

Moderators' Summary: Antibiotics and Infection

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Historically, orthopaedic injuries in large-scale military campaigns have constituted more than half of United States battlefield casualties, a pattern that continues today in the global war on terrorism. Early administration of antibiotics, knowledge of common offending organisms, and management of acute and chronic infections are crucial to treating soldiers with orthopaedic injury.

Current recommendations regarding antibiotic prophylaxis are reviewed by Holtom. Antibiotic prophylaxis, which consists of a brief course of antibiotic therapy given before surgery to prevent infection, decreases the rate of wound infections after the surgical treatment of closed fractures. An antibiotic should be started at least 60 minutes before skin incision and continued for no longer than 24 hours. Antibiotic therapy is indicated for dirty or contaminated wounds. Continued research is needed into culture-specific selection of antimicrobials for prophylaxis, as are more precise guidelines for when therapy should be ended.

Prokuski reviews treatment of acute infections. A variety of acute infections can arise after musculoskeletal injury (particularly after substantial open wounds), including anaerobic myonecrosis, anaerobic cellulitis/fasciitis, tetanus, streptococcal myonecrosis, and acute osteomyelitis. Complex military musculoskeletal wounds are particularly susceptible to developing infection. Treatment includes débridement, culture-specific parenteral antibiotics, local antimicrobials, adequate soft-tissue coverage, and delayed reconstruction. Failure to resolve wound infection is attributable to

immune compromise of the host, antimicrobial resistance, wound-healing deficiencies, and the adherence of pathogens to wound surfaces via a biofilm. The pathogens, their biofilm, and the compromised tissue that provides a surface for adherence must be removed. In most instances, wide, thorough, repeat débridement is necessary. Continued research is needed into objective means of quantifying and defining the adequacy of débridement, the zone of injury, the bacterial load, and biofilms.

Failure of an acute inflammatory response to resolve a wound infection heralds a cascade of events affecting the host and pathogens. Chronic infection culminates in a refractory condition. As Cierny describes, the factors contributing to this outcome include immune compromise of the host, ineffective and antimicrobial therapy-resistant organisms, wound-healing deficiencies, and the adherence of pathogens to exposed wound surfaces via an impenetrable and resistant biofilm.

After removing the pathogens, their biofilm, the surfaces available for adherence, and all tissues compromising treatment, the treating team must discover factors contributing to pathogen persistence, analyze the various treatment options, and coordinate treatment. Imaging techniques are used to define the zone of injury. The host is quantitatively evaluated for wound-healing deficiencies through laboratory profiles. Pathogens are characterized via wound cultures and tissue samplings. Preoperatively, the anatomic extent of the anticipated débridement is mapped with regard to coverage, revitalization, and reconstruction. Probable outcomes of the

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various treatment options are compared, with the ultimate goal of an infection-free limb salvage achieved within the tolerance of the host.

When reconstruction is neither safe nor reasonable, amputation or palliation is considered. Once a treatment protocol has been select-

ed, the surgical approach to débridement is expansile and atraumatic, and it is choreographed to coincide with procedures necessary for future reconstruction. All nonvital tissue, foreign bodies, and hardware are removed. Dead space and instability are eliminated. The host and wound

are resuscitated, and the antibiotic protocol is adjusted to cover new isolates. The reconstruction takes place as a clean-contaminated procedure. The methods used in reconstruction are tailored to the needs of the patient and matched to the resources of the treatment team.