

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

BACKGROUND

Orthopedic surgeries often involve **removing bone or pathological tissue**, traditionally done with instruments like **curettes and rongeurs**.



These methods can be **time-consuming**, lead to **increased blood loss**, and risk **contamination of adjacent tissues**.

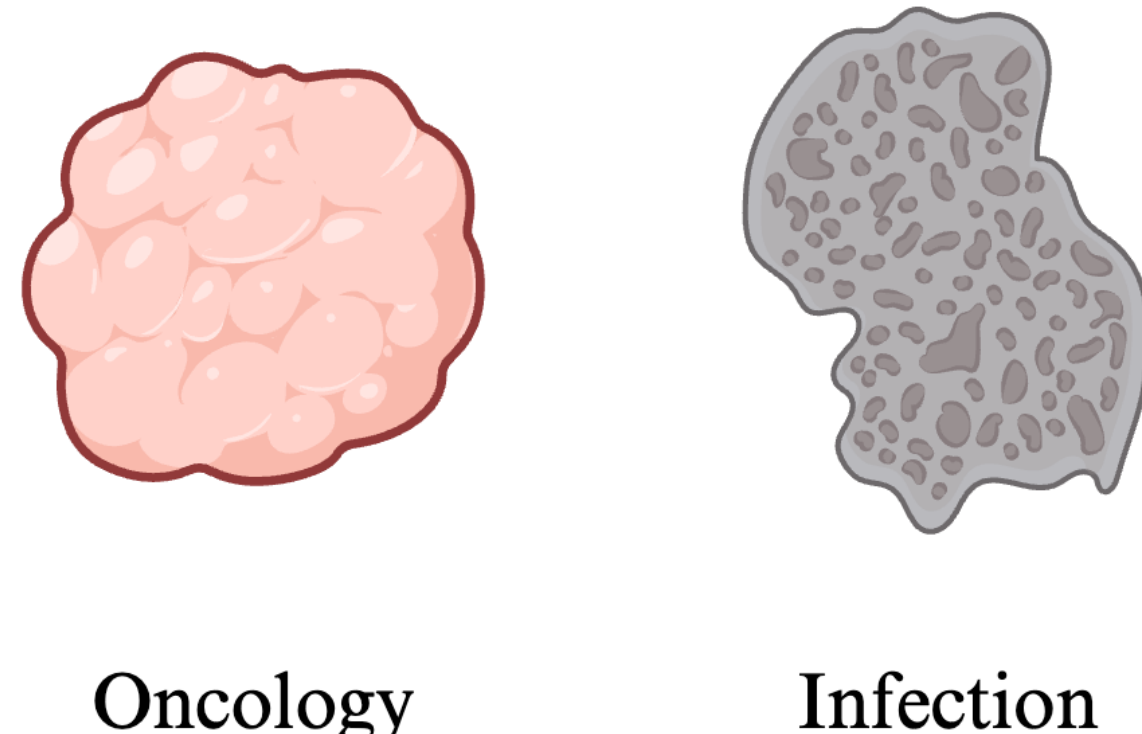
Vacuum-assisted tools have been developed to **aid tissue removal**, enabling suction without discarding tissue, potentially improving outcomes and enabling tissue collection for downstream applications.

Limited research exists on **vacuum-assisted devices beyond bone marrow harvesting**.

METHODS

Retrospective cohort study on patients undergoing orthopedic procedures with the **Avitus® Bone Harvester** repurposed for tissue removal from December 2021 to July 2023.

Procedures categorized into **oncology** and **debridement for infection cases**, further classified into **primary infection** and **infection following trauma**.



Data collected on demographics, intraoperative details, complications, and follow-up.

Statistical analysis conducted using descriptive statistics in R Studio.

RESULTS

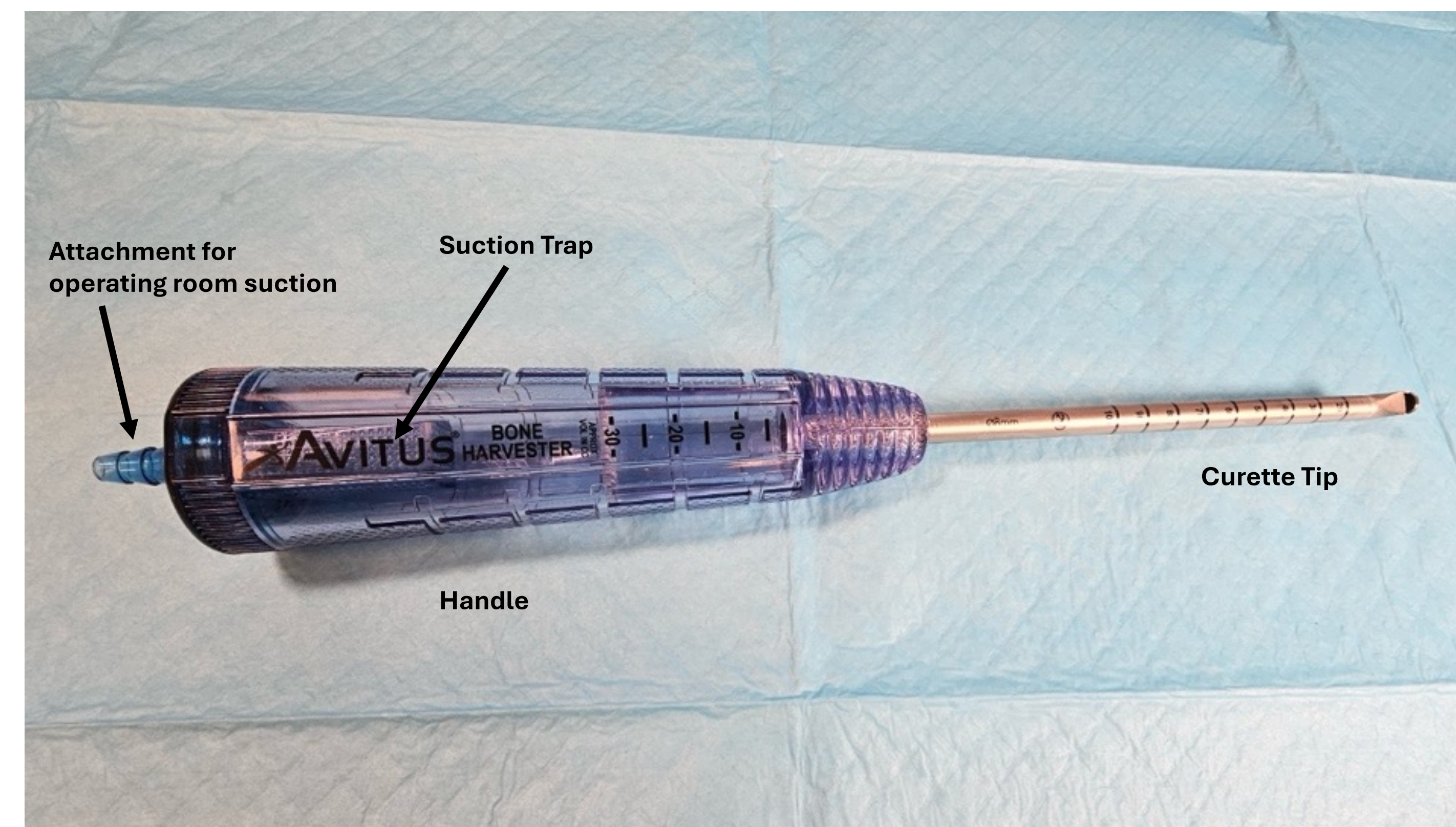


Figure 1. The Avitus® Bone Harvester. The device is made up of a curette attached to a handle that can be linked up to standard operating room suction. The handle contains a suction trap that allows it to store debrided tissue.

Table 1. Oncology Cases Outcomes

| Breakdown | Oncology Cases (n=16) |
|-------------------------------------|-----------------------|
| Benign-aggressive tumor | 9 (56.3) |
| Metastatic bone tumors | 7 (43.8) |
| Outcomes | |
| Total Procedure Blood Loss, mL (sd) | 153.75 (200.52) |
| Total Procedure Time, min (sd) | 149.63 (60.87) |
| Complications, n (%) | |
| Persistent Pain | 6 (37.5) |
| Infection | 0 (0.0) |
| Reoperation, n (%) | 6 (37.5) |
| Time to Reoperation, days(sd) | 238.33 (161.91) |

Abbreviations: n, number; sd, standard deviation; mins, minutes; ml, milliliters

There were **44 patients** included, with **debridement for infection cases most common (45.5%)**, followed by **oncology cases (36.4%)**.

Table 2. Outcomes from Infection Cases

| Outcomes | Primary Infection Cases (n=20) | Infection following Trauma Cases (n=8) |
|-------------------------------------|--------------------------------|--|
| Total Procedure Blood Loss, mL (sd) | 442.4 (644.86) | 316.67 (306.05) |
| Total Procedure Time, min (sd) | 154.50 (78.97) | 199.63 (154.80) |
| Persistent Infection, n (%) | 3 (15.0) | 4 (50.0) |
| Persistent Pain, n (%) | 2 (10.0) | 0 (0.0) |
| Reoperation, n (%) | 8 (40.0) | 7 (87.5) |
| Time to Reoperation, days(sd) | 102.40 (97.74) | 38.29 (45.57) |

Abbreviations: n, number; sd, standard deviation; mins, minutes; ml, milliliters

In **oncology cases**, definitive diagnosis established using the device, **no post-operative infections reported**.

Infection clearance rate 85.0% for **primary infection cases**, **50.0%** for **infection following trauma**.

Average **blood loss 314.52 mL**, average total **procedure time 160.93 minutes**.

Overall reoperation rate **47.7%**, unplanned reoperation rate **11.4%**.

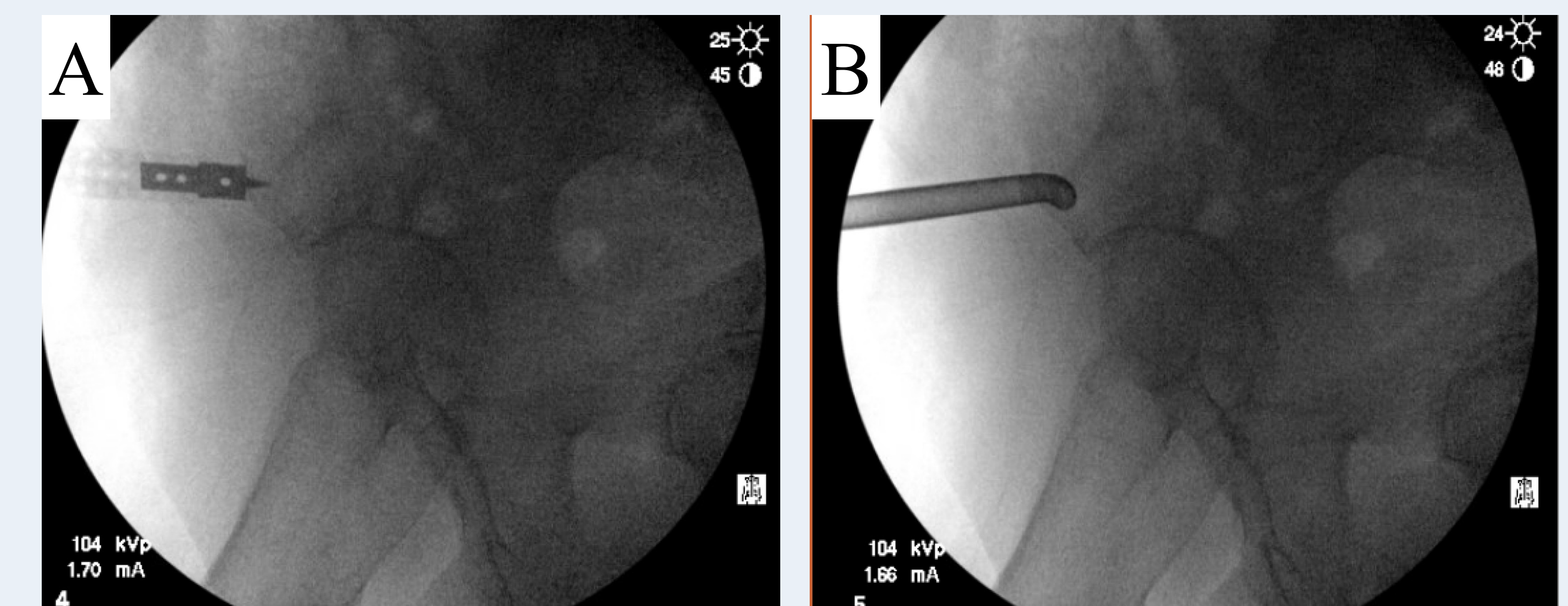


Figure 2. Intraoperative fluoroscopic images demonstrating the use of the device. (A) A pilot hole creator with an anchor tip (Avitus® Pilot Hole Creator) is used to create a circular cortical bone window. (B) The tip of the vacuum-assisted device is guided to the corticotomy site.

CONCLUSIONS

Vacuum-assisted bone harvester effectively utilized in **a wide range of debridement and curettage** procedures across diverse orthopedic surgeries.

Effective tissue removal in oncology cases with low recurrence rates, demonstrating potential to minimize contamination and **preserve tissue for accurate diagnoses**.

High rate of osteomyelitis eradication observed in debridement for primary infection cases.

Device utilization should consider **cost-effectiveness** and **patient-specific risk factors**.

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