

Exploring Versatile Applications of a Vacuum-Assisted Bone Harvester in Orthopedic Surgery

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Abstract:

Background: Orthopedic procedures often require removing bone or pathological tissue, with traditional methods involving instruments like curettes and rongeurs. However, these methods can be time-consuming and lead to increased blood loss. To mitigate these side effects, vacuum-assisted tools have been developed to aid in tissue removal. These devices enable surgeons to suction tissue without discarding it, potentially improving outcomes in conditions such as osteomyelitis or tumor removal while enabling collection of the material for downstream applications. Despite limited research, vacuum-assisted devices show promise beyond bone marrow harvesting. This study assesses outcomes from the use of vacuum-assisted tissue removal, with a goal to understand if these devices can be used for tissue removal across a variety of pathologic conditions.

Methods: A retrospective cohort study was conducted on patients undergoing orthopedic procedures with the Avitus[®] Bone Harvester repurposed from its original design from December 1, 2021, to July 1, 2023. Procedures were categorized into oncology, and debridement for infection cases. Infection cases were further categorized into those secondary to trauma and those involving primary infections (osteomyelitis and periprosthetic joint infection). Clinical variables, including demographics, intraoperative details, complications, and follow-up, were reviewed. Statistical analysis included descriptive statistics computed with R Studio.

Results: The study included 44 patients, with debridement for infection cases being the most common (primary infection: 45.5%; infection secondary to trauma: 18.1%), followed by oncology cases (36.4%). In all oncology cases, a definitive diagnosis was established using the device, and no post-operative infections were reported. The infection clearance rate was 85.0% for primary infection cases and 50.0% for cases of infection following trauma. Across the entire cohort, the average blood loss was 314.52 mL (sd: 486.74), and the average total procedure time was 160.93 minutes (sd: 91.07). The overall reoperation rate was 47.7%, with an unplanned reoperation rate of 11.4%.

Discussion: The vacuum-assisted bone harvester was effectively utilized in a wide range of debridement and curettage procedures across diverse orthopedic surgeries. In oncology cases, the device enabled effective tissue removal with low recurrence rates, demonstrating its potential to minimize contamination while preserving tissue for accurate diagnoses. Additionally, a high rate of osteomyelitis eradication was observed in debridement for primary infection cases. The utilization of the device should be guided by considerations of cost-effectiveness and patient-specific risk factors.