

Classification and Incidence of Bacterial Infections and Risk Factors for Recurrent Osteomyelitis in Infected Nonunion and Osteomyelitis Patients After Bone Fracture

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CONFLICTS OF INTEREST:

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ABSTRACT:

INTRODUCTION: Osteomyelitis is a complex clinical problem with a high recurrence rate that can occur due to a relapse of the original organism or reinfection with a different pathogen.

Previous studies suggest that gram positive cocci are the most common cause of bone infections and have identified possible risk factors for recurrence: repeated operations, post-traumatic osteomyelitis, internal fixation at the first stage bone exposure, and *Pseudomonas aeruginosa* infection. However, the comprehensiveness of these studies is lacking. The purpose of this study is to investigate the most common bacteria in traumatic osteomyelitis and infected nonunion cases and identify risk factors for recurrent osteomyelitis in these patients.

METHODS: A retrospective analysis of 1825 patient charts following fracture fixation with a diagnosis of an infected non-union or osteomyelitis was conducted from 2006-2018. We performed a descriptive analysis for both nominal and categorical variables and a multivariate analysis for risk factors for recurrent osteomyelitis, including demographic data, comorbidities, location of osteomyelitis, microbiologic data, and surgical outcome data. Statistical analysis with linear regression was performed using JMPSAS software.

RESULTS: The 141 patients included in our analysis had a mean age of 53.65 ± 14.8 years old with the majority being male. The most common comorbidities identified were tobacco use and

hypertension. The most common locations of osteomyelitis were tibia/fibula and spine. The most common type of bacteria isolated in those patients with infected nonunion were Methicillin-sensitive *Staphylococcus aureus* and Methicillin-resistant *Staphylococcus aureus* (MRSA). The three most common antibiotics administered were Vancomycin, Doxycycline, and Daptomycin. The top two complications in those patients with infected nonunion were wound healing problems and recurrent infection. Risk factors for developing recurrent osteomyelitis include days until infection, elevated hematocrit, and number of complications. While factors decreasing the risk of recurrent osteomyelitis were elevated hemoglobin and elevated CRP.

DISCUSSION: The finding of the most common causal organisms being MSSA and MRSA, gram-positive cocci, is consistent with published literature and our hypothesis. Vancomycin, Doxycycline, and Daptomycin were the most commonly employed antibiotics, consistent with the treatment of these gram-positive cocci infections. Wound healing problems and recurrent infections were the most common complications, but our results suggest conflicting data regarding which factors increase and decrease the risk for recurrent osteomyelitis. Further analysis into this data is warranted and ongoing, particularly with regards to the contradictory nature of elevated hemoglobin decreasing risk while elevated hematocrit increases risk. Limiting factors of this study include the small percentage of the original cohort included (7.7%), a result of the high number of diabetic foot wounds without fracture in our initial cohort, as well as strict inclusion criteria. Future plans include further analysis into risk factors for recurrence, as well as relating complications and cases of recurrent osteomyelitis and infected nonunion to antibiotics used in treatment of certain bacteria. This analysis will hopefully allow us to develop a more effective and streamlined protocol for hospital management of osteomyelitis and infected nonunion and decreased prevalence of complications and recurrence.