SEPTIC ARTHRITIS

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Septic arthritis is a relatively uncommon disease. However, even a slight delay in diagnosis can result in severe destruction of the joint and possible spread into adjacent bone (1) (Fig. 1). The podiatric physician should be familiar with the diagnosis and treatment of septic arthritis to prevent the devastating sequelae. The diagnosis should be considered when examining any monoarticular erythematous, hot, swollen joint. Septic arthritis has a propensity for joints of the lower extremity with the knee being the most common site (1).

PATHOGENESIS

The etiology of septic arthritis is contiguous spread, direct implantation, hematogenous sources or surgical contamination.

Contiguous spread occurs when osteomyelitis is present in the metaphyseal or epiphyseal bone. Bacteria can spread into subchondral bone leading to eventual infection of the joint.

Septic arthritis can result from bacteria invading the synovium through the blood stream. This source is more common in children and is usually the result of otitis media or upper respiratory tract infections.

Direct implantation of bacteria into a joint may occur during a puncture wound. Contamination during surgery resulting in joint infections is more common when joint implants are used (2).

BACTERIOLOGY

Staphylococcus aureus is the most common organism over all age groups (3, 4). Depending on the age of the patient and predisposing factors other organisms become more prevalent. In the neonate, Streptococcus and gram negative organisms are more common (3). H. influenzae is a common agent in children from ages six months to five years (3). Teenage patients have a higher incidence of Neisseria gonorrhoeae caused septic arthritis. Less than five percent of adult septic arthritis is caused by E. coli, Pseudomonas mirabilis and P. aeruginosa (5). However, P. aeruginosa infections are common following puncture injuries (6).

Patients suffering from sickle cell anemia often have salmonella recovered as the offending organism. In compromised patients, such as burn victims or drug abusers, Serratia marcescans pyarthrosis is common. Other organisms have been reported in the literature as infecting agents but are fairly uncommon.

Identifying the potential cause of the infection allows the physician to be more accurate in choosing his presumptive therapy. The goal to treatment in septic arthritis is early drainage with appropriate antibiotics. A thorough understanding of the potential organism that may be causing the infection can prevent unnecessary delays in therapy.

DIAGNOSIS

Patients with septic arthritis will present with an extremely painful, hot, and swollen joint. The patient will also exhibit varying signs of sepsis such as elevated temperature, malaise, tachycardia and confusion. The onset of symptoms is frequently rapid in development.

On physical examination the patient will demonstrate extreme pain on range of motion of the joint. They will attempt to splint the joint in the position of greatest comfort. The joint area will have signs of edema, erythema and an increase in local temperature.

Differential diagnosis will include acute rheumatic fever and acute juvenile arthritis in children. These two diseases can produce the same joint inflammation and pain that septic arthritis exhibits (7). In adults the differential diagnosis will include trauma, gout, pseudo-gout and foreign body synovitis as primary differentials (7).

Routine laboratory data may be of help. The peripheral white blood count is usually elevated with a shift to the left. Elevation of the sedimentation rate and a positive C-reactive protein may be found. However, the diagnosis of septic arthritis should not be dismissed simply on normal results of these studies (7). Blood cultures are positive in approximately 50 percent of the cases and should always be obtained (8).

Fig. 1. Appearance of articular surface erosion in patient with septic arthritis 48 hours after onset of symptoms.

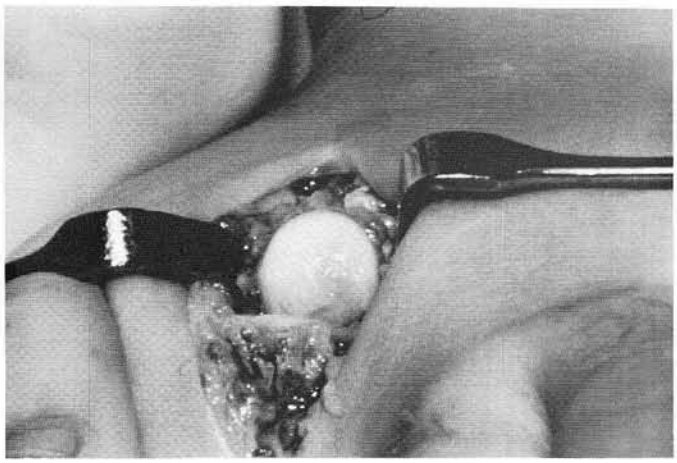

Fig. 1. A. Head of fourth metatarsal exposed during surgical arthrotomy.

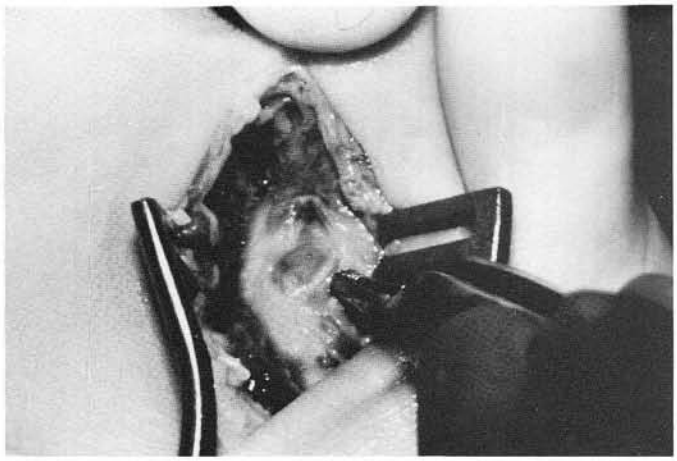

Fig. 1. B. Base of fourth proximal phalanx with defects extending to subchondral bone.

Radiographs are commonly negative in early stages. As the disease continues, severe joint effusion and a juxta-articular osteopenia will be appreciated. Joint narrowing can be quite progressive in the face of pyogenic arthritis (9). The progression of the radiographic findings is proportional to the virulence of the organism (Fig. 2). If osteomyelitis is also present, osseous erosion may be detected on x-ray. Routine radiographs should also be evaluated for the presence of fracture fragments or a foreign body.

Nuclide bone scanning techniques can be helpful in the early diagnosis of septic arthritis. Technetium-99 and Gallium-67 have been employed for this purpose (Fig.3) (9). Although these studies are very sensitive for infection, they lack specificity. Indium-111 labeled leukocytes have been reported by several groups to be both sensitive and specific for infection (10). The scan has been shown to be useful in differentiating between septic joints and painful inflammation following loosening of an implant.

Fig. 2. Radiograph of patient with septic arthritis of third metatarsophalangeal joint 5 days after onset of symptoms. Note irregularity with narrowing of joint surfaces and juxta-articular osteopenia.

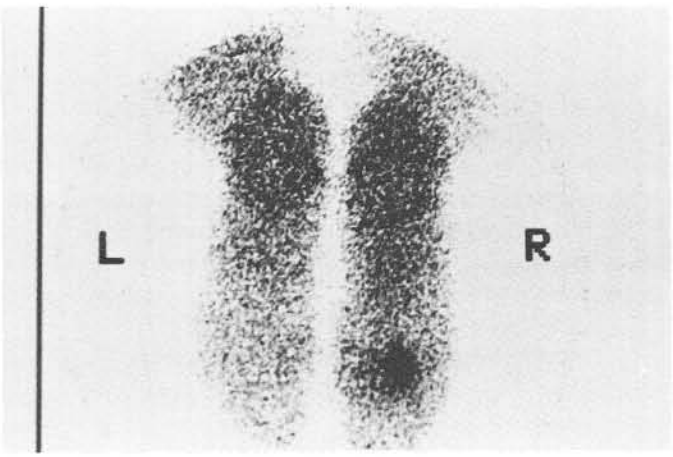

Fig. 3. Technetium-99 bone scan showing well defined increased uptake in area of third metatarsophalangeal joint in patient who was subsequently diagnosed as having septic arthritis.

Joint aspiration should be performed if one is considering septic arthritis. A contraindication to arthrocentesis is present if soft tissue infection is apparent. If a joint is entered through infected soft tissue, pathogenic organisms can be implanted into the joint. A previously sterile joint would then be contaminated. When joint aspiration is necessary in this situation the joint should be penetrated through non-cellulitic areas if possible.

The amount of fluid retrieved with aspiration will only be a few cc's in the joints of the foot. Therefore, the fluid should be analyzed for more critical studies first. In order of importance, the aspirate should undergo the follow-

ing studies: culture and sensitivity, gram stain, examination for crystals, white blood cell concentration and differential (11). Other studies such as protein glucose enzymes and viscosity have been found to have little or no value.

In septic arthritis the aspirate will vary in color from cloudy yellow to creamy white or gray. This usually varies with the duration or virulence of the infection (7). In most septic joints the white blood count will be higher then 100,000. The one exception to this is gonococcal arthritis, where the white blood count is usually below 50,000 cells (7). The differential count will consist of 90-95 percent polymorphonuclear leukocytes.

The gram stain and culture of the aspiration are very important for the definitive diagnosis of septic arthritis. Extreme care should be taken with culturing techniques. Certain organisms require a special environment for growth. An example is H. influenzae which requires a CO 2 environment. In some series the percentage of organisms reproduced by culture was as low as 70 percent (4). For that reason, the diagnosis of septic arthritis may have to be made on clinical grounds only in some patients.

TREATMENT

Successful management of septic arthritis requires prompt diagnosis followed by joint drainage and proper antibiotics (1, 12). Although current treatment with antibiotics has improved the outcome, significant sequelae are still seen. The extent of destruction is clearly related to the delay in therapy (1,12).

The principles of treatment of septic arthritis do not differ from those of any infection. The septic joint could be thought of as an abscess, requiring drainage for removal of the infection. The joint is a defined closed space which allows easier penetration for needle aspiration. The infected synovium allows for easy penetration of antibiotics into the joint (7).

Thorough debridement of the joint is necessary for complete eradication of the infection (13). The method of joint evacuation is a matter of controversy in the medical literature. Few studies have been able to clearly document a superiority in either multiple needle aspirations or in surgical arthrotomy.

Proponents of surgical drainage insist that it is impossible to completely debride the joint though a needle and that bacteria left in the joint will accelerate joint damage (13). Another criticism of multiple joint aspirations is associated pain and possible joint damage by the needle. Open debridement allows for direct visualization of the joint. This permits lysing of adhesions and debridement of necrotic bone or soft tissue that may be present. Goldstein et al. reported finding greater thinning of cartilage in those patients where needle aspiration had been performed as compared to those undergoing arthrotomy (14).

Proponents of the nonsurgical needle aspiration argue that arthrotomy can result in loss of function of the joint from fibrosis (13). The patient would also not have to withstand the stress of surgery and anesthesia. If the joint is packed open an additional surgery may be required for closure. Drains placed at the time of surgery may lead to additional infection. However, the smaller joints of the foot are often difficult to needle aspirate and that may lead to incomplete debridement.

Recent literature supports the use of arthroscopic drainage (15). Although this method may appear attractive, a significantly high failure rate has been seen (7). Further study of the method of debridement is necessary to prove it advantageous over current methods.

Fig. 4. Penetration of needle into joint should be angulated to allow easier access and prevent additional joint damage.

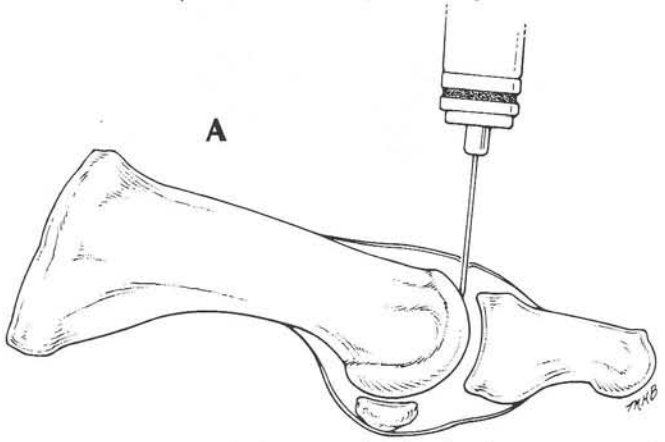

Fig. 4. A. Incorrect method can result in further damage to articular surface.

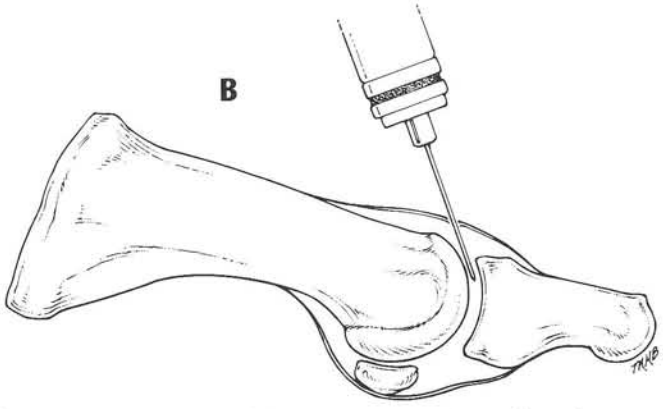

Fig. 4. B. Correct approach increases penetration without damage.

Fig. 5. Ten year old patient presenting with septic arthritis of second metatarsophalangeal joint secondary to puncture wound.

Fig. 5. A,B. Preoperative clinical and radiographic appearance. Note flattening of second metatarsal head.

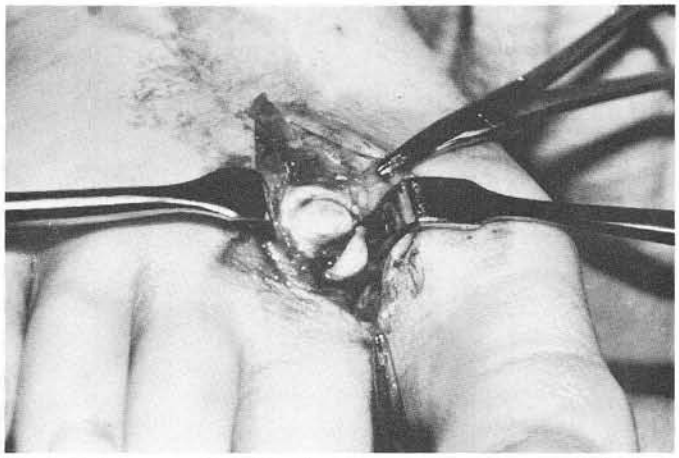

Fig. 5. C. Intraoperative clinical appearance showing severe destruction of second metatarsal head.

Fig. 5. D. Postoperative radiograph following debridement of second metatarsophalangeal joint.

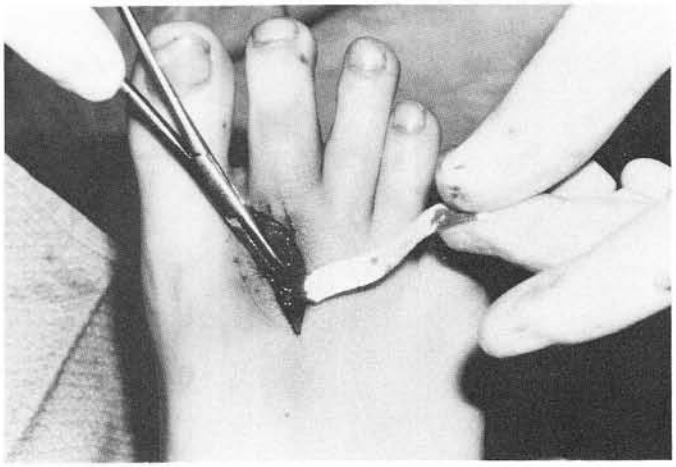

Fig. 5. E. Postoperatively wound packed and irrigated each day.

Fig. 5. F. Wound closed by secondary intention with sterile adhesive stripping.

Retrospective studies have shown the single aspiration with antibiotic within the first week of the disease as effective in the majority of cases (12,13). Surgery should be reserved for those patients who do not respond to aspiration. Arthrotomy should almost always be performed in patients with advancing osteomyelitis, infected joint implants, longstanding infections, or in the toxic patient. Only one study showed significant advantage with surgical therapy as the primary procedure (16). The remainder of the literature supports early needle aspiration (13).

Sterile joint aspiration should be performed with a large bore needle. The penetration of the needle should be in the correct manner to avoid possible damage to the articular surfaces (Fig.4). The initial drainage should be sent for appropriate studies. The joint may then be irrigated with sterile saline until the aspirate is clear. If fluid accumulates in the joint additional aspirations may be necessary. Surgery should be considered if there is no improvement or if there is regression after aspiration (13). There has been no additional compromise of the joint associated with those who required surgical debridement following failed aspiration (13).

Patients requiring surgical drainage may be packed open until the infection has cleared. Daily dressing changes with debridement and irrigation are performed until the wound is clean. At that time the wound may be coapted by delayed primary closure or allowed to close by secondary intention (Fig.5).

Following drainage the joint should initially be immobilized. As soon as the acute episode subsides gentle passive range of motion should be initiated. Early motion is critical in preventing significant decreases in range of motion. Immobilization can lead to extra articular fibrosis as well as intra-articular adhesions (13). Trias has shown in rabbits that intermittent pressure exerted during range of motion has led to cartilage regeneration (17).

Systemic antibiotics should be initiated as early as possible. Presumptive therapy should cover S. aureus adequately since it is the most common organism causing septic arthritis (3,4,18). Intravenous coverage should consist of nafcillin or cefazolin if the patient has no allergies. These medications have shown effectiveness in low minimal inhibitory concentrations (MIC) as well as excellent capsular perfusion. Patients with documented allergy to penicillin can be placed on clindamycin presumptively.

Additional empiric coverage may be necessary for some patients. Knowledge of the more common organisms associated with certain age groups and disease states can make the choice of presumptive antibiotics more beneficial. Therefore, a 2 year old presenting with septic arthritis should be covered for H. influenzae in addition to S. aureus. This patient may initially be started on cefuroxime. Cefuroxime is effective against B-lactamase producing Hemophilus as well as S. aureus.

Once culture and sensitivity tests return the therapy can be modified appropriately. Intravenous antibiotics should be continued for a minimum of 2 weeks (8,18). If the patient is responding well oral antibiotics can be administered from 2 to 4 weeks. Infusion of antibiotics directly into the joint has shown no advantage and may be inappropriate (19).

SUMMARY

Acute septic arthritis is an emergency situation requiring early diagnosis and appropriate therapy to obtain good results. The extent of damage to the joint is clearly related to the delay in time before treatment is initiated. Therapeutic regimens include early diagnosis, drainage of the joint and appropriate antibiotics. The method of drainage can be either surgical or non-surgical. Infected joints treated within the first 6 days of symptoms respond well to aspiration with antibiotics. Surgical arthrotomy should be reserved for longer standing, more severe, or infections still present after aspiration.

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