

Osteomyelitis



Steven K. Schmitt, MD

KEYWORDS

- Osteomyelitis • Diabetic foot infection • Hematogenous osteomyelitis
- Traumatic osteomyelitis • MRSA

KEY POINTS

- Hematogenous osteomyelitis is the most common presentation in children and is often medically treated, although methicillin-resistant *Staphylococcus aureus* infections may require surgery.
- Staging of osteomyelitis addresses both the extent of the disease and the underlying health of the host, and can help to suggest appropriate management steps.
- Probing to bone has a high correlation with infection in diabetic foot ulcers. Cross-sectional techniques such as MRI can suggest a diagnosis when clinical presentation is less clear.
- Appropriate treatment of diabetic foot infections includes assessment of vascular supply as part of the decision making regarding surgical debridement.
- Established infections in patients with open fractures may present as nonunion and require a combination of medical and surgical treatments.

INTRODUCTION AND HISTORY

Osteomyelitis is an infection of the bone. Several major syndromes are commonly seen, including hematogenous osteomyelitis, vertebral osteomyelitis (discussed elsewhere in this issue), osteomyelitis after trauma, and diabetic foot infection.

Osteomyelitis is an ancient disease, with fossilized evidence of animal infection hundreds of millions of years ago. Discussion of human osteomyelitis dates to the time of Hippocrates (460–370 BC).¹ Acute hematogenous osteomyelitis was called “abscessus in medulla” by Broomfield in 1773.² The coining of the term “osteomyelitis” is attributed to Nelaton in 1844.¹ In the preantibiotic era, osteomyelitis management was surgical, with standard of care consisting of debridement, saucerization, and wound packing with secondary healing. With the arrival of penicillin in the 1940s, mortality owing to staphylococcal osteomyelitis improved from around 30% to 10%, with

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Section of Bone and Joint Infections, Department of Infectious Disease, Medicine Institute, Cleveland Clinic, Cleveland Clinic Lerner College of Medicine, 9500 Euclid Avenue, Desk G-21, Cleveland, OH 44195, USA

E-mail address: schmits@ccf.org

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the literature evolving to discussion of the relative roles of surgical decompression and antibiotic therapy in the treatment algorithm.

EPIDEMIOLOGY AND CLASSIFICATION

In children, hematogenous osteomyelitis predominates and affects mostly long bones. In younger adults, osteomyelitis is often related to trauma or surgery. In older adults, the most common clinical presentations are contiguous osteomyelitis related to joint arthroplasty (discussed elsewhere in this issue), lower extremity osteomyelitis related to diabetes mellitus and vascular disease, and osteomyelitis related to decubitus ulceration.

There are 2 major classification schemes for osteomyelitis. The first, proposed by Lew and Waldvogel,³ is based on etiology. In this scheme, osteomyelitis is divided into 3 categories by pathophysiologic mechanism: hematogenous osteomyelitis; contiguous focus osteomyelitis from trauma, surgery, prosthetic material, or soft tissue spread; and vascular insufficiency osteomyelitis often seen in diabetes mellitus.

The second classification scheme, proposed by Cierny and Mader,⁴ provides some guidance for management. Osteomyelitis is divided by anatomic stages, and placed in the setting of host health status (Table 1). Host health status is defined by local and systemic factors (Table 2). Local host factors include edema, circulatory status, tobacco use, and neuropathy, whereas systemic factors include immunocompromising diseases such as neoplasm, organ failure and diabetes, age, and malnutrition. Stage I disease is typically treated with antibiotics, with more advanced stages requiring combined medical and surgical interventions.

PATHOPHYSIOLOGY

Hematogenous osteomyelitis of the long bones usually affects the metaphysis.⁵ Slowing of blood flow in vascular loops at the metaphysis near the epiphyseal plates leads to deposition of microbes and establishment of infection. An inflammatory response ensues, leading to increased pressure in the medullary bone. This pressure causes the infection to break through to the cortex and, if unchecked, ultimately through the periosteum. This can lead to decreased blood supply to the periosteum with bone necrosis.

Table 1
Cierny-Mader staging system: anatomic and physiologic types

	Type
Anatomic stage	Anatomic type
1	Medullary
2	Superficial
3	Localized
4	Diffuse
Physiologic host	Physiologic type
A	Normal host
Bs	Systemic compromise
Bl	Local compromise
Bls	Systemic and local compromise
C	Treatment worse than disease

From Cierny G 3rd, Mader JT, Penninck JJ. A clinical staging system for adult osteomyelitis. Clin Orthop Relat Res 2003;(414):7–24; with permission.

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