

Enzymatic Debridement as a Tissue-Sparing Wound Bed Preparation Strategy in a Preterm Newborn With Postoperative Wound Dehiscence: An Off-Label Case Report

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Case Report

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Abstract

Achieving effective wound bed preparation while preserving fragile viable tissue remains a major challenge in neonatal surgical wounds. Surgical wound dehiscence following excision of sacrococcygeal tumors in preterm newborns is associated with delayed healing, high risk of infection, and frequent presence of necrotic tissue. Enzymatic debridement based on bromelain is an established approach in burn care, but evidence in neonatal postoperative wounds is extremely limited.

This case report describes the off-label use of bromelain-based enzymatic debridement in a late preterm newborn who developed a full-thickness postoperative wound dehiscence after surgical excision of a giant sacrococcygeal tumor. Following multidisciplinary evaluation, enzymatic debridement was performed under procedural sedation in a neonatal intensive care setting, followed by advanced wound management including antimicrobial dressings, regenerative therapies, and supportive treatments.

The procedure was well tolerated, with no local or systemic adverse events. Rapid removal of non-viable tissue, reduction of inflammation, and progressive granulation were observed, leading to complete wound closure within three weeks.

This case suggests that enzymatic debridement may represent a tissue-sparing strategy for wound bed preparation in complex neonatal postoperative wounds when conventional approaches are not feasible. Further studies are required to define safety, indications, and standardized protocols.

Introduction

Surgical wound dehiscence in preterm newborn

Surgical wound dehiscence (SWD) represents a relevant postoperative complication in neonatal surgery and is associated with increased morbidity, prolonged hospitalization and higher risk of infection.^{1,2} Preterm newborns are particularly vulnerable, with reported incidence rates markedly higher than those observed in term infants and adults, especially after major abdominal or sacrococcygeal procedures.^{3,4} The management of SWD in this population is often complex, requiring a balance between effective wound bed preparation (WBP)⁵ and minimization of tissue trauma.

Neonatal skin vulnerability

The increased susceptibility of preterm newborn to wound complications is closely related to the structural and functional immaturity of their skin barrier. Reduced epidermal thickness, impaired dermal-epidermal cohesion, and altered inflammatory responses contribute to delayed healing and higher risk of tissue breakdown following surgical stress or infection.^{6,7}

Bromelain-based enzymatic debridement (NexoBrid[®], MediWound, Israel) beyond burns

Bromelain-based enzymatic debridement is an established and evidence-based approach for the management of deep partial- and full-thickness burns, including pediatric patients. Its mechanism of action is based on the selective degradation of necrotic tissue while sparing viable dermal structures, a property that underpins its favorable safety profile in burn care. This selective enzymatic activity may be particularly relevant in fragile tissues, where preservation of viable skin is crucial. However, evidence regarding its application in non-burn wounds, especially in neonatal postoperative settings, remains extremely limited, and its use in this context is still off-label.⁸

Rationale and aim of the case report

In complex neonatal surgical wounds characterized by significant fibrin burden, inflammation, and high contamination risk, alternative strategies for WBP may be required when conventional approaches fail or are not feasible. This case report describes the off-label use of bromelain-based enzymatic debridement in a late preterm newborn with postoperative wound dehiscence following excision of a giant SCT, aiming to explore its feasibility, safety, and clinical impact within a multidisciplinary neonatal intensive care setting.

Case presentation

Patient informations

A late preterm female newborn (33 weeks of gestational age) was delivered by cesarean section and diagnosed at birth with a giant sacrococcygeal teratoma (SCT). No prenatal diagnosis had been established, as the pregnancy had progressed in a war-affected setting where access to regular antenatal care and routine ultrasound screening was severely limited. Consequently, the mass was identified only at delivery. Due to the size and complexity of the lesion, the patient was transferred at 7 days of life to a tertiary pediatric surgical center for definitive surgical management.

Clinical findings and initial assessment

Following surgical excision of the giant SCT, classified according to the Altman system as type II due to the predominantly external mass with significant intrapelvic extension⁹, the newborn was managed in the Neonatal Intensive Care Unit (NICU) for postoperative monitoring and supportive care. The initial postoperative course was influenced by the anatomical location of the surgical site, the need for prolonged prone positioning, and frequent handling for clinical care. On postoperative day 6, signs of impaired wound healing became evident, leading to the identification of a central surgical wound dehiscence in the lumbosacral region and prompting referral to the Wound Care Team for specialist assessment.

On initial evaluation, the sacrococcygeal surgical wound was classified as a Sandy Grading System stage 3a¹⁰, consistent with a full-thickness wound dehiscence. The wound bed was completely covered by necrotic fibrinous tissue, with no visible granulation tissue. Marked local inflammatory signs were present, including intense erythema, increased local warmth, edematous and irregular wound edges, and moderate to increased exudate. According to the STONEES criteria¹¹, the wound showed features suggestive of local infection, including erythema, increased exudate, presence of non-viable tissue, exposure of deeper tissues, and lack of healing progression.

The wound measured approximately 3 cm in the cranio-caudal direction and 12 cm latero–laterally. Due to the immediate proximity of the wound edges to the anal region, the risk of fecal contamination was high, and the application of negative pressure wound therapy (NPWT) was not feasible.

During wound assessment and dressing changes, the newborn exhibited pain and discomfort upon contact and manipulation of the wound. Pain was assessed using the Neonatal Pain, Agitation and Sedation Scale (N-PASS)¹², with scores consistent with moderate procedural pain (N-PASS pain score average 4), requiring careful analgesic management during wound care procedures. Figure 1A and 1B shows the wound appearance at initial assessment.

Please insert Fig. 1A here.

Please insert Fig. 1B here.

Figure 1A and 1B. Initial wound assessment on postoperative day 6. The sacrococcygeal surgical site shows a full-thickness wound dehiscence (Sandy Grading System stage 3a), with complete coverage of the wound bed by necrotic fibrinous tissue, inflamed and edematous wound edges, and moderate to increased exudate.

Timeline of clinical events

The sequence of clinical events is summarized in Table 1.

Table 1
Chronological sequence of major clinical events during hospitalization. Abbreviations: SCT, Sacrococcygeal teratoma.

Postoperative Day	Clinical Event
Day 0	Surgical excision of giant SCT
Day 6	Onset of central lumbosacral surgical wound dehiscence
Day 7	Specialist wound care assessment; wound classified as Sandy Grading System 3a
Day 10–12	Standard advanced wound care; persistent fibrinous burden
Day 13	Off-label enzymatic debridement with bromelain-based enzymatic debridement under procedural sedation
Day 14	Marked reduction of inflammation and necrotic tissue; early granulation observed
Day 16–18	Progressive granulation and wound improvement
Day 34	Complete wound closure; discontinuation of wound dressings
Day 45	Patient discharged in stable clinical condition

Please insert Table 1 here.

Table 1. Chronological sequence of major clinical events during hospitalization. Abbreviations: SCT, Sacrococcygeal teratoma.

Diagnostic assessment

During the postoperative course, microbiological surveillance revealed a high infectious burden, with multiple positive screening swabs indicating extensive colonization by multidrug-resistant organisms. In the context of clinical deterioration, blood cultures became positive, and the patient developed septic shock, requiring prompt escalation of antimicrobial therapy and hemodynamic support in the Neonatal Intensive Care Unit.

Broad-spectrum antimicrobial treatment was initiated and subsequently adjusted according to microbiological findings and clinical response, following an antimicrobial stewardship approach. Despite systemic infection control, the surgical wound remained characterized by persistent non-viable tissue and local inflammatory signs, suggesting that impaired wound healing was driven not only by systemic infection but also by local factors.

Diagnostic assessment of the wound was limited by the anatomical location in the lumbosacral region, with close proximity to the anal area and a high risk of fecal contamination. These factors constrained

the use of advanced diagnostic and therapeutic tools, including NPWT, and supported the need for alternative strategies for WBP.

Therapeutic Intervention

Therapeutic Intervention

Standard wound care prior to enzymatic debridement

Following identification of the surgical wound dehiscence, standard advanced wound care strategies were initiated with the aim of controlling local infection, managing exudate, and promoting wound bed preparation. Cleansing and antisepsis were performed using polyhexanide-based solutions (PHMB), followed by the application of antimicrobial dressings and moisture-balancing agents, including Dialkyl Carbamoyl Chloride (DACC) based materials and hydrogels. Silicone contact layers were used to protect the wound edges and minimize trauma during dressing changes.

Despite these measures, the wound remained characterized by a persistent fibrinous and necrotic burden, significant local inflammation, and lack of effective wound bed progression. Frequent dressing changes were required due to the anatomical location and high risk of fecal contamination, further complicating local wound management. Local antimicrobial dressings were systematically applied as part of the wound care strategy to reduce bacterial load and prevent secondary infection. Despite exposure to multiple risk factors for contamination, microbiological surveillance combined with systemic antimicrobial therapy allowed adequate control of the microbial burden, with no evidence of uncontrolled local infection at the time of reassessment. Given the limited response to conventional wound care and the impossibility of applying NPWT, an alternative strategy for selective WBP was considered.

Off-label enzymatic debridement with a bromelain-based agent

A multidisciplinary discussion involving pediatric surgeons, plastic surgeons, neonatologist and wound care nurse specialists led to the decision to perform off-label enzymatic debridement using a bromelain-based agent. Written informed consent for off-label use was obtained from the parents after detailed explanation of the procedure, potential risks, and expected benefits.

The procedure was performed in the NICU, allowing continuous cardiorespiratory monitoring and immediate availability of advanced neonatal support. Procedural sedation and analgesia were achieved according to local neonatal sedation protocols, with fentanyl (2 µg/kg) and ketamine (2 mg/kg) for the procedure of application, and ketamine (2mg/kg) exclusively for removal. During the procedure, the patient remained in spontaneous breathing, without any oxygen supply or further medication. Pain and discomfort were constantly assessed using the N-PASS, with no significant evidence of inappropriate sedation. In the observation period between procedures, cardiorespiratory parameters remain stable, without clinical relevant morphological ECG changes or arrhythmias such as tachycardia. No clinical

immediate complications have been reported, such as hyperthermia or anemia, nor suspected adverse reactions.

After wound cleansing and protection of the surrounding skin with transparent polyurethane film, bromelain-based enzymatic debridement was prepared and applied according to the manufacturer's instructions, ensuring complete coverage of the wound bed, and covered with transparent polyurethane film (Fig. 2).

Please insert Fig. 2 here.

Figure 2. Application of the bromelain-based agent for enzymatic debridement, with protection of the perilesional skin using transparent polyurethane film.

The enzymatic agent was left in place for 4 hours under sterile occlusion, according to manufacturer's instructions¹³. At the end of the exposure time, the product was removed using sterile irrigation. The wound bed appeared well debrided, with selective removal of non-viable tissue and preservation of viable structures (Fig. 3). No local or systemic adverse events were observed during or after the procedure.

Please insert Fig. 3 here.

Figure 3. Wound bed after enzymatic debridement showing effective selective removal of non-viable tissue with preservation of viable structures.

Adjunctive therapies

Following enzymatic debridement, adjunctive therapies were introduced to support tissue regeneration and modulate local inflammation, with careful consideration of safety and biocompatibility in the neonatal population¹⁴.

Photobiomodulation therapy using blue light was applied as a supportive, non-invasive treatment to assist inflammation control and cellular metabolism. This modality was selected for its favorable safety profile and its proposed mechanism of action, which includes stimulation of mitochondrial activity and modulation of inflammatory pathways. In neonatal tissues, where excessive inflammatory responses and oxidative stress may impair healing, photobiomodulation was considered an appropriate supportive approach to promote physiological wound repair without additional tissue trauma.¹⁴

In addition, injectable treatments combining hyaluronic acid and amino acids (HA + AA) were used as part of the wound care strategy.^{15,16} This approach was based on the biological role of hyaluronic acid in neonatal wound healing, as fibroblasts in early life are known to preferentially produce hyaluronic acid (HA) rather than collagen during the initial phases of tissue repair.¹⁶ HA provides a highly biocompatible extracellular matrix scaffold, supports cell migration, contributes to hydration of the wound environment, and participates in regulation of the inflammatory response. The association with amino acids (AA) was

intended to further support cellular metabolism and tissue regeneration in the developing organism, as well as to limit enzymatic degradation of HA.¹⁶

As part of the adjunctive wound management strategy, an enzymatic antimicrobial alginogel based on glucose oxidase, lactoperoxidase, and guaiacol (GLG) technology was used as the primary dressing during the healing phase.^{17,18} This alginogel was selected to support local antimicrobial control through a physiological enzymatic mechanism, without reliance on conventional antimicrobial agents and without known mechanisms associated with antimicrobial resistance. The formulation allowed gentle filling of the wound cavity, adapting to wound geometry without exerting pressure on the wound edges or wound bed, thereby minimizing the risk of compression-related microcirculatory impairment, which is particularly relevant in fragile neonatal tissues. The alginate component also contributed to absorption of wound exudate, supporting moisture balance and protection of the periwound skin.^{17,18}

The enzymatic alginogel was maintained as the primary dressing between HA + AA injections and photobiomodulation sessions, which were performed as clinically indicated. As a secondary dressing, a paraffin-impregnated gauze was applied to protect the wound surface, and the entire dressing system was consistently secured with a silicone-based contact layer, with the aim of minimizing trauma during dressing changes and preserving periwound skin integrity.

This adjunctive approach was integrated into the overall wound care protocol as a supportive, non-aggressive strategy, aligned with the physiological processes of neonatal wound healing and adapted to the anatomical and contamination-related challenges of the lumbosacral region.

Details of therapeutic interventions, including drug dosages, dressing strategies, and adjunctive treatments, are summarized in Table 2.

Table 2

Overview of standard wound care, enzymatic debridement, adjunctive therapies, and dressing strategies applied during the clinical course. Abbreviations: HA + AA, Hyaluronic Acid and Amino Acids; DACC, Dialkylcarbamoyl Chloride; ECM, Extracellular Matrix; GLG, Glucose Oxidase, Lactoperoxidase, Guaiacol; NICU, Neonatal Intensive Care Unit; N-PASS, Neonatal Pain, Agitation and Sedation Scale; PHMB, Polyhexamethylene Biguanide; WBP, Wound Bed Preparation.

Intervention	Details	Rationale	Exchange frequency
Standard wound care (pre-bromelain-based enzymatic debridement)	PHMB-based cleansing; local antimicrobial dressings (DACC with hydrogels); silicone contact layers; frequent dressing changes	Control of local bioburden, moisture balance, protection of wound edges, and WBP	Daily or earlier if clinically indicated (fecal contamination)
Procedural sedation and analgesia	Fentanyl and Ketamine with continuous cardiorespiratory monitoring; pain monitored with N-PASS	Ensure procedural comfort and safety during enzymatic debridement in NICU setting	Fentanyl $\approx 2 \mu\text{g/kg}$ + Ketamine 2 mg/kg for the application procedure; Ketamine 2 mg/kg exclusively for the removal procedure
Enzymatic debridement (bromelain-based enzymatic debridement application)	Off-label bromelain-based enzymatic debridement application under sterile occlusion for 4 hours in NICU	Selective removal of non-viable tissue while preserving viable structures	1 application for 4 hours
Adjunctive primary dressing	Enzymatic antimicrobial alginogel GLG technology	Physiological antimicrobial control without known resistance mechanisms; gentle cavity filling; exudate absorption; microcirculation preservation	Daily or earlier if clinically indicated (fecal contamination)
Adjunctive regenerative therapy	Injectable HA + AA, administered during healing phase	Support neonatal wound healing physiology, ECM scaffolding, hydration, and cellular metabolism	Every 96 hours (5 applications)
Adjunctive inflammation modulation	Photobiomodulation therapy (blue light), applied as clinically indicated	Non-invasive modulation of inflammation and support of cellular metabolism	Every 96 hours (5 applications)

Intervention	Details	Rationale	Exchange frequency
Secondary dressing	Paraffin-impregnated gauze secured with silicone-based contact layer	Protection of wound surface and minimization of trauma during dressing changes	As adjunctive primary dressing

Please insert Table 2 here.

Table 2. Overview of standard wound care, enzymatic debridement, adjunctive therapies, and dressing strategies applied during the clinical course. Abbreviations: HA + AA, Hyaluronic Acid and Amino Acids; DACC, Dialkylcarbamoyl Chloride; ECM, Extracellular Matrix; GLG, Glucose Oxidase, Lactoperoxidase, Guaiacol; NICU, Neonatal Intensive Care Unit; N-PASS, Neonatal Pain, Agitation and Sedation Scale; PHMB, Polyhexamethylene Biguanide; WBP, Wound Bed Preparation.

Follow-Up and Outcomes

Clinical follow-up after enzymatic debridement demonstrated a favorable and progressive wound healing trajectory. Within 24 hours after bromelain-based enzymatic debridement application, the wound bed appeared clean and well prepared, with effective removal of non-viable tissue and the presence of early bleeding points, indicating preservation of viable tissue. Local inflammatory signs showed a marked reduction, with decreased erythema, edema, and exudate. The periwound skin remained intact.

In the subsequent days, the wound exhibited progressive granulation tissue formation across the entire wound bed, accompanied by further reduction of inflammatory signs. Local wound management was continued using the planned adjunctive strategy, with enzymatic antimicrobial alginogel GLG as the primary dressing, supported by HA + AA injections and photobiomodulation therapy as clinically indicated.

Throughout the follow-up period, all treatments were well tolerated, and no local or systemic adverse events related to enzymatic debridement, adjunctive therapies, or dressing strategies were observed. Pain and discomfort during wound care procedures were adequately managed, and no signs of procedural distress or delayed healing attributable to the treatment approach were noted.

Over the following weeks, continued wound contraction and epithelialization were observed, leading to complete wound closure within 21 days after enzymatic debridement (Fig. 4).

Please insert Fig. 4 here.

Figure 4. Wound appearance at 21 days, showing complete closure following enzymatic debridement.

As healing progressed, the need for advanced wound dressings was gradually discontinued. At the time of discharge, the surgical site was fully healed and the patient was clinically stable, with no evidence of wound-related complications.

Patient perspective

The parents reported satisfaction with the wound management approach and no perceived distress during the postoperative course.

Discussion

From a wound care perspective, the main challenge in this case was not only the presence of a postoperative dehiscence, but the difficulty in achieving effective WBP in a highly fragile tissue environment. In preterm newborns, reduced dermal-epidermal cohesion and increased susceptibility to mechanical stress^{6,7} limit the applicability of standard debridement strategies.

Postoperative wound dehiscence in preterm newborns represents a challenging clinical scenario, often associated with prolonged healing times, increased risk of infection, and limited tolerance to aggressive surgical interventions. In the present case, the wound was located in the lumbosacral region, in close proximity to the anal area, which significantly increased the risk of fecal contamination and precluded the use of NPWT. Despite adequate systemic infection control and advanced local wound care, the wound remained dominated by fibrinous and necrotic tissue, indicating failure of conventional WBP strategies⁵.

Within this context, enzymatic debridement was considered as an alternative approach to achieve selective removal of non-viable tissue while minimizing mechanical trauma to viable structures. bromelain-based enzymatic debridement is well established in burn surgery, where its selective enzymatic action allows effective debridement while preserving viable dermal tissue⁸. Although its use in non-burn wounds, particularly in neonates, remains off-label and poorly documented, this mechanism of action may be theoretically advantageous in fragile postoperative wounds where surgical or sharp debridement is undesirable or associated with high risk.

When considering available debridement strategies, each option presents relevant limitations in the neonatal setting. Surgical or sharp debridement, although effective, may be associated with excessive tissue loss and bleeding, and often requires more invasive management. Autolytic debridement is less traumatic but may be too slow and insufficient in the presence of extensive fibrin or necrotic tissue, especially in contaminated wounds. Enzymatic debridement, on the other hand, provides a more selective approach, targeting non-viable tissue while preserving viable structures^{5,8}.

The concept of tissue preservation is particularly relevant in neonatal wound care, where even limited additional tissue damage may significantly affect healing⁸. In this context, enzymatic debridement may represent a balanced approach, allowing effective WBP without the drawbacks associated with more aggressive or slower techniques.

In this case, a single application of bromelain-based enzymatic debridement under NICU-level monitoring and procedural sedation resulted in rapid wound bed transformation, with visible preservation of viable tissue, early bleeding points, and marked reduction of local inflammatory signs within 24 hours. This was followed by progressive granulation and complete wound closure within 21 days after enzymatic debridement. While causality cannot be established from a single observation, the temporal relationship suggests that effective and timely debridement of devitalized tissue may have played a key role in enabling subsequent wound healing.

Safety is a critical consideration when introducing off-label treatments in neonatal surgical patients^{19,20}. The procedure was performed in a controlled NICU environment, with continuous monitoring and standardized neonatal sedation protocols. No local or systemic adverse events were observed, and pain was adequately managed throughout the procedure and subsequent wound care. These findings suggest that, in highly selected cases and when delivered within a multidisciplinary framework, enzymatic debridement may be feasible and well tolerated in the neonatal population.

Post-debridement wound management relied on an integrated wound care strategy, including an enzymatic antimicrobial alginogel with GLG technology as the primary dressing, protective secondary dressings, and adjunctive therapies aimed at supporting tissue regeneration and inflammation control. Given the multimodal nature of the intervention, it is not possible to isolate the contribution of individual therapies. However, the structured integration of WBP,5 contamination control, and tissue-sparing dressings reflects a wound care-oriented surgical approach rather than reliance on a single therapeutic modality.

Taken together, these observations support the relevance of timely and selective WBP as a key step in the management of complex neonatal surgical wounds.

This report has important limitations. It describes a single case, with multiple concurrent interventions and a complex infectious background that may not be generalizable to other postoperative scenarios. Objective quantitative wound assessment tools and long-term follow-up beyond hospital discharge were not available. Consequently, conclusions regarding efficacy must remain cautious.

From a surgical and wound care standpoint, this case suggests that enzymatic debridement may be considered as a potential option for WBP in selected neonatal postoperative wounds when conventional strategies fail or are not feasible, or when rapid WBP is required, provided that the procedure is performed in a specialized center with appropriate expertise and monitoring²¹. Further evidence from multicenter case series, registries, and prospective observational studies is required to better define indications, safety profiles, and standardized protocols for off-label enzymatic debridement in neonatal surgical wound management.

Implications for practice and research

Despite these limitations, this case indicates that enzymatic debridement may be considered as a WBP option in carefully selected newborns postoperative wounds when: 1) devitalized tissue persists despite standard wound care; 2) surgical or sharp debridement is undesirable or associated with high risk; and 3) the procedure can be performed under NICU-level monitoring with appropriate neonatal sedation and multidisciplinary expertise^{21,22}. Further evidence is required through multicenter registries, prospective observational cohorts, and standardized reporting of safety endpoints (e.g., pain, bleeding, systemic effects) and healing outcomes (e.g., time to granulation and closure, need for re-intervention). Establishing shared criteria for patient selection, procedural standardization, and follow-up will be essential before broader consideration of this off-label approach in neonatal surgical wound care.

Limitations

This report has several limitations that should be acknowledged. It describes a single case, and conclusions regarding efficacy cannot be generalized. The clinical course included multiple concomitant interventions (systemic antimicrobial therapy, primary and secondary dressings, photobiomodulation, and HA + AA applications), which limits causal inference regarding the specific contribution of bromelain-based enzymatic debridement. Objective longitudinal measures - such as standardized wound scoring systems, quantitative exudate assessment, or validated photographic planimetry - were not systematically collected, and follow-up was limited to the in-hospital period. Finally, the complex infectious background and the unavoidable risk of fecal contamination represent relevant confounding factors and may not reflect more typical postoperative SWD scenarios.

Conclusion

In a late preterm newborn with complex postoperative sacrococcygeal wound dehiscence and high contamination risk, off-label debridement with a bromelain-based enzymatic agent was feasible and well tolerated when performed under NICU monitoring and procedural sedation. The intervention was followed by rapid wound bed improvement and complete wound closure within 21 days. This case underscores the need for further systematic evaluation of enzymatic debridement in neonatal postoperative wounds to better define safety profiles, optimal indications, and standardized care pathways.

Declarations

Use of Artificial Intelligence

Artificial intelligence tools were used to support language editing. All content was critically reviewed and approved by the authors.

Ethics and consent to participate

According to institutional policies, ethical approval was not required for this case report. Written informed consent for participation and off-label treatment was obtained from the patient's parents/legal guardians.

Consent to publish

Written informed consent was obtained from the patient's parent(s)/legal guardian(s) for publication of this case report and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

Availability of data and materials

The data supporting the findings of this study are available within the article.

Competing interests

The authors declare no competing interests.

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Authors' contributions

B.N. conceived and designed the study, performed the investigation and data curation, wrote the main manuscript text, and prepared Figures 1–4. B.V.D. contributed to investigation and data curation and reviewed the manuscript. B.V. reviewed and edited the manuscript. E.C., F.F., A.M. and M.M. contributed to investigation and supervised clinical care. E.L.R. contributed to methodology, supervised the work, and reviewed the manuscript. G.C. and Z.R. supervised the work and reviewed the manuscript. G.G. supervised the study and reviewed the manuscript. All authors reviewed and approved the final manuscript.

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Authors' information (optional)

Not applicable.

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Figures

A**B**

Figure 1

A and 1B. Initial wound assessment on postoperative day 6. The sacrococcygeal surgical site shows a full-thickness wound dehiscence (Sandy Grading System stage 3a), with complete coverage of the wound bed by necrotic fibrinous tissue, inflamed and edematous wound edges, and moderate to increased exudate.



Figure 2

Application of the bromelain-based agent for enzymatic debridement, with protection of the perilesional skin using transparent polyurethane film.

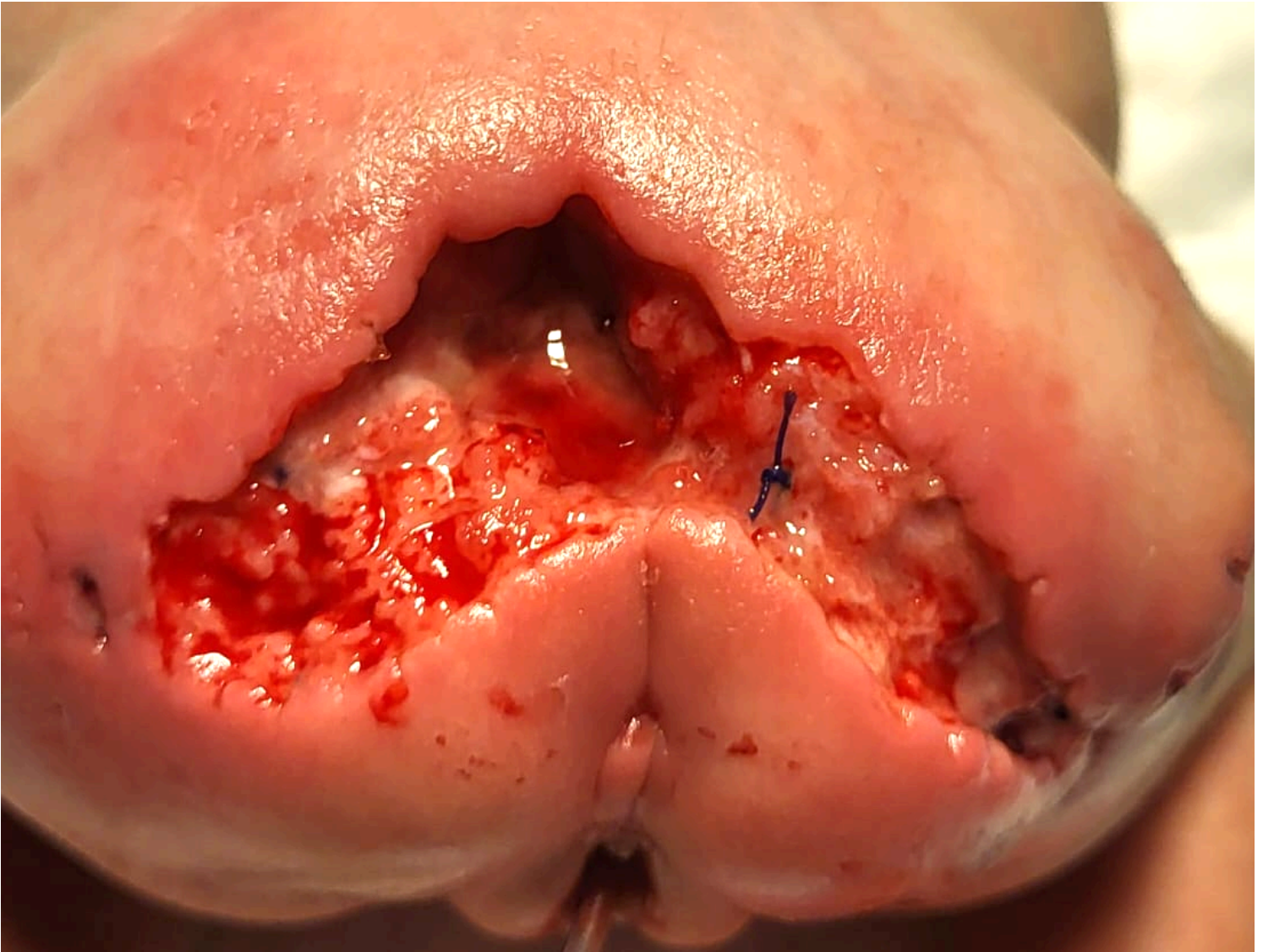


Figure 3

Wound bed after enzymatic debridement showing effective selective removal of non-viable tissue with preservation of viable structures.



Figure 4

Wound appearance at 21 days, showing complete closure following enzymatic debridement.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [CAREChecklistcompleted.pdf](#)