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Introduction

It seems straightforward right? Swollen joint, painful and warm to touch, recent onset à tap it. Sounds easy, but it is often missed by providers. Why? Many think that septic arthritis is something other than septic arthritis, like rheumatoid arthritis, local trauma, or crystal-induced arthritis. That's bad form.



Bacteria are by far the most common cause. Less common causes of infection in the joint vicinity include septic bursitis, Lyme disease, or certain viruses (e.g. Cikungunya, Dengue, Zika). In those with history of foreign travel or immunocompromised folks, don't forget about fungi and mycobacteria.

Risk factors

For organisms to enter a joint space, one of the following is needed:

1) Direct inoculation: bacterial spread from the outside environment directly into the joint capsule. Think penetrating trauma, recent surgery or instrumentation, or, rarely, intraarticular injection.

2) Hematogenous spread: Much more common. Organisms spread from the bloodstream. This is classically bacteremia, and we associate 2 major risk factors with this situation:

a. Patient's joint integrity is weak/damaged to begin with: preexisting joint disease (i.e. crystal arthritis, RA, osteoarthritis), age >50, any joint hardware present.

b. Systemic risk factors: diabetes mellitus, IV drug abuse, alcoholism, indwelling catheters.

3) Contiguous spread from nearby deep space infection such as osteomyelitis. This is the least common method.

Combining any of these risks substantially increases one's chances of developing septic arthritis.

Pathophysiology

There is no basement membrane in the synovial space, so therefore once bacteria penetrate the joint capsule, it's like a jailbreak and they seed the entire cavity.

Causative organisms: both on exams and "real life", joint infections are classically monomicrobial.

Staphylococcus aureus: by far the most common cause of septic arthritis. Otherwise known as Darth Vader, the dark lord of rheumatologic and dermatologic infections.

Streptococcus species: classically pneumoniae or pygones.

Neisseria gonorrhoeae: most common cause of septic arthritis in sexually active, young patients. On the test they will be <30 years old.

Overall, gonococcal arthritis makes up <2% of all gonorrhea complications. It's rare, but it's also hard to diagnose. The triad of tenosynovitis, dermatitis, and polyarthralgias occur frequently. The arthritis tends to be migratory, which is both unique and classic for this disease. Synovial cultures are only positive in 50% of cases along with a low bacterial count, so nuclear amplification tests are preferred. Make sure to not only do arthroscopy but get cervical/urethral samples as well.

Check out our Podcast Episode 56 on gonococcal arthritis, "Tinder Swipe for Gonorrhea"

Brucellosis: zoonotic infection that is a gram-negative coccobacillus. Infection comes from unpasteurized milk or cheese, or direct contact with an infected animal.

Borrelia burgdorferi: Lyme disease. Suspect in those that meet epidemiologic criteria (outdoors in a high-risk area, erythema migrans rash, fever, migratory arthralgias).

Check out our podcast episode 25 on lyme disease, "Doxycycline for all, #blessed"

IV drug abuse or immunosuppression: *Pseudomonas* makes an appearance, but honestly who knows what bug is causing the infection in these patients. Almost any bacteria, fungi, or even mycobacteria could be an issue. Penetrating trauma to the joint: think polymicrobial, anaerobes, and the usual skin flora.

Presentation: classically monoarticular, large joints are the most common sites, and the knee is involved >50% of cases. Patients will present with fevers, joint pain, swelling, warmth, and limited range of motion (all these symptoms are seen in 80% of patients). In ~20% of patients, 2-3 joints could be involved. Polyarticular infections are more common in those with RA, Neisseria gonorrhoeae infection, or overwhelming sepsis.

If you see axial joint involvement, immediately think IV drug abuse history.

Younger patients can be febrile, older patients might have a more insidious presentation.

Diagnosis: Clinical suspicion is important, as the blood work is of limited helpfulness.

Blood cultures are only positive in about 50% of cases. The WBC count, ESR, CRP are commonly ordered and can be elevated, but are nonspecific.

X-rays should be performed, especially if recent manipulation or surgery of the join occurred. Ultrasound is more sensitive for effusions than x-rays.

Septic Arthritis: Staph is back, back again

The real money is in the bedside arthrocentesis. It needs to be performed prior to antibiotic administration. Certain joints require radiographic guidance (i.e. hip or sacroiliac).

Send the synovial fluid for gram stain, culture, WBC count with differential, crystal assessment with polarizing microscope. Key findings:

- >20,000 WBCs with mostly neutrophils = strongly supportive of septic arthritis in the correct clinical context
- Gram stain is only positive in 30-50%
- Synovial fluid culture is positive in >60% of patients with nongonococcal arthritis

	Noninflammatory	Inflammatory (gout, RA, Reactive, spondyloarthritis)	Septic
Clarity/Color	Clear, straw-color hue	Yellow, low viscosity	variable
WBCs (per microL)	<200	>2000	>20,000
Neutrophils	<25%	>50%	>75%

Cultures are no help in most cases due to the organisms being *S. aureus*, but in rare cases they might grow strange, less common organisms.

Cultures suck for *N. gonorrhoeae*, so nucleic acid amplification is preferred.

If the effusion is hemorrhagic, trauma is the most common cause, followed by coagulopathy or neoplasm.

Differential diagnoses

-Traumatic arthritis: bloody synovial fluid, history of trauma)

-RA: symmetric, RA usually mimics septic arthritis and can be very difficult to tease out one or the other).

-Gout or pseudogout: history of prior attacks, often first metatarsal joint location, tophi, crystals on synovial fluid. Look for crystals,

BUT if crystals are positive and gram stain is positive, the patient can have both! Treat for both!

-Reactive arthritis: GI or GU symptoms, conjunctivitis, or skin lesions

Treatment

Drain the joint. You can do this during the initial arthrocentesis and your patient will thank you for it. Consider a septic joint as an abscess!

Who needs surgery? When drainage not achieved by bedside, penetrating trauma with residual foreign body, joint effusion persists days after aspiration.

Antibiotic selection

Gram positive suspected: start with Vancomycin → if MSSA use cefazolin, nafcillin, oxacillin

 \rightarrow if MRSA, vancomycin, daptomycin, linezolid, clindamycin

Gram negative suspected: ceftriaxone, cefotaxime, ceftazidime, cefepime

The initial antibiotic regimen should be tailored to culture and susceptibility results when available.

Time course: for patients with septic arthritis due to S. aureus in the setting of concomitant bacteremia (but no evidence of

endocarditis), IV therapy for four weeks is preferred. In general, no matter the cause, most studies agree on four weeks total of therapy.

Prognosis

One study showed 3% mortality. It causes higher morbidity than people think, mainly for older patients and with comorbidities. In one study, polyarticular septic arthritis had a mortality rate up to 50%!

In one study with 121 septic arthritis cases, a "poor joint outcome" (amputation, arthrodesis, prosthetic surgery, or severe functional deterioration) was found in 1/3 of patients. Again, the biggest adverse prognostic factors were old age and pre-existing joint disease. IV drug abuse patients with septic arthritis are high risk for morbidity, and it's getting more common. In one nation-wide series of septic knees, patients with injection drug user-related septic arthritis increased from 5% in 2000 to 11% in 2013.

References: for a complete list of references, please check out our website under this topic heading. We are trying to conserve paper and save the world ;)