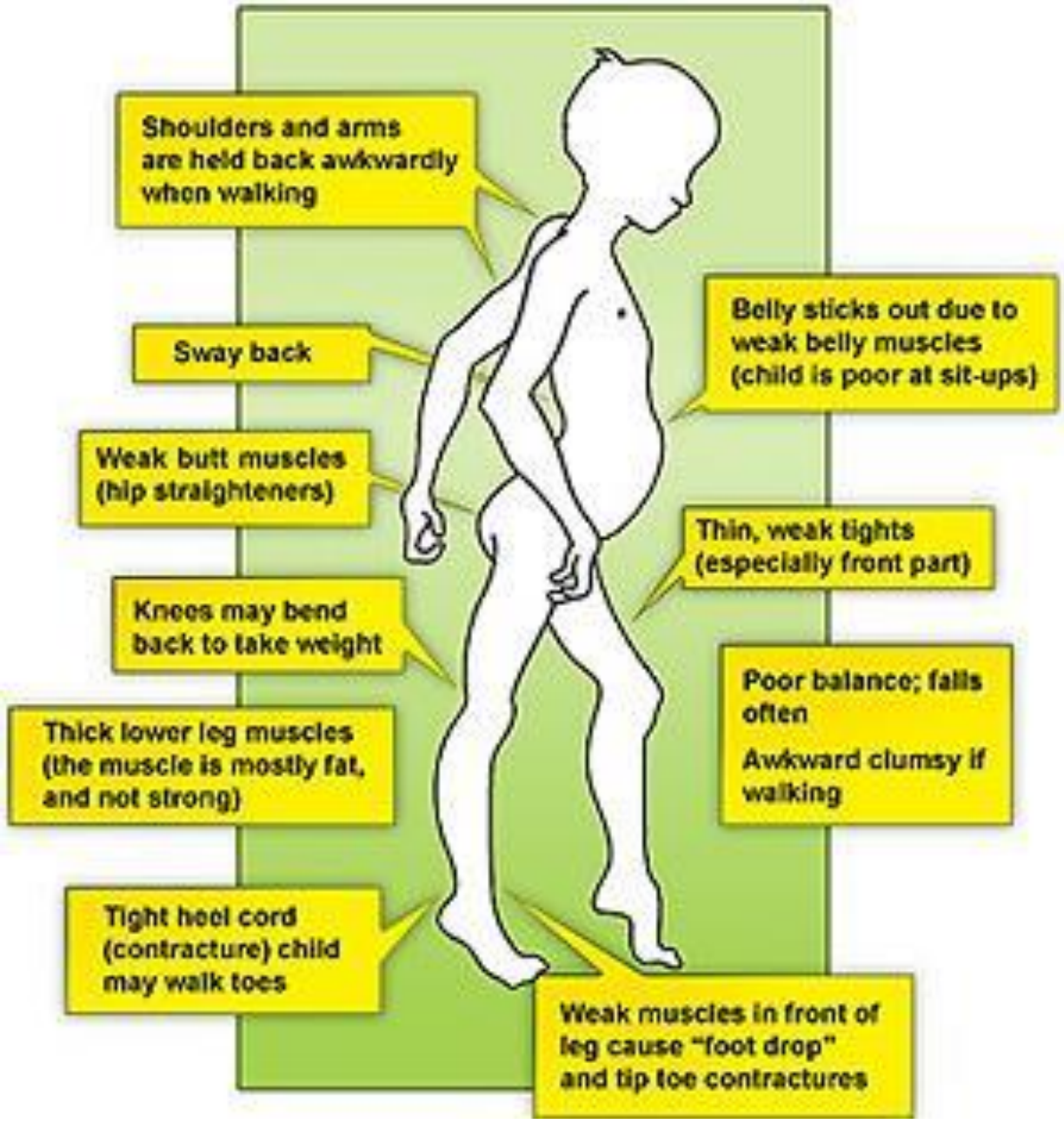
Case no. 7

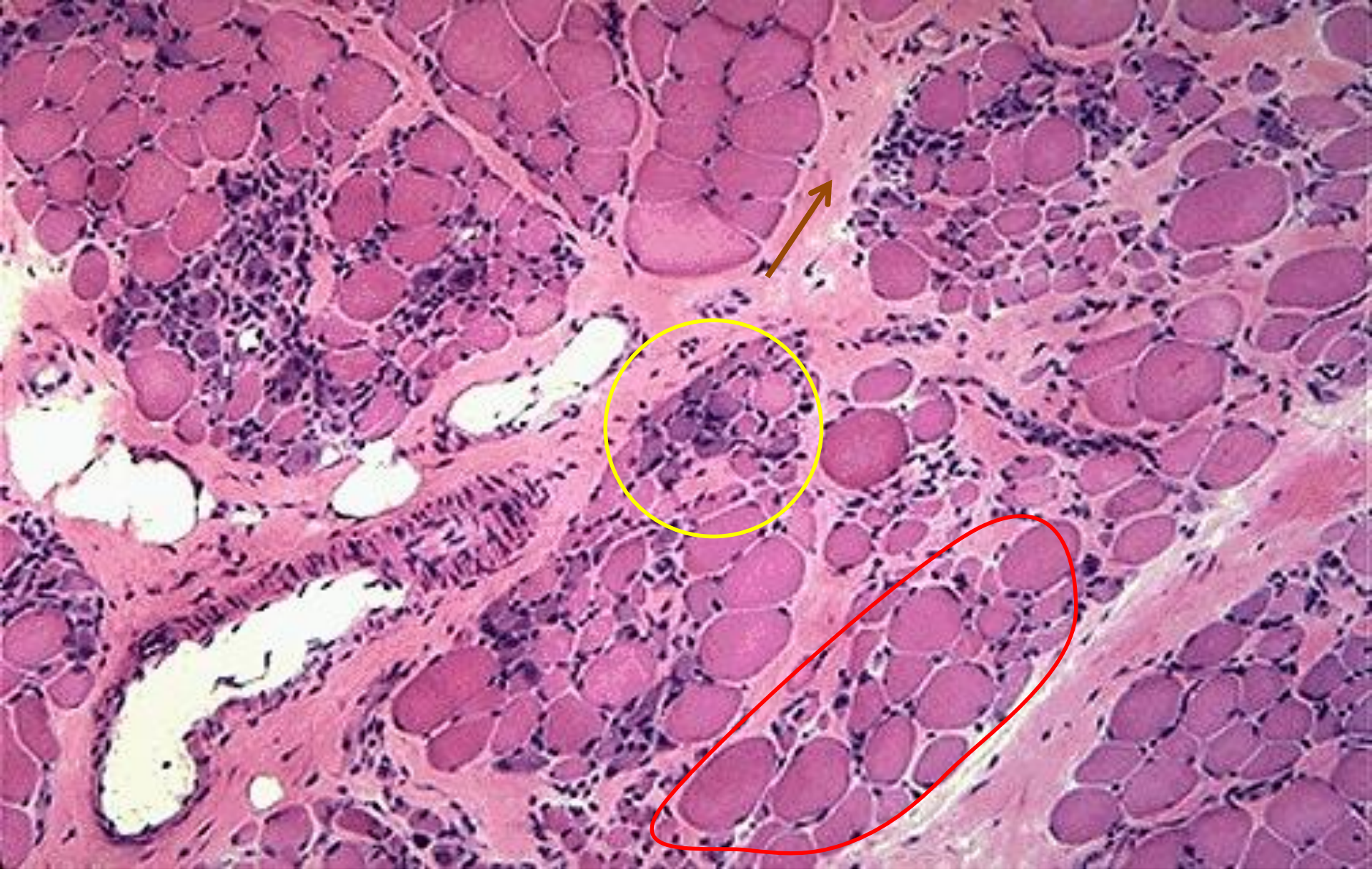

Bone
Perimysium
Blood vessel
Muscle fiber
Tendon
Epimysium
Endomysium
Fascicle

A 3 years old boy presented to his pediatrician with complaint of his parents from difficulty in walking , poor balance , and frequent falls . Laboratory investigation shows elevated creatine kinase . Muscle biopsy show absence of dystrophin by western blot analysis .
What is your provisional diagnosis?

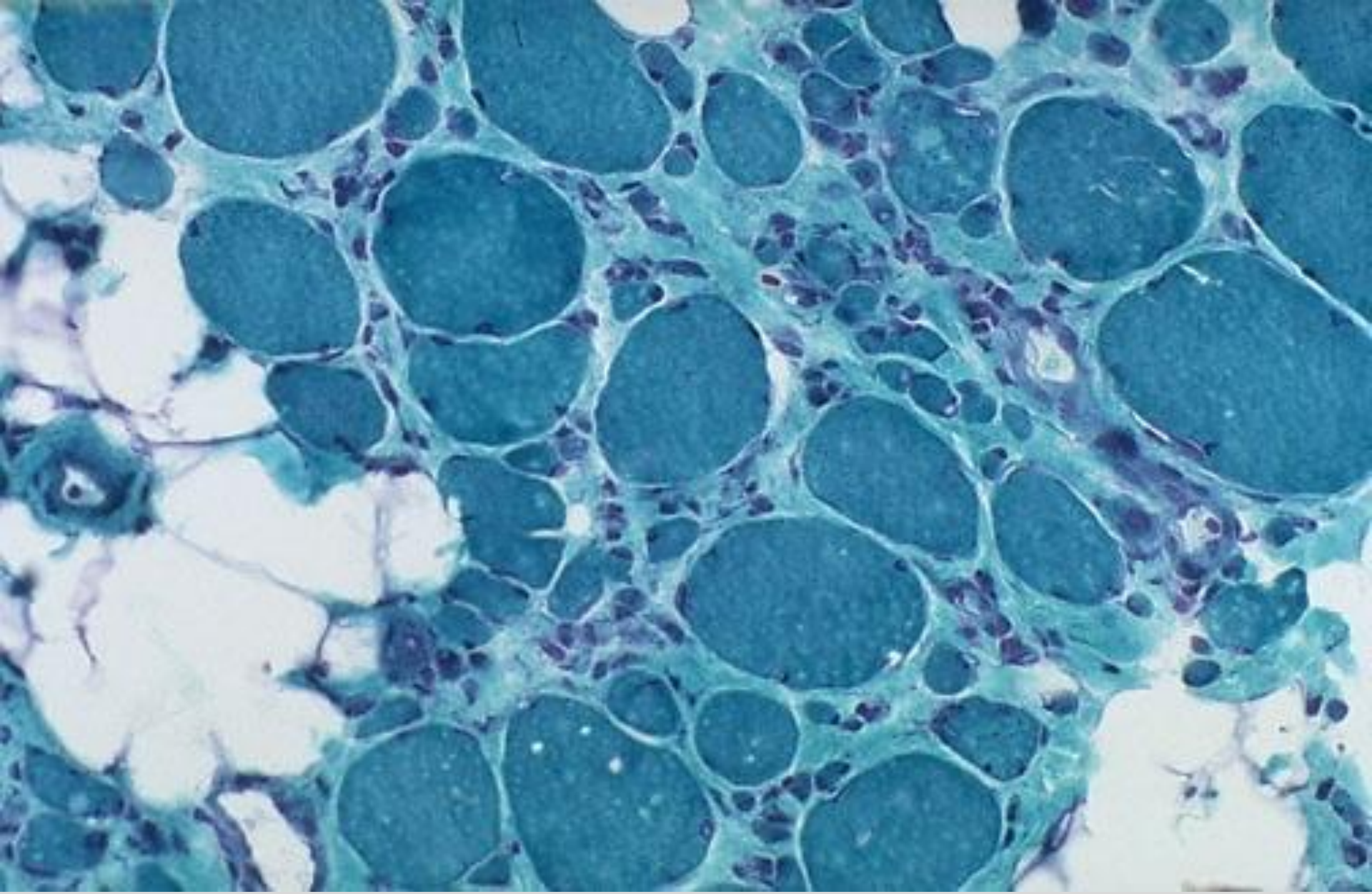
Duchenne Muscular Dystrophy




Shoulders and arms are held back awkwardly when walking
Sway back
Weak butt muscles (hip straighteners)
Knees may bend back to take weight
Thick lower leg muscles (the muscle is mostly fat, and not strong)
Tight heel cord (contracture) child may walk toes
Belly sticks out due to weak belly muscles (child is poor at sit-ups)
Thin, weak tights (especially front part)
Poor balance; falls often
Awkward clumsy if walking
Weak muscles in front of leg cause "foot drop" and tip toe contractures



Duchenne muscular dystrophy showing variations in muscle fiber size (red circle), increased endomysial fibrous connective tissue (brown arrow), and Basophilic regenerating fibers (yellow circle).



Immunohisto chemistry stain of dystrophin

Note again the atrophy/hypertrophy scenario

Dystrophin, an intracellular protein, forms an interface between the cytoskeletal proteins and a group of transmembrane proteins

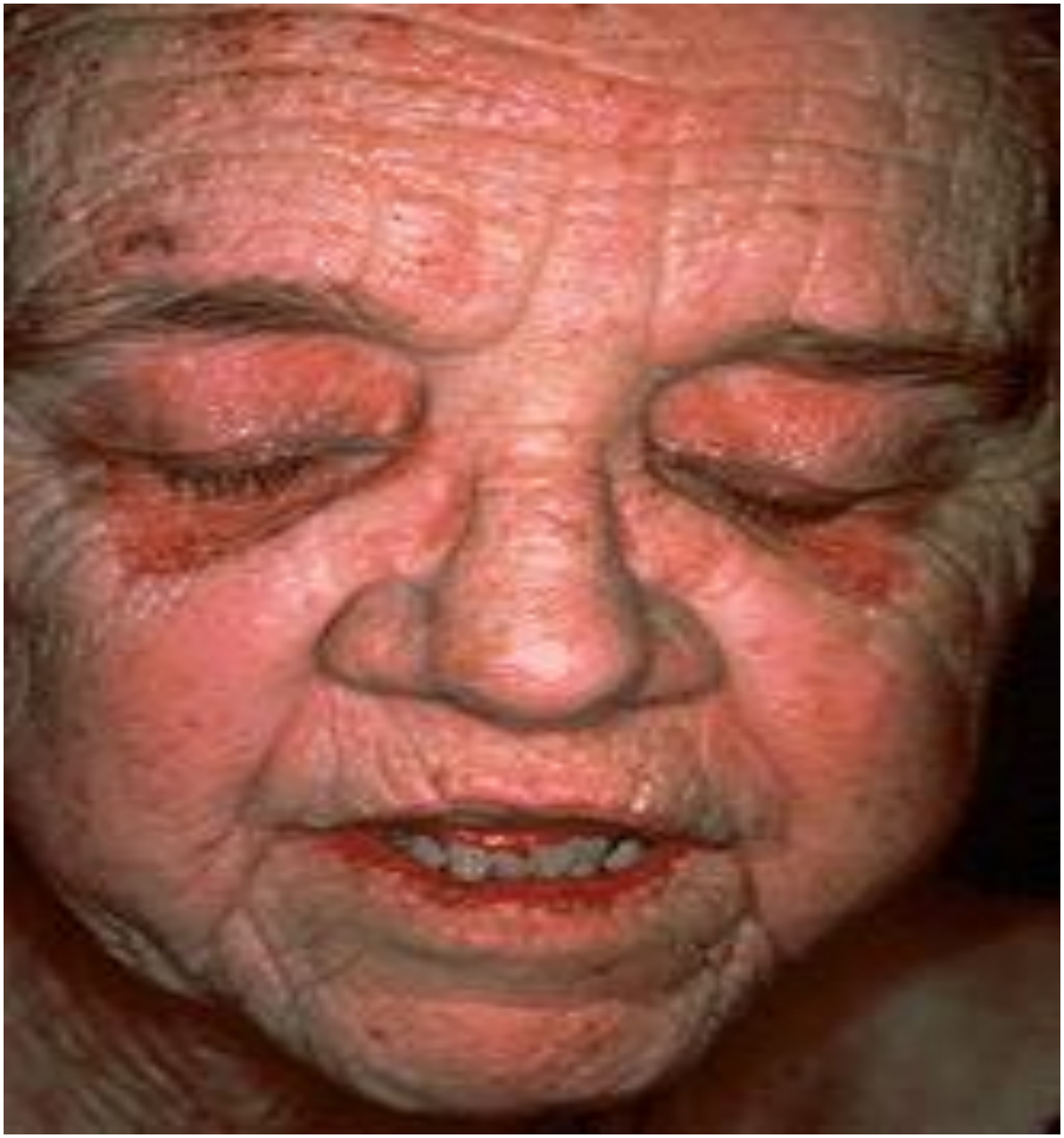
Dystrophin stain shows absence of dystrophin membrane associated protein

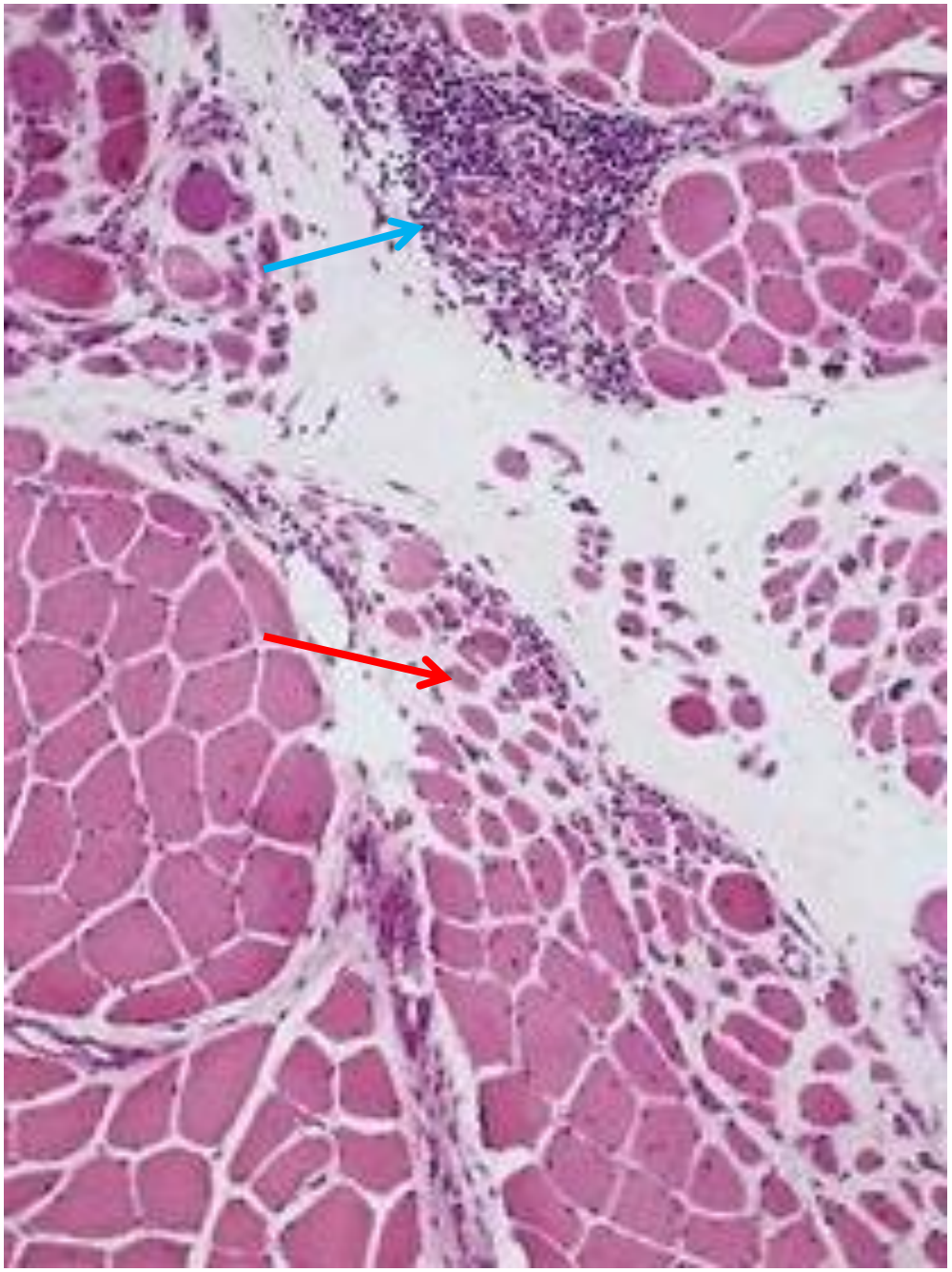
Answer on Case 7:

Duchenne Muscular Dystrophy

Case no.8

A 52-year-old woman presents with 6-month history of progressive muscle weakness and a skin rash. Physical examination is remarkable for a diffuse purple/red discoloration of the skin over her cheeks, nose, and eyelids. Examination confirms proximal muscle weakness. Laboratory findings show an increase in creatine kinase (10 times the normal).





The histologic appearance of muscle shows perifascicular atrophy of muscle (red arrow) fibers and inflammation (blue arrow).

Answer on Case 8:

Dermatomyositis

- END -