

# Infection of bones and joints

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# Acute haematogenous osteomyelitis

- Causal organism:  
Gram- positive and Gram- negative  
with aerobic or anaerobic metabolism



# Acute haematogenous osteomyelitis

- Gram +:
- Staphylococcus aureus in 80 %  
Streptococcus pyogenes
- Staphylococcus epidermidis
- Haemophilus influenzae

# Acute haematogenous osteomyelitis

- Gram - :
- Escherichia coli
- Klebsiella
- Proteus vulgaris
- Pseudomonas aeruginosa
- Salmonella, Shigella
- Clostridium

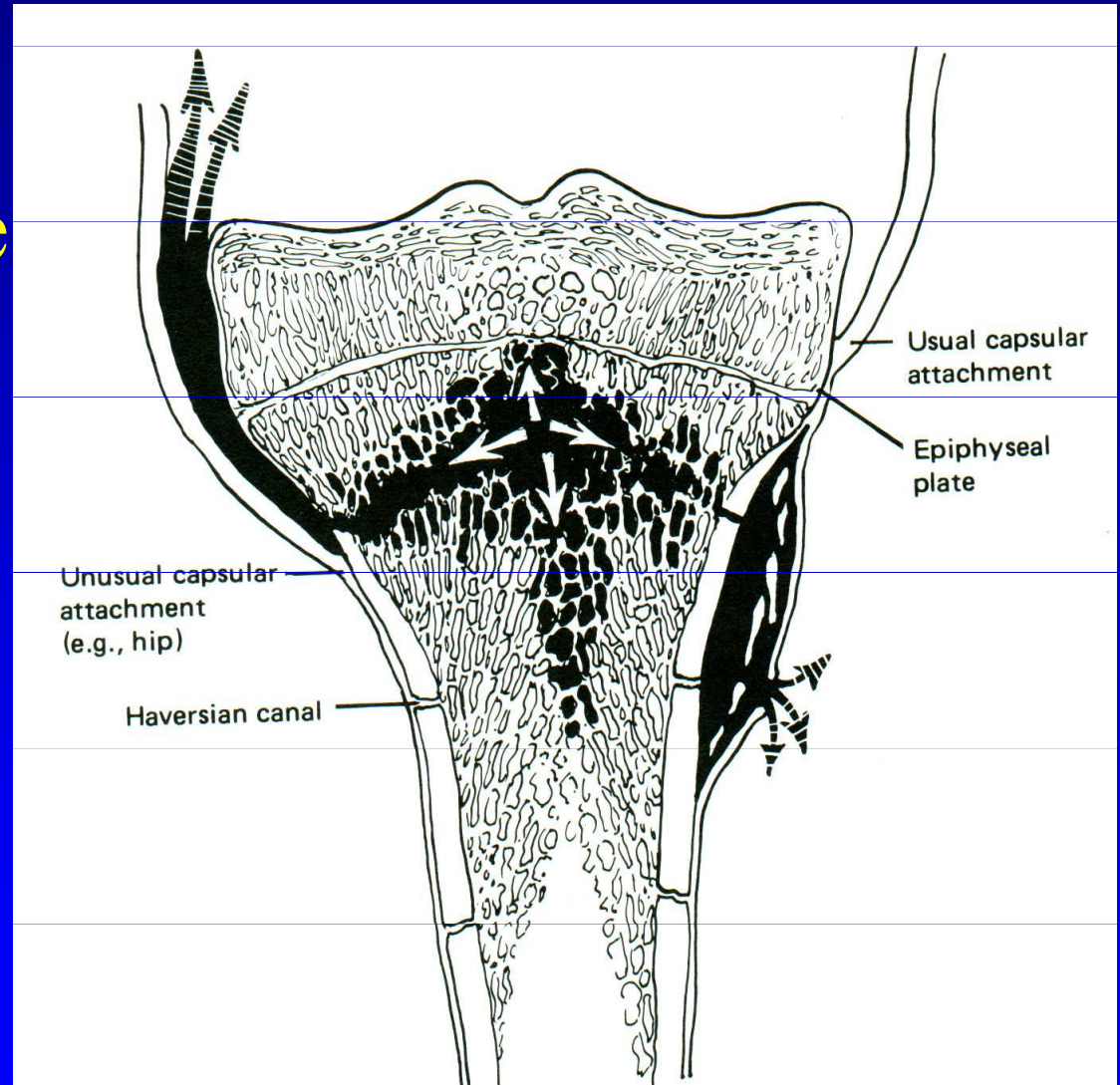
# They way of infection

- Haematogenous seeding  
from infection focus in the body
- Suppurative focus in the vicinity  
(phlegmona, absces, Batson plexus in  
urinary tract infection)
- Dirrect transport (open fracture)

# Acute haemotogenous osteomyelitis

Typical localisation -  
Metaphysis of long bone

More often in children



# Pathological anatomy

Hyperemia, swelling, pus

Subperiosteal abscess

Disturbance in circulation,  
infective thrombosis

Osteolytic lesion

Necrosis of bone, sequestra

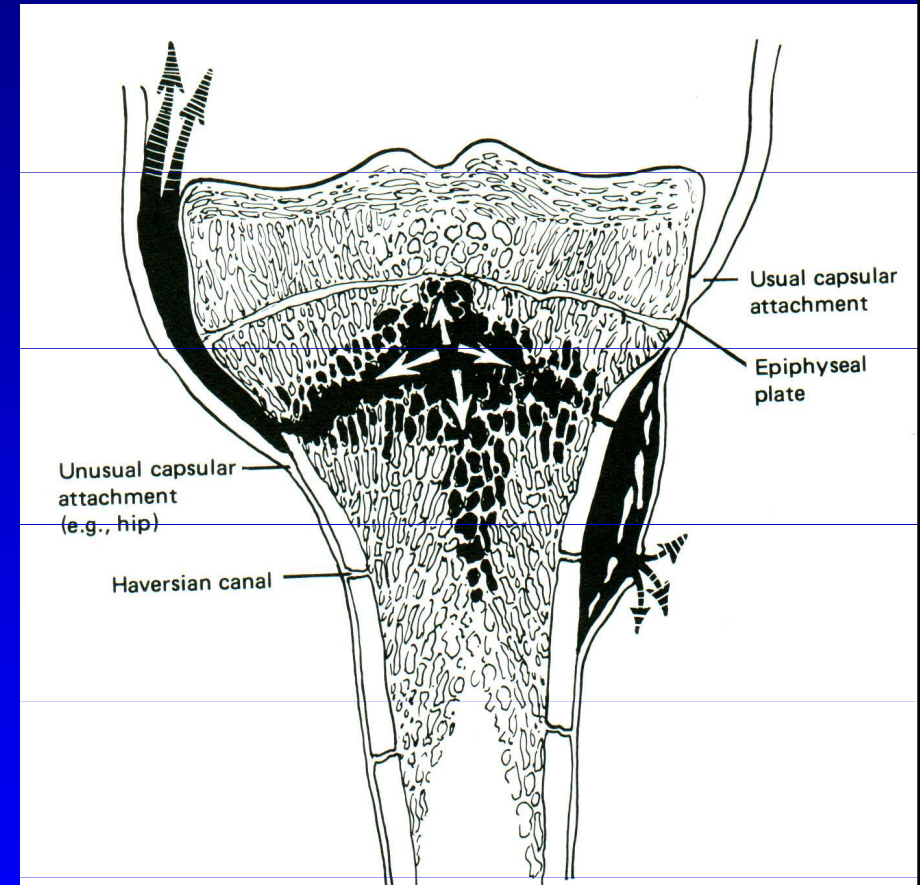
Sequestra of the whole diaphysis

- involucrum

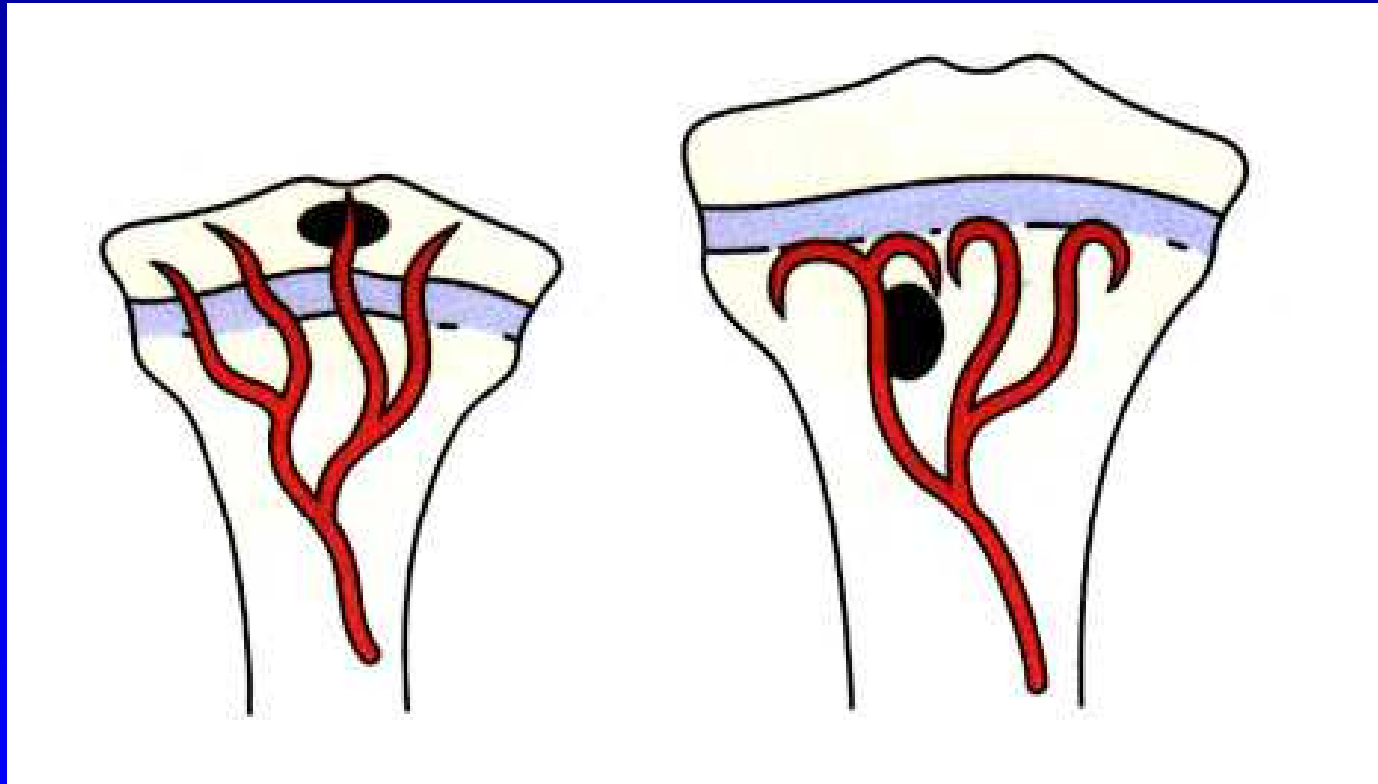
Destruction of growth plate

Spread into the lungs and other bones

Sepsis



In children up to six months: spread through growth plate  
In children above six months: growth plate is a barrier



## Local symptoms:

Rubor, calor, dolor, tumor, functio laesa  
Tenderness, fistula, discharge

## Systemic symptoms:

Fever ( septic fever – two degrees between in the  
morning and in the afternoon)

Shivering

Fatigue

Tachycardia, tachypnoea, hypotension

Nausea, stomach problems

# Laboratory tests

- Leucocytosis
- ESR
- CRP
- Differential blood test
- Electrophoresis of proteins
- Metabolic acidosis
- Bacteriological examination from the pus
- Haemoculture



# Radiological finding

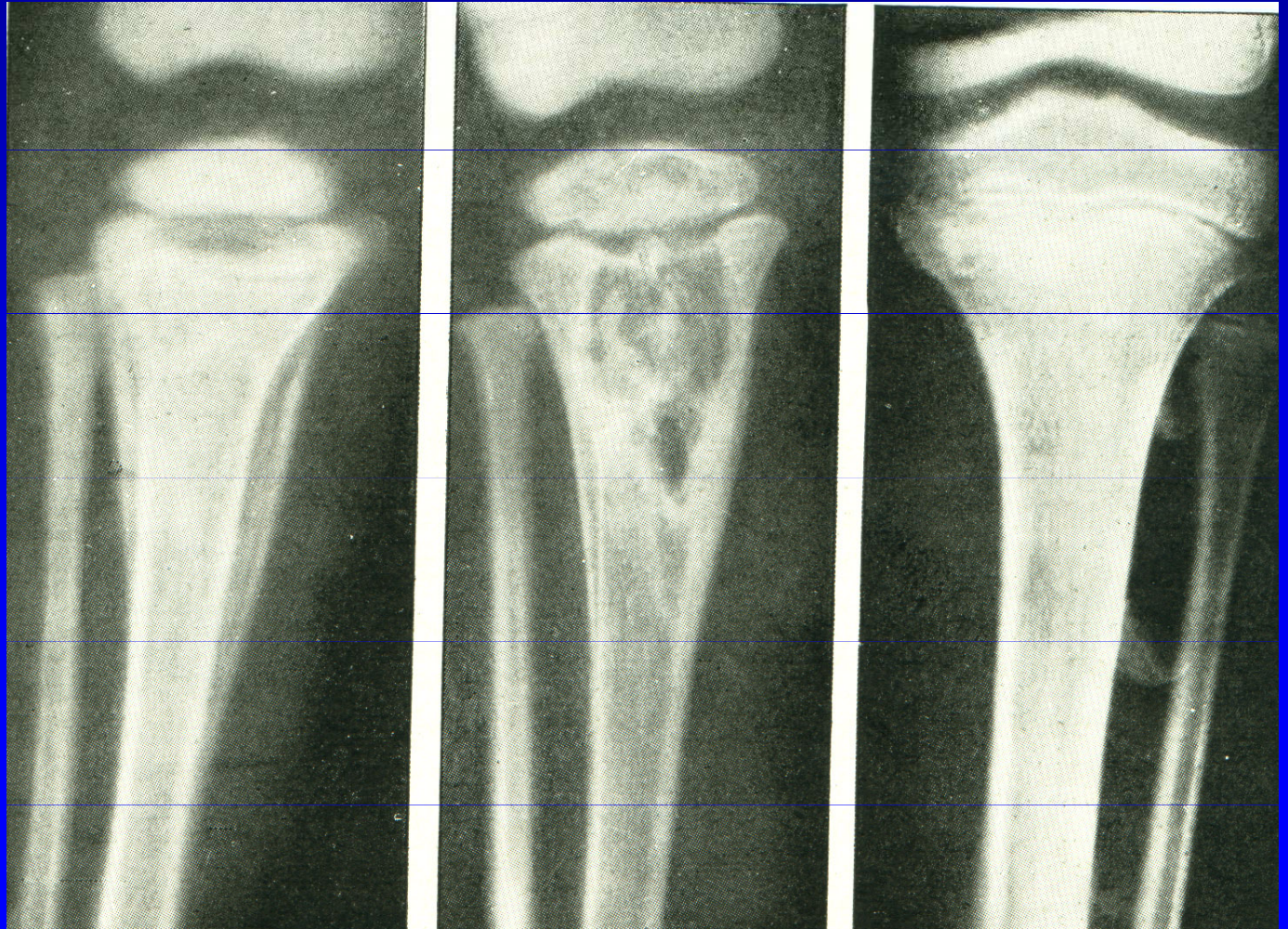
Swelling of soft tissues

Irregular rarefaction in bone

Osteolysis in the metaphysis

Elevated periosteum

Sequestra





# Radiological finding

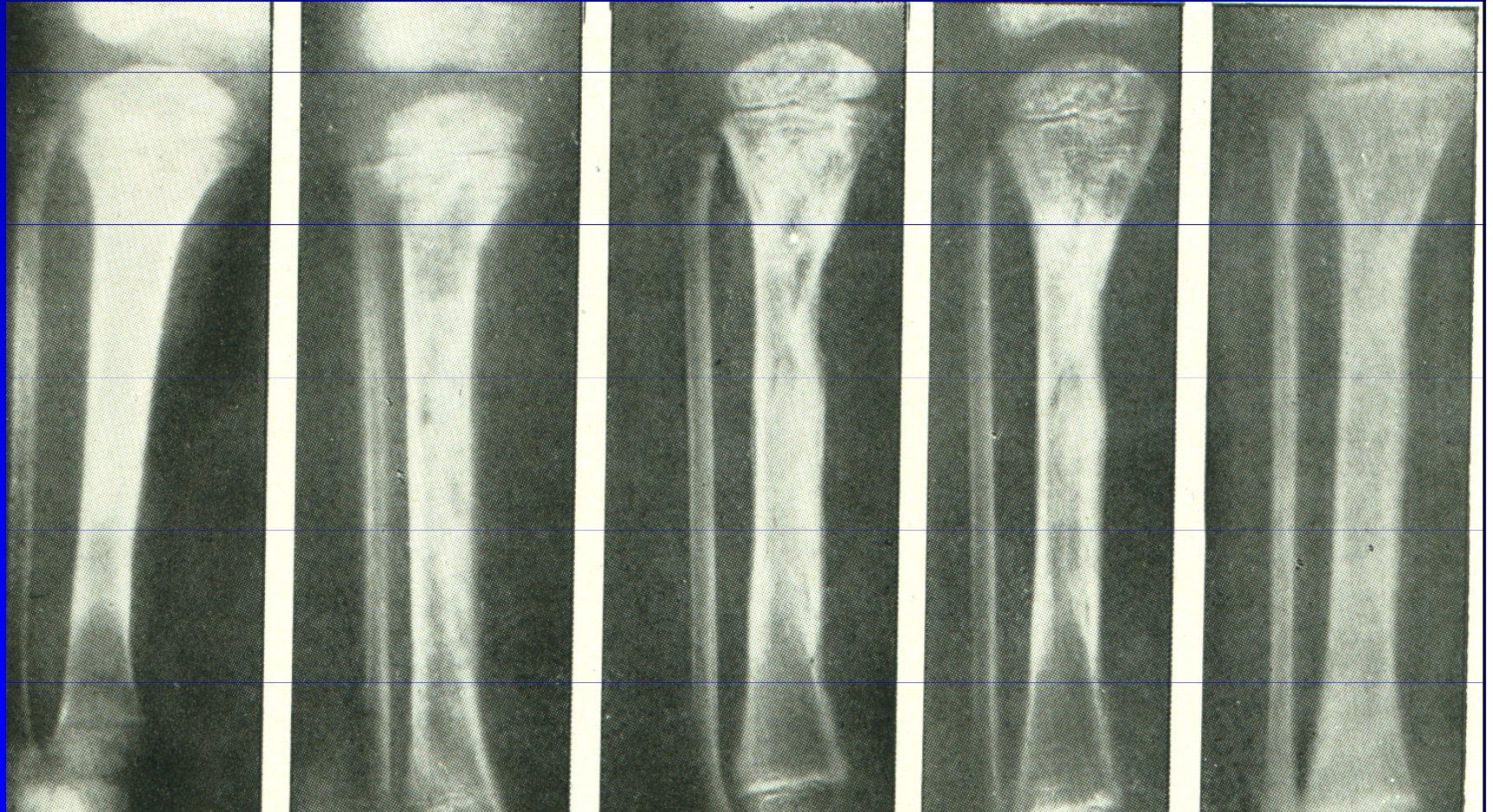
Swelling of soft tissue

Irregular rarefaction in bone

Osteolysis in the metaphysis

Elevated periosteum

Sequestra





# Management

Bed rest, splinting

Analgetics

Antibiotics i.v. for 2 weeks, than orally 6-12 weeks

(amoxicilin/ ac. clavulanicum

Ciprofloxacin

Cefalosporins

Gentamycin)

Vancomycin - in MRSA infection

Change of antibiotics – according bacteriological  
examination

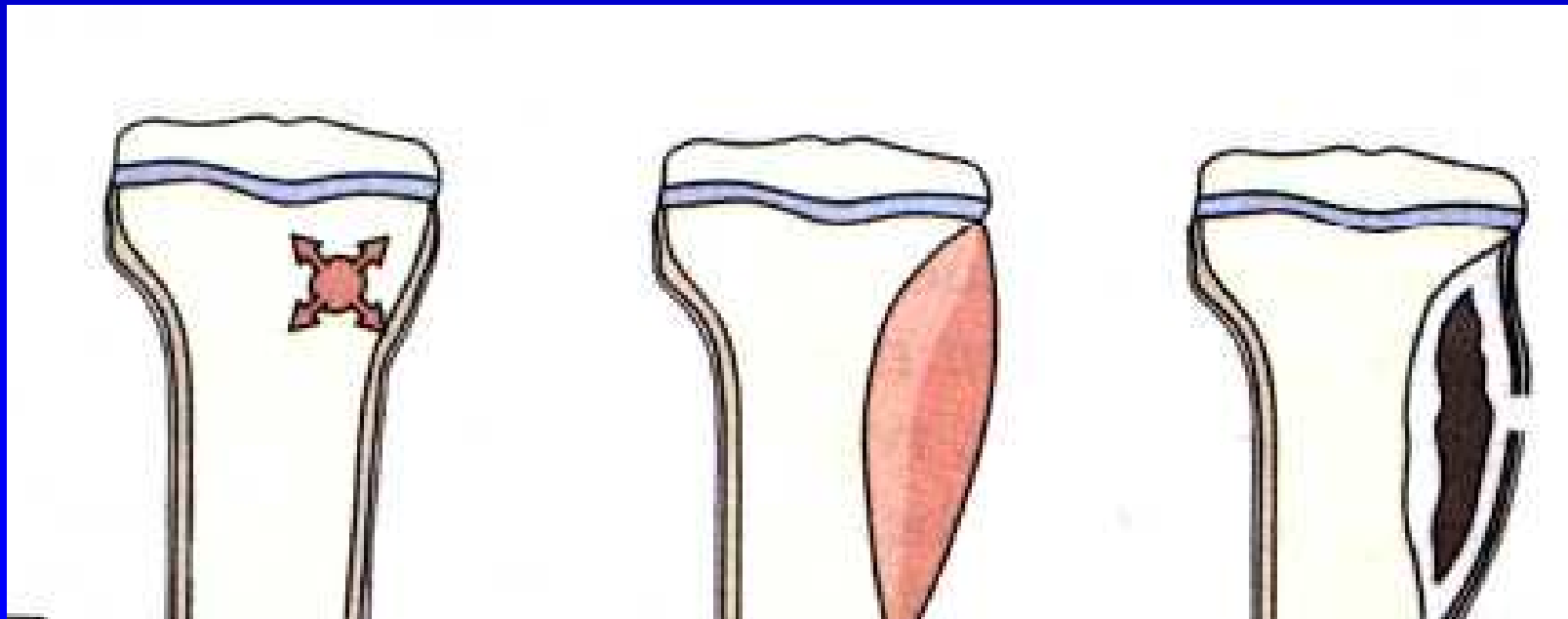
# Management

Aspiration of the abscess

Drilling of the bone and decompression

Drainage

Local application of antibiotics



# Posttraumatic osteomyelitis

Antibiotics

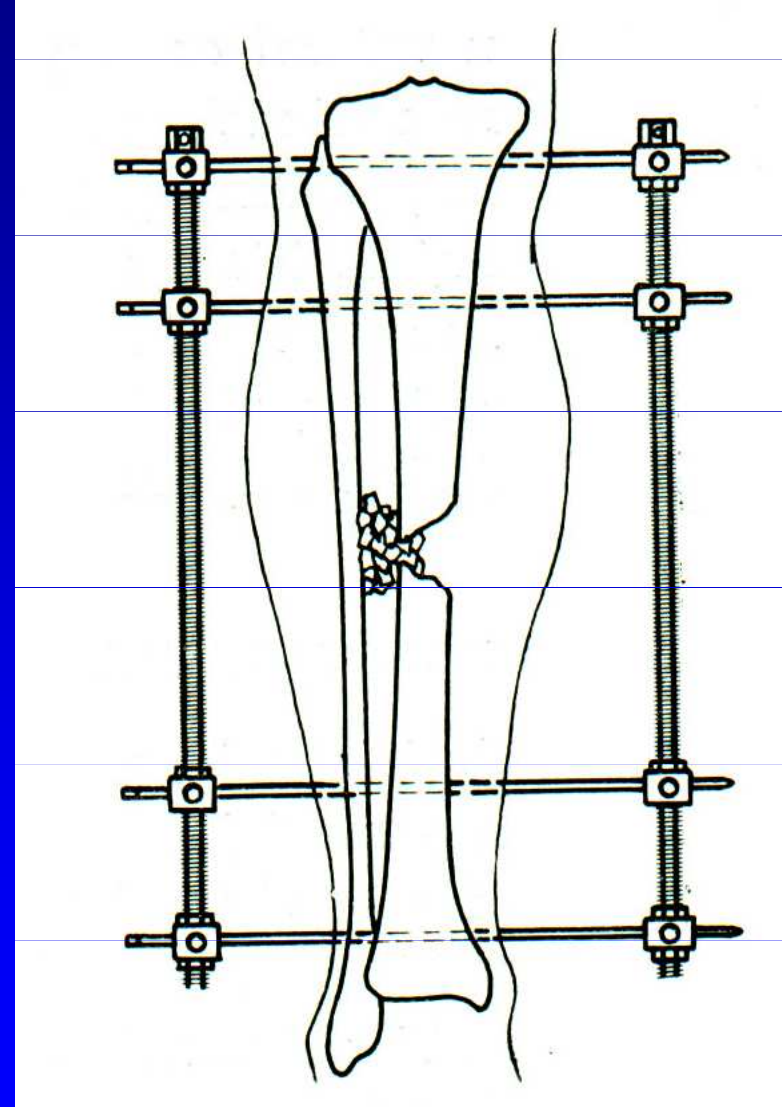
Debridement

Rinsing lavage

Removal of internal fixation

External fixator

Local application of  
antibiotics





# Subacute osteomyelitis

Less virulent organisms

Mild symptoms



Brodie's abscess



Sclerosis of bone



# Osteomyelitis of the vertebra

Slow onset

Subfebrilia

Back ache

Limited movements

Tenderness

Spasm of paravertebral  
muscles



# Radiological finding

Swelling of soft tissue

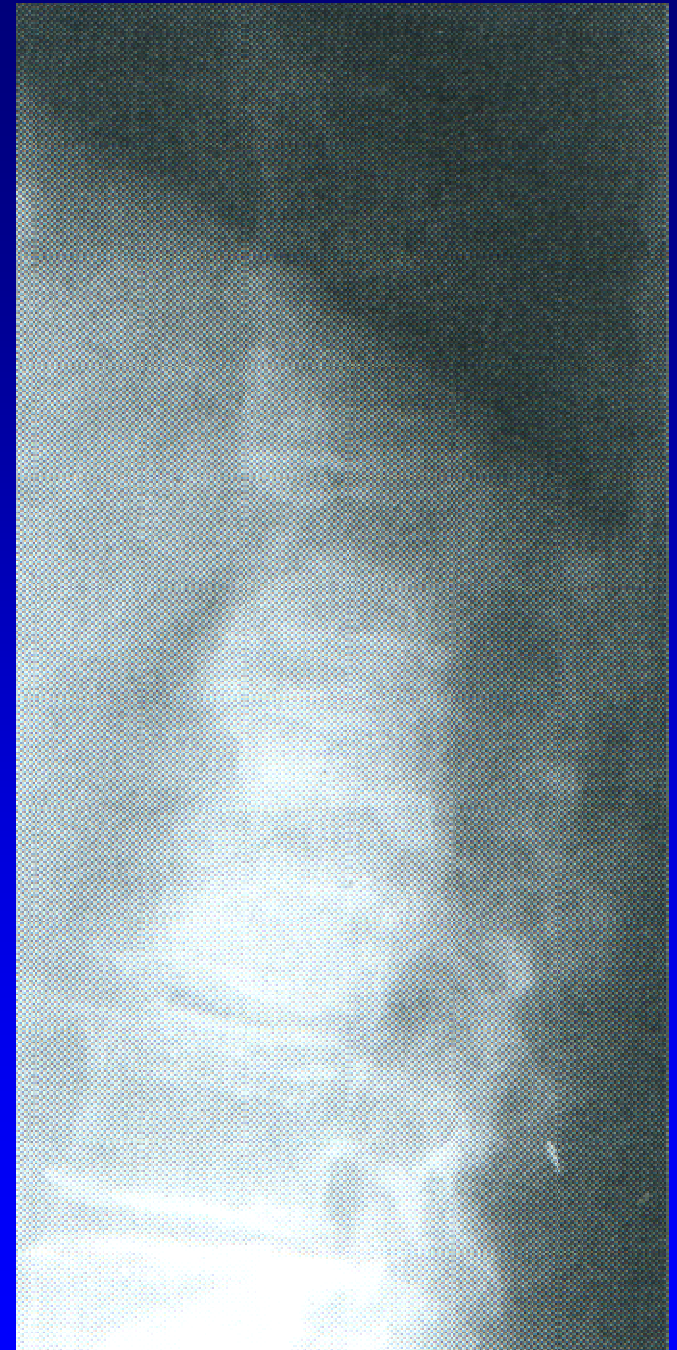
Erosion of the end plates

Osteolysis and destruction

Narrowing of intervertebral space

MRI

Scintigraphy





# Management

Bed rest, orthosis

Antibiotics i.v., after 2-3 weeks orally 6-12 weeks

If not successful – aspiration from the abscess

Drainage, debridement, sequestrectomy

Antibiotics locally

# Chronic osteomyelitis

Cause: not successful treatment of acute stage  
immunodeficiency  
high virulent organism

# Pathological anatomy

## Sequestra

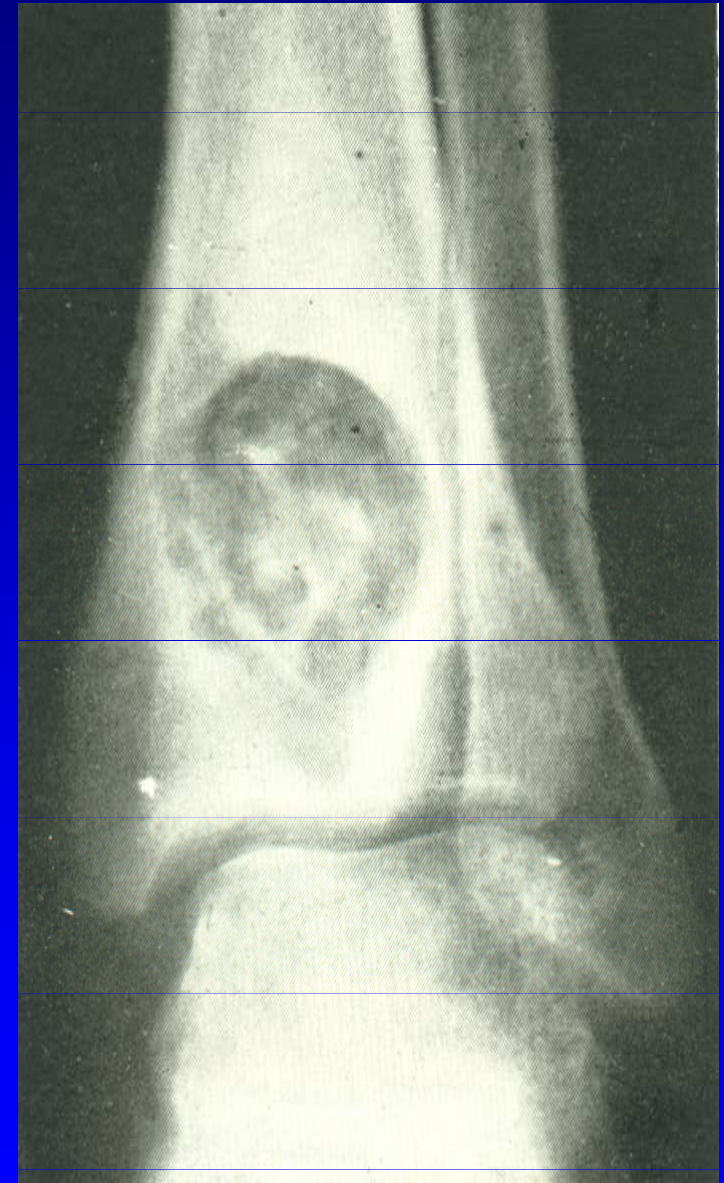
- necrotic bone surrounded by  
pus and granulation tissue

## Pyogenic membrane

## Sclerotic surrounding

- prevents revascularization and transport  
of antibiotics

## Diffuse rarefaction and osteolysis



# Symptoms

Pain, tenderness, limited function

Discharging sinuses

Sequestra

Recurrence of acute stage

Fatigue

Cachexia

# Radiological finding

Combination of rarefaction and sclerosis  
of bone

Sequestra

Periosteal apposition of bone

Fistulography

MRI

CT

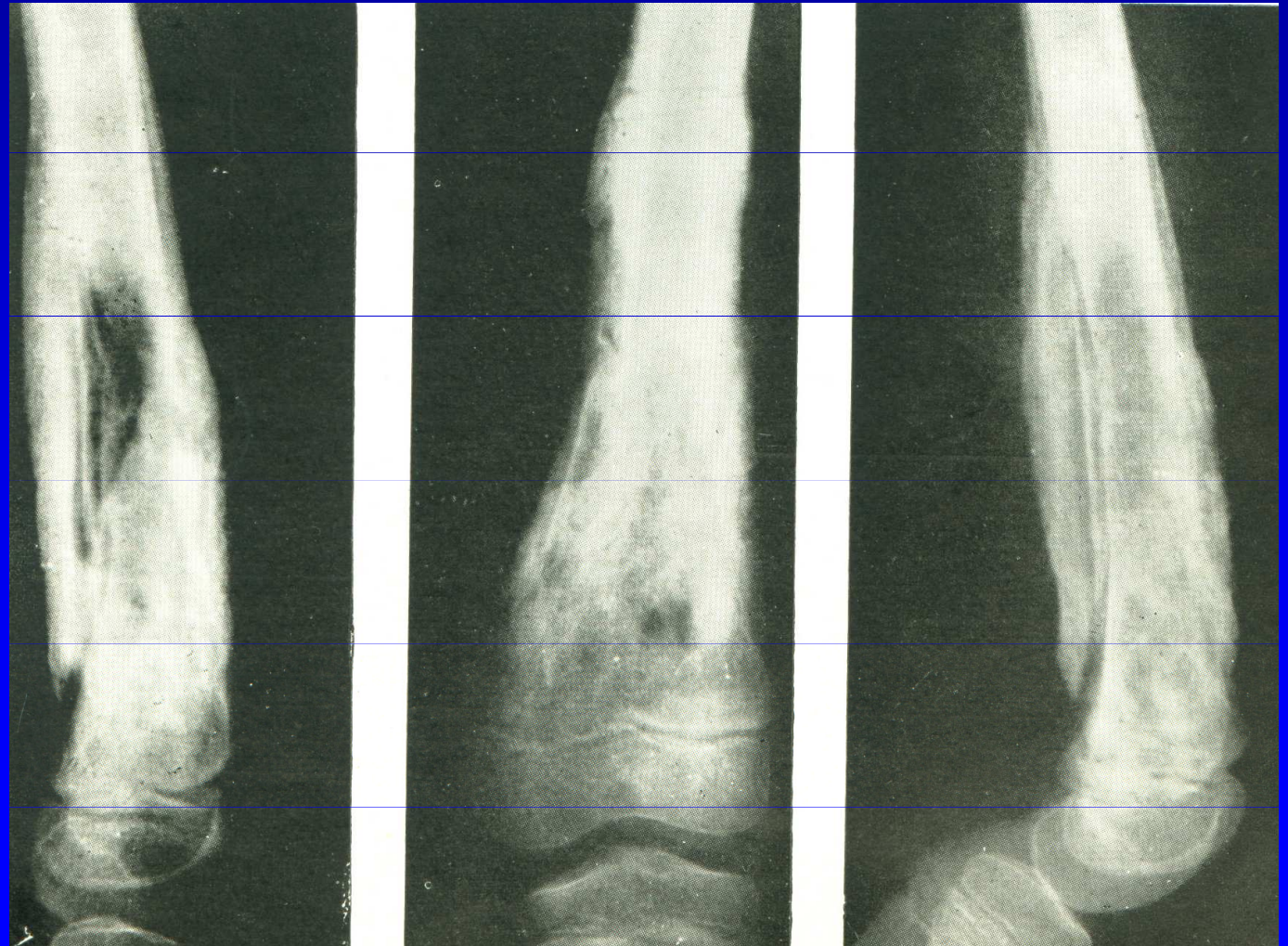




Combination of rarefaction and sclerosis  
of bone

Sequestra

Periosteal apposition of bone



# Management of chronic osteomyelitis

The rule: *ubi pus, ibi evacua* !

Sequestrotomy, lavage

Local antibiotics – garamycin

Systemic antibiotics

Support of immunity

Seldom: conservative treatment

# Postoperative infection

## Periprosthetic infection

- Up to 2 weeks: debridement, lavage, synovectomy
- Later: one stage revision  
two stage revision (spacer)  
Girdlestone, Prostalac





# Sequelae

Recurrence of infection

Growth arrest – shortening of the extremity

Weakness of muscles

Joint contracture

Septic arthritis

Amyloidosis

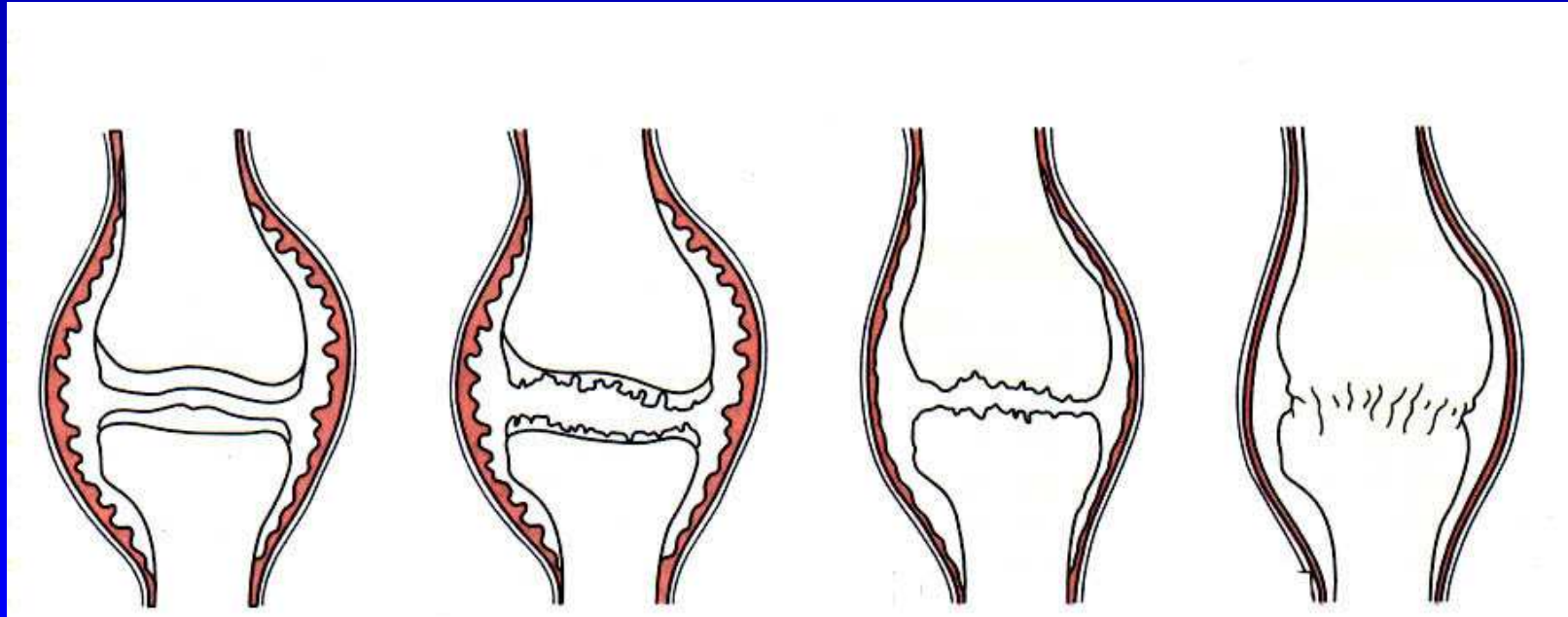
Epidermoid carcinoma

Patological fracture

Sepsis

# Septic arthritis

## Suppurative arthritis of the joint



# Septic arthritis

- Gram +:
- Staphylococcus aureus
- Streptococcus pyogenes
- Staphylococcus epidermidis
- Haemophilus influenzae
- Gonococcus
- Pneumococcus

# Septic arthritis

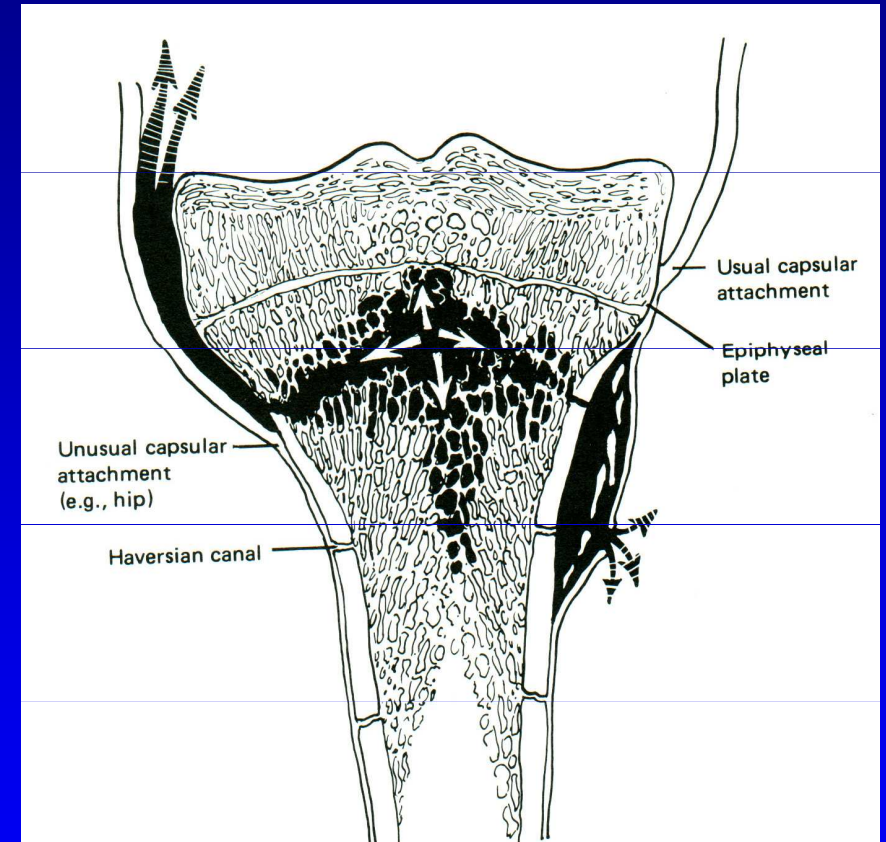
- Gram - :
- Escherichia coli
- Klebsiella
- Proteus Hauseri
- Pseudomononas aeruginosa
- Salmonella

# The way of infection

Haematogenous seeding

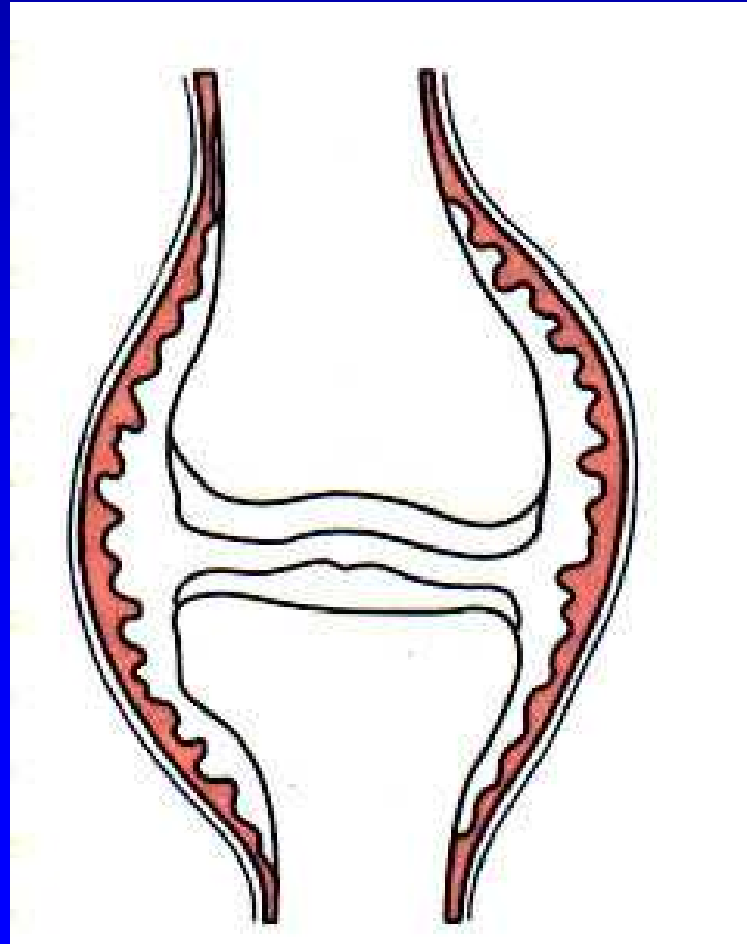
From metaphysis – hip, elbow

Direct way-  
by aspiration, surgery, trauma



# Pathological anatomy

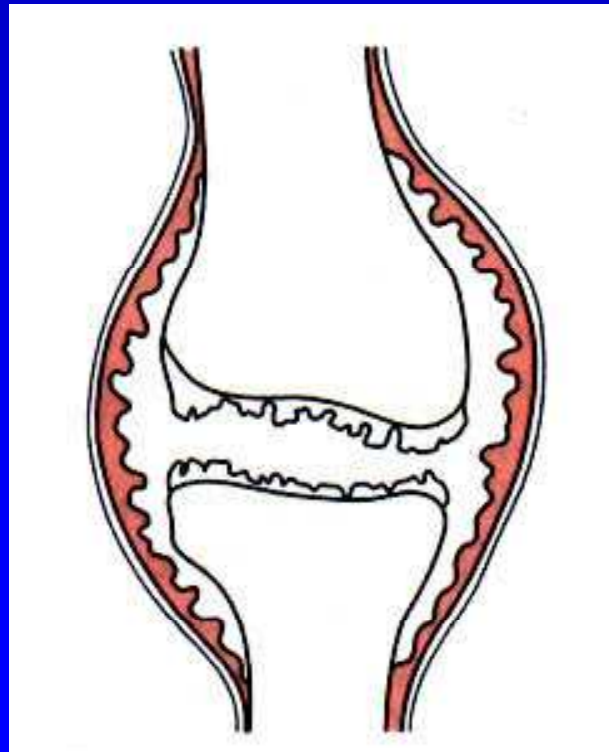
1. Synovitis purulenta  
synovial membrane is thick, pus



# Pathological anatomy

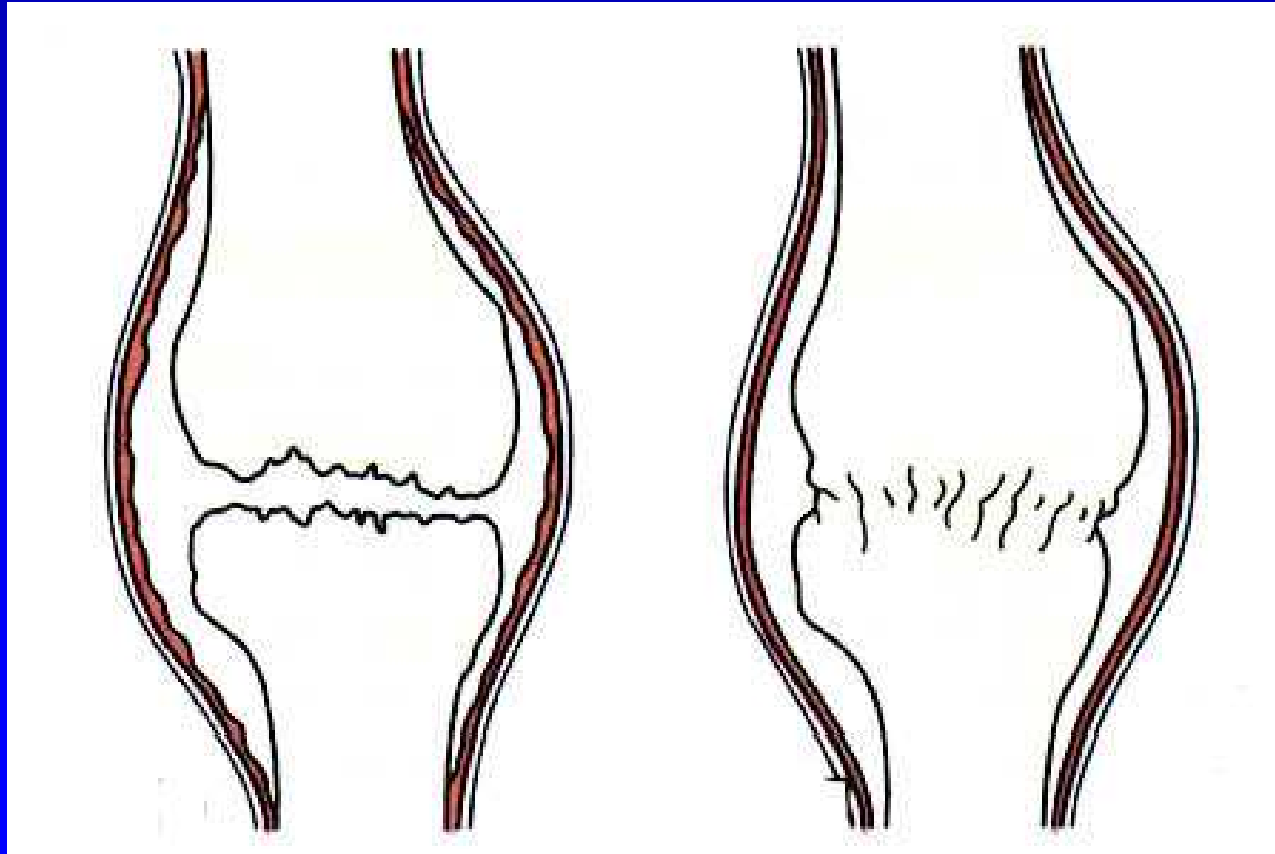
## 2. Phlegmona of joint capsule

The whole joint capsule is involved, pus and granulation tissue, erosions of the cartilage, pannus formation



# Pathological anatomy

3. Panarthrititis. Inflammation involves the joint and periarticular tissues, abscesses, destruction of cartilage, fibrous or osseous ankylosis





# Local symptoms

Rubor, calor, dolor, tumor, functio laesa  
tenderness, discharge from sinuses



## Systemic symptoms:

Fever ( septic fever – two degrees between in the morning and in the afternoon)

Shivering

Fatigue

Tachycardia, tachypnoea, hypotension

Nausea, stomach problems

# Newborn septic arthritis

X-ray:

Soft tissue swelling

Widening of joint space

Pathological subluxation

Periosteal thickening

Rarefaction of epiphysis  
and metaphysis

Later on narrowing  
of joint space





# Adult septic arthritis

X-ray:

Soft tissue swelling

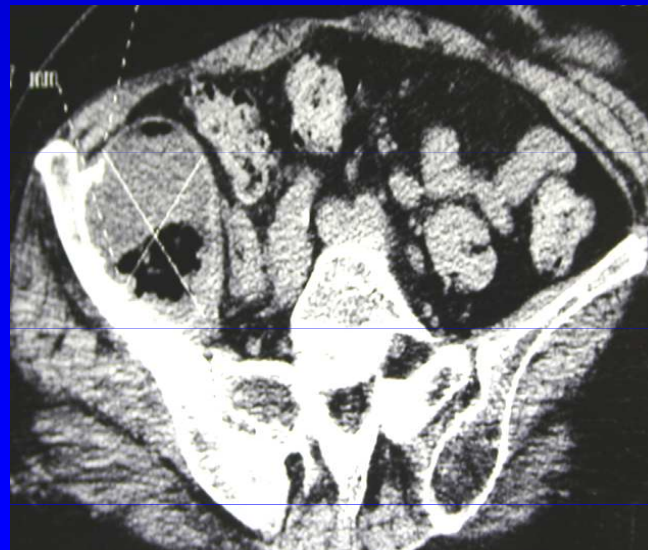
Widening of joint space

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and metaphysis

Later on narrowing  
of joint space



# Laboratory tests

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- ESR
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- Differential blood test
- Electrophoresis of proteins
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# Management

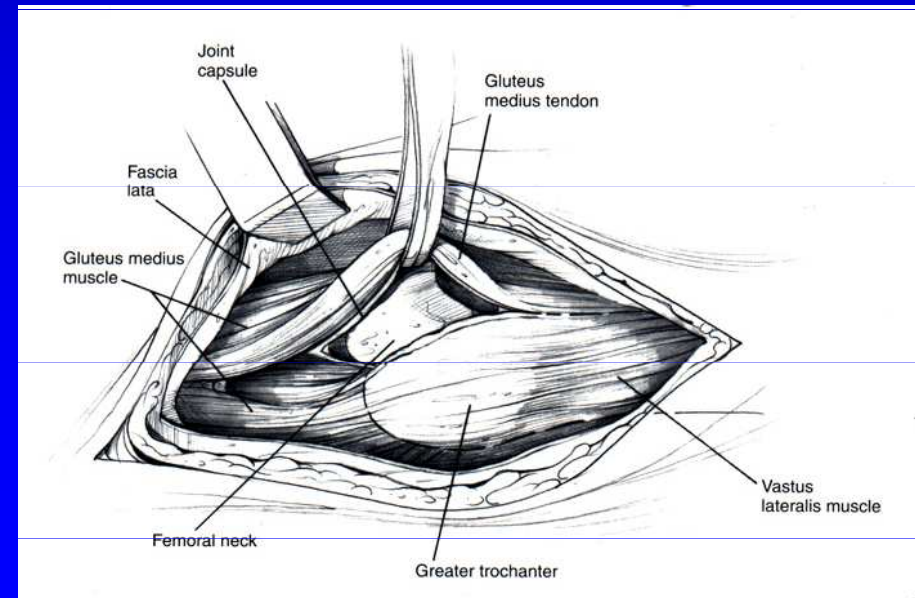
Aspiration

Splinting, analgetics

Antibiotics i.v., after 2 weeks orally 6-12 weeks

Arthroscopy and lavage

Incision and drainage



# Sequelae

Osteoarthritis

Epiphyseal destruction

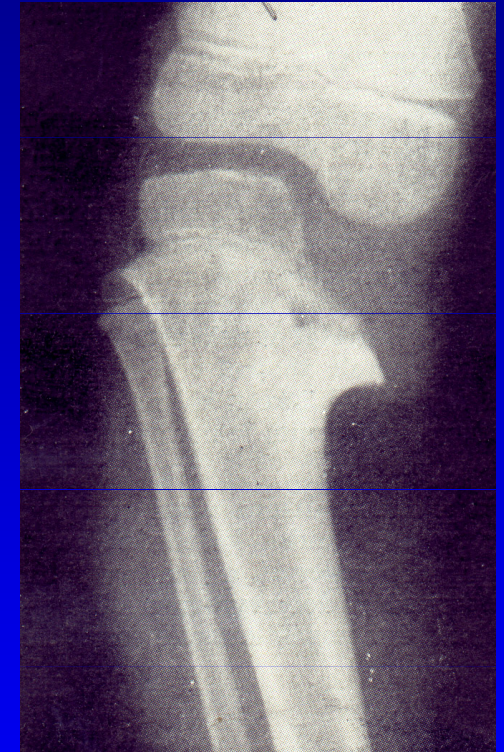
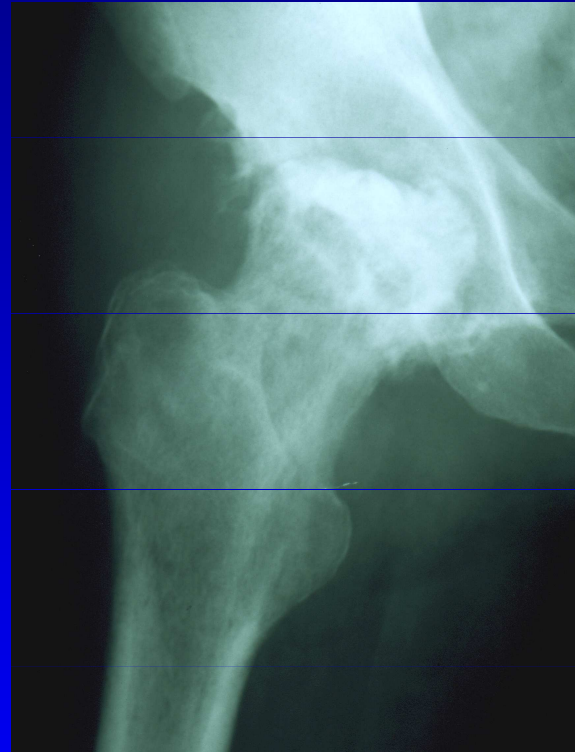
Necrosis

Disturbance of growth plate

Ankylosis

Subluxation or dislocation

Sepsis



# Tuberculosis

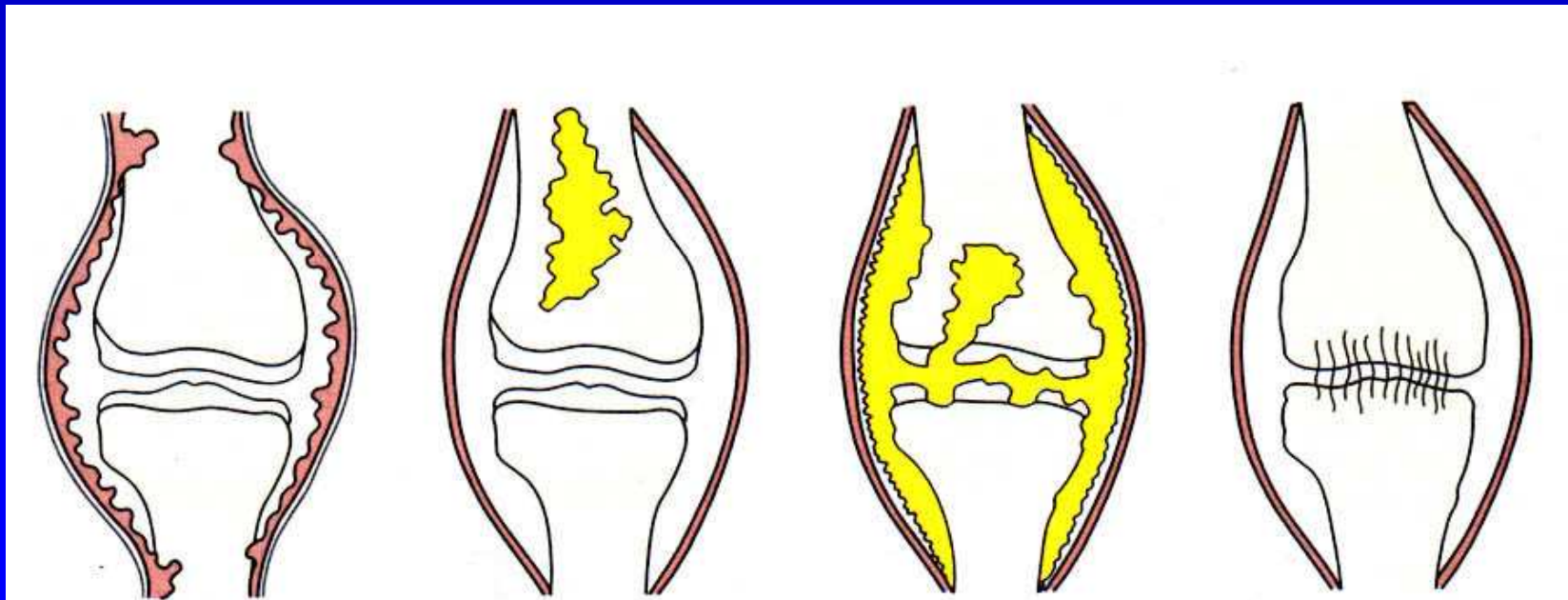
Granuloma formations

Nodes 1-2 mm connecting together

The cause- *Mycobacterium tuberculosis*

*Mycobacterium bovis*

Haematogenous seeding (from lungs)



# Patological anatomy

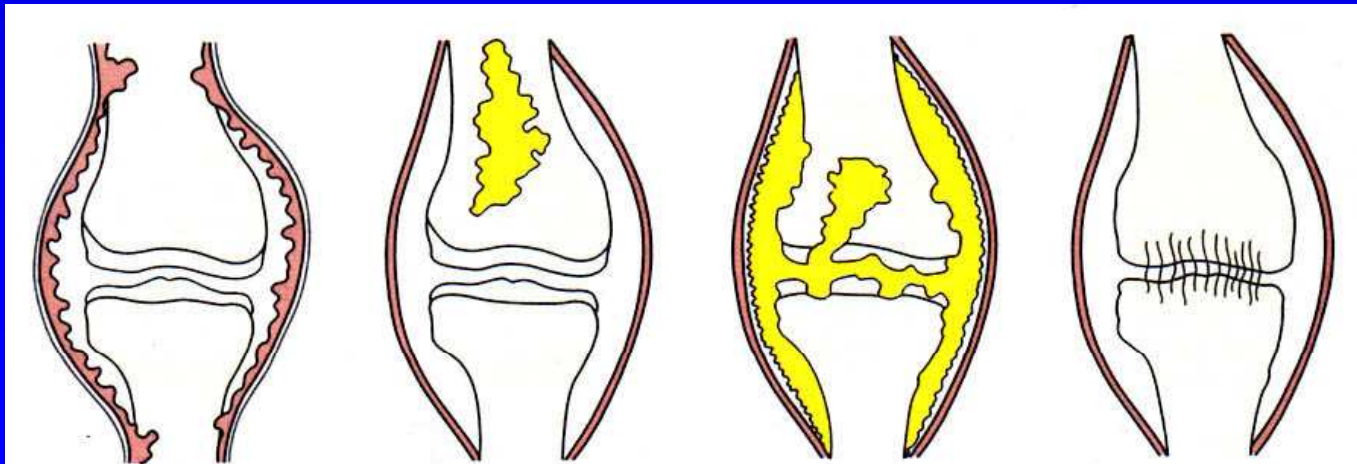
1. Proliferative form (tbc granuloma, fungus)
2. Exsudative form (caseation, hydrops, empyema)

Miliar TB nodes:

Langerhans cells (with Mycobacteria)

Epiteloid celled, lymphoid cells

Nodes form TB granuloma





# Patological anatomy

Cold abscess

Hydrops

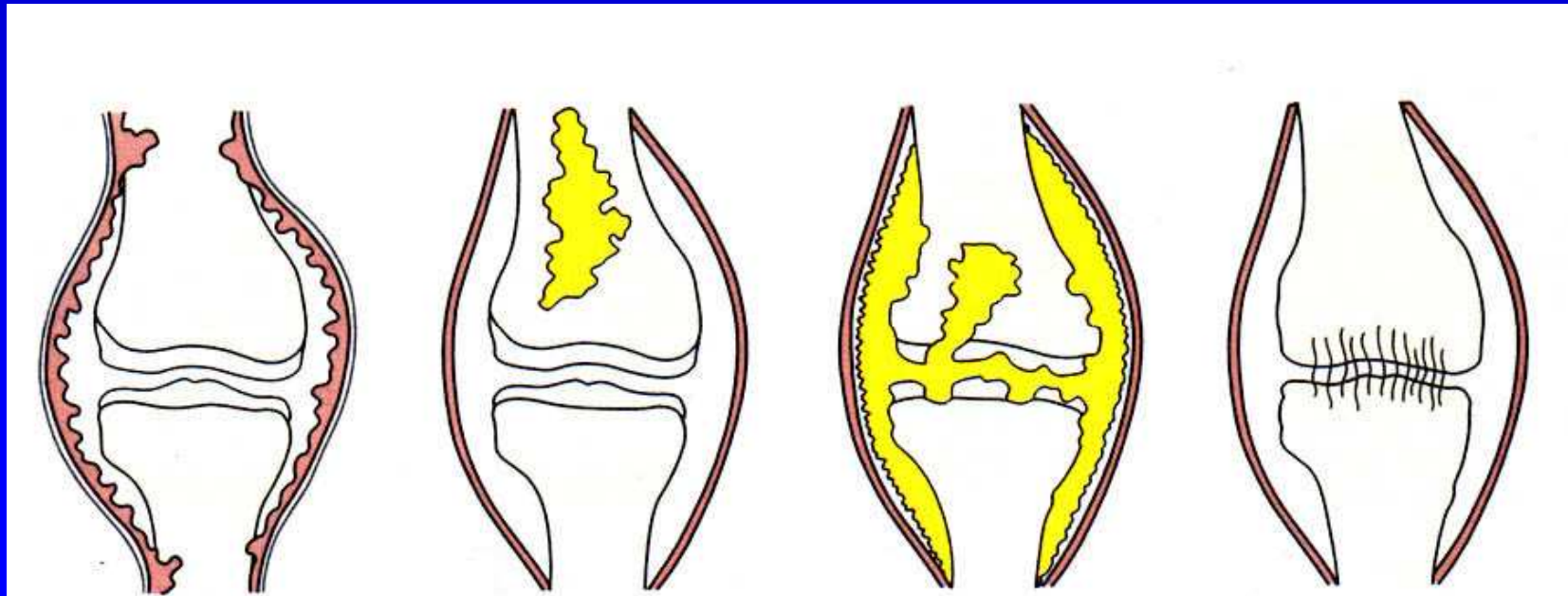
Fungus

Starts as synovitis or spreads from epiphysis

Slow progression

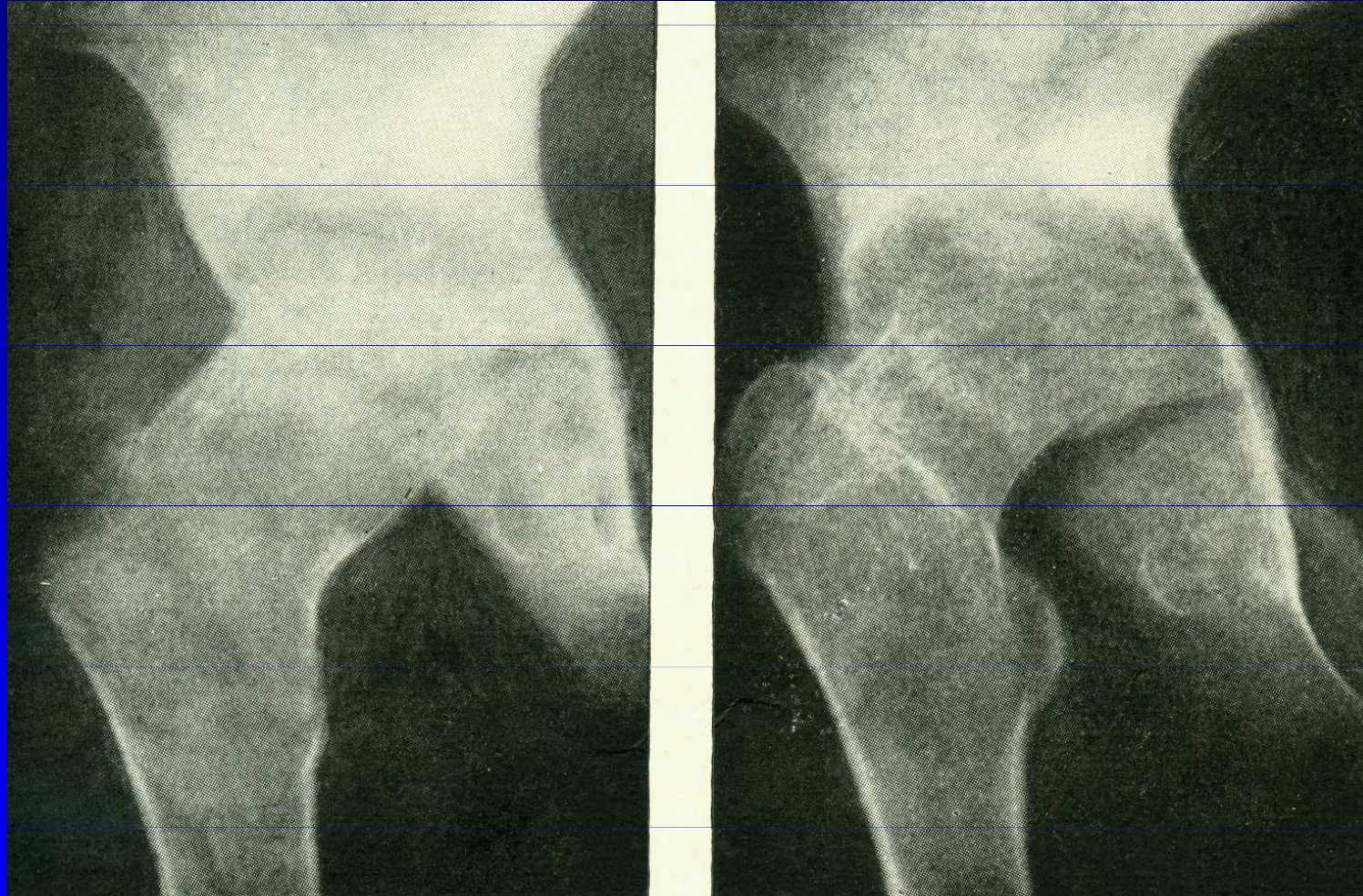
Destruction of cartilage

Fibrous or osseous ankylosis



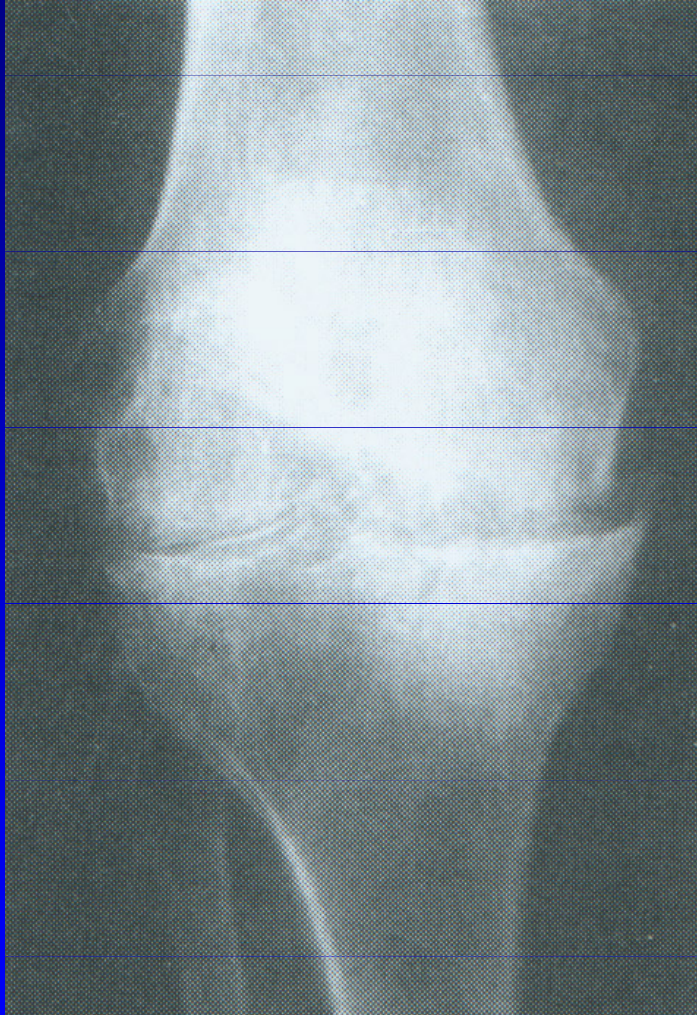


# TB coxitis



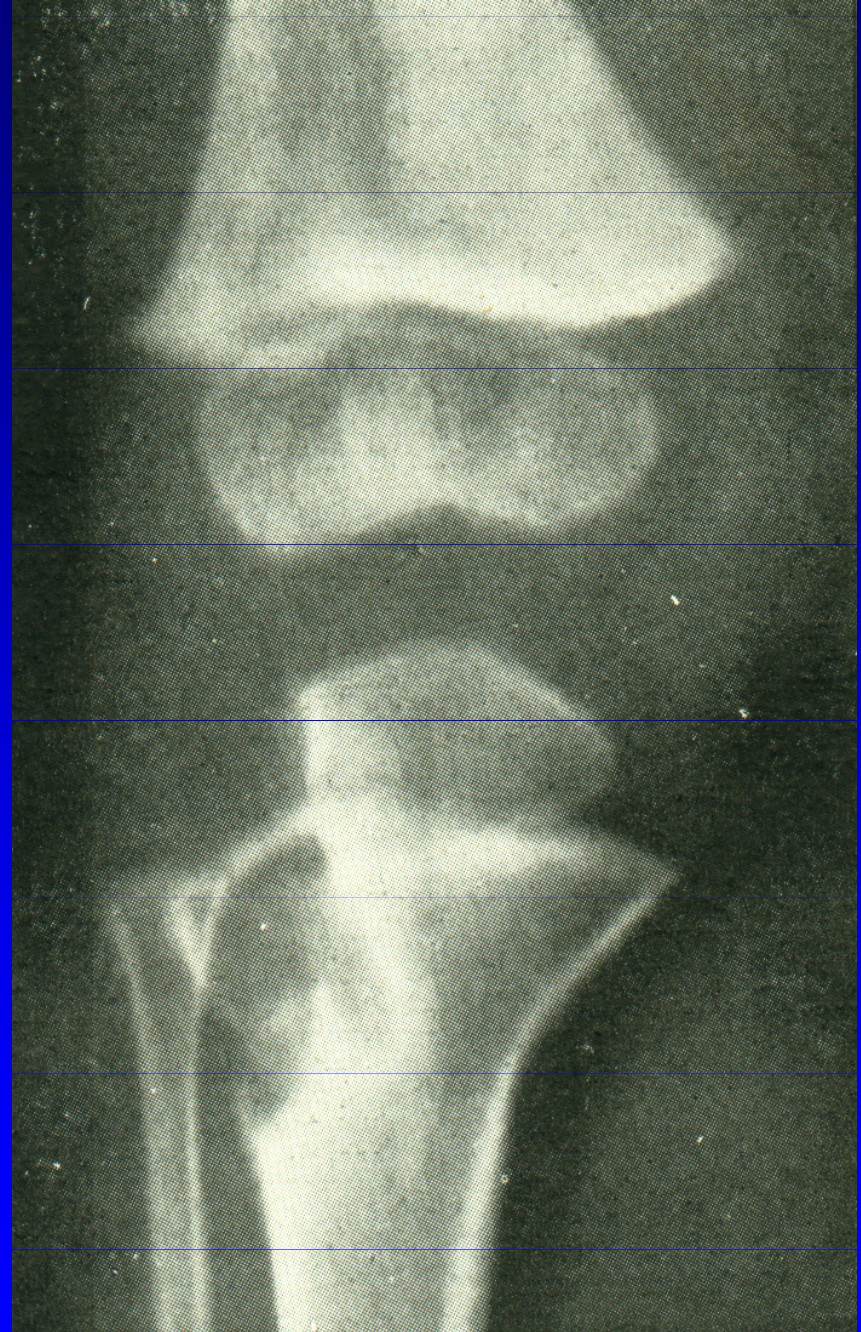


# TB of the knee joint



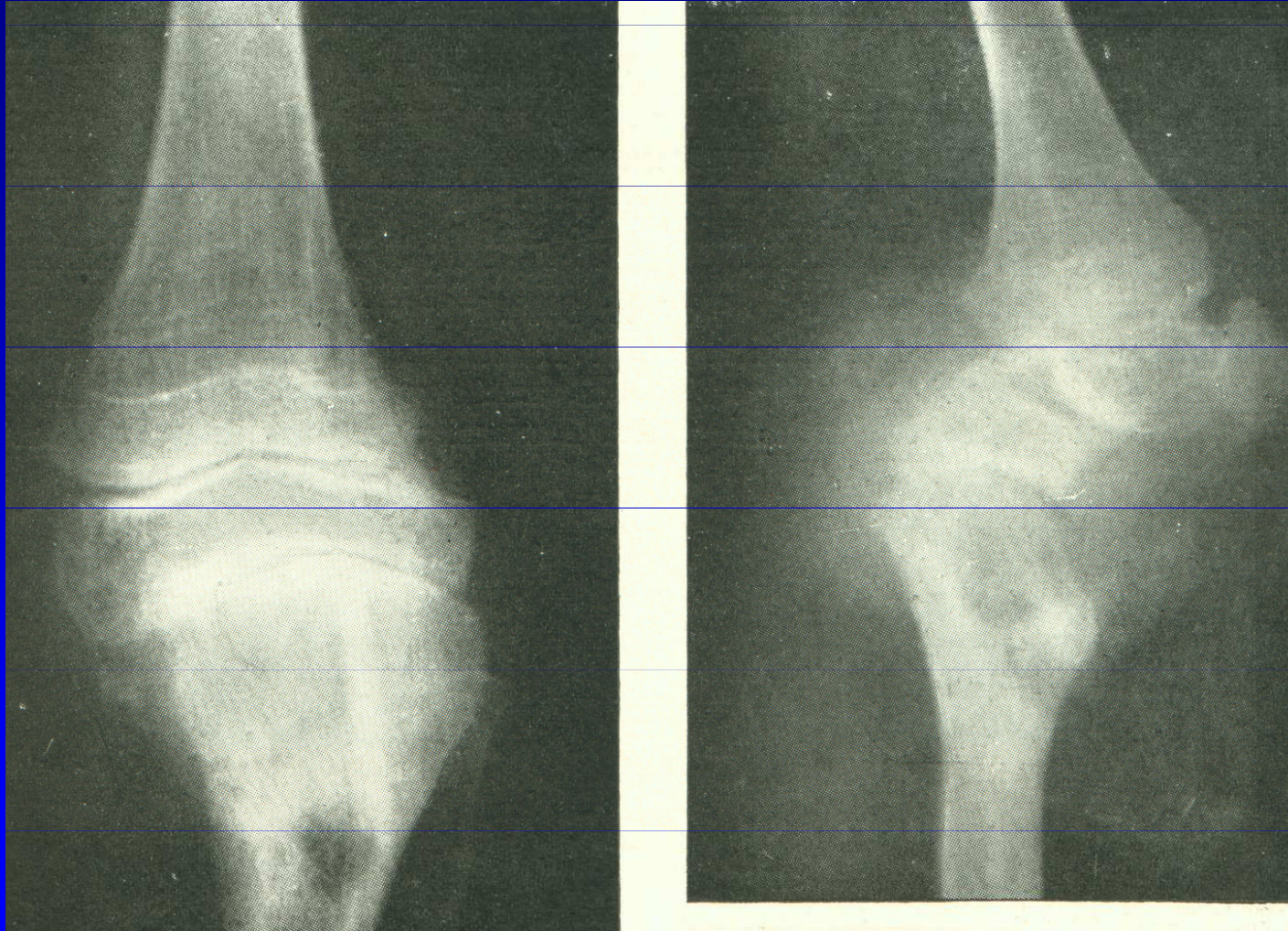


TB paraarticular  
lesion in metaphysis





# TB of the knee joint- subluxation



# Diagnostics

Aspiration

Biopsy

Histology

PCR (polymerase chain reaction)

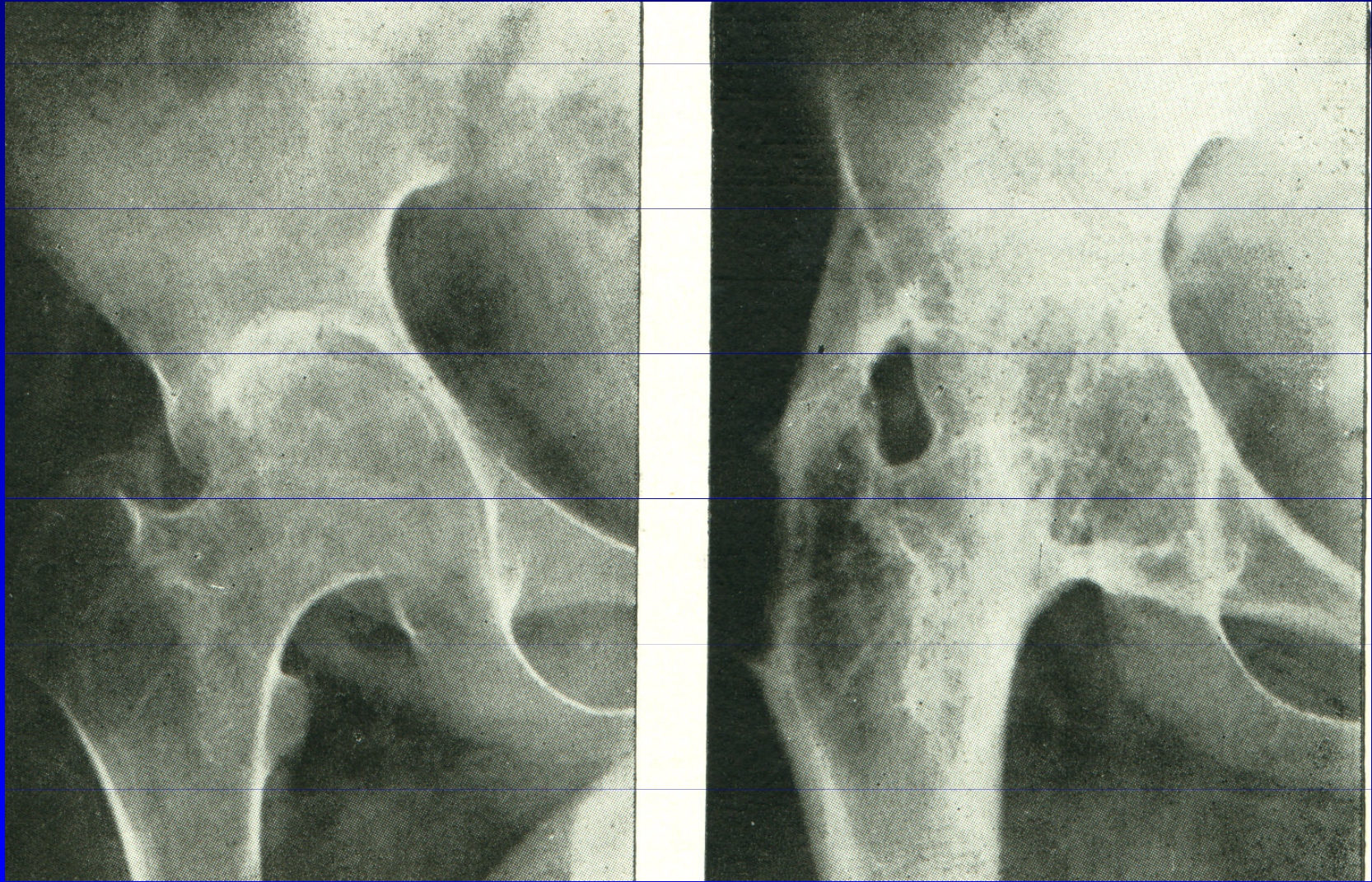
Serology: IgM, IgA, IgG

MTD test : Mycobacterium tuberculosis

direct test – amplification of RNA  
with chemiluminiscent agent



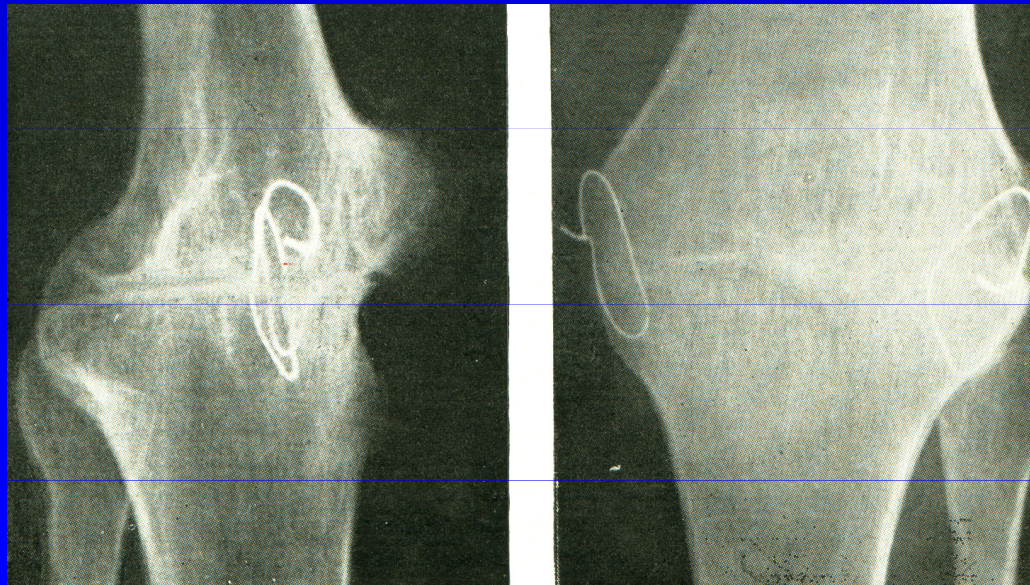
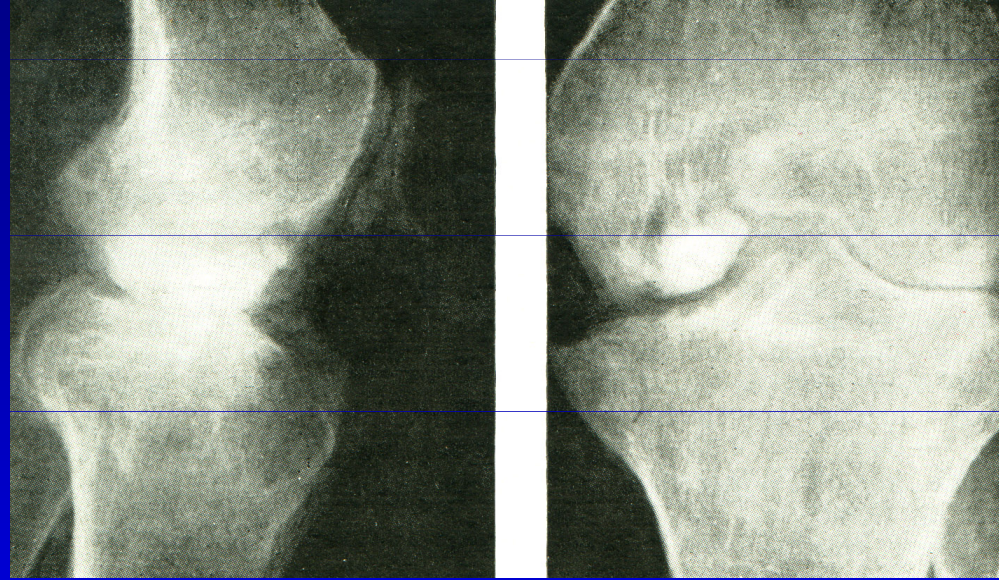
# TB coxitis healed by extraarticular arthrodesis





# TB arthrosis of the knee joint

## Arthrodesis



# Management

Antituberculous chemotherapy:

Two bactericid agent: Isoniazid, rifampicin,  
PAS, ethambutol, pyrazinamid,  
cycloserin, capreomycin, STM.

Therapy is long- 9 months at least

Rest, orthesis

Surgery- debridement, synovectomy,

In the hip – Girdlestone resection  
arthrodesis



# Spina ventosa





# TB spondylitis

Half of all cases

Thoracic and lumbar spine- malum Potti

Cervical spine -malum Rusti

Osteolytic lesion in anterior part  
of the body

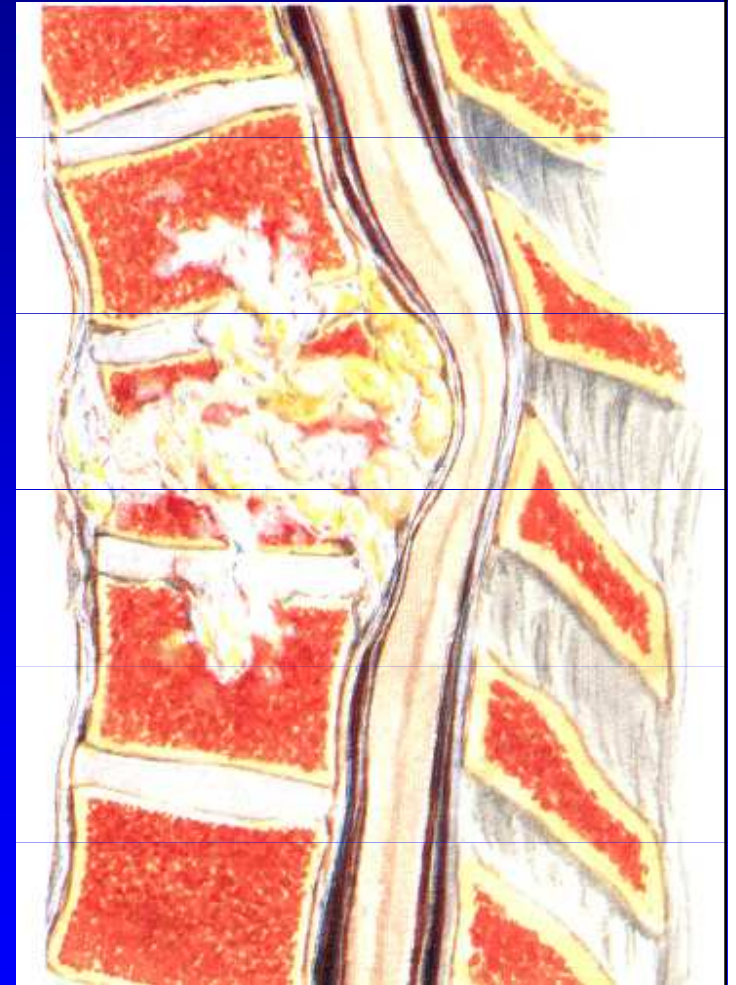
Paravertebral abscess

Narrowing of disc space

Spreading into the adjacent vertebra

Collapse forwards

Angular kyphosis





# Symptoms

Back ache, tenderness, spasm

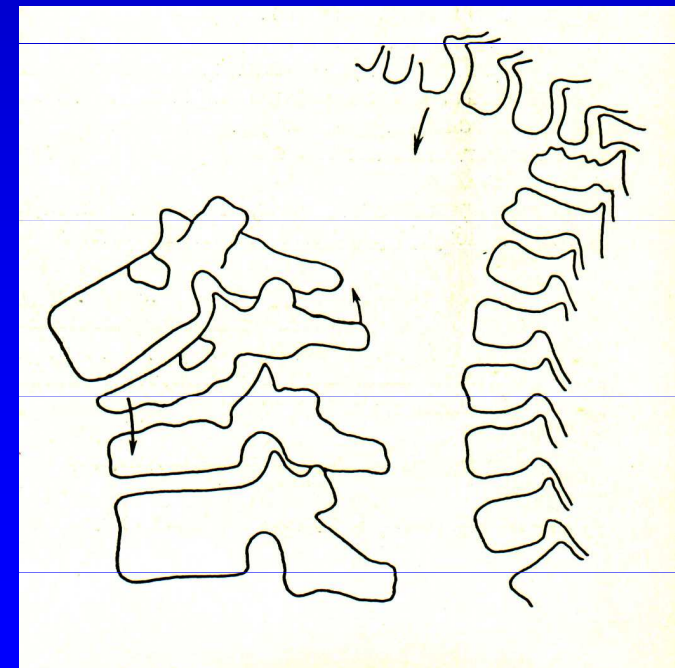
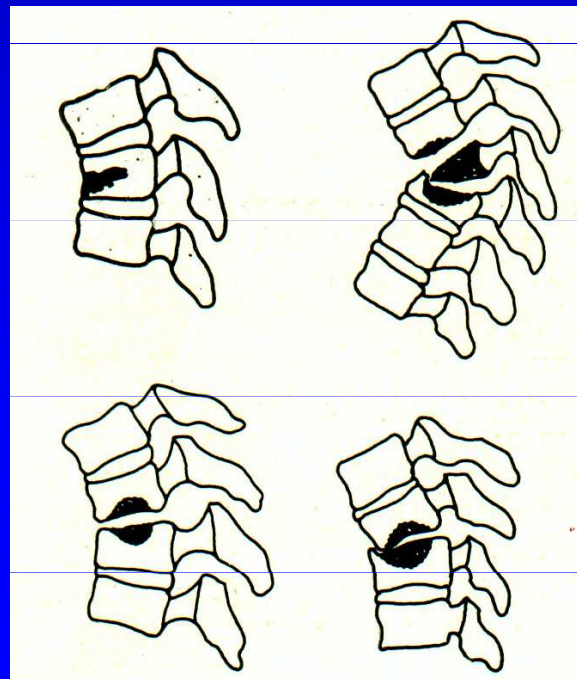
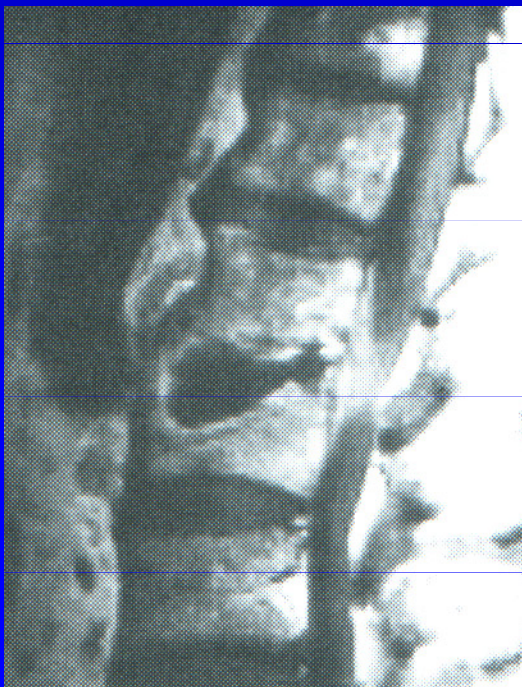
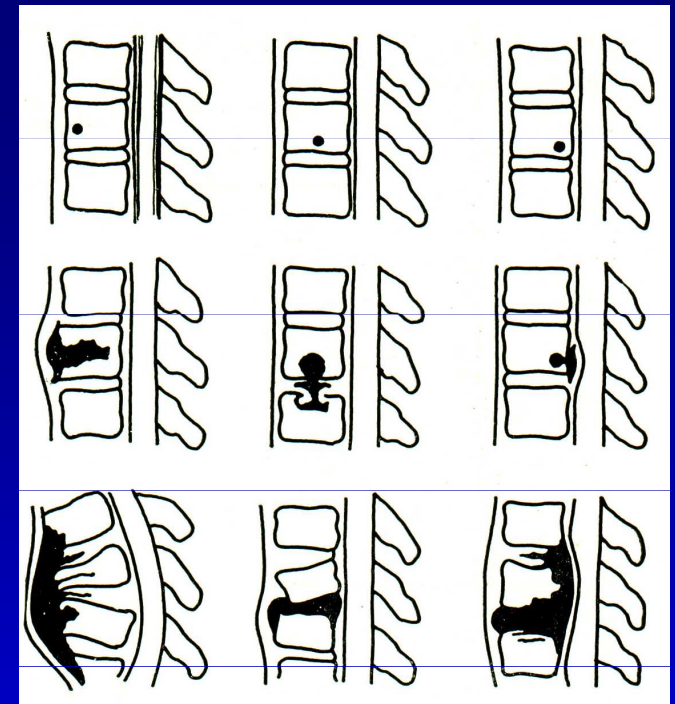
Sharp gibbus

Spasticity, paraparesis, paraplegia

Sinuses from cold abscess

# Radiological finding

- Osteolytic lesion in anterior part of the body
- Paravertebral abscess
- Narrowing of disc space
- Spreading into the adjacent vertebra
- Collapse forwards
- Angular kyphosis



# Management

Debridement of the lesion

Revision of abscess

Decompression of spinal cord and  
nerve roots

Stabilisation of the spine