Case Report

Hell J Surg. 2024 Jan-Mar;94(1):33–37
doi: 10.59869/23027

Management of a large Stage 4 sacrococcygeal pressure injury with surgical debridement and Negative Pressure Wound Therapy

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ABSTRACT

Background: Pressure injuries, affecting millions annually, pose substantial challenges globally.

Aim: Presentation of the management of a patient with a large sacrococcygeal pressure injury in our tertiary hospital.

Case presentation: Our (case) study highlights the case of a 67-year-old male with severe comorbidities and a significant sacrococcygeal pressure injury managed through surgical debridement and negative pressure wound therapy (NPWT). The patient's condition, complicated by infection, necessitated tailored treatment. NPWT, applied for 80 days and followed by absorbent dressings, facilitated granulation tissue formation and wound closure within 162 days post-NPWT cessation.

Conclusion: The case underscores the efficacy of NPWT in conjunction with infection control strategies, offering insights into managing complex pressure injuries, especially in settings with limited surgical resources.

Key Words: *Pressure injury; sacrococcygeal pressure ulcer; negative pressure wound therapy; surgical debridement*

INTRODUCTION

Pressure injuries, previously termed pressure ulcers, remain a significant burden on individuals and society, impacting approximately 3 million adults annually in the United States alone [1]. They present a considerable financial concern for various stakeholders including society, healthcare services, insurers, and patients [2]. The prevalence of pressure injuries has a median rate of 10.8%, with studies showing a range from 4.6% to 27.2% [3].

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Submission: 09.01.2024, Acceptance: 07.03.2024

Pressure injuries stem from various factors: prolonged pressure, friction, moisture, and internal issues like malnutrition and anaemia [4]. Risk factors include reduced mobility, skin moisture, poor nutrition, and diminished sensation [5]. Advanced age, cognitive impairment, and health conditions exacerbate tissue damage. Prolonged pressure diminishes oxygen supply, leading to tissue breakdown [4]. Even short periods of immobility can trigger ulceration. Dysfunction in nervous regulatory mechanisms worsens blood flow control, contributing to ulcer formation [6]. Treatment approaches vary based on factors such as nutritional status, pressure injury location and size, patient comorbidities, presence of infection, and healthcare system capabilities [7]. Treatment options for pressure ulcers encompass various approaches, including thorough cleaning and debridement to eliminate dead tissue [8]. Specialised wound dressings like hydrocolloid

or alginate dressings are employed to foster healing. In some cases, antibiotics may be prescribed to address infection [8]. Surgical interventions, such as sharp surgical debridement or other advanced techniques, may be considered for cases requiring extensive tissue removal or exposure of underlying structures [8]. Additionally, negative pressure wound therapy (NPWT) can be effective for deep or infected ulcers, particularly those with exposed bone [9]. Negative pressure wound therapy (NPWT) has been used either as a primary treatment or bridging in the management of large pressure injuries, especially with the presence of infection [9]. In our case study, we present a 67-year-old male patient with severe comorbidities and a significant sacrococcygeal pressure injury and the management with surgical debridement and use of negative pressure wound therapy (NPWT).

CASE PRESENTATION

A 67-year-old Caucasian male was referred from a secondary care hospital at the Department of Internal Medicine of our tertiary hospital due to a recently established ischaemic stroke of the right parietal lobe, as well as newly diagnosed heart failure and atrial fibrillation. Regarding his past medical history, he has been suffering from diabetes mellitus type 2, hypertension and dyslipidemia. The Braden Score on initial evaluation was 15, which considers the patient at risk of developing pressure injuries [10]. On physical examination, the patient was bedridden, had lower extremity oedema and pressure injuries on both his thighs. He also had a large sacrococcygeal pressure injury (Figure 1a). The patient was haemodynamic stable and non-febrile. C-reactive protein (CRP) levels were 195mg/l (0-5 mg/l) and due to purulent material from the pressure ulcers, a diagnosis of soft tissue infection was made and intravenous piperacillin-tazobactam and daptomycin were administered. During his hospital stay, a computed tomography (CT) scan of the abdomen was performed with the presence of ascites which was aspirated. The culture from the ascitic fluid revealed Enterococcus faecium which was sensitive to Daptomycin.

A surgical evaluation of the patient's pressure ulcer was performed under local anaesthesia. Regarding the sacrococcygeal pressure ulcer, it was initially categorised as unstageable full-thickness pressure injury, as the

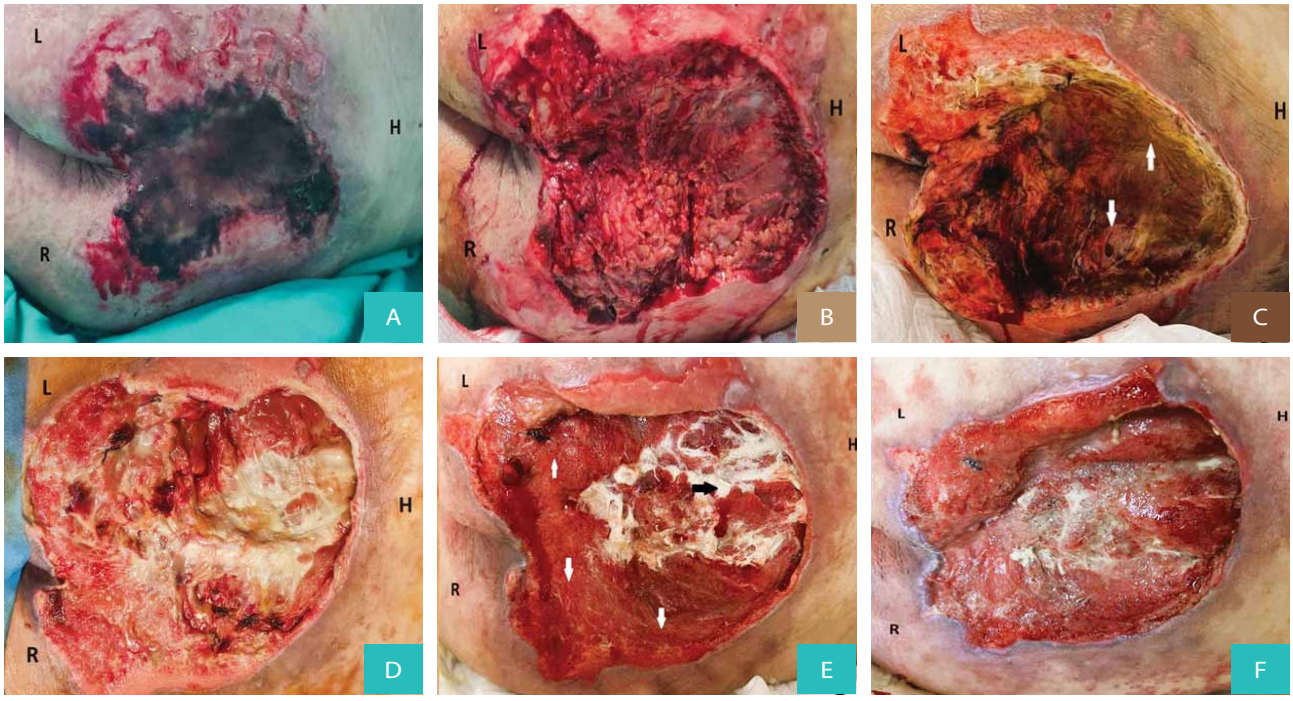

FIGURE 1. Patient's large sacrococcygeal pressure injury. A: On initial evaluation. Note the presence of eschar covering the wound. B: The wound after the 1st surgical debridement was categorised as stage 4. C: Two weeks after surgical debridement and initiation of negative pressure wound therapy, the pressure injury had new necrotic tissue formation (white arrows). A second surgical debridement was performed. D: On day 21 necrotic tissue was removed and wound cultures were sent. E: Pressure ulcer on patients discharge (Day 43). Note the granulation tissue (white arrows) and the presence of fibrous tissue over the sacrum (black arrow). F: The wound at the end of NPWT Day 80.
L: left lower limb, R: right lower limb, H: towards patient's head.

extent of the tissue damage within the ulcer could not be confirmed because it was obscured by slough and eschar. The ulcer seemed to extend into the muscles and other supporting structures including the fascia and the sacrum making osteomyelitis or osteitis likely to occur. The laboratory risk indicator for necrotising fasciitis (LRINEC) score was 3 [11]. Under local anaesthesia, surgical debridement was performed with removal of all necrotic tissues (Figure 1b). Tissue was also sent for culture which revealed a low bacterial load of Acinetobacter baumannii, Klebsiella pneumoniae (KPC), and Candida albigans. After surgical debridement, negative pressure wound therapy (NPWT) was applied on the wound surface using a pressure of 120mmHg (day 1). The sponge of the Vacuum Assisted Closure (VAC) system was replaced every two days and evaluation of the wound was performed. The patient's inflammation markers were improved. On day 14 due to the presence of necrotic tissue, a second surgical debridement took place and NPWT was used again (Figure 1c). On day 21, granulation tissue was present on nearly half of the surface area of the wound, except the areas where bony prominence was present (Figure 1d). A third surgical debridement of this area was performed and tissue was sent again for a culture that revealed a high bacterial load of Klebsiella pneumonia (KPC). For that reason, meropenem was administered for ten days. On day 23, the patient was febrile (39C) with elevation of the inflammation markers. Blood cultures revealed Clostiridium clostridiiforme bacteremia. Meropenem was replaced with metronidazole and the patient remained afebrile with normalisation of white blood cell counts and C-reactive protein (CRP) levels (Figure 2).

The patient was discharged on day 43 (Figure 1e) and he was referred to a rehabilitation center. NPWT was still used and the wound was evaluated every 3-4 days. No further surgical debridement was needed. NPWT was used until day 80 as it was replaced with highly absorbent alginate and foam dressings (Figure 1f). By day 103, the wound was covered with granulation tissue with newly formed skin tissue and the diameter of the deficit was gradually decreasing (Figure 3a). After 242 days, the wound was healed and the patient remains in excellent clinical condition (Figures 3b-d).

DISCUSSION

Pressure ulcers are a global issue, impacting approximately 1 to 3 million individuals in the United States each year. The incidence rates vary from 5% to 15% among hospitalised patients, with higher occurrences observed in intensive care units and specific long-term care settings [1]. A recent revision by the National Pressure Ulcer Advisory Panel (NPUAP) has brought changes to the definition and staging system of pressure ulcers [12]. The updated staging system replaces the term "ulcer" with "injury" and utilises Arabic numerals instead of Roman numerals to denote stages. The revised definition of a pressure injury now specifies that these injuries typically occur over bony prominences or beneath medical or other devices. Each definition outlines the extent of tissue loss and the anatomical characteristics that may or may not be present at

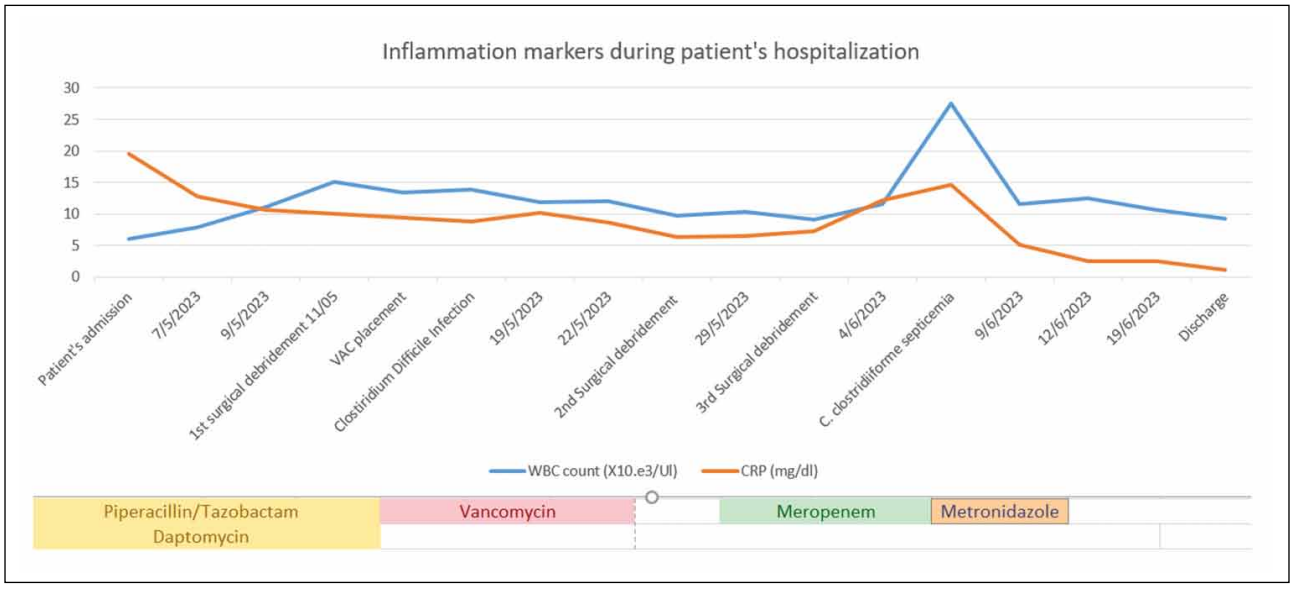

FIGURE 2. Inflammation markers (White Blood Cell-WBC count and C-reactive protein-CRP) during patient's hospitalization. The type and duration of antibiotics administered are also shown.

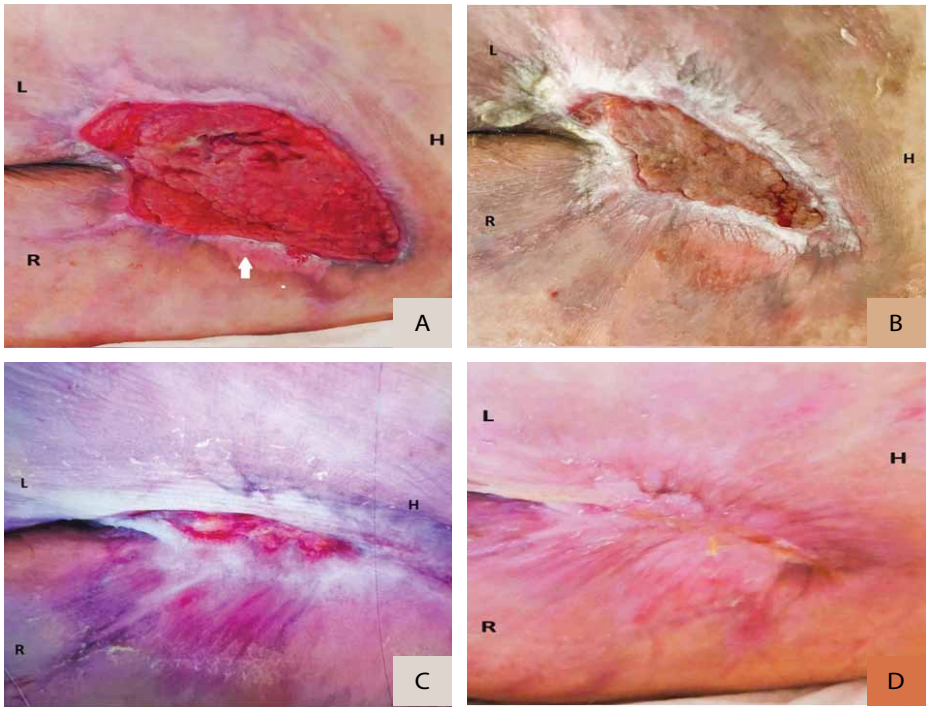

FIGURE 3. A: Day 103. Note the epithelization of the would ulcer (white arrow). B: Day 160. Highly absorbent alginate and foam dressings were used. C: Day 208 D: Day 242. The wound finally healed.
L: left lower limb, R: right lower limb, H: towards patient's head.

each stage of injury. Regarding the economical impact of pressure injuries, it is estimated that the cost of pressure ulcer prevention per patient at risk per day varied between 2.65 € and 87.57 € across all settings and the cost of pressure ulcer treatment per patient per day varied between 1.71 € to 470.49 € across all settings [2].

Treatment of Stage 1 and 2 pressure injuries includes the reduction of pressure and repositioning of the patient, utilisation of specialised support surfaces, decrease of friction, shear, and moisture, adequate nutrition, and dressing selection to promote moist wound healing [13]. Regarding stage 3 and 4 pressure injuries, treatment strategies are more complex. In addition to the aforementioned measures, negative pressure wound therapy may be utilised. Moreover, cell or tissue-based products and topical growth factors have been employed. Surgical techniques include primary closure if the injury is superficial and relatively small, debridement, and skin flap closure [13]. The appropriate method should be chosen based on various factors such as the patient's performance status, nutritional support, medical staff experience, and the availability of methods. In our case, the absence of a plastic surgery department precluded the ability to perform complex skin grafts. Conversely, negative pressure wound therapy was available as there was the capacity to replace the foam every 2-3 days and perform proper surgical debridement when necessary. All procedures were conducted bedside, thereby minimising the potential complications associated with receiving general anesthesia. The use of NPWT seems to be more effective in terms of granulation tissue formation and wound shrinkage compared to wet-to-dry dressing [14]. In our case, NPWT was applied for 80 days. After NPWT, highly absorbent alginate and foam dressings were used as there was no technical staff available to properly manage and evaluate vacuum-assisted closure (VAC) therapy. This management alteration may have changed the duration of the wound healing process, as the ulcer was finally healed 162 days after the discontinuance of VAC therapy.

Management of local infection is another important risk factor for delayed wound healing [9]. In our case, two wound cultures were taken. Antibiotics based on the antibiogram were administered only after the bacterial load increased, and the ulcer remained inflamed 20 days after the initial evaluation and surgical debridement. Inflammation markers were monitored, although they did not alter our therapeutic plan.

CONCLUSION

In this study, we present a case of a patient with medical comorbidities and a large stage 4 sacrococcygeal pressure injury. The combination of surgical debridement, use of negative pressure wound therapy and local infection control were used together and the wound despite the large size on initial evaluation was finally healed. Managing these patients involves a lengthy procedure that requires ongoing and meticulous clinical assessment, involving

diverse medical specialties like infectious diseases specialists within a multidisciplinary framework.

Declaration of conflicting interest: *The authors declare that there are no conflicts of interest.*

Funding: *This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.*

Ethical Standards: *1) This case report has been approved by the hospital's ethics committee (Hippokrateion General Hospital) and has therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments. 2) All persons gave their informed consent prior to their inclusion in the study.*

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