Infections in Orthopedics

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What are the most common causes of infection?
Predisposing factors are important to consider when determining what causes infection and who is at risk for infection. Patients who are susceptible or at risk include those with diabetes mellitus, cancer, or recent trauma; those taking steroids; those with recurrent urinary tract infections or sinus infections; those with skin infections or bed sores; those with poor dental care; those who are bacteria carriers; and infants and the elderly. After all of those predisposing factors are taken into account, the most common causes of infection are postoperative or surgical site infections.

What are the most common types of infections seen by orthopedic physicians?
We break it down into 3 categories: skin and soft tissue, bone (osteomyelitis), and joint (septic arthritis). Some of the most common infections we see in orthopedics are human immunodeficiency virus-associated infections, patients with sickle-cell anemia, and infections in joints, including Pneumococcal infections and Lyme disease.

What are the symptoms of infection?
The hallmarks are warmth, swelling, fluctuance, pain, and decreased mobility (ie, a painful joint that patients don’t want to use, or, in a child, not wanting to walk on an extremity).

What role does imaging play in infection diagnosis?
Technetium-99m-MDP bone scan for osteomyelitis is probably effective in 90% to 95% of cases of osteomyelitis within 24 to 48 hours of the onset of symptoms. Then, gallium combined with

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doi: 10.3928/01477447-20120327-04
indium-111 white blood cell scans used in conjunction with the bone scan can be helpful in identifying infection. Magnetic resonance imaging helps us look at the extent of the infection and inflammation in bone and soft tissue. Computed tomography helps define the extent of bony destruction. Computed tomography and ultrasound are both useful for image-guided aspiration or biopsy for obtaining cultures.

**How do you treat infections?**

The hallmark of treatment is identification of an organism, so ideally if you have a clinical suspicion of infection, you should get a culture before starting antibiotic treatment. Once the results of the culture come back, you can treat presumptively with antibiotics. If there is an abscess or if the infection is in avascular tissue (where blood supply won’t bring antibiotics to the site), surgical debridement is required.

Also, identifying the right patient is crucial. Intravenous drug users typically get infections with *Pseudomonas*; infants are more susceptible to *Staphylococcus aureus*, group B *Streptococcus*, and gram-negative coliform; and in the 6-month to 4-year age group, it is *Haemophilus influenzae*. Empiric antibiotic treatment depends on getting a good history or physical examination.

**What are the preventative measures that should be taken pre-, peri-, and postoperatively to reduce the risk of infection?**

Controlled studies are currently being done to determine what we can do preoperatively to reduce infections. A hot topic is whether showering with antibacterials the night before or morning of surgery helps reduce the risk of infection.

Also, approximately 25% of people carry *S aureus* in their noses, so they are chronic *Staphylococcus* carriers. Some people have advocated giving patients an antibiotic spray or cream for their noses to minimize the spread of infection. Researchers are also looking at surgeons to determine whether they are chronic carriers of infections such as *Staphylococcus* and methicillin-resistant *S aureus* and whether they should be treated for the infection before returning to the operating room.

**What are the risks associated with infection?**

The most obvious risks are the loss of limb and life. From a cost standpoint, postoperative infections result in $3.5 to $5.7 billion spent annually. For people who underwent total hip or knee arthroplasties and have infections that aren’t in the acute or subacute phase, we would take the implant out and use antibiotic-impregnated cement spacers with polymethylmethacrylate. Antibiotic-impregnated cement is also available. Then, systemic antibiotics with excellent surgical debridement and repeat surgical debridement are done. Once laboratory and clinical results, including erythrocyte sedimentation rate and C-reactive protein, are normal, reimplantation can occur.

**What progress has been made in the treatment of infection?**

One of the areas of interest is using polymerase chain reaction (PCR) for rapid identification of bacteria. It takes 24 to 48 hours to identify bacteria using traditional methods, whereas PCR offers the opportunity to identify it in much less time. Using PCR can identify infections after patients are already taking antibiotics and their cultures come back culture-negative. It is also useful for certain bacteria that are difficult to identify, such as nonfermenting gram-negative rods. DNA sequencing may play an important role in the future.

**What does the future hold for the treatment of infection?**

New classes of drugs are being developed for use with infections. One of them is antiviral strategies, in which the drug attacks the toxin instead of attaching to the bacteria. The drug acts as an antitoxin, or something that binds to the toxin or the toxin receptor and modifies the infection’s gene expression. Also, antibacterial biomaterials, such as coatings on metal implants, are being developed to minimize glycocalyx formation—a slime that grows on metal implants that provides an environment for bacteria to breed.

Potentiators, which make antibiotics more effective, are also being developed. In the future, we’re looking at therapies other than just plain antibiotics that can either enhance the effectiveness of antibiotics or work in a completely different mechanism to treat infection.