

# OSTEOMYELITIS

## (INFLAMMATION OF THE BONE AND BONE MARROW)

### BASICS

#### OVERVIEW

- Sudden (acute) or long-term (chronic) inflammation of bone and the associated soft-tissue elements of bone marrow, endosteum (lining of the inner surface of the bone), and periosteum (membrane covering the outer surface of the bone)
- Usually caused by bacteria and rarely by fungi and other microorganisms

#### GENETICS

- Breeds with inherited immunodeficiency or blood-related diseases

#### SIGNALMENT/DESCRIPTION of ANIMAL

##### *Species*

- Dogs and cats

##### *Breed Predispositions*

- Breeds with inherited immunodeficiency and blood-related diseases

##### *Mean Age and Range*

- Blood-borne infections of the metaphysis (area between the end and the shaft of the bone, where bone growth occurs)—young dogs

##### *Predominant Sex*

- Male dogs—for post-traumatic infection; blastomycosis (a fungal infection)

#### SIGNS/OBSERVED CHANGES in the ANIMAL

- Sudden (acute) postoperative wound infections after orthopedic surgery may mimic signs of sudden (acute) osteomyelitis; may progress to long-term (chronic) disease
- Most patients have long-term (chronic) disease at time of examination and diagnosis
- Episodes of lameness
- Draining tracts
- Persistent ulcers
- Previous trauma
- Fracture or surgery—post-traumatic disease
- Affected vertebrae or intervertebral disks (dogs)—may note hind-limb weakness and difficulty in rising
- Travel to regions where fungal (mycotic) infections are common—fungal infection
- Sudden (acute) blood-borne disease (dogs)—sudden onset of systemic illness; fever (known as “pyrexia”); sluggishness (lethargy); limb pain; local signs of acute inflammation
- Long-term (chronic) condition—usually associated with chronic draining tracts, nonhealing ulcers, pain, secondary loss of muscle mass (known as “muscle atrophy”), and joint stiffness
- Unhealed fractures with infection—may note instability, grating detected with movement (known as “crepitus”), and limb deformity
- Fungal infections—may see limb swelling, lameness, and intermittently draining tracts
- Bone infections of the spine—may cause pain and nervous deficits (such as paralysis)

#### CAUSES

- Open fracture (that is, a fracture for which the skin is punctured, leaving an open wound to the fracture)
- Traumatic injury
- Surgical repair with metal implants of a closed fracture (that is, a fracture for which the skin was intact, prior to surgery)
- Elective orthopedic surgery
- Prosthetic or artificial joint implant
- Gunshot wound
- Penetrating foreign body
- Bite and claw wounds
- Involvement of bone from soft-tissue infection—inflammation/infection of tissues around and supporting teeth (known as “periodontitis”); inflammation/infection of the nose (known as “rhinitis”); inflammation/infection of the middle ear (known as “otitis media”); inflammation/infection of the nail bed (known as “paronychia”)
- Blood-borne infection
- Staphylococci—cause approximately 50% of bone infections; often single type of bacteria (known as “monomicrobial”) infections
- More than one type of bacteria (known as “polymicrobial”) infection—common; may contain mixtures of aerobic gram-negative bacteria (bacteria that can live and grow in the presence of oxygen); anaerobic bacterial cultures (for bacteria that can

live and grow in the absence of oxygen) should be submitted with potential isolates including: *Actinomyces*, *Clostridium*, *Peptostreptococcus*, *Bacteroides*, and *Fusobacterium*

- Fungal infection—*Coccidioides immitis*; *Blastomyces dermatitidis*; *Histoplasma capsulatum*; *Cryptococcus neoformans*; *Aspergillus*

### RISK FACTORS

- Open fracture (fracture for which the skin is punctured, leaving an open wound to the fracture) and bone contamination
- Soft-tissue trauma
- Bite and claw wounds
- Migrating foreign body
- Orthopedic surgery
- Prosthetic or artificial joint implant or metal surgical implant (such as bone plate)
- Cortical bone allograft (bone graft transplanted from genetically nonidentical animals of the same species)
- Immunodeficiency
- Methicillin-resistant bacteria populations are increasing in hospitals and veterinary clinics

## TREATMENT

### HEALTH CARE

- Inpatient—surgical removal of tissue (known as “débridement”), drainage, flushing the wound (known as “irrigation”), and wound management until infection begins to resolve; infected fractures (surgical stabilization)
- Outpatient—long-term antibiotics, administered by mouth
- Depends on severity, location, and degree of associated soft-tissue injury
- Take care to prevent infections by bacterial contamination from other patients in the hospital, so called “hospital-related infections”

### ACTIVITY

- Restricted—with any danger of a fracture occurring at the site of weakened bone (known as “pathologic fracture”); with an unhealed fracture

### DIET

- No restriction

### SURGERY

- Long-term (chronic disease)—surgical removal of tissue (débridement); removal of pieces of dead bone or bone that has become separated from blood supply (known as “sequestra”); establishment of drainage
- Infected stable fracture—leave pre-existing metal surgical implants in place during healing
- Infected unstable fracture—remove metal surgical implants; stabilize fracture by other techniques
- Bone deficits—bone graft
- Localized long-term (chronic) infection—may resolve infection by amputation (tail, digit, limb) or by surgically removing the entire affected area (known as “en bloc resection”)—sternum, thoracic wall, lower jaw [mandible], upper jaw [maxilla]—and primary wound closure
- Remove all metal surgical implants after the fracture has healed

## MEDICATIONS

Medications presented in this section are intended to provide general information about possible treatment. The treatment for a particular condition may evolve as medical advances are made; therefore, the medications should not be considered as all inclusive.

- Antibiotics—depend on susceptibility of microorganisms; also consider possible toxicity, frequency and route of administration, and expense; most penetrate normal and infected bone well; must be given for 4 to 8 weeks, possibly longer
- Staphylococci (dogs)—usually *Staphylococcus intermedius*, which are resistant to penicillin because of  $\beta$ -lactamase production; highly susceptible to cloxacillin, amoxicillin-clavulanate, cefazolin, and clindamycin
- Anaerobes (bacteria that can live and grow in the absence of oxygen)—more are sensitive to metronidazole and clindamycin
- Aminoglycosides and quinolones (ciprofloxacin and enrofloxacin)—effective against gram-negative aerobic bacteria (bacteria that can live and grow in the presence of oxygen)
- Quinolones—usually used only for infections caused by gram-negative organisms or *Pseudomonas* that are resistant to other antibiotics that can be given by mouth
- Long-term (chronic) disease—continuous local delivery of drugs by antibiotic-impregnated methylmethacrylate beads
- Itraconazole—used to treat fungal infections; given continuously, may control disseminated aspergillosis for up to 2 years
- Identify other antimicrobial drugs by repeating cultures and susceptibility determination if the infection becomes unresponsive to the initial agent

## FOLLOW-UP CARE

### PATIENT MONITORING

- X-rays—every 4 to 6 weeks; used to monitor bone healing
- Repeat bacterial culture of the bone for suspected persistent infection

### POSSIBLE COMPLICATIONS

- Recurrence of osteomyelitis (inflammation/infection of the bone and bone marrow)
- Long-term (chronic) disease—may result in limb deformity, impaired function, fracture disease, or nervous system deficits
- Cancer—rare complication of long-term (chronic) infection of fractures repaired by metal surgical implants

### EXPECTED COURSE AND PROGNOSIS

- Sudden (acute) infection and long-term (chronic) bacterial infection of the intervertebral disks and adjacent bone of the spine (known as “diskospondylitis”)—may be cured by 4 to 8 weeks of antibiotics, if bone death (necrosis) is limited and no fracture is present
- Long-term (chronic) disease—resolution with antibiotics alone unlikely; provide appropriate surgical treatment
- Recurrence of long-term (chronic) infection—evident by return of lameness or draining tracts; may occur weeks, months, or years after the last treatment; may require repeated surgical procedures

### KEY POINTS

- Treatment is expensive and therapy is of long duration
- Recurrence of long-term (chronic) infection—evident by return of lameness or draining tracts; may occur weeks, months, or years after the last treatment; may require repeated surgical procedures
- Long-term (chronic) disease—resolution with antibiotics alone unlikely; provide appropriate surgical treatment

