

Characteristics of Occult Infection With Nonunion Repair in Patients Without Clinical or Laboratory Signs of Infection

Nihar Samir Shah, MD; Matthew Frederickson, BS; Matthew David Doyle, BA; Ramsey Samir Sabbagh, MS; Evan C. Dowell, BA; Andres Mor Huertas, BS; H. Claude Sagi, MD
University of Cincinnati, Cincinnati, OH, United States

Purpose: Successful treatment of fracture nonunion requires both correct identification of the contributing factors and subsequent selection of appropriate therapy. Recent literature has described occult infections in the setting of nonunion as infections that slow progression of healing but do not present with signs of infection. The purpose of this study is to determine the incidence of occult infection in fracture nonunion, its causative organisms, and associated injury or patient characteristics.

Methods: Patients who presented to a single Level I trauma center with a primary compliant of fracture nonunion from 2014 to 2019 were identified using an institutional database. Patients were excluded for pathologic fractures, nonunion secondary to nonoperative management, and index nonunion repair at an outside hospital. Medical records were reviewed for demographic variables including age at time of nonunion repair, body mass index (BMI), sex, smoking status, diabetes, injury characteristics, culture results, and physical examination and laboratory values at time of presentation. Welch t tests and χ^2 tests were used to compare characteristics between groups.

Results: A total of 327 nonunion patients were identified, 65% (n = 211) of whom had no clinical or laboratory signs of infection at presentation. Following operative intervention, 6% (n = 13) of these patients had positive intraoperative cultures or gross purulence indicating occult infection. The most common organisms causing occult infection were low-virulence coagulase-negative staphylococci (CoNS) and *Propionibacterium acnes*. 35% of patients (n = 116) presented with clinical and /or laboratory signs of infection, with 14% (n = 16) of these patients having negative cultures. The most common organisms in the infected nonunion group were methicillin-resistant *Staphylococcus aureus* (MRSA) and gram-negative rods. There were no significant differences in age, sex, BMI, smoking or diabetes status, or percentage of open fracture between any of the groups. However, patients with occult infection were more likely to be of the upper extremity (62% vs 14%, $P < 0.01$) and less likely to involve the tibia (8% vs 64%, $P < 0.01$) when compared to those with signs of infection at presentation.

Conclusion: The incidence of infection in patients presenting for nonunion repair without clinical or laboratory findings consistent with infection is 6%. Occult infected nonunion occurs primarily in the upper extremity with pathogenic organisms almost exclusively of low virulence (CoNS and *P. acnes*). Given the significant incidence of occult infection, it is a prudent rule to obtain specimens for culture and pathology in all patients presenting for nonunion repair.