

OSTEOMYELITIS

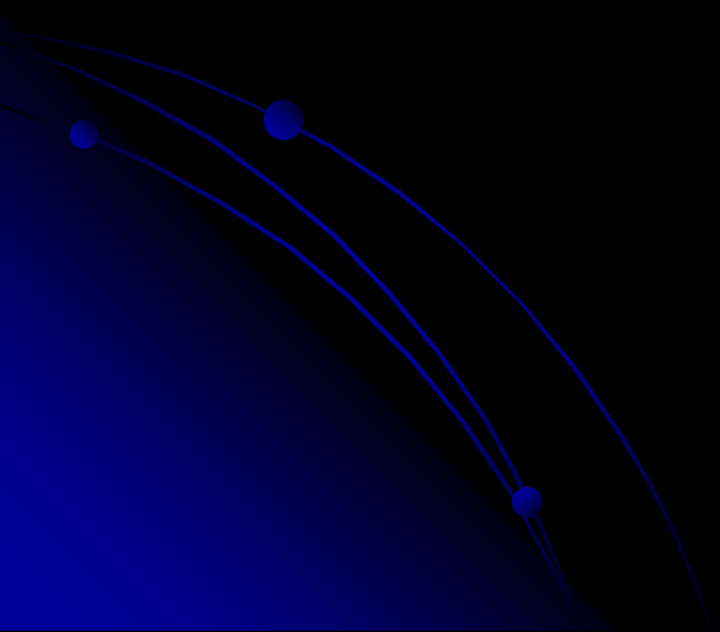






FIGURE 2: Exophytic, friable area (greatest magnification)





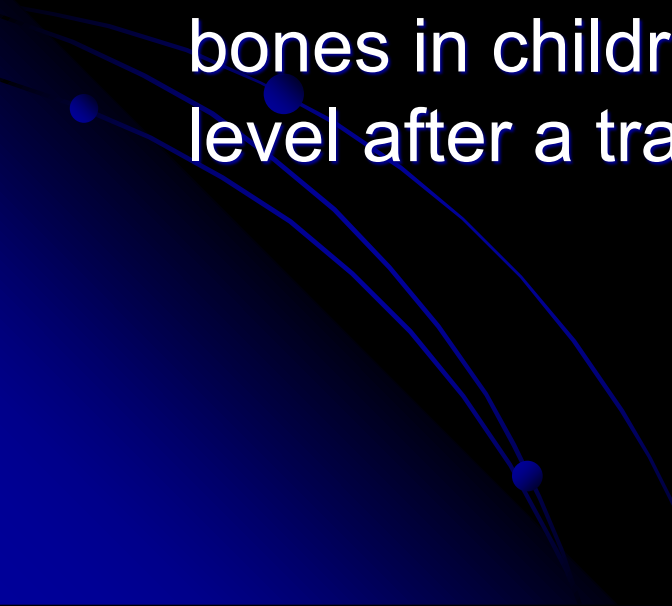


Photo: Thibault, J.W. (2017). *Medical and Surgical Pathology* (4th ed.). Elsevier, 2017. 1000. 1000.



Definition: Inflammation of the bone and its marrow produced by haematogenous infection, most commonly by *Staphylococcus aureus* or other pathogens.

Initial localization - metaphyseal area of long bones in children and adolescents or at any level after a trauma with open wounds



Osteomyelitis classification

a. Acute hematogenous

1. Newborn osteomyelitis
2. Childhood and adolescence osteomyelitis
3. Adult osteomyelitis

• b. Chronic osteomyelitis

1. Prolonged after the acute osteomyelitis
2. Chronic osteomyelitis d'emblee (from the beginning)

Osteomielita acuta

Etiologie

90% din cazuri- stafilococ auriu

Streptococ, stafilococ alb, proteus etc.

Incidenta maxima: 5- 15 ani

b/f : 4/1



Historical

- Hippocrates named it - bone" decay"
- Lannelongue studied it in terms of clinical and pathological aspects
- Pasteur (1880) defined as an agent of acute osteomyelitis of adolescents - Staphylococcus aureus
- Trueta - works on specifics vascularization at different ages

Pathological anatomy

Two phases:

1. generalized infection
2. localization of infection

Subperiosteal abscess - characteristic lesions -
skin openings - fistulae

• Cartilage growth plate - barrier to infection

• Neighbouring joint - hidarthrosis

• Can affect the joint - surrounding soft tissues

• => Septic osteoarthritis

PLATE VI

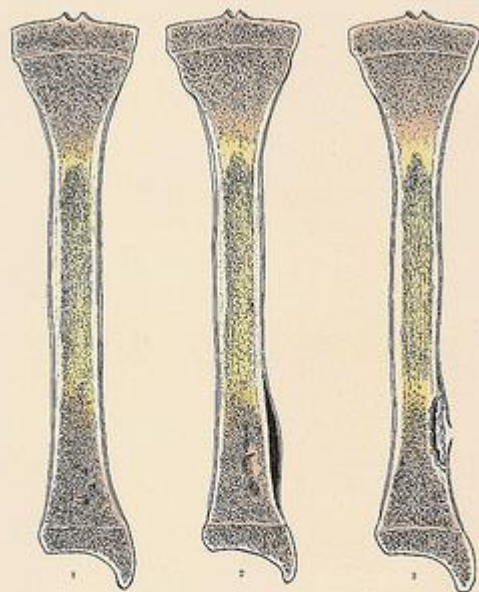


Diagram of Very Early Stage of Acute Osteomyelitis.

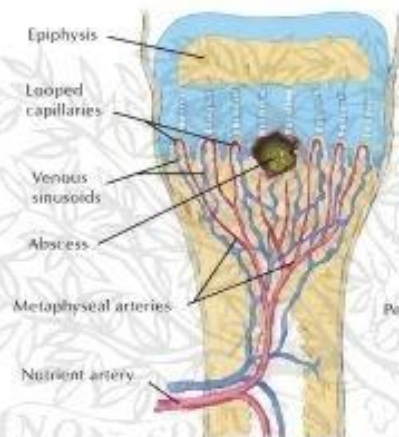
FIG. 1.—Bacterial emboli have lodged in the red marrow of the lower metaphysis. Trephining or drilling the overlying cortex is indicated.

FIG. 2.—The bacterial infection of the metaphysis has spread in the red marrow, and there is a sequestrum forming beneath the periosteum. Drainage of this, without also opening the cortex, is not sufficient.

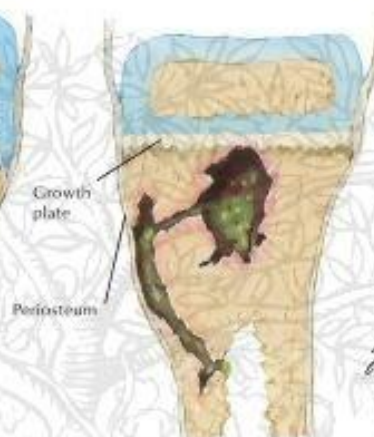
FIG. 3.—In favourable cases the acute disease subsides, but a cortical sequestrum will form with or without operation.



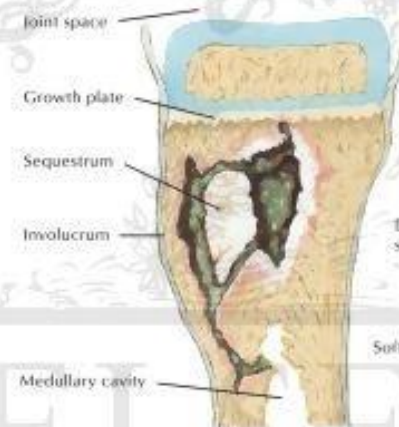
Pathogenesis



Terminal branches of metaphyseal arteries form loops at growth plate and enter irregular afferent venous sinusoids. Blood flow slowed and turbulent, predisposing to bacterial seeding. In addition, lining cells have little or no phagocytic activity. Area is catch basin for bacteria, and abscess may form.



Abscess, limited by growth plate, spreads trans-versely along Volkmann canals and elevates periosteum; extends subperiosteally and may invade shaft. In infants under 1 year of age, some metaphyseal arterial branches pass through growth plate, and infection may invade epiphysis and joint.



As abscess spreads, segment of devitalized bone (sequestrum) remains within it. Elevated periosteum may also lay down bone to form encasing shell (involucrum). Occasionally, abscess walled off by fibrosis and bone sclerosis to form Brodie abscess.



Infectious process may erode periosteum and form sinus through soft tissues and skin to drain externally. Process influenced by virulence of organisms, resistance of host, administration of antibiotics, and fibrotic and sclerotic responses.

Simptomatologie

- Debut - adesea brutal
- Durere vie, provocata la presiune sau spontana, exacerbata de mobilizare si intensă noaptea
- Sediul durerii- de obicei la genunchi
- Membru pelvin in flexie, abductie si rotatie externa
- Stare generala: frisoane, cefalee, vomă, tahipnee, febra cu remisiune matinala, agitatie sau prostratie
- Local: regiunea se tumefiaza, tegumente calde, rosii, lucioase, edematiate
- Durerea precede edemul

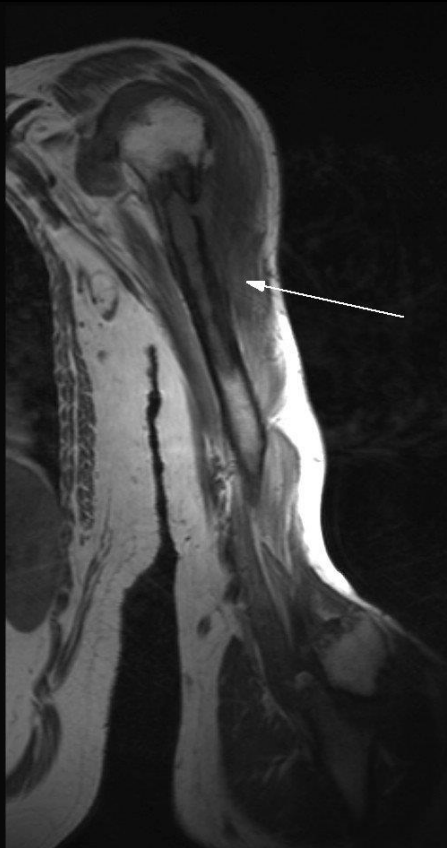


Laboratory and imagistic examinations

- Blood culture may be positive
- Antibigram
- Leukocytosis, ESR ↑
- Urine culture - can be positive
- ASLO
- Radiography
- Scintigraphy
- MRI

MRI

W 1264 : L 586



Bone scan



A

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Subperiosteal abscess



W 2400 : L 526

CT

Clinical forms

1. Toxic form

- Adynamia, prostration, delirium, burnt tongue

2. Septicaemic

- Evolution less rapid, but high gravity

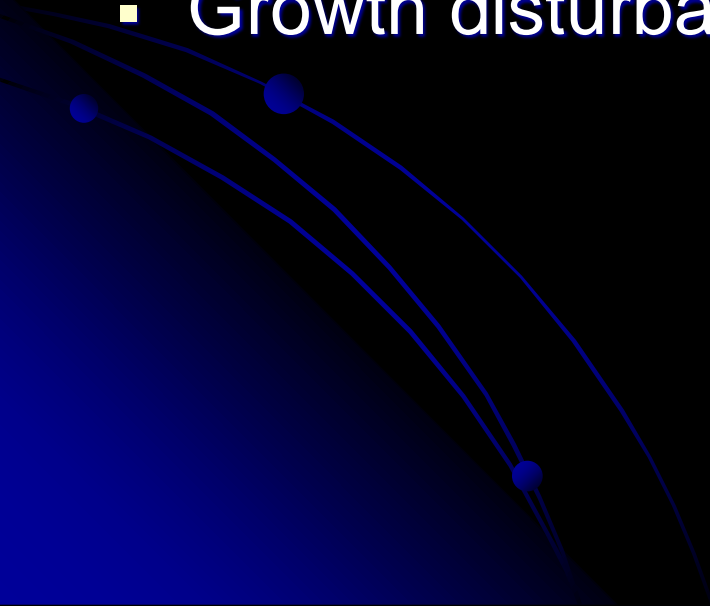
3. Piloemic form

- Most common - local clinical manifestations
- After draining, the temperature decreases, then increases again after 24-48 hours, due to the emergence of a new infectious site
- Secondary infectious sites may occur: lung, liver, pericardium
- Positive blood cultures

4. Attenuated form

- Attenuated clinical signs

Complications

- Arthritis, followed by ankylosis
 - Pathological fractures
 - Pathological dislocations
 - Growth disturbance of the limbs
- 



Treatment

- Urgent
- Local treatment - immobilisation in a cast
- General treatment – antibiotic
- Blood cultures followed by specific antibiotic
- Until antibiogram results:
- Penicillin G 10 million to 15 million U/24 h, iv, and im 4-6 hours
- Penicillin M: oxacillin, methicillin, 6-8 g / day
- Cephalosporins :4-8 g / day intravenously or i.m.
- Gentamicin, Tobramycin, Kanamycin: 1mg/Kgc/zi in 3 doses / day

Treatment

- Subperiosteal abscess is drained, and after antibiogram results are given antibiotics targeted
- Treatment will be extended - stops after normalized ESR, CRP
- Adjuvant therapy: small blood transfusions (200-300 ml) vitamin therapy, gamma globulin, immunoglobulin

Local treatment:

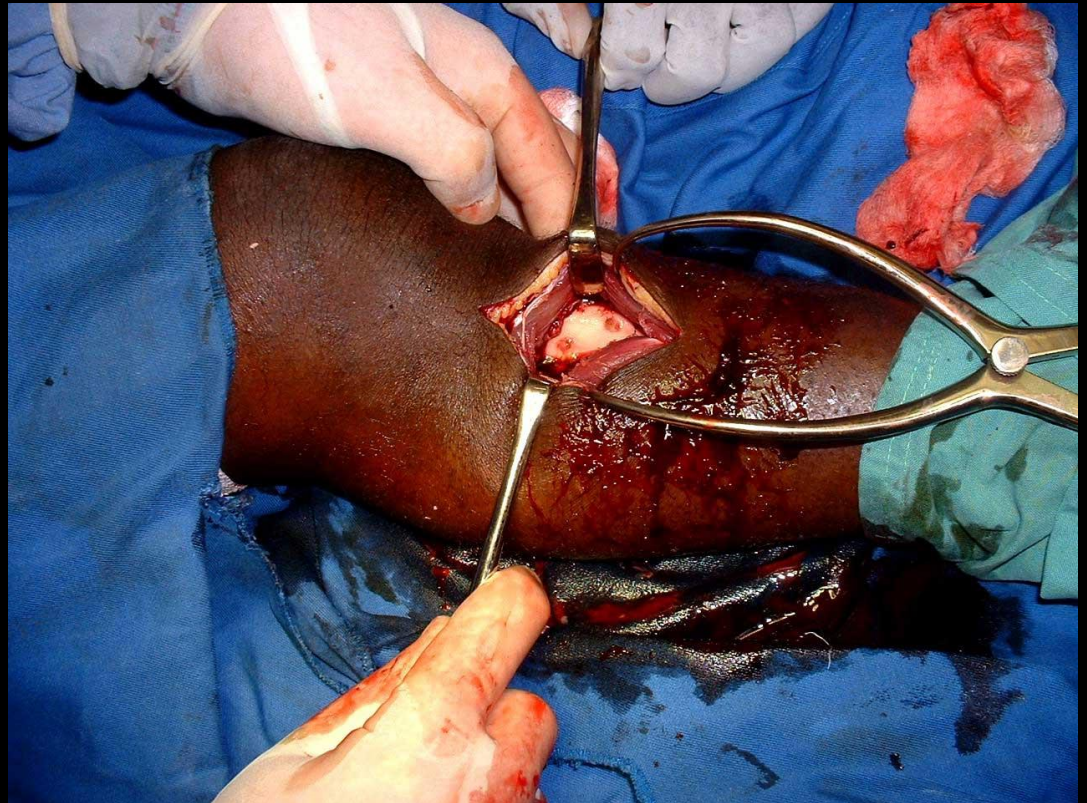
- Cast immobilisation - infectious phenomena decrease, laboratory and Rx

Surgical treatment

- In case of subperiosteal abscess - large incision, evacuation, curettage, drainage, immobilisation in a cast
- Trepanation, trepanoevidation (limited indications)
Sequestrectomy, filling the resulted defects with cancellous bone graft, vascularized flaps



Trepanoevidation

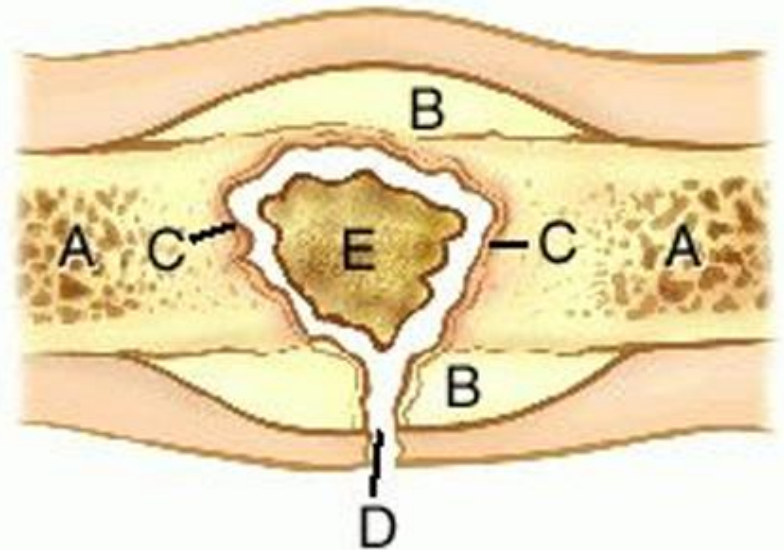


Chronic osteomyelitis

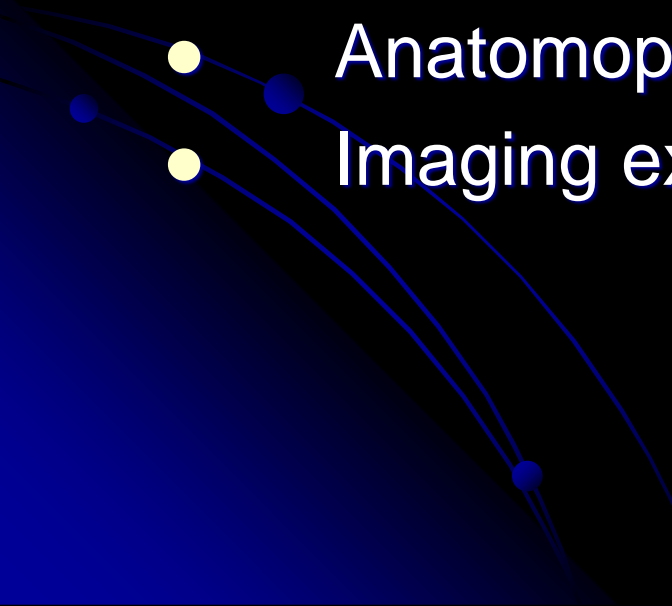
- Chronic osteomyelitis is a bone infection with extended duration of symptoms.
 - Bone inflammation caused by infectious pathogens
 - May remain localized or may spread
 - Affecting the bone marrow, cortical bone, periosteum, soft tissues
- Result:
 - Inflammation and bone destruction
 - Bone necrosis
 - Formation of new tissue



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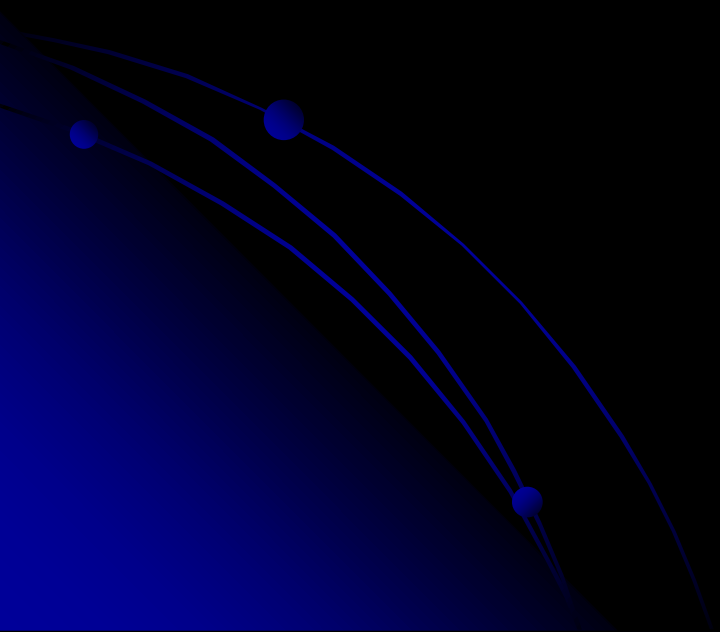


Diagnosis is based on:

- Data from history
 - Clinical signs
 - Laboratory data
 - Isolation of the pathogen
 - Anatomopathological exam (biopsy)
 - Imaging exams
- 

Clinical signs

- No acute symptoms:
- Pain at palpation of the affected region
- Partial functional impairment



Clinical forms

- Chronic osteomyelitis from the beginning
 - Osteomyelitis hyperostosa
 - Brodie abscess
 - Osifluent abscess (aluminous periostitis Olier)
 - Chronic sclerosing osteomyelitis Garré
- Secondary chronic osteomyelitis
 - Chronic posttraumatic osteomyelitis

Hyperostosis osteomyelitis

Pain

- Deep, nonlocalized pain
- spontaneous and intermittent, decreases at resting
- then becomes intense, especially at night

Palpation

- shaft appears thickened, irregular and painful surface of the affected area



Brodie abscess

Pain

- Pain is the main sign, having – deep, bad localisation
- Does not decrease at rest or analgesics.

Palpation

- prolonged pain, corresponds to abscess
- bone segment – spindle shaped
- soft tissues are not changed
- skin may experience slight edema and collateral circulation
- no regional lymphadenopathy.

Ossifluent abscess

- Low intensity pain
- Then gradually swelling occurs

Chronic sclerosing osteomyelitis Garré

- Pain occurring in spikes
- Generally moderate intensity
- On palpation spindle like thickening of bone

Chronic posttraumatic osteitis

- sometimes the limb is thickened
- most of the time it is thinned by muscle weakness
- multiple scars resulting from fistula, previous surgery
- trophic skin disorders often present
- single or multiple fistula openings - purulent discharge

Laboratory examination

Laboratory analysis - nonspecific inflammatory signs

- **leukocytosis**
- **increased ESR**
- **Increased levels of C-reactive protein**

Isolation of the pathogen

- Sometimes very difficult to identify the pathogen
- Antibiofilms - fistula:
 - Positive: when coagulase-positive *Staphylococcus aureus* is predominantly isolated or when one species is isolated in sterile culture
- Open bone biopsy is the standard diagnostic

Isolation of the pathogen

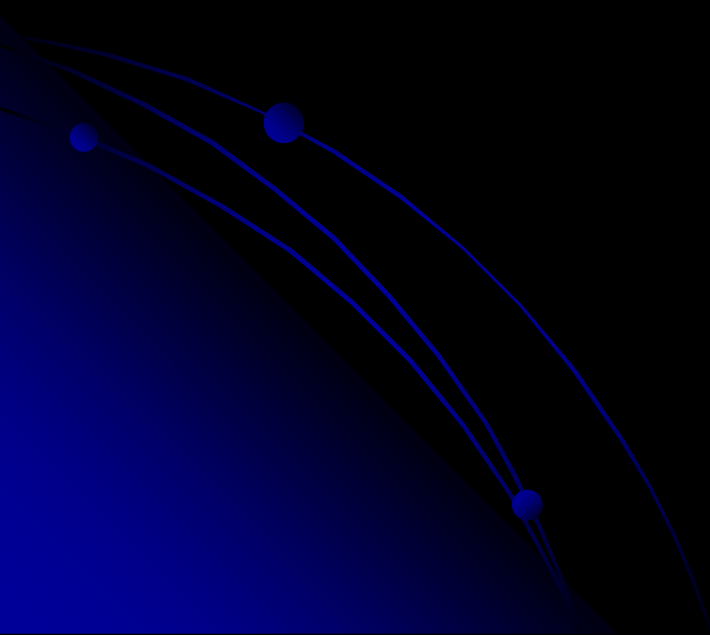
- *Staphylococcus aureus*, the most common germ involved in chronic osteomyelitis
- The etiologic agent also depends on the age, the epidemiological factors and the type of osteomyelitis, primary or secondary.

Complications

1. Malignancy of the fistula

- ***It is a very rare complication***

2. Secondary amyloidosis



Imagistica osteomielitei cronice

Examenul Radiologic

- Evaluarea extensiei procesului la nivelul osului (extensia infectiei active intramedulare, abceselor aparute pe zonele de necroza, sechestr).
- Radiografia simpla a regiunii
 - In doua incidente
 - Cuprinde segmentul, articulatiie adiacente
- Fistulografia - informatii privind traiectul fistulos



Imagistica osteomielitei cronice

Osteomielita sclerozanta Garre

- Radiografic corticala apare ingrosata si foarte condensata iar cavitatea medulara apare ingustata.
- Zona metafizo-diafizara afectata este ingrosata fuziform.



Imagistica osteomielitei cronice

Abcesul Brodie

- extensie digitiforma in osul adiacent prin intermediul epfizei, imagine care daca apare este
- patognomonica pentru infectie (tunelizare)



Imagistica osteomielitei cronice

Osteita cronică traumatică

- calus hipertrofic, cu contur neregulat structura neomogena, zone de condensare care alternează cu zone de osteoliză
- sechestrul izolat de restul țesutului osos printr-o zonă clară
- pseudartroză fistulizată caracterizată printr-un spațiu clar între fragmentele osoase, condensarea extremităților osoase și obliterarea canalelor medulare
- osteoporoză sau osteoliză în jurul implantelor metalice

Imagistica osteomielitei cronice

Tomografia Computerizata

- are valoare in ceea ce priveste studiul osului si al tesuturilor moi

RMN

- imaginile cu substanta de contrast
- ajuta la diferentierea cicatricilor fibroase de zonele de infectie, precum si la eliminarea artefactelor
- ajuta la diferentierea abceselor de zone cu inflamatie difuza.

Medicina nucleara

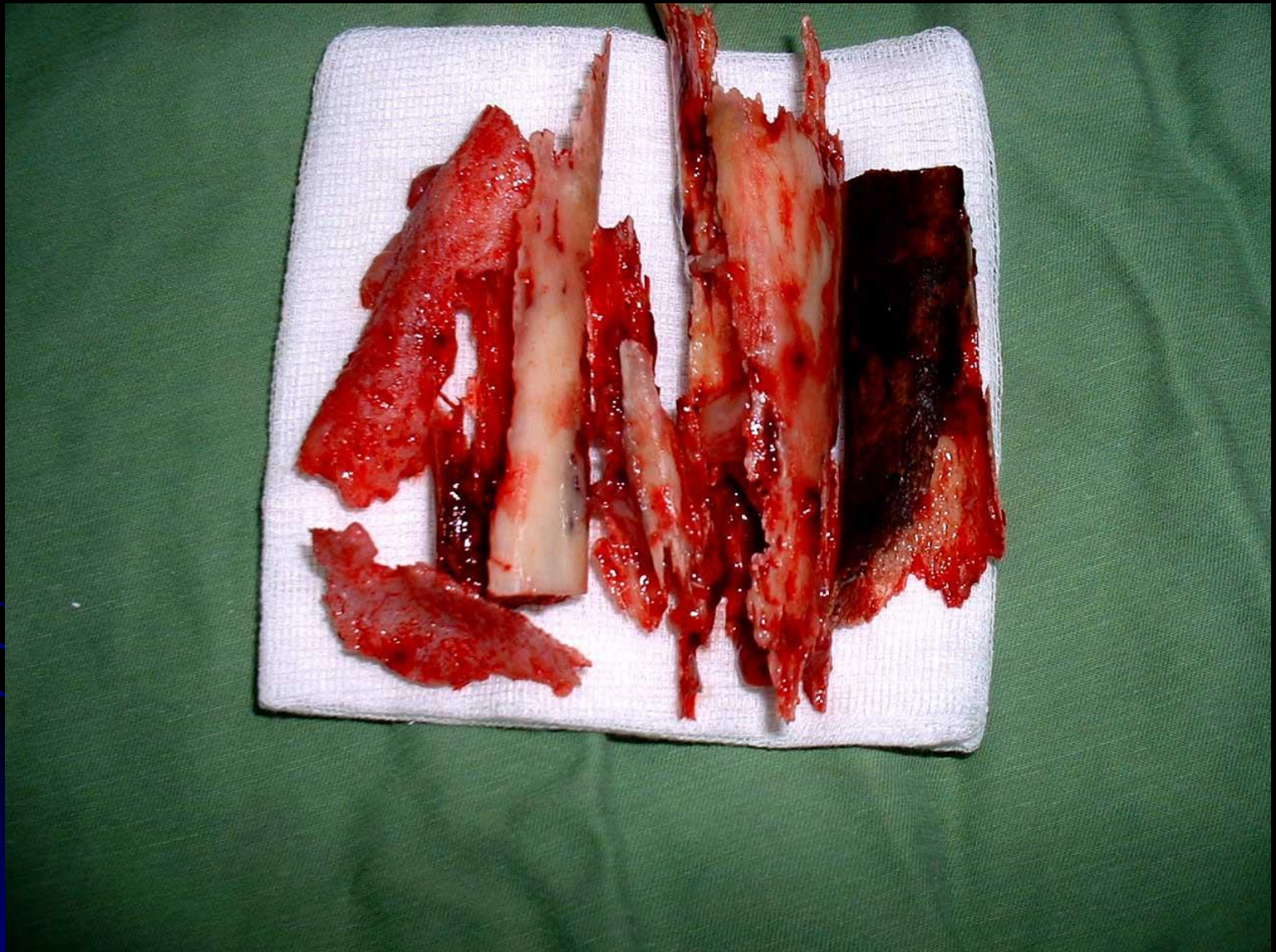
- **FDG (2-[fluorine 18]-fluoro-2-deoxy-D-glucoze)-PET (tomografia cu emisie pozitronica) sa fie considerata metoda de electie**
- **Scintigrafie (gallium, indium)**

TRATAMENT

- combina tratamentul chirurgical cu cel medicamentos
- presupune o echipa pluridisciplinara
- principiile de tratament ale infectiei, in general sunt aplicabile si in cadrul infectiei osului
- in situatia in care statusul general al pacientului este compromis, apar o serie de variabile suplimentare, datorita actiunii bolii, a operatiilor de reconstructie precum si a actiunii toxice a terapiei antibiotice.

TRATAMENT

- Tratamentul chirurgical urmareste debridarea, umplerea spatiilor goale restante, refacerea aportului sanguin local, acoperirea cu parti moi, stabilizarea si reconstructia.
- Papineau - doua tehnici asemanatoare de tratament prin imobilizare si grefa osoasa, fara inchidere cutanata sau cu inchidere cutanata intarziata deliberat



Tehnicile de microchirurgie

TRANSPORTUL OSOS

- Segmentele osoase sunt fixate proximal prin fixare externa si se face corticotomie in metafiza de la distanta fata de defect.

TRANSFERUL OSOS PEDICULAT

- cand tratamentele conventionale nu se pot aplica(ex. defect osos >6 cm, vascularizatie scazuta sau infectia patului receptor)
- daca tratamentele anterioare au esuat

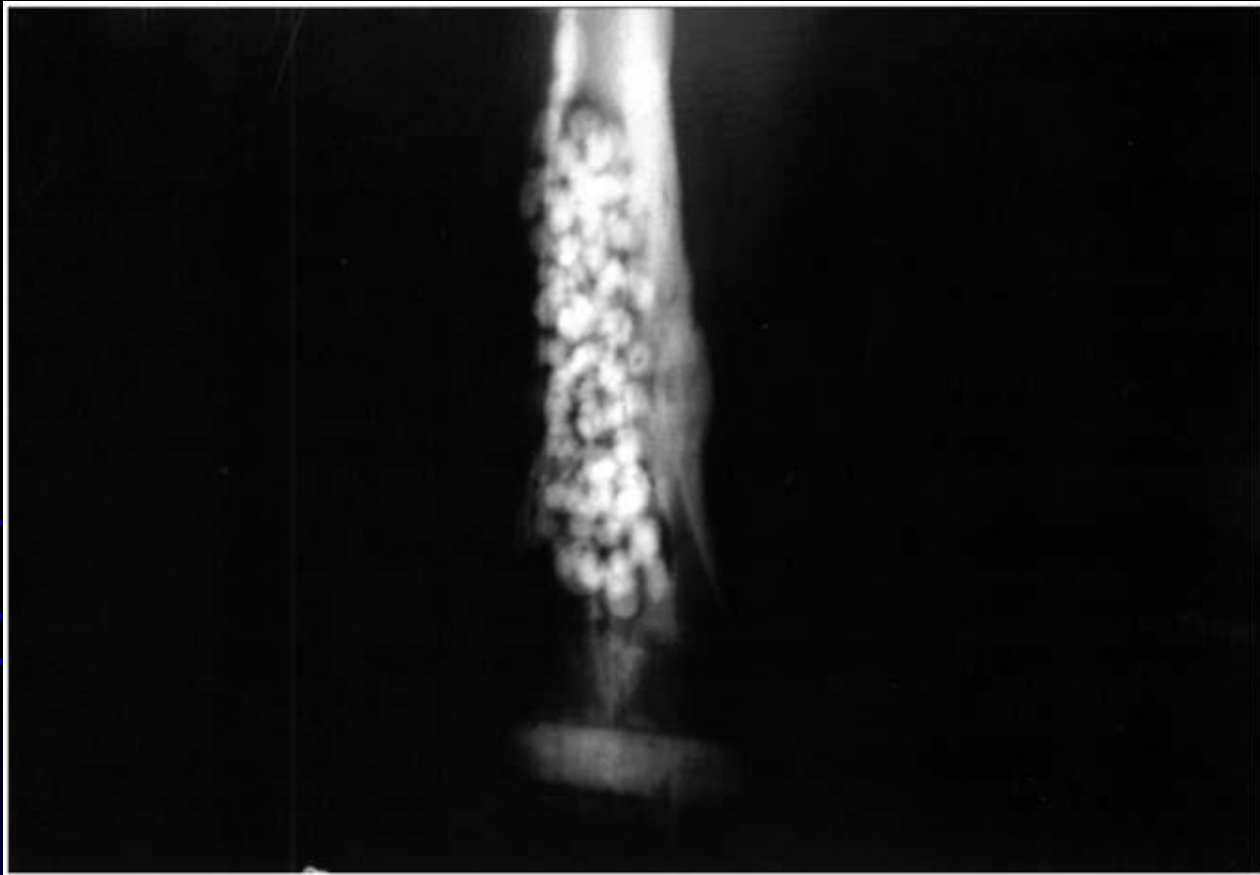
Umplerea defectelor cu grefon osos sau cu substituti ososi

Lambouri vascularizate sau grefe de piele

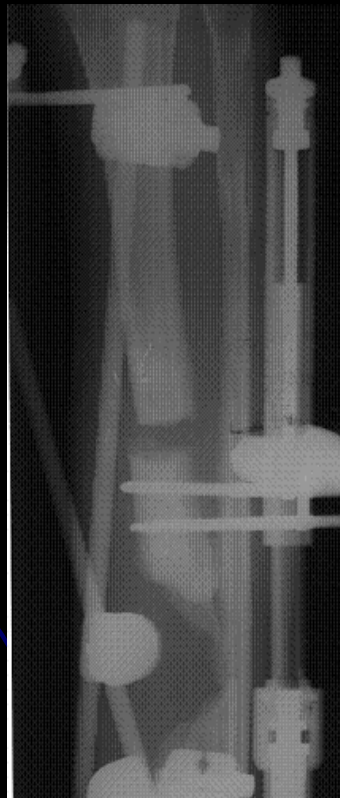
ANTIBIOTERAPIA

- Odata cu identificarea agentului patogen, trebuie initiata terapia antibiotica pe baza antibiogramei
- Tratamentul inadecvat poate duce la extensia necrozei si a sechestrului osos. Un tratament adecvat trebuie sustinut 4-6 saptămâni
- Tratamentul se va initia odata cu identificarea germenului
- Daca infectia este severa, sau daca este necesara debridarea imediata, se va initia terapia cu antibiotice cu spectru larg, pana la venirea rezultatului antibiogramei
- Sisteme cu eliberare locala de antibiotic - asigura concentratia eficienta fara a da si efectele sistemice ale antibioterapiei generale

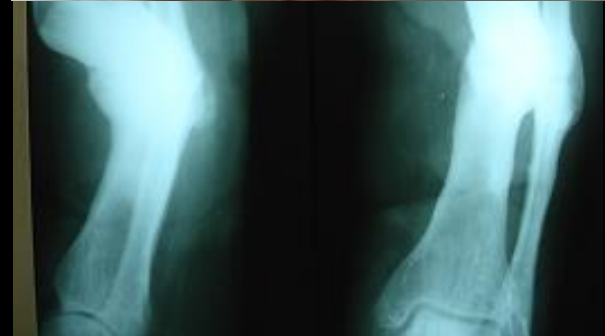
- Sisteme cu eliberare locala de antibiotic



- m, 50 de ani, fumator
- transport osos
- osteotaxie cu fixator extern,
- antibioterapie conform antibiogrammei.
- evolutia a fost favorabila, cu vindecarea pacientului



- m, 42 de ani , pseudartroza infectata de tibie.
- debridare, spacer de ciment
- transport osos
- fixator extern
- lambou liber transferat de latissimus dorsi

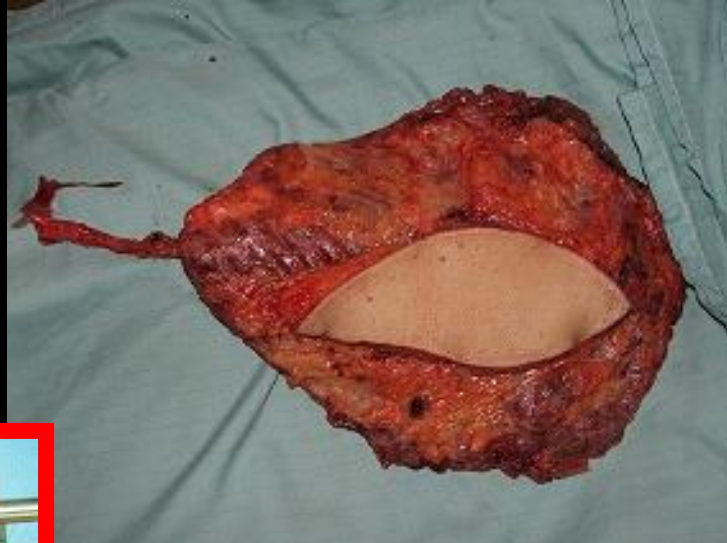


- m, 50 de ani, osteomieliță cronică fistulizată de gambă post traumatism rutier soldat cu o fractură deschisă
- multiple reintervenții chirurgicale
- debridare, grefă spongioasă din creastă iliacă
- lambou din latissimus dorsi
- osteotaxie cu fixator extern
- transfer de piele liber despicată



Rx preoperator

- m, 51 de ani, osteomieliță cronică de gambă, fumător,
- reintervenții multiple și antibioterapie
- preoperator - defect tegumentar extins, cu evidențierea diafizei tibiale



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