



Case report

Ending surgical site infection by negative pressure wound therapy (NPWT): A case report



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ABSTRACT

Introduction and importance: Hundreds of millions of people may go through surgery every year worldwide. Surgical site infection (SSI) is one of the most common complications of the surgery. SSI increases the duration of treatment, delays wound healing, increases the use of antibiotics, and in severe cases, causes patient death and imposes high costs on the patient and the health care system.

Case presentation: The present case report is a 45-year-old man with a history of 8-years type 2 diabetes who underwent surgery for a pilonidal cyst. Despite routine dressing changes (cleansing the wound with saline and applying sterile gauze) twice a day and intravenous (IV) antibiotic therapy, no improvement was observed and the wound became infected. The patient was referred to our wound care team. NPWT (applying a pressure of 125 mm Hg intermittently) was performed 4 times a day for one week. Also, after each session until the beginning of the next session, the patient's wound was bandaged. The patient's wound healed completely after about 2 months.

Clinical discussion: Patients with diabetes mellitus will have difficulty in wound healing due to microvascular changes. Thus, efficient therapeutic methods such as surgical debridement, maggot therapy, and NPWT are necessary for management of surgical site infection.

Conclusion: This case report was showed that NPWT is an affordable and highly efficacious treatment method for management of SSI in patients with diabetes mellitus. Therefore, it is suggested that wound care teams may use NPWT to treat SSIs.

1. Introduction

Hundreds of millions of people may go through surgery every year worldwide. In the USA, 23 million patients go through surgery every year [1,2]. Surgical site infection (SSI), which usually occurs 30 days after surgery, is one of the most common complications of the surgery, despite advances in surgical techniques, understanding the pathogenesis of surgical wound infections, and the widespread use of prophylactic antibiotics [2]. SSI occurs in approximately 1–3 out of every 100 patients who undergo surgery and often results from bacteria, including *streptococci*, *staphylococci*, or other microorganisms [3]. SSI increases the duration of treatment, delays wound healing, increases the use of

antibiotics, and in severe cases, causes patient death and imposes high costs on the patient and the health care system [4].

Pilonidal disease (also called pilonidal cyst disease) is a common disease that is four times more common in men [5]. The exact pathogenesis of the disease is not known, but factors such as excessive area hair, increased sweating, trauma, poor personal hygiene, and obesity have been shown to contribute to the disease [6]. It is mainly found in the sacrococcygeal region and surgery is the only way to treat pilonidal disease [5].

In patients with diabetes, wounds heal slowly, and may not even heal well or not heal completely. Sometimes there is a possibility of an infection at the wound site [6]. The infection can spread quickly to tissue

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or bone near the wound or even to areas far from the wound. In some cases, in the absence of emergency care, the infection can be life threatening and even lead to death [7].

Several techniques have been developed to repair SSIs, including antibiotic therapy, dressings, wound debridement, and the use of negative pressure wound therapy (NPWT) [8]. In NPWT, negative pressure is applied to the wound intermittently or continuously and accelerates wound healing. This negative pressure is applied to the wound by using a vacuum pump (Fanavar Pooya Sepahan Engineering Company) and creating a vacuum. As a result of NPWT, ideal conditions are created for wound healing and wound healing is faster. NPWT has a beneficial effect on the formation of new tissue by removing secretions and harmful substances from the wound surface [8,9]. This case report was reported according to the SCARE 2020 Guidelines to ensure the quality of reporting [10].

2. Case presentation

This case is a 45-year-old man living in a village in Urmia, West Azerbaijan Province, Iran, who has had type 2 diabetes for approximately 8 years. About 6 months ago, the patient suffered from severe back pain and bleeding from the perianal area. The patient had a low socio-economic level and was at the primary level of literacy. He has also been working in an animal husbandry for 10 years. He was at a poor level in terms of blood sugar control. He also mentioned hypothyroidism. To control his blood sugar, he was taken metformin 500 mg tablet twice in a day, and for the treatment of hypothyroidism, he also was taken 0.1 mg levothyroxine tablet daily. The patient had a family history of diabetes and hypertension. He denied a history of drug or alcohol use, but the patient was smoking more than one pack a day. No pathological findings were found on neurological examination.

The patient had referred to Imam Khomeini Hospital in Urmia with chief complaints of severe back pain and blood discharge from his perianal area. He had been experiencing mild pain for 3 years and itching in the perianal area. The pain is sometimes aggravated by sitting. The patient had felt a lump that came out of the bloody discharge with a lot of itching. During this period, he did not visit a doctor, until 6 months ago, when the patient noticed a pore in the same area where the bloody and purulent discharge came out, and about two months ago, when the patient's pain intensified and there was a lot of bloody and purulent discharge. The patient had to change his clothes frequently. On anorectal examination in the lithotomy position, a nodularity of about 2 × 2 cm was seen, which has an induration of about 2 × 3 cm and there is a hole on which purulent secretions came out (Fig. 1). Moreover, in its pathology report, a pilonidal cyst containing hair was reported. The vital signs of patient on admission were as follows: Pulse rate: 100 beats per minute (bpm); temperature: 37.1 °C; blood pressure: 130/90 mm Hg; respiration rate: 20 bpm. In addition, some of the patient's laboratory information during admission is provided as follows (Table 1):

The patient underwent surgery and was hospitalized in Imam

Table 1

The patient's laboratory information during admission.

Urine analysis (UA)	Biochemistry	Cell blood count (CBC)
Color: yellow	BUN: 14.8 mg/dl	WBC: 21,000 μ l
Appearance: semi clear	Creatinine: 0.9 mg/dl	RBC: 5,490,000 μ l
PH: 5	Urea: 40.9 mg/dl	HGB: 12.5 g/dl
Protein: negative	LDL: 288 mg/dl	HCT: 39%
Sugar: negative	HDL: 37 mg/dl	MCV: 64.9 fl
Blood: negative	Sodium: 130 mEq/dl	MCH: 19.5 pg
Urobilinogen: negative	Potassium: 3.9 mEq/dl	MCHC: 30.46 g/dl
Ketone: negative	Blood sugar: 365 mg/dl	RDW-CV: 15.7%
Casts: not seen	TSH: 0.4 mg/dl	RDW-SD: 42.3 fl
Bacteria: few	T4: 0.7 mg/dl	PLT: 249,000 μ l

Khomeini Hospital for three days after surgery. During the patient's hospitalization, his blood sugar was checked with a glucometer every 6 h and the insulin protocol (regular insulin) was performed. Intravenous antibiotics, including 1 g of AMP cefazolin twice a day, as well as AMP acetaminophen (as analgesic), were administered. The surgical dressing was changed twice a day. The area of operation was regularly checked for the symptoms of infection. The patient was discharged from the hospital after three days. Necessary instructions were given to the patient (e.g., the dressing should be changed and washed daily). Also, due to the fact that the patient suffered from diabetes mellitus and the wound healing process was slower and more prone to infection, the patient was advised to have more control over his blood sugar and to check the area of the operation for the symptoms of infection.

Although the patient was treated with intravenous antibiotic therapy and dressing and washing with normal saline twice a day, there was no healing after 12 days, so the patient was referred to our dressing management team. Our management team suggested the use of NPWT (Fig. 1) due to the patient being diabetic and that the operation area was constantly moist. First, in antibiogram culture, drug resistance to *Staphylococcus aureus* infection was reported (Table 2). The patient was treated with intravenous antibiotics including 1 g of AMP meropenem three times daily, AMP clindamycin 600 mg twice daily, and AMP vancomycin 1 g daily.

The patient's wound was initially stimulated by mechanical debridement and normal saline lavage. Infectious non-living tissues

Table 2

The results of patient's wound culture.

Wound culture	Results
Culture	<i>Staphylococcus aureus</i>
Sensitive	Imipenem-meropenem-ceftriaxone
Resistant	Trimethoprim-sulfamethoxazole
Intermediate	Clindamycin-Ciprofloxacin
WBC	3-4
RBC	2-5
Bacteria	Moderate



Fig. 1. Healing the surgical site infection by NPWT.

were removed from the wound site. This action provides a suitable environment for wound healing. Granulation tissues appeared in the wound. Then NPWT (applying a pressure of 125 mm Hg intermittently) was performed 4 times a day for one week (Fig. 1). Also, after each session until the beginning of the next session, the patient's wound was bandaged. The device was calibrated by the equipment team before each session. All the deep parts of the wound were filled due to the rapid growth of granulation tissues. The patient's wound healed completely after about 2 months (Fig. 1) and was discharged from the service of the wound care management team in good general condition.

3. Discussion

Advances in technology and the improvement of treatment facilities for patients with diabetes mellitus have increased their lifespan [7]. In this condition, surgical procedures performed for various purposes in this population are very important [11]. Wound care at the surgical site is very important in patients, especially in patients with diabetes mellitus, as the chance of healing with standard and proper wound care is only 24 to 30% [12].

NPWT is an effective treatment for deep wounds [7]. Over time, the use of NPWT has expanded significantly and nowadays it is considered one of the best wound healing methods [8]. Compared to other wound healing methods, NPWT has significant advantages [8,9]. The use of NPWT can accelerate wound healing by removing excess fluid that prevents wound healing, reducing the risk of wound infection, and reducing wound dressing [7–9]. However, NPWT also has disadvantages. NPWT cannot be used in cases such as wounds near the joints, cancerous tissue, wounds close to organs or blood vessels, areas with very low blood flow and thin and fragile skin [8,9].

Consistent with our study, Hajimohammadi et al. in a case report showed that the use of NPWT is a gateway of hope for patients with diabetic foot ulcers and is very effective in accelerating the wound healing process [9]. Another study by Parizad et al. found that NPWT, maggot therapy, and silver foam dressing revived hope for patients with diabetic foot ulcers [8]. In another study in line with our study conducted by Hasan et al. showed that the effect of NPWT on foot ulcers in diabetic patients is very significant [13]. In another study conducted by Seo et al. the results showed that NPWT stimulated endothelial progenitor cells in diabetic patients with foot infections or skin defects [14]. Most existing studies showed the effectiveness of NPWT on wound healing in diabetic patients and pilonidal sinus disease [7,15,16]. This case report also showed that it can be used for diabetic patients who are candidates for surgery and has a significant efficiency in the process of healing and repair of the surgical site infection.

4. Conclusion

Patients with diabetes mellitus will have difficulty in wound healing due to microvascular changes. If an untreated wound becomes infected, it can spread locally to muscles and bones. Therefore, there is a need for new and effective methods to prevent infection and accelerate the healing process of wounds and to prevent exorbitant costs for treatment. This case report showed that the use of vacuum therapy to accelerate wound healing by removing excess fluid that prevents wound healing, reducing the risk of wound infection, and reducing wound dressing. Therefore, it is recommended that wound care teams may use this approach to speed up the healing process.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Provenance and peer review

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All ethical principles were considered in conducting this case report. All patient information kept confidential.

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Rasoul Goli: Study concept, data collection, writing the paper and making the revision of the manuscript following the reviewer's instructions. Mohammad Lorzini, Mazhar Ebrahimzade, Mahnaz Abdali: Study concept, reviewing and validating the manuscript's credibility. Mansour Arad: reviewing and validating the manuscript's credibility.

Declaration of competing interest

None.

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