Case study

Wound cleansing with an absorption mechanism-based wound dressing and autolytic debridement: a case series

ABSTRACT

Objective The aim of this study is to present three cases demonstrating the positive effect of a wound dressing with a wound-cleaning absorption mechanism in patients with cavitary, infected, exudative pressure injuries.

Methods Consecutive patients treated with a hydro-responsive wound dressing were prospectively followed up, and wound healing parameters and the autolytic debridement process were recorded. Informed consent was obtained from all patients included in the study, and clinical data were collected using a standardised assessment form.

Conclusion The hydro-responsive wound dressing demonstrated a healing effect on cavitated, infected, exudative wounds.

Keywords pressure injuries, autolytic debridement, wound dressing, nursing care.

For referencing Gül Ş, Karakaya D, Sezgünsay E. Wound cleansing with an absorption mechanism-based wound dressing and autolytic debridement: a case series. WCET™ Journal 2026;46(2):26-31.

DOI https://doi.org/10.33235/wcet.46.2.26-31

INTRODUCTION

Pressure injuries (PI) are a global health problem. In addition to causing patient pain, they prolong hospital stays and increase healthcare costs.[1] The most important aspects of the care and treatment of pressure injuries are eliminating the underlying factors that cause them and implementing necessary preventive measures. Pressure injuries may develop when preventive measures are insufficient or when patient-related factors are present. In the treatment of pressure injuries, a comprehensive approach is applied that includes systemic measures, such as reducing pressure, supporting tissue perfusion through position changes, and nutritional supplementation, as well as various local treatment methods, such as debridement, topical negative pressure and dressings.[2] Both advanced and traditional dressings are used to protect the wound from trauma, support healing, manage exudate, stop bleeding, reduce odour and promote the formation of healthy tissue.

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Necrotic tissue on the wound directly impedes the healing process.[3] Therefore, the use of wound care products that control infection by providing effective cleansing and debridement, facilitate exudate management, and stimulate granulation and epithelialisation is a fundamental approach in wound management. Preparing the wound bed by removing non-viable tissue is essential for wound healing. To this end, international guidelines emphasise the use of various debridement methods.[2]

Performing debridement is a fundamental requirement to accelerate wound healing and reduce the risk of local infection.[4] The literature describes various debridement methods, including surgical, mechanical, enzymatic and autolytic approaches.[5] Among these methods, autolytic debridement is a selective and safe approach that removes dead and necrotic tissue through a natural process using the body's own enzymes, without damaging healthy tissue. The moist wound environment that supports autolytic debridement provides an optimal foundation for cellular and molecular mechanisms during the healing process, while also significantly reducing patients' pain levels.[6,7] With recent advancements in wound care technologies, hydro-responsive wound dressings are frequently chosen to facilitate this process in both chronic and acute wounds. These products are recommended for clinical use not only because they facilitate autolytic debridement but also because they provide exudate management and infection control.[8,9]

The hydro-sensitive wound dressing is a soft, conformable pad containing super-absorbent polyacrylate (SAP) particles pre-activated with isotonic Ringer's solution and the antiseptic

polyhexanide (PHMB).[10] The dressings continuously release fluid into the wound to soften necrotic tissue and fibrin, while the SAP particles absorb bacteria and protein-rich wound exudate.[5] The hydro-sensitive wound dressing facilitates the removal of dead tissue through the body's own "safe" autolysis mechanism, thereby enabling the restart of epithelialisation and promoting healing.[11] It is anticipated that this dual-action (irrigation and absorption) mechanism of hydro-responsive dressings will enhance clinical success, particularly in critical patient groups where wound bed preparation is challenging. While data on the efficacy of this technology are available in the literature, there is a need for a more detailed examination of its specific implications in palliative care units, intensive care units and home care settings.

This study aims to evaluate the effect of a hydro-responsive wound dressing on debridement and wound bed preparation in patients with pressure injuries.

CASE SERIES

Case 1

Case background

Case 1 involves a 42-year-old male patient who developed tetraplegia following a spinal cord operation. The patient was bedridden and required total assistance from caregivers for his daily activities. While his cognitive functions remained intact and he had no additional chronic comorbidities, he was receiving long-term care in a nursing home facility. Physical examination revealed two significant pressure injuries located in the sacral region. The first was an unstageable pressure injury measuring 10×10cm, with a wound bed entirely obscured by necrotic tissue and presenting no detectable exudate. The second, a Stage 4 pressure injury, measured 7×7×4cm and was characterised by the presence of both necrotic and slough tissue, with moderate exudate. Notably, these two injuries were interconnected by a 22cm tunnelling tract, indicating extensive subcutaneous involvement between the wound sites. Furthermore, the patient's clinical management was complicated by contractures in the lower extremities, which significantly hindered repositioning efforts. Additionally, due to laboratory findings indicating a high risk of haemorrhage, sharp surgical debridement was deemed contraindicated, necessitating a more conservative approach to wound bed preparation.

Management and outcomes

During the initial phase of wound management, the wound beds were cleansed with saline solution, while the periwound skin was maintained with a no-rinse barrier cream cleanser to support and preserve skin integrity. Regarding the primary intervention, a hydro-responsive wound dressing was applied to the necrotic area of the unstageable injury and the slough tissue of the Stage 4 injury. To enhance periwound protection and ensure the dressing remained in place, stoma paste was applied to the wound margins.

Case study 1: Day 1

Case study 1: Day 2

Case study 1: Day 7

Case study 1: Day 14

Case study 1: Day 21

Case study 1: Day 27

Case study 1: Day 30

Case study 1: Day 32

The dressing change protocol, initially performed every 24 hours, was subsequently extended to every 3 days. By the 27th day, the application of hydro-responsive dressings was discontinued as all necrotic and fibrotic tissues had been successfully cleared from the wound beds. Follow-up care was maintained with a cream containing an aqueous extract of Triticum vulgare, resulting in complete epithelialisation and healing by the 32nd day.

Case study 2

Case background

Case 2 involves an 81-year-old female patient with a complex medical history, including congestive heart failure, atrial fibrillation, hypertension, and atherosclerotic heart disease. The patient was bedridden but remained conscious and

cooperative with stable vital signs and adequate oral intake. Upon her transfer from a tertiary intensive care unit to the palliative care department, an initial clinical assessment was performed.

At admission, the patient presented with an unstageable pressure injury measuring 25×20cm, with a distinct demarcation line. To reduce the inflammatory burden from extensive necrotic tissue, bedside surgical debridement was performed. Following the procedure, the injury was reclassified as Stage 4, measuring 25×20×6cm. The wound bed contained residual necrotic and fibrotic tissues. Additionally, the patient suffered from both fecal and urinary incontinence, which contributed to the development of incontinence-associated dermatitis (IAD).

Case study 2: Day 1

Case study 2: Day 2

Case study 2: Day 3

Case study 2: Day 7

Case study 2: Day 16

Case study 2: Day 24

Case study 2: Day 36

Case study 2: Day 42

Management and outcomes

To manage the IAD and the risks associated with the patient's ongoing diarrhea, the periwound skin was maintained using a no-rinse barrier-cream cleanser and barrier spray. Given the unavailability of a commercial fecal management system at the facility, nursing staff implemented an innovative alternative by utilising an ostomy collection bag to achieve fecal containment and prevent further skin breakdown.

A hydro-responsive wound dressing was applied to the wound surface following the initial assessment. To ensure the dressing remained secure, the wound margins were framed with ostomy paste and sealed with a transparent film dressing. Furthermore, a foam dressing was integrated into the protocol to stabilise the ostomy bag and serve as an additional physical barrier, effectively preventing fecal contamination of the wound bed.

The initial dressing changes were performed every 24 hours for the first two sessions, then transitioned to every 3 days. By the 16th day, the fibrotic tissue had been successfully debrided, and healthy granulation tissue had emerged. Subsequent care was adjusted to prioritise granulation promotion with specialised products, a regimen maintained through home care services following the patient's discharge.

Case study 3

Case background

Case 3 involves an 89-year-old male patient receiving home-based long-term care. The patient's medical history is significant for paraplegia, hypertension and atherosclerotic heart disease. Clinically, the patient is bedridden and presents with significant cognitive impairment, being neither oriented nor cooperative. His daily hygiene and wound care are managed by his primary family caregivers. Upon initial evaluation, a significant unstageable pressure injury measuring 20×18cm was identified. The assessment revealed that the periwound skin was severely macerated, a condition attributed to the high volume of wound exudate.

Management and outcomes

Following the initial assessment, the wound bed was cleansed with saline solution, after which a hydro-responsive wound dressing and a transparent film dressing were applied. To ensure the secure adherence of the dressing, ostomy paste was utilised at the margins. To manage the macerated periwound areas, a barrier spray was applied to protect skin integrity.

On the 7th day, the injury was reassessed at 20×18×2cm, and hydro-responsive dressings were continued at 3-day intervals. By the 21st day, the wound dimensions had decreased to 16×16×2cm. A fully granulated wound bed was successfully achieved by the 33rd day of treatment. Consequently, the hydro-responsive dressing protocol was discontinued on the 39th day and replaced with an alginate dressing to support further healing. Throughout the entire process, all clinical care and dressing changes were maintained within the home care environment. Regrettably, the patient passed away on the 54th day of follow-up.

Case study 3: Day 1

Case study 3: Day 7

Case study 3: Day 21

Case study 3: Day 33

Case study 3: Day 39

Case study 3: Day 45

Case study 3: Day 51

Case study 3: Day 54

DISCUSSION AND CONCLUSIONS

Necrotic tissue and uncontrolled exudate in the wound bed hinder healing and create a favourable environment for bacterial growth. Debridement is a fundamental component of wound bed preparation. This procedure involves removing contaminants from the wound bed—including necrotic tissue, microorganisms, biofilm, foreign bodies, pro-inflammatory cytokines, and proteases—to promote healing and prevent infection. However, numerous factors influence the decision of which type of debridement will be effective for the patient, including the patient's age, infection status, treatment goals, wound type and the healthcare professional's experience and competence.[12] Additionally, when selecting a debridement method, the patient's comfort and preferences should be considered, and a personalised, patient-centred wound care approach should be adopted. Considering clinical characteristics, such as advanced age, comorbid chronic conditions, bleeding risk based on laboratory findings, and the need to monitor a single patient in a home care setting, an alternative approach was preferred over surgical debridement for the patients included in this study. In this context, hydro-responsive wound dressings were chosen because they facilitate the degradation of necrotic tissue, preparing the wound bed for surgical intervention, while also offering a safe and feasible approach.

Autolytic debridement, a natural process utilised in the management of pressure injuries, involves phagocytosis, leukocyte activity, and proteolytic enzymes that selectively target necrotic tissue. In this process, autolysis facilitates the degradation (breakdown) of necrotic tissue, leading to its separation from the wound bed. The effectiveness of the autolytic process is directly dependent on the wound maintaining a moisture balance conducive to this natural degradation and on the functionality of the immune system. Hydro-responsive wound dressings support this process by facilitating the autolytic debridement of necrotic tissue that has lost its viability and promoting the formation of new granulation tissue.[5,13,14] These dressings create a rinsing effect by continuously releasing Ringer's solution into the wound via their super-absorbent polyacrylates, which facilitates wound cleansing and enables autolytic debridement. In addition to absorbing excess exudate, the dressing can modulate elevated protease levels, such as matrix metalloproteinases (MMPs), and demonstrate anti-inflammatory effects by absorbing bacteria.[15] Due to these properties, it is considered an effective wound dressing suitable for both acute and chronic wounds with impaired healing.

The results of this study demonstrate that hydro-responsive wound dressings are effective at degrading necrotic tissue and facilitating subsequent debridement in unclassified-stage pressure injuries covered with necrotic tissue. By promoting the autolysis of necrotic tissue, this dressing has enabled clinicians to assess wounds more easily and quickly. Furthermore, in the wound bed, which became ready for safe bedside surgical debridement in a short time, continued care with the hydro-responsive wound dressing after debridement facilitated the dissolution of fibrotic tissues, and these tissues could be easily and painlessly removed from the wound bed. These findings demonstrate that the method is not only effective but also easy to apply and safe to manage.

The findings are consistent with studies reported in the literature. In a study conducted by Spruce et al (2016)[16] on 20 patients with various chronic wounds, an average reduction of 62% in the level of necrotic tissue was observed, and debridement resulting in over 80% healthy tissue in the wound bed was achieved in nearly half of the patients. In the same study, a reduction in wound size and/or depth was observed in 50% of the patients, with a reported decrease of 21.5% in wound area and 45.7% in wound depth.[16]

Similarly, Kaspar (2011)[17] reported that the use of hydro-responsive wound dressings in 170 patients with chronic wounds led to a reduction in necrotic tissue and an increase in the proportion of wounds containing granulation tissue. These findings are supported by other clinical studies demonstrating

the effectiveness of hydro-responsive wound dressings in the autolytic debridement and cleansing of chronic wounds.[11,18,19]

Another significant advantage of hydro-responsive wound dressings is their ability to manage exudate and control protease activity. It has been reported that hydro-responsive wound dressings with a super-absorbent core are highly effective at absorbing and trapping wound exudate, thereby contributing to the removal of harmful MMPs and supporting the progression of healing.[20] The literature also indicates that effective exudate management provided by hydro-responsive wound dressings is associated with a positive healing response. In this study as well, a reduction in necrotic and fibrotic tissues in the wound bed was observed during the period when the hydro-responsive wound dressing was used, while granulation tissue and epithelialisation increased. Additionally, the absence of infection during the period when this dressing was used in the included patients was considered a notable finding. This finding can be explained by the ability of hydro-sensitive wound dressings to absorb bacteria and regulate inflammatory processes, and is consistent with findings reported in the literature.

Overall, the data obtained support the notion that debridement is an important component of the clinical treatment regimen for wound bed preparation and facilitating healing. Furthermore, this study's findings demonstrate that hydro-responsive wound dressings that support autolytic debridement are an effective, safe, and clinically convenient option for removing necrotic tissue. In conclusion, the use of high-evidence-level products recommended by international guidelines accelerates wound healing, improves patients' quality of life, facilitates early discharge, and contributes to both individual and societal economies.

It is well known that hydro-responsive wound dressings are highly effective in treating pressure injuries, particularly in appropriate cases, such as those described here. A key aspect of the treatment approach for pressure injuries is the ability to plan treatment based on the wound stage, size, the patient's needs and the healthcare provider's skills. The use of evidence-based products in treatment is critical. The results of this study confirm that autolytic debridement is important and necessary for the healing of pressure injuries.

CLINICAL IMPLICATIONS

The findings of this case series suggest that hydro-responsive wound dressings may provide a safe and feasible debridement approach for pressure injuries covered with necrotic tissue. Particularly in clinical situations where surgical debridement is difficult to perform—such as in elderly patients, those at risk of bleeding, or those receiving home care—these dressings can support wound bed preparation, offering clinicians a practical treatment option. Additionally, they may support the wound-healing process through mechanisms, such as exudate management, protease modulation and reduction of bacterial load. Therefore, hydro-responsive wound dressings can be considered as part of multidisciplinary wound care strategies in the management of pressure injuries and other chronic wounds.

LIMITATIONS

This study has several limitations. First, the study is a case series consisting of only three cases, and the generalisability of the findings to larger patient populations is limited. Additionally, the absence of a control group prevents a direct comparison of the efficacy of the hydro-sensitive wound dressings with other debridement methods. Future prospective studies involving larger sample groups will contribute to a more comprehensive evaluation of the efficacy of hydro-sensitive wound dressings across different wound types.

ACKNOWLEDGEMENTS

The authors thank the staff and patients who made this study possible.

AUTHOR CONTRIBUTIONS

Conception and design of the work: ŞG, ES, DK

Interpretation of data: ŞG, ES, DK

Drafting the work: ŞG, ES

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Final approval of the version to be published: ŞG, ES, DK

CONFLICT OF INTEREST

The authors declare no conflicts of interest.

ETHICS

The patients consented to the use of their information for this case study. Photographs were taken with the patients' verbal and written consent.

FUNDING

The authors received no funding for this study.

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