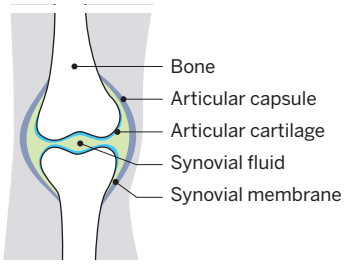
SEPTIC ARTHRITIS

Septic arthritis, also known as infectious arthritis, is a severe type of orthopedic infection. It occurs when bacteria, mycobacteria, fungi, or viruses infect an articulating joint, causing inflammation of the synovial membrane and accumulation of purulent fluid within the joint capsule.

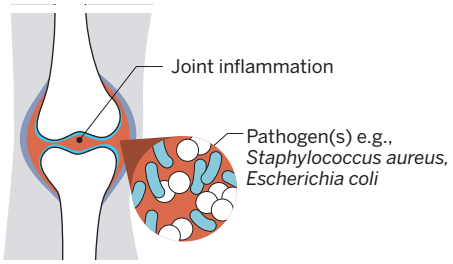
SEPTIC ARTHRITIS

- **Septic arthritis is a medical emergency** which, if not treated rapidly, can lead to irreversible damage to the joint resulting in significant disability and an increased risk of death.
- Septic arthritis most commonly affects young children, the elderly, anyone with an artificial joint or existing joint disease, and immunocompromised people.
- **Prosthetic joint infection (PJI)** is a subcategory of septic arthritis where the infection involves a surgically implanted prosthetic joint. It is useful to think of PJI and **native joint septic arthritis (NJSA)** separately because the evaluation, differential diagnosis, and treatment strategies are somewhat different.[1]

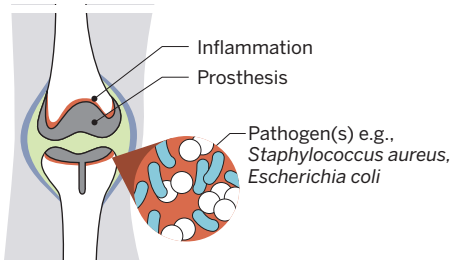
HEALTHY KNEE JOINT



NATIVE SEPTIC ARTHRITIS OF KNEE JOINT



PROSTHETIC KNEE JOINT INFECTION



THE BURDEN OF SEPTIC ARTHRITIS

Joint infections represent a **heavy health and economic burden** for patients and society, and prosthetic joint infections are particularly costly to treat.

NATIVE JOINT SEPTIC ARTHRITIS[1-4]

- 4-10 new cases/year/100,000 population
- 84% admitted to hospital
- 7-15% mortality among patients hospitalized with septic arthritis
- 55% discharged to skilled care facility or require home health care

PROSTHETIC JOINT INFECTION[1,5-9]

- Rising arthroplasty volumes in developed countries will markedly amplify the future healthcare burden
  - US hip arthroplasty volumes are projected to increase by 176% by 2040 and 659% by 2060; knee arthroplasty by 139% and 469%
- Examples of infection rates:
  - 2.2% US
  - 0.85% Germany
  - 1.41% Finland
  - 0.76% Taiwan
- The management of PJI is expensive, time-consuming, and resource-intensive

CAUSES AND CLINICAL PRESENTATION OF SEPTIC ARTHRITIS[1,2,7]

Septic arthritis is caused by bacteria, mycobacteria, fungi and, less commonly, viruses.

PATHOGENS CAN ENTER THE JOINT VIA THREE ROUTES

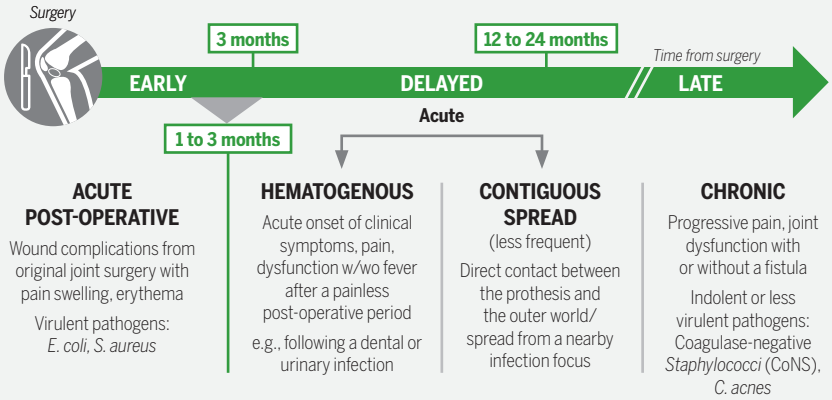
- **From another infection in the body via the bloodstream (most common)**
- **From a penetrating injury or during surgery**
- **Spread from an infection in adjacent bone or soft tissues (skin, muscles, etc.)**

NATIVE JOINT SEPTIC ARTHRITIS

- **Many Gram-positive and Gram-negative bacteria can cause NJSA:**[2]
  - *S. aureus* is the most common for all ages
  - *K. kingae* is significant in children < 5 years
  - *N. gonorrhoeae* is an important cause in sexually active patients
- **Signs and symptoms:**
  - joint pain/tenderness
  - erythema
  - warmth
  - edema/joint effusion
  - fever

PROSTHETIC JOINT INFECTION

Likely pathogens correlate with time since surgery [7, 10-16]



DIAGNOSTIC APPROACH [1-2, 7, 10, 16-19]

- **Diagnosis of joint infections is complicated** as they are often associated with hard-to-grow organisms. In PJI, biofilm-forming organisms and polymicrobial infections may also be present. Traditional testing methods may therefore require multiple tests and it can take up to two weeks to identify the pathogen(s). Also, it is not uncommon for the diagnosis to be made without ever identifying the pathogen.
- **The molecular syndromic testing approach enables rapid and accurate identification of multiple pathogens and antimicrobial resistance markers**, including fastidious organisms, anaerobes and polymicrobial infections, and remains valuable even in patients pre-treated with antibiotics.
  - **In native joint septic arthritis**, the SANJO guideline recommends the use of molecular PCR techniques on synovial fluid in patients receiving antibiotics at the time of aspiration, when difficult-to-culture pathogens are suspected, or when cultures remain negative despite a strong clinical suspicion.
  - In addition, **in children**, molecular PCR testing is recommended when cultures are negative or in suspected K. kingae infection, improving pathogen detection, particularly after prior antibiotic exposure.
  - **In prosthetic joint infections**, ICM recommendations consider molecular techniques promising adjuncts to conventional diagnostics, particularly in culture-negative cases, when rapid pathogen identification is critical, when rare organisms are suspected, or in high-risk patients such as those with recurrent PJI.
- Syndromic PCR tests may help to more rapidly and easily identify the cause of non-specific symptoms, such as joint pain, red or swollen joints in a **clinically actionable timeframe**. More rapid results may potentially **reduce the time to targeted therapy** and **may support a better surgical strategy.**

NATIVE JOINT SEPTIC ARTHRITIS

A positive synovial fluid culture confirms the diagnosis. In addition, molecular PCR testing on synovial fluid is recommended when cultures are negative, when prior antibiotic therapy has been administered, or when difficult-to-culture pathogens are suspected. [2, 18, 20]

Blood culture bottles are frequently used to increase the sensitivity of synovial fluid culture.

- Arthrocentesis/surgery to collect synovial fluid for Gram stain, culture, molecular, and histological and inflammatory marker analyses.
- Radiologic assessment of the joint.
- Blood tests for markers of inflammation.
- Differential diagnosis includes rheumatoid arthritis, reactive arthritis, gout/pseudogout, trauma, degenerative joint disease.

PROSTHETIC JOINT INFECTION

Diagnosis is criteria-based and various organizations have published recommendations. [10, 16-17, 21-24]

- Presence of a sinus tract is a common, definitive criteria.
- In addition to synovial fluid analysis/culture, blood tests, and radiologic evaluation:
  - Multiple peri-prosthetic tissue biopsies are obtained for histopathology and culture
  - Sonicate fluid culture (useful for detecting biofilm-producing organisms)
- Two or more positive cultures with the same organism are recommended to confirm the diagnosis.

TREATMENT STRATEGIES

NATIVE JOINT SEPTIC ARTHRITIS [2, 20]

- **Surgery** to drain the infection and wash out the joint.
- **Antibiotics** are usually given for 3-6 weeks, based on susceptibility testing when available or local resistance patterns and trends.

PROSTHETIC JOINT INFECTION [1, 7, 14-15, 20-22]

Along with antibiotics and drainage, a decision must be made in regard to **retaining *vs.* removing/replacing the prosthesis**. While this treatment decision is not standardized, the table below lists different options and their considerations.

SURGICAL OPTIONS	CONSIDERATION	TREATMENT / PROCEDURE
DAIR*	Presentation < 30 days	ATBX** (e.g., Rifampin + Fluoroquinolone) x 2-6 weeks
One-stage replacement arthroplasty	No sinus tract Healthy patient and soft tissue Prolonged ATBX use No bone graft Low-virulence organism with good ATBX sensitivity	Remove and replace prosthesis ATBX Impregnated cement IV*** ATBX x 4-6 weeks
Two-stage replacement arthroplasty	Highly recommended for infected joint > 4 weeks Must be medically fit for multiple surgeries Requires adequate bone stock	Remove prosthesis ➔ ATBX spacer ➔ IV ATBX x 4-6 weeks ➔ new prosthesis implanted
Resection arthroplasty	Poor bone and soft tissue quality Recurrent infection with MDR**** organism	Remove infected tissue and hardware without reimplantation Joint fused
Unfit for surgery	Refuse surgery	Suppressive ATBX

* DAIR: Debridement, antibiotics and implant retention; **ATBX: Antibiotics; ***IV: Intravenous; ****MDR: Multi-drug resistant.

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