New Techniques and Emerging Evidence #NT9

Clinical Cases, Solutions, and Novel Techniques

Using Next-Generation Sequencing to Explore Scalpel Contamination During Upper Extremity Fracture Repair: Applying New Technologies to Solve Old Questions

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Purpose: Surgical dogma suggests surgical blades function as a vehicle for introducing bacteria to the surgical site. However, the literature surrounding the prevalence of surgical blade contamination has varied significantly over the past several decades. In this study, modern high-throughput DNA sequencing was used to detect bacterial DNA on surgical blades used for skin incision in patients undergoing upper extremity fracture open reduction and internal fixation.

Methods: This was a prospective, pilot study conducted at a tertiary care center. All acute, closed upper extremity fractures requiring operative stabilization were consecutively enrolled. The primary end point was defined as the presence of bacterial DNA on the surgical blade. At the time of surgery, 2 sterile blades were simultaneously opened into the sterile field and placed on separate handles. The control blade remained on the sterile instrument table and was not used for any part of the procedure. The test blade was used for the initial skin incision and superficial dissection. The blades were then sent for next-generation sequencing (NGS) analysis following the manufacturer protocol. Negative control blades were opened directly into a sterile container while positive control blades were used for skin incision through known, visible infection.

Results: 40 patients were enrolled in this study. The median age was 33.5 years old and 30% were female; the median body mass index was 26.52. Humerus fractures were the most common injury (17, 42.5%), followed by clavicle fractures (13, 32.5%) and radius/ulna fractures (10, 25.0%). NGS analysis revealed no contamination of surgical blades used for skin incision; 3 control blades tested positive for bacterial DNA. Median time to surgery was 12.5 days, with 85% of patients treated as outpatient procedures. Negative-control blades tested negative for bacterial DNA (0/2); positive-control blades tested positive for bacterial DNA contamination (2/2).

Conclusion: Surgical blades used for skin incision in the upper extremity are not contaminated with bacteria as measured by NGS. This finding, challenges established surgical dogma regarding surgical blade contamination, and further supports that the same surgical blade can safely be used for deeper dissection.