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Orthopedic 441 Team

MED441 KING SAUD UNIVERSITY

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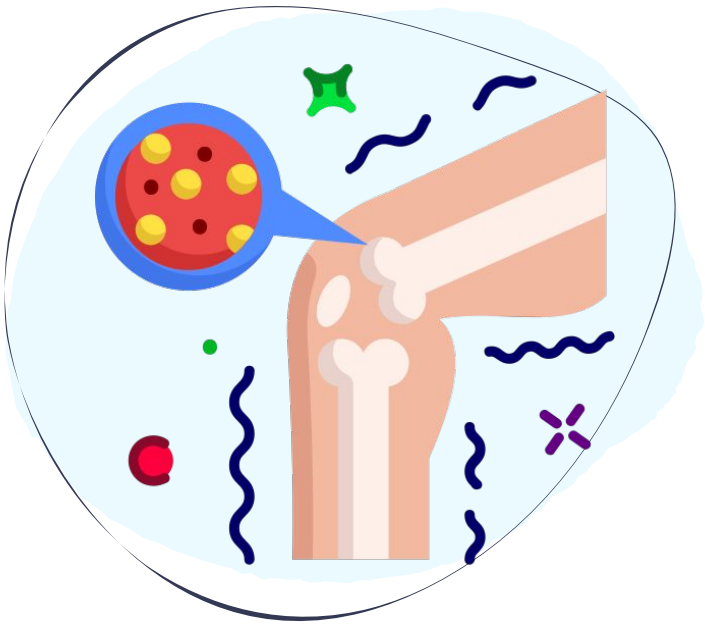

Bone & Joint Infections

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Color Index:

- Main Text
- Important
- 441 Notes
- Old Notes
- Extra

Objectives

No objectives were provided for this lecture.

Resources

Osteomyelitis
By Osmosis

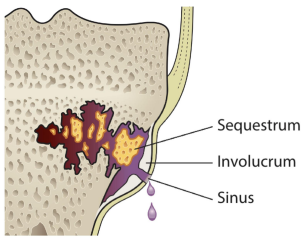
Septic Arthritis
By Osmosis

Osteomyelitis
By Orthobullets

Osteomyelitis

Overview

- Initial treatment → Based on presumed infection type → Clinical findings and symptoms, "you give broad spectrum antibiotics until you can identify the organism from the final culture".
- Definitive treatment → Based on final culture[1].
- Glycocalyx: Polysaccharides biofilm that forms commonly around artificial joints & foreign bodies, that will prevent the antibiotics from reaching, can't be treated without removal of glycocalyx, that's why in order to treat the infection you have to remove the foreign body, otherwise the infection will stay there.
  - Exopolysaccharide coating.
  - Envelops bacteria.
  - Enhances bacterial adherence to biologic implants.
- Terminology:
  - Sequestrum (dead bone): This happens when blood supply is cut off from area of bone due to infection[2].
  - Involucrum: New bone formed at site of infection and trapping a cavity of bone.



Bone Infection

- Osteomyelitis (OM): Infection of bone (the cortex) and bone marrow (inside the bone itself).
- Route of infection:
  - Direct inoculation (organism comes from outside) → Open fractures, cut wounds.
  - Blood-borne organisms (indirect) → Hematogenous.
- Determination of the offending organism is not a clinical diagnosis, but depends on deep culture which it is essential, "the deep culture is taken from deep bone not soft tissue, unless there was pus for example".

Classification

- Acute Hematogenous OM
- Subacute (2-6 weeks)
- Acute OM (Acute <2 weeks)
- Chronic OM (Chronic >6 weeks) Some sources define chronic osteomyelitis as having a duration ≥ 3 months.

1- To determine the organism + its sensitivity to antibiotics, to choose the appropriate antibiotic.
2- In the course of inflammatory response in an infected bone, there is an increased osteoclastic activity resulting in increased bone breakdown, as a result, a segment of bone may become separated and consequently loses its blood supply, therefore bacteria within the sequestrum are isolated from antibiotics carried in the bloodstream, which means the infection can't be properly treated.

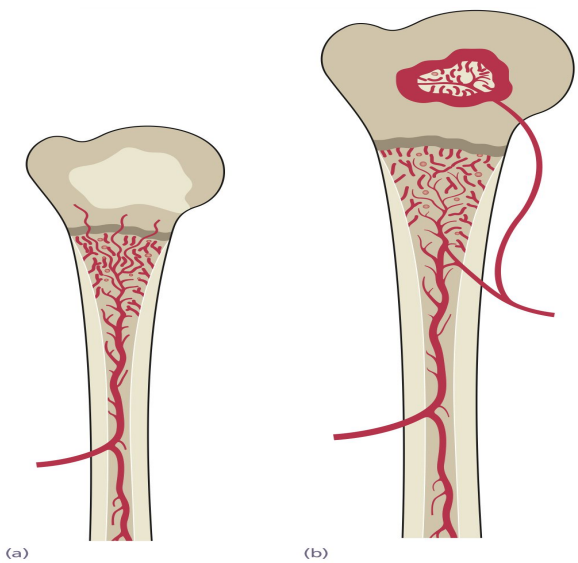
1 Acute Hematogenous Osteomyelitis

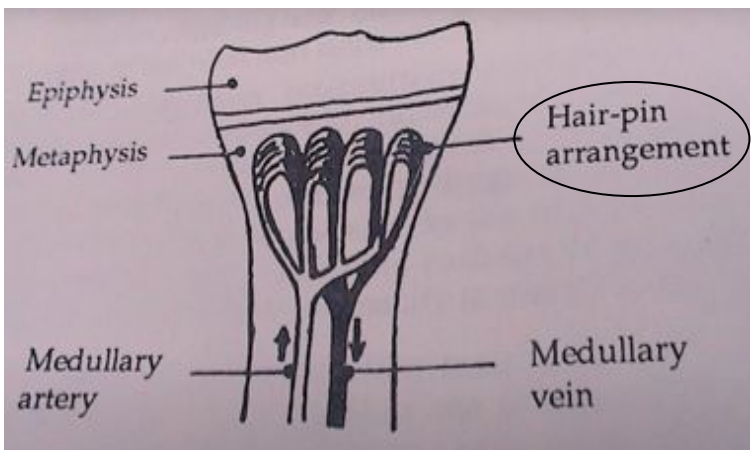
Clinical Features

- Caused by blood-borne organisms.
- More common in children.
  - Boys > girls.
  - Most common in long bone **metaphysis** or **epiphysis**.
  - Lower extremity >> upper extremity.
- Pain, malaise, restlessness.
- Loss of function of the involved extremity, fixed flexion deformity, contractures and stiffness.
- Soft tissue abscess and swelling, especially if the infection spread to soft tissues.

Etiology and Pathogenesis[1]

- Acute haematogenous osteomyelitis is mainly a disease of children. When adults are affected, it is usually because resistance is lowered.
- The bloodstream is invaded, perhaps from a minor skin abrasion, treading on a sharp object, an injection point, a boil, a septic tooth or in the newborn from an infected umbilical cord.
- In adults, the source of infection may be a urethral catheter, an indwelling arterial line or a contaminated needle and syringe.
- In children, the infection usually starts in the vascular metaphysis of a long bone, most often in the proximal tibia or in the distal or proximal ends of the femur.
- Predilection for this site has traditionally been attributed to the peculiar arrangement of the blood vessels in that area: the non-anastomosing terminal branches of the nutrient artery twist back in **hairpin loops** before entering the large network of sinusoidal veins; the relative vascular stasis and consequent lowered oxygen tension are believed to favour bacterial colonization.
- Epiphyseal and metaphyseal blood supply:
  - **In newborn infants (a)** some metaphyseal arterioles from the nutrient artery penetrate the physis and may carry infection directly from the metaphysis to the epiphysis.
  - **In older children (b)** the physis acts as a barrier and the developing epiphysis receives a separate blood supply from the epiphyseal and peri- articular blood vessels.





1- Extra explanation from Apley's & Solomon's System of Orthopedics and Trauma.

Diagnosis

Blood Tests

- ↑ **WBC** count mainly neutrophils.
- ↑ **ESR** not specific (better in total joint arthroplasty infection).
- **Blood cultures** → may be positive in children, must be done especially if patient is febrile.
- **C-reactive protein** monitor response to treatment.
  - **Most sensitive monitor of infection course in children**, respond very fast.
  - Short half-life, gives good indication if the treatment is working.
  - Dissipates "start to reduce" in about 1 week after effective treatment.

Imaging

Radiographic Changes

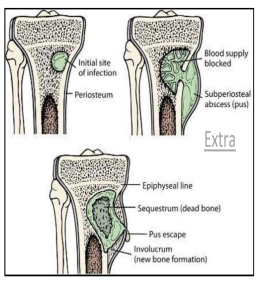
X-ray is the recommended initial imaging modality because it is inexpensive and can rule out differential diagnoses.
from amboss

1. **Early:** Soft tissue swelling, no changes visible on X-ray.
2. **10-14 days:** Bone demineralization = Decreases bone density "2-3 weeks to see bone changes on X-ray".
3. **Later** (in chronic stage)**:**
   - **Sequestrum** (indication of OM): Dead bone with surrounding granulation tissue, appears as a dense sclerotic lesion.
   - **Involucrum**: Periosteal new bone formation, considered a periosteal reaction.

- Early X rays may not reveal any findings except soft tissue swelling at site of infection, bony changes take up to 10-14 days to show up, there is decreased blood supply due to it not being managed for a while which in turn causes osteopenia, (osteopenia may appear earlier not diagnostic).
- REMEMBER: The patient can present with symptoms without bony changes in the X ray.

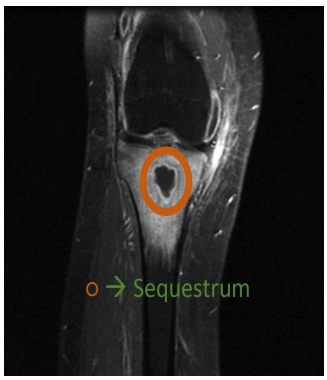
Soft tissue swelling

Sequestrum is the central island, not the border



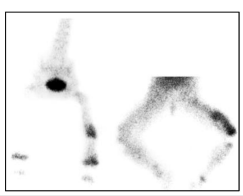
MRI

- MRI bone changes appear before X-ray "best tool for radiological diagnosis as it is sensitive and specific", but difficult in young children as they require general anesthesia".
- Shows changes in bone and bone marrow before plain films.
- Decreased T_1-weighted bone marrow signal intensity.
- **Increased post-gadolinium** (contrast) **fat-suppressed T_1-weighted signal intensity.**
- Increased T_2-weighted signal relative to normal fat.
- **Picture:** There's no activity in this area = dead, it doesn't have any blood supply, it could be a sequestrum or Brodie's abscess.
- MRI can reveal the periosteal reactions.



Nuclear Medicine Studies

- May help when not sure of the course or source of infection.
  - Regular bone scan: It will be positive, if you have anything that increases the activity, like: Infection, tumor, fracture, etc..
  - **Special bone scans for infections include:**
    1- Gallium bone scan **2-** WBCs labeled bone scan (most specific scan for bone infections)
  - Useful in delayed cases, when we want to check if there is more than one focus of infection "if we treated one place but the child is not improving".
  - **Picture:** Increase uptake in femur bone, due to increase activity, so it's possibly infection, tumor or fracture we don't know, the increase uptake in the bladder is because of the urine, it doesn't mean there's an infection.

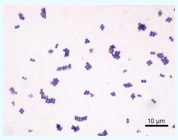


Treatment

1. Identify the organisms
2. Select appropriate antibiotics
3. Deliver antibiotics to the infected site
4. Halt tissue destruction

Empirical Treatment

- Is initiated **before definitive cultures become available**, based on patient's age and other circumstances.
- **NEVER start the antibiotic BEFORE obtain the culture**.

Newborn (up to 4 months of age) 	• The most common organisms:
	  ○ Staphylococcus aureus "most common organism in bone infection".
	  ○ Gram-negative bacilli.
	  ○ Group B streptococcus "after URTI".
	• Newborns: Crying, pain, swelling, stiffness (loss of function)
	  ○ May be afebrile "weak immunity هذه المشكلة إنهم بدون حرارة"
	  ○ 70% positive blood cultures.
	• Primary empirical therapy includes:
	  ○ Oxacillin (penicillin) specific for staph. for group (+).
	  ○ Plus 3rd generation cephalosporin for group (-).

Children (4 years of age or older)	• The most common organisms:
	  ○ Staphylococcus aureus.
	  ○ Group A streptococcus.
	  ○ Coliforms (uncommon).
	• Empirical treatment includes:
	  ○ Oxacillin or cefazolin (1st gen cephalosporins).
	  ○ If suspecting gram-negative organisms → 3rd generation cephalosporin.
	• **Haemophilus influenzae bone infections almost completely eliminated due to vaccination.**

Adults (21 years of age or older)	• **Organisms:**
	  ○ **Most common organism → S. aureus**.
	  ○ Wide variety of other organisms has been isolated.
	• Initial empirical therapy: Oxacillin or cefazolin.
	• Oxacillin is key because it is the most important in all age groups

Sickle Cell Anemia 	• **Salmonella** is a characteristic organism. • The primary treatment is **fluoroquinolones** (only in adults), **can't be given** to children. • Alternative treatment is 3rd generation cephalosporin.

Hemodialysis and IV Drug Abuser	• Common organisms:
	  ○ **Staphylococcus aureus**.
	  ○ S. epidermidis.
	  ○ Pseudomonas aeruginosa.
	• Treatment of choice is penicillinase-resistant synthetic penicillins (PRSPs)[1] + ciprofloxacin.
	• Alternative treatment is vancomycin **with** ciprofloxacin (allergy).

1- PRSPs include: Oxacillin, Cloxacillin, Dicloxacillin, Methicillin, and Nafcillin.

Operative Treatment

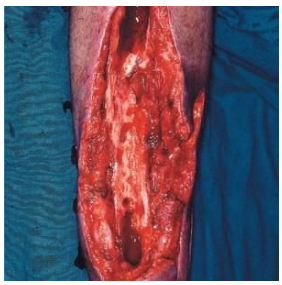
- Started after cultures. Starting treatment beforehand masks the results
- **Indications for operative intervention:**
  - Drainage of an abscess, if we're sure there's pus (as a result of our investigations), antibiotics can't treat the collection of abscess, the efficacy of antibiotics in pus may be limited by various factors like low pH, protein binding and degradation by bacterial enzymes.
  - Debridement of infected (dead) tissues to prevent further destruction, dead tissue can't respond to antibiotics so it's removed.
  - Refractory cases that show no improvement after non-operative treatment, we use nuclear scan for this case, "in case of presence of sequestrum it must be removed (sequestrectomy)".

2 Acute Osteomyelitis

Clinical Features

- Usually comes after open fracture or closed fracture with open reduction and internal fixation (iatrogenic) e.g. somebody have surgery then acute OM.
- Clinical findings similar to acute hematogenous OM "pain, swelling, loss of function, fever, stiffness and tenderness, so patient will be sick and febrile"
- **Most common offending organisms are:**
  - S. aureus.
  - P. aeruginosa.
  - Coliforms.
- **Complications:**

1- Septicemia and distant abscesses. 2- Septic arthritis 3- Chronic osteomyelitis.
4- Growth disturbance in skeletally immature and deformity 5- Pathological fracture



Treatment

- **Empirical therapy: Oxacillin** (for gram+ coverage include MSSA) **+ ciprofloxacin** (for gram- coverage include P. aeruginosa)
- **Treatment:**
  - Radical incision & drainage. Radical means you take everything out, bone, soft tissue and even the skin, "take everything that is dead until you reach the healthy tissue or it will not heal".
  - Removal of orthopedic hardware "device, screws, plates, nail or any implant" if necessary. External fixator, screws, these FB have no communication with blood so they must be removed as they act as a good media for colonization.
  - Rotational or free flaps (tissue transplant → muscles + soft tissue + skin) for open wounds if needed.

3 Chronic Osteomyelitis

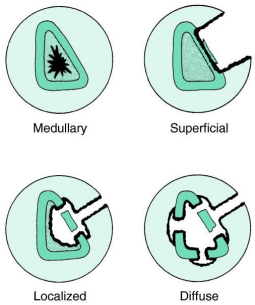
Clinical Features

- **Common in:**
  - Inappropriately treated acute OM.
  - Immunosuppressed, they will present with sinus discharging pus **without fever**.
  - Trauma.
  - Diabetics.
  - IV drug abusers.
- **Most common organisms:**
  - S. aureus.
  - Enterobacteriaceae (mainly with IV drug abuse).
  - P. aeruginosa.
- **Features:**
  - Skin and soft tissues involvement.
  - **Sinus tract** (discharging sinus) → May occasionally develop squamous cell carcinoma.
  - Periods of quiescence followed by acute exacerbations.
  - Presences of **sequestrum** (requires urgent intervention) "source of bacteria" antibiotics cannot reach it.

Anatomical Classification

4 Types:

- Medullary (can erode internal blood vessels and aid in forming sequestra).
- Superficial (only surface "part of cortex and soft tissue around it", because it is superficial we can eradicate it surgically).
- Localized (sinus formation with pus "draining" between outside and medulla).
- Diffuse (**the worst**, whole medullary canal, the sinus has destroyed the whole bone).



Diagnosis

- **Best test to identify the organisms → Operative sampling of deep specimens from multiple foci.**
- Nuclear medicine → Activity of the disease. E.g. Bone scan, gallium scan to tell if the lesion is old, remission, reactive and show us if infection is expanded and destruction more tissue.
- Anything that wasn't useful in acute is useful here: Plain X-rays, CT scans.

Treatment

- Empirical therapy **not indicated** because bone is dead. The main difference between acute and chronic is that in chronic there is no rush to start therapy because the damage has already occurred.
- Do culture and sampling followed by Surgical debridement followed by antimicrobial therapy.
- IV antibiotics must be **based on deep cultures not the superficial culture**.
- **Surgical debridement:**
  - Complete removal of compromised bone and soft tissue.
  - Hardware: **Most important factor**
    - Almost impossible to eliminate infection without removing implant.
    - Organisms grow in a glycocalyx (biofilm) around the foreign body "device" shields them from antibodies and antibiotics, we have to take out the glycocalyx.
  - Bone grafting and soft tissue coverage is often required, you use a flap (containing muscle, soft tissue and skin) rather than skin alone.
  - Amputations are still required in certain cases, diabetes mellitus, if huge area of bone and soft tissue is destructed.

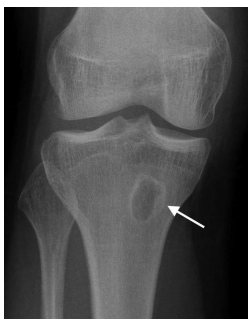
4 Subacute Osteomyelitis

Clinical Features

- **May occur in:**
  - Partially treated acute osteomyelitis.
  - Occasionally in fracture hematoma.
- Painful limp, but not severe like acute.
- **No** systemic and often no local signs or symptoms, the patient is afebrile and doesn't look sick.
- Signs and symptoms on plain radiograph.
- Can happen when the fracture hematoma gets infected.

Diagnosis

- Frequently normal WBC count and negative blood cultures.
- **Usually useful tests:** "any infection you need to rule out tumor"
  - ESR, not very specific could be elevated due to sore throat.
  - **Bone cultures**, only a small percentage have a positive result.
- **Radiographs:**
  - **Brodie's abscess** → Localized radiolucency seen in long bone metaphysis, difficult to differentiate from **Ewing's sarcoma**[1].
  - **Picture:** Cyst surrounded by sclerotic area (means it's well protected, not spreading), localized in the metaphysis and hypodense in the middle. Abscess very well circumscribed. An area of osteopenia surrounded by a thick cortex which is very well localized and won't spread.



Treatment

- Most commonly involves femur and tibia "lower limb".
- It can cross the physis "growth plate" even in older children.
- Metaphyseal Brodie's abscess → Surgical curettage (the only treatment for brodie's abscess).

5 Septic Arthritis

Clinical Features[2]

1- Acute onset.
2- Classical triad of fever, joint pain, and **restricted range of motion**.
3- Arthritis: Usually **monoarticular,** most commonly affected joint "**Knees**", Joints are swollen, red, warm, and painful.
- Those on corticosteroid treatment, may develop a 'silent' joint infection[3].

Diagnostics[2]

1- Arthrocentesis: For all patients with suspected septic arthritis.
- Synovial fluid analysis (SFA) in septic arthritis:
  - Appearance: Often yellow-green and turbid (nonspecific).
  - Cell count: ↑WBC count **(e.g. > 50,000/mm3)**, neutrophil (PMN) dominance of > 90%.
  - Glucose levels: Lower than blood glucose levels.
- Infection of the skin overlying the affected joint is an absolute contraindication to arthrocentesis due to the risk of introducing pathogens into the joint.

2- CBC, CRP, ESR: Leukocytosis and elevated inflammatory markers may be seen (nonspecific).
3- X-ray: Preferred initial imaging modality (prosthetic and native joints)
4- Ultrasonography: The most reliable method for revealing a joint effusion in early cases[3].

1- (Which is a differential diagnosis), you should do more investigations to differentiate between the tumor and abscess, bone scan will show a high uptake for both, you could open the area and send for culture and histopath to differentiate between infection and tumor.
2- Extra explanation from Amboss but important.
3- Extra explanation from Apley's & Solomon's System of Orthopedics and Trauma.

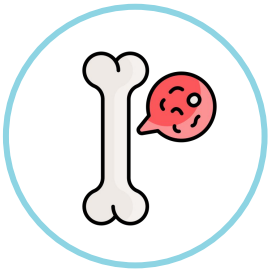
Most Common Site

Infants & children → Hip joint

Adults → Knee joint

Route of Infection

Hematogenous spread (indirect).



Extension of metaphyseal/diaphyseal osteomyelitis in children (direct) e.g. abscess → joint.

Complication of a diagnostic or therapeutic joint procedure "iatrogenic" (e.g. aspiration, steroid injection).

Metaphyseal Osteomyelitis Can Lead to Septic Arthritis in

1. **Proximal femur**
   Most common in this category
   (It may go up to the hip and cause septic arthritis)
2. **Proximal humerus**
   (goes to shoulder joint)
3. **Radial neck**
   (goes to elbow joint)
4. **Distal fibula**
   (goes to ankle joint)

Adults at Risk for Septic Arthritis are Those With

Rheumatoid Arthritis

- Tuberculosis → Most characteristic because of immunosuppression.
- S. aureus most common.

IV Drug Abuse

- Pseudomonas most characteristic.

Treatment

Empirical Therapy

- Prior to the availability of definitive cultures.
- Based on the patient's age and/or special circumstances.

Newborn (up to 3 months of age)	Children (3 months to 14 years of age)

• Most common organisms: Almost same as acute OM in newborn
  ○ S. aureus.
  ○ Group B streptococcus.
• Less common organisms:
  ○ Enterobacteriaceae.
  ○ Neisseria gonorrhoeae.
• 70% with adjacent bony involvement.
• Blood cultures are commonly positive.
• **Initial treatment: PRSP + 3rd generation cephalosporin**.
	• Most common organisms:
	  ○ **S. aureus**.
	  ○ Streptococcus pyogenes.
	  ○ S. pneumoniae.
	  ○ H. influenzae → **Markedly decreased with vaccination**.
	  ○ Gram-negative bacilli.
	• **Initial treatment: PRSP + 3rd generation cephalosporin.**
	• Alternative treatment: Vancomycin + 3rd generation cephalosporin.

Acute Monoarticular (one joint is involved) Septic Arthritis in Adults

- The most common organisms:
  1. S. aureus.
  2. Streptococci.
  3. Gram-negative bacilli e.g. pseudomonas.
- Antibiotic treatment: PRSP + 3rd generation cephalosporin.
- Alternative treatment: PRSP + ciprofloxacin.

Polyarticular Septic Arthritis	Chronic Monoarticular Septic Arthritis (cartilage damage)
Most common organisms: 1. Gonococci. 2. B. burgdorferi. 3. Acute rheumatic fever. 4. Viruses.	Most common organisms: 1. Brucella. Most common 2. Nocardia. 3. Mycobacteria. 4. Fungi.

Surgical Treatment

- **Mainstay of treatment:**
  - Surgical drainage → Open or arthroscopic تنظير المفصل "clean and wash with a scope but if it's difficult you can open"
  - Daily aspiration.
- Tuberculosis infections → Pannus (soft tissue granuloma due to inflammation and proliferation of the synovium leads to formation of pannus) → Similar to that of inflammatory arthritis (rheumatoid arthritis). Pannus "hypertrophied synovium" could cause stiffness & loss of function and has to be removed.
- Late sequelae of septic arthritis → Soft tissue contractures → May require soft tissue procedures (such as a quadricepsplasty "corrective surgical procedure on the quadriceps femoris muscle and tendon to release adhesions and improve mobility"), the quads become short and you can't extend the knees anymore so we have to do surgery to make it more elongate.

6 Infected Total Joint Arthroplasty

Diagnosis

- Most common pathogen:
  1. **S. epidermidis** — Most common with any foreign body
  2. **S. aureus**
  3. **Group B streptococcus**
- Worst type of infection in joints is the artificial joints because it is a foreign body that's why we remove them.
- If joint got infected, we have to take deep aspiration of knee, remove prosthesis, treat, put new prosthesis.
- ESR → Most sensitive but not specific.
- CRP may be helpful.
- **Culture of the hip aspirate → Sensitive and specific**.
- Preoperative skin ulcerations → ↑ **Risk**. If the patient shaves before the operation he will cause small skin openings and ulcerations that will be a good medium for infections, all shaving must be done in the OR to avoid scratches of the skin.
- Most accurate test → **Tissue culture**.
- History of **joint replacement surgery**, pain, fever and joint stiffness (if the patient has normal temperature it is **loose joint arthroplasty** not infected joint arthroplasty).

Prevention

Video explaining Laminar Flow (Air suction mechanism)

- Perioperative intravenous antibiotics is the most effective method for decreasing its incidence.
- Good operative technique.
- Laminar flow → Avoiding obstruction between the air source and the operative wound.
- Special "space suits", everything is sterile even the face area.
- Most patients with TJA **do not need** prophylactic antibiotics for dental procedures, **unless they have an infection/abscess** then antibiotics are given.
- Before TKA revision → Knee aspiration is important to rule out infection. The culture may be negative but it doesn't rule out an infection.

Treatment of TJA

Acute infections within 2-3 weeks of arthroplasty (prosthesis has metal part and plastic part)	• Prosthesis salvage → Stable prosthesis. • Exchange polyethylene (plastic part) components, you open the joint and keep the prosthesis and cover the surface of the tibia and femur with polyethylene (don't remove the prosthesis). • Synovectomy → Beneficial if synovium is infected.

Chronic TJA infections **>3** weeks of arthroplasty	• Implant and cement removal.
	• Staged exchange arthroplasty:
	  ○ Stage 1: After removal of prosthesis, put spacer (cement and antibiotic) and keep it there for 6 weeks, then do new culture.
	  ○ Stage 2: Put the new prosthesis.
	• Glycocalyx:
	  ○ Formed by polymicrobial organisms.
	  ○ Difficult infection control without removing prosthesis and vigorous debridement.
	• Helpful steps:
	  ○ Use of antibiotic-impregnated cement, antibiotics used are usually vancomycin tobramycin and gentamicin.
	  ○ Antibiotic spacers/beads.
	  ○ You could do both antibiotic-impregnated cement and antibiotic spacers/beads.

EXTRA

Osteomyelitis

- bone infection with progressive inflammatory destruction

Etiology

- most commonly caused by *S. aureus*
- mechanism of spread: hematogenous (most common) vs. direct-inoculation vs. contiguous focus
- risk factors: recent trauma/surgery, immunocompromised patients, DM, IV drug use, poor vascular supply, peripheral neuropathy

Clinical Features

- symptoms: pain and fever
- on exam: erythema, tenderness, edema common ± abscess/draining sinus tract; impaired function/WB

Diagnosis

- see Medical Imaging, MI23 and MI28
- workup may include: WBC and differential, ESR, CRP, blood culture, aspirate culture/bone biopsy

Table 7. Treatment of Osteomyelitis

Acute Osteomyelitis	Chronic Osteomyelitis
IV antibiotics 4-6 wk; started empirically and adjusted after obtaining blood and aspirate cultures	Surgical debridement
± surgery (I&D) for abscess or significant involvement	Antibiotics: both local (e.g. antibiotic beads) and systemic (IV)
± hardware removal (if present)	

Acute osteomyelitis is a medical emergency which requires an early diagnosis and appropriate antimicrobial and surgical treatment

Most commonly affected joints in descending order
knee → hip → elbow → ankle → sternoclavicular joint

Plain Film Findings in a Septic Joint

- Early (0-3 d): usually normal; may show soft-tissue swelling or joint space widening from localized edema
- Late (4-6 d): joint space narrowing and destruction of cartilage

Septic Joint

- joint infection with progressive destruction if left untreated

Etiology

- most commonly caused by *S. aureus* in adults
- consider coagulase-negative Staphylococcus in patients with prior joint replacement
- consider *N. gonorrhoeae* in sexually active adults, and newborns
- most common route of infection is hematogenous
- risk factors: young/elderly (age >80 yr), prosthetic joint, recent joint surgery, skin infection/ulcer, IV drug use, recent intra-articular corticosteroid injection, immunocompromised (cancer, DM, alcoholism, RA)

Clinical Features

- inability/refusal to bear weight, localized joint pain, erythema, warmth, swelling, pain on active and passive ROM, ± fever

Investigations

- x-ray (to rule out fracture, tumour, metabolic bone disease), ESR, CRP, WBC, blood cultures
- joint aspirate: cloudy yellow fluid, WBC >50,000 with >90% neutrophils, protein level >4.4 mg/dL, joint glucose level <60% blood glucose level, no crystals, positive Gram stain results
- listen for heart murmur (if concern for infective endocarditis, use Duke Criteria)

Treatment

- IV antibiotics, empiric therapy (based on age and risk factors), adjust following joint aspirate C&S results
- non-operative
  - therapeutic joint aspiration, serially if necessary
- operative
  - arthroscopic or open irrigation and drainage

Serial C-reactive protein (CRP) can be used to monitor response to therapy

Does This Adult Patient Have Septic Arthritis?
JAMA 2007;297(13):1478-1488
Purpose: To review the accuracy and precision of the clinical evaluation for the diagnosis of nongonococcal bacterial arthritis.
Methods: Review of 14 studies including 6242 patients of which 653 had positive synovial culture (gold standard diagnostic tool for septic arthritis).
Results: Age, diabetes mellitus, rheumatoid arthritis, joint surgery, hip or knee prosthesis, skin infection, and human immunodeficiency virus type 1 infection significantly increase the probability of septic arthritis. Joint pain, history of joint swelling, and fever are found in >50% of cases. The presence of increased WBC increases the likelihood ratio (for counts <25000/μL: LR, 0.32; 95% CI, 0.23-0.43; for counts ≥25000/μL: LR, 2.9; 95% CI, 2.5-3.4; for counts ≥100000/μL: LR, 28.0; 95% CI, 12.0-66.0). A polymorphonuclear cell count of ≥90% increases the LR of septic arthritis by 3.4, while a PMN cell count of <90% reduces the LR by 0.34.
Conclusions: Clinical findings may be used to identify patients with a monoarticular arthritis who may have septic arthritis. Laboratory findings from an arthrocentesis are also required and helpful prior to Gram stain and culture.

Quiz

Q1: An 8-year-old girl comes to the emergency department with her mother because of right ankle pain. Her mother states that the pain started two weeks earlier and subsequently became worse. She also reports fever for the last week, and pain around the joint. Physical examination shows the right ankle is erythematous, warm, swollen and tender to palpation over the lateral malleolus. Radiographs of the ankle show soft tissue edema and a large radiolucency in the distal fibula. Which of the following is the most likely organism?

A. Staphylococcus aureus

B. Group A streptococcus

C. Salmonella

D. E.coli

Q2: A 12-year-old girl comes to the emergency department with her father because of right wrist pain. She states that the pain began 17 days ago and has continued to worsen. She reports being ill with a fever and an upper respiratory illness prior to the onset of the wrist pain. Her temperature is 38.5°C (101.3°F), pulse is 92/min, respirations are 22/min, and blood pressure is 132/76 mm Hg. Physical examination shows the right wrist is erythematous, warm, swollen, and tender to palpation over the distal radius. Radiographs of the wrist show soft tissue edema and a large radiolucency in the distal radius. Which of the following is the most definitive treatment for this condition?

A. Excision of the bone lesion

B. IV antibiotics

C. Irrigation and debridement of the bone lesion

D. IV antibiotics with Irrigation and debridement of the bone lesion

1:A 2:D

Quiz

Q3: A 32-year old man comes to the emergency department because of fever, worsening pain, and impaired range of motion in his right knee for 3 days. He states that he often has to clear small nails or glass splinters from the rough pavement of his construction site before kneeling to do work-related tasks. He has never had a prosthetic implant, there is no family history of rheumatoid arthritis or gout, and that he does not have unexplained skin lesions. Examination shows there is an obvious effusion in his right knee, it is visibly red and swollen, and warm and painful to touch. He refuses to bend it. His left knee is unaffected. Which of the following would be the most helpful test in establishing a diagnosis?

A. CBC and cultures

B. Joint fluid analysis and culture

C. Right knee film

D. Polarizing microscopy of synovial fluid for crystals

Q4: A 72-year-old who underwent a total knee replacement 3 weeks ago, presents with increasing knee pain and swelling, with raised inflammatory markers. An aspiration of the joint cultures coagulase-negative staphylococcus. The next most appropriate step in management is?

A. Two-stage revision, with cement spacer plus intravenous antibiotics.

B. Intravenous antibiotics.

C. Open washout/debridement, polyethylene exchange and intravenous antibiotics.

D. Arthroscopic washout/debridement and intravenous antibiotics.

Q5: A 71-year-old patient presents with increasing knee pain 6 weeks after having a total knee replacement. Which of the following would be most reliable in the diagnosis of infection?

A. Erythrocyte sedimentation rate

B. C-reactive protein

C. Microscopy and culture of joint aspirate

D. Triple phase isotope bone scan.

E. MRI

3:B 4:C 5:C

Quiz

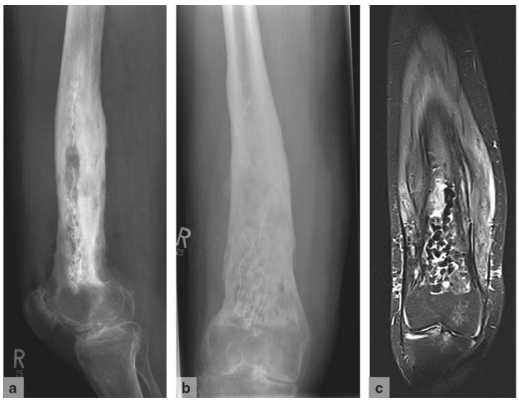
SAQs

441 & 439:

A 45 year old diabetic lady presents to your clinic complaining of a discharging wound in her foot. She reports having this issue for the past 3 years as it started soon after she had developed a calcaneal comminuted fracture.

439

441



1. What is the most likely diagnosis?
   1- Chronic osteomyelitis
   2- Subacute osteomyelitis

2. Name the 3 most possible organisms?
   1- S. Aureus
   2- Enterobacteriaceae
   3- P. Aeruginosa

3. How would you manage this patient (2 investigations & 3 modalities of treatment)?
   1- Nuclear scan
   2- Deep specimen culture
   3- IV antibiotics based on the culture
   4- Complete removal of compromised bone and soft tissue
   5- Hardware removal

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This work was originally done by team 438 & 439