Regional and Seasonal Variations in Posttraumatic Infections After Open Fracture

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Purpose: The purpose of this study was to determine if either the incidence of posttraumatic infection or the causative organism varies with season of the year or geographic region in which an open fracture occurred.

Methods: A representative Level I trauma center from each of the seven climatic regions of the United States (Northwest, High Plains, Midwest/Ohio Valley, New England/Mid-Atlantic, Southeast, South, and Southwest) took part in this study. A retrospective review of all skeletally mature patients sustaining an open fracture of either the upper or lower extremity between 2007 and 2012 was undertaken. Charts were analyzed to extract information regarding date of injury, Gustilo-Anderson grade of open fracture, any subsequent treatment for a posttraumatic wound infection, and the causative organisms. Patients from each region were placed into one of four groups based on the time of year that the injury occurred: spring (March-May), summer (June-August), fall (September-November), and winter (December – February). χ^2 analysis was used to assess whether any observed differences were of statistical significance.

Results: A total of 4149 patients were included in the analysis. The overall incidence of infection for all open fractures across the US was 8.9% (368 patients) and this did not vary significantly by season (spring 10.1%, summer 8.0%, fall 9.1%, winter 8.5%). There were, however, significant differences in overall infection rates between the climatic regions: Southeast 5.1%, Northwest 6.7% ($P = 0.1077$), Southwest 8.1% ($P = 0.0008$). Midwest/Ohio Valley 10.1% ($P < 0.0001$), High Plains 14.6% ($P < 0.0001$), and South 15.1% ($P < 0.0001$). Additionally, some climatic regions showed a significant seasonal variation in the incidence of infection. The Northwest region was lowest in spring and highest in winter (5.0% vs. 10.6%, $P = 0.0066$), the Southwest was lowest in summer and highest in fall (4.4% vs. 12.0%, $P < 0.0001$), the High Plains region was lowest in summer and highest in fall (6.5% vs. 21.4%, $P = 0.0033$), and the Southeast was lowest in fall and highest in spring (3.8% vs. 6.7%, $P = 0.0057$). The Midwest/Ohio Valley and the South did not demonstrate a seasonal variation in infection rates. The most common causative organism varied not only by region, but peak season as well. The regions with the highest rate of infection in the spring (South, Southeast, and Midwest/Ohio Valley) reported methicillin-resistant *Staphylococcus*

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aureus (MRSA) as the most common causative organism, while the regions with the highest infection rates in the fall and winter (High Plains, Southwest, and Northwest) reported methicillin-sensitive *S. aureus* (MSSA). Within the individual regions, seasonal variations existed with respect to the causative organism as well.

Conclusion: A significant seasonal and regional variation exists regarding both the incidence of infection as well as the causative organisms for posttraumatic wound infection following open fractures. We recommend that surgeons consult with their infectious disease colleagues to better understand these variations for their individual hospital, and adjust their treatment regimens accordingly.