

# Surgical Methods for Buruli Ulcer Treatment: A literature Review

Minatulah Elzawawy BA<sup>1</sup>, Bianca Sanabria MA<sup>1,2</sup>, Babar Rao <sup>2,3,4</sup>

1. Rutgers Robert Wood Johnson Medical School 2. Center for Dermatology, Rutgers Robert Wood Johnson Medical School 3. Rao Dermatology, Atlantic Highlands, NJ 4. Department of Dermatology, Weill Cornell Medicine

## Background

Buruli Ulcer (BU) is a necrotizing disease of the skin and soft tissue caused by *Mycobacterium ulcerans*. It is a neglected topical disease that occurs mainly in Central and West Africa, where 1775 of the 2121 new cases were reported in 2022. Initially, these lesions present as painless solitary or multiple nodules or plaques and progress to ulceration, mostly located on the lower leg. Although rare, Buruli ulcers can result in permanent disfigurement and long-term disability. To reduce functional loss, early diagnosis and treatment is essential. Over the years, the recommended treatment modalities described in literature have changed. The main treatment of BU shifted from the use of surgery with wide-excision margins to the use of rifampicin-based combinations of antibiotics. However, recently, literature has shifted again to emphasize the benefits of surgery as a treatment modality, especially to speed up wound healing and prevent tissue loss resulting from antibiotic-induced paradoxical reactions. Additionally, new surgical methods such as biopsy mapping recently described in literature have been recommended as ways to limit functional and cosmetic sequelae following surgery. This review serves to summarize the surgical methods and adjunct laboratory and microscopy techniques described in literature.

## Materials and Methods

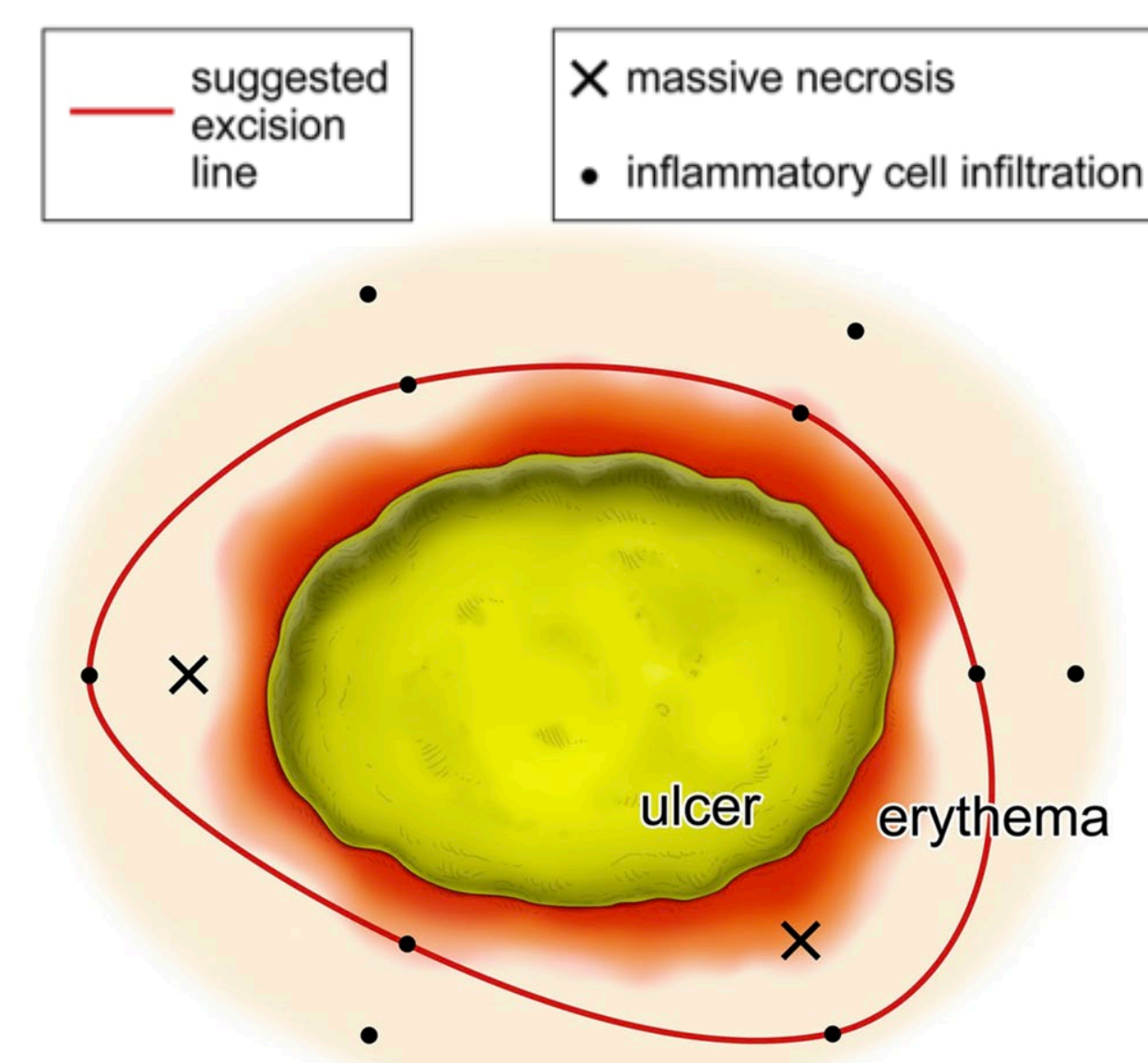
We conducted a PubMed search using the MeSH terms ("Buruli Ulcer"[Mesh]) AND ("Buruli Ulcer/pathology"[Majr] OR "Buruli Ulcer/surgery"[Majr]). The search was limited to articles on human species and available in the English language. All study types were included. Articles that did not specify Buruli ulcer surgical methods were excluded.

## Results

Table 1: Summary of Major Surgical Methods used in combination with antibiotics

Surgical Approach	Procedure	Aim	Considerations
<b>Wide Excision</b>	Wide margins are used to excise lesion including macroscopically unaffected tissue.	To remove infected tissue and reduce bacterial burden in excision margins.	<ul style="list-style-type: none"> <li>• Suitable for small and moderate lesions (&lt;1600 mm<sup>2</sup>).</li> <li>• May require reconstructive surgery</li> <li>• May result in large scars</li> </ul>
<b>Conservative Excision</b>	Involves excision only of the macroscopically involved tissue without excising healthy tissue. Followed by direct closure of the wound.	To reduce wound healing time and avoid reconstructive surgery.	<ul style="list-style-type: none"> <li>• Suitable for small or moderate (&lt;1600 mm<sup>2</sup>) excision where direct closure is possible.</li> </ul>
<b>Curette of lesion</b>	Involves curettage of macroscopically abnormal skin and subcutaneous tissue including wound edges. Leaves wound open to heal by second intention.	To reduce duration of antibiotics and wound healing time.	<ul style="list-style-type: none"> <li>• Suitable for small lesions (&lt;400 mm<sup>2</sup>) being concurrently treated with antibiotics.</li> </ul>
<b>Debridement</b>	Necrotic or inflamed tissue is debrided. Typically, it does not involve excision of wound edges or macroscopically abnormal tissue.	To increase the rate of wound healing by removing necrotic tissue and mycolactone toxin which inhibits wound healing.	<ul style="list-style-type: none"> <li>• Suitable for any lesion size</li> <li>• Ideal for large lesions where conservative excision is not possible.</li> </ul>
<b>Biopsy Mapping</b>	Several punch biopsies are taken around the ulcer followed by histological analysis to distinguish necrosis vs inflammatory cell infiltration. Only sites with histological necrosis are debrided. Sites with inflammatory cellular infiltration indicate healing and can be preserved.	To avoid unnecessary radical resection and increase rate of wound healing by using histological necrosis to determine extent of debridement.	<ul style="list-style-type: none"> <li>• Suitable for any lesion size.</li> <li>• Ideal for treatment of paradoxical reactions.</li> <li>• Requires advanced resources and trained physicians.</li> </ul>

Figure 1: Mapping Biopsy Method



Adapted from (Takahashi et al 2020)

## Discussion

Surgery in combination with antibiotics is recommended to speed up wound healing, reduce the duration of antibiotic treatment, and prevent or treat paradoxical reactions that impair wound healing. Paradoxical reactions occur during antibiotic treatment due to the reversal of immune inhibition by mycolactone toxin. This can complicate clinical decisions on the extent of debridement or excision, which typically rely on macroscopic evaluation. However, recent studies have recommended biopsy mapping and the use of histological necrosis to determine the extent of debridement. This distinguishes between immune cell infiltration and necrosis to avoid unnecessary radical surgery. While surgery is an efficient approach in the management of Buruli ulcers, our review highlights the need for studies to compare the effectiveness and recurrence risk of different surgical methods. This can

help establish guidelines for surgical approaches and specific criteria (macroscopic and histologic) to determine the extent of resection.

## References

Takahashi T, Kabuto M, Nakanishi G, Tanaka T, Fujimoto N. Histological and quantitative polymerase chain reaction-based analysis of Buruli ulcer using mapping biopsy method. PLoS Negl Trop Dis. 2020 Jun 22;14(6):e0008051. doi: 10.1371/journal.pntd.0008051. PMID: 32569298; PMCID: PMC7332088.

A full list of references is available upon request.

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