

Successful Treatment of Necrotizing Fasciitis after Rectal Surgery with the Application of a Negative-pressure Wound Therapy: A Case Study

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Introduction: Necrotizing fasciitis (NF) is an aggressive soft tissue infection that involves the deep fascia and is characterized by the extensive deterioration of the surrounding tissue. Immediate recognition and aggressive treatment, including debridement and systemic antibiotics, are mandatory for the successful management of NF. Following radical debridement, closure of the remaining wound can pose significant reconstructive challenges. Accumulating evidence indicates that application of negative-pressure wound therapy (NPWT) is useful in the treatment of patients with severe acute complex wounds, including NF.

Case Presentation: A 58-year-old man who had undergone surgical resection for rectal carcinoma followed by chemo-radiation therapy developed NF of the pelvis and thigh three years after the surgical procedure. Following extensive debridement, a VAC system was applied to the large open wound and successfully contributed to wound bed cleansing, which was followed by surgery for skin grafting.

Conclusion: This case demonstrates the successful management of a complex and potentially lethal wound of the perineum to lower leg with debridement and skin grafting as well as with the application of the VAC system. (J Nippon Med Sch 2015; 82: 290–294)

Key words: necrotizing fasciitis, negative-pressure wound therapy, colorectal cancer, skin grafting

Background

Necrotizing fasciitis (NF) is a life-threatening condition that can occur as a result of trauma or foreign bodies in surgical wounds as well as idiopathically. NF is characterized by a progressive infection in fascial planes with necrosis of the subcutaneous tissue^{1–3}. NF affects the extremities more frequently than central areas³. Risk factors for NF include diabetes mellitus, trauma, wound infections, decubitus ulcers, alcoholism, carcinoma, peripheral vascular disease, smoking, and intravenous drug abuse. A variety of microbes, including gram-positive group A *Streptococcus*, haemolytic *Streptococci*, and *Staphylococcus aureus*; gram-negative *Enterobacteriaceae*, *Escherichia coli*, *Klebsiella spp.*, and *Proteus spp.*; anaerobes including *Peptostreptococcus*, *Clostridium*, and *Bacteroides*; and fungi such as *Candida* and acid-fast bacteria have all been implicated in the pathogenesis of NF³.

Rapidly progressive soft tissue infection characterized by widespread necrosis of the fascia and subcutaneous tissue can lead to extensive necrosis and sepsis². The mortality rate is high (25%–73%), which requires prompt diagnosis, antibiotic treatment, and extensive surgical removal of devitalized tissues as well as initiation of necessary measures to correct underlying systemic illness^{1,3}. Of these, aggressive early debridement is the single greatest factor that improves the survival of patients who develop NF⁴. Attention can be shifted on healing the debrided wound after the NF is addressed and the patient is medically stable.

The management of NF requires analgesia and multiple dressing changes, which lowers the patient's quality of life as well as the quality of medical care⁵. The approach to wound closure is guided by the surgical management, which may include split-thickness skin grafting,

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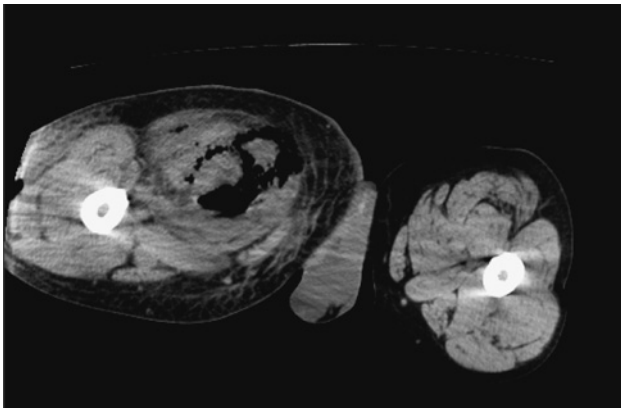


Fig. 1 Computed tomography scan demonstrated soft-tissue inflammation and edema with multiple gas bubble formations and generalized from the obturator muscle to the femoral muscle.

delayed surgical closure or healing by secondary intention.

Negative-pressure therapy or VAC is a well-known wound care system for the treatment of complex wounds. This dressing technique consists of placing an open cell-foam dressing into the wound cavity while a vacuum pump produces a negative pressure and an adhesive drape. Herein, we report the case of a 58-year-old man who presented with NF of the pelvis to the thigh that was treated successfully with surgical debridement, broad-spectrum antibiotics, and skin grafting as well as with the VAC therapy.

Case Presentation

A 58-year-old man presented to the surgery outpatient department with a 1-day history of increasing pain, swelling, and fever at his right gluteal area extending to the right upper thigh. Three years ago, he had undergone abdominoperineal resection followed by adjuvant radio- and chemotherapy (12 courses of modified FOLFOX6, 13 courses of FOLFILI, and 60 Gy of irradiation) for rectal cancer with lung metastases (Dukes D). The chemo-radiation therapy directed toward the lung lesions was completed within 6 months after surgery and demonstrated complete response. Yearly review and colonoscopy showed no loco-regional recurrence of the cancer or distant metastases. After irradiation, however, a small amount of purulent discharge occurred through the perineal suture site. Magnetic resonance imaging (MRI) performed at this time showed an abscess formation localized around the sacral bone. The patient had a past history of type II diabetes mellitus that had been treated

with oral hypoglycemic agents. The serum glucose level, however, had been poorly controlled.

At presentation, the patient was febrile with a temperature of 38.7°C and appeared toxic and hemodynamically unstable with a heart rate of 96 beats/min and a blood pressure of 88/50 mmHg. Physical examination revealed swelling, erythema, blistering, and subcutaneous crepitus of the right lower limb, extending from the gluteal region posteriorly down to the thigh. A large amount of purulent discharge was found in the gluteal region. Abdominal examination revealed a stoma and a midline incision scar, but no other abnormal findings. Initial blood investigations revealed a markedly increased white cell count ($17.4 \times 10^9/L$) and C-reactive protein levels (28.4 mg/dL), with a decreased hemoglobin level (7.6 g/dL) and normal platelet counts. Serum creatinine and blood urea nitrogen levels were also increased. Serum creatine kinase level was slightly elevated (251 U/L) and the hepato-biliary enzymes were within normal range. Pelvic and right leg radiographs showed subcutaneous and inter-muscular gas that led to the diagnosis of lower limb to perineum NF with gas gangrene. This was confirmed with a computed tomography (CT) of the pelvis that revealed a perisacral abscess, concurrent with gas formation in the lower pelvis to right thigh (Fig. 1). Given his life-threatening condition, the patient underwent emergent surgery under general anesthesia for radical exploration and debridement of the lesion. Intraoperatively, myonecrosis and NF of the forceps femoris with feculent material throughout the posterior compartment of the leg.

Post-operatively, the patient was transferred to the intensive care unit for respiratory support, renal support, and inotropic support. The patient was administered broad-spectrum antibiotics: doripenem (1 g/day), clindamycin (2,400 mg/day), and vancomycin (1 g/day). Necrotic tissue and arterial blood were cultured. Immediately following surgery the wound was initially treated with twice dry-to-wet treatment daily. Two days after the initial surgery, however, physical examination and CT scan confirmed that the NF with gas formation had extended to the posterior aspect of the lower leg and an additional radical exploration and debridement was performed. VAC dressing (VAC Therapy™, KCI, Oxfordshire, United Kingdom) was applied to the wound after the second debridement (Fig. 2). The VAC system had to be reapplied in theatre twice weekly. Sequential debridement and wound assessment demonstrated marked improvements with visible granulation tissue following the



Fig. 2 Intraoperative photograph of the wound in a patient with necrotizing fasciitis after the second debridement.



Fig. 4 Wound appearance at the time of the sixth debridement and vacuum-assisted closure (VAC) exchange (post-operative day 21). Healthy granulation tissue is present throughout the wound.



Fig. 3 Following debridement, the vacuum-assisted closure (VAC) system was applied to the wound of the patient with NF.



Fig. 5 Post operative photograph illustrates that the previous soft tissue defect was completely covered by the mesh-graft.

application of the VAC system set at 125 mmHg continuous topical negative pressure (Fig. 3). The patient required four additional wound debridements in the subsequent two weeks. The VAC therapy was discontinued after the sixth debridement as the granulation that had covered the wound was satisfactory (Fig. 4). Mesh skin

grafts obtained from the antero-lateral aspect of the left thigh were applied to the thigh wounds on the tenth day following the last debridement, which resulted in successful and complete coverage of the previous soft tissue defect (Fig. 5).

Currently, at 36 months follow-up, the patient is well and able to ambulate independently following postoperative rehabilitation.

Discussion

The patient in this case report was treated successfully, in accordance with current therapeutic concepts, with aggressive hemodynamic stabilization, parenteral broad-spectrum antibiotic administration, and urgent wide surgical excision to remove all devitalized tissue as well as the application of VAC. Furthermore, in this case, no adverse events occurred in association with VAC, indicating that VAC facilitated primary closure of a large wound from the hip to the lower extremity that had been caused by acute NF. This approach proved more comfortable for both the patient and the nursing staff. VAC had a complementary function; its range of indications includes pressure sores, stasis ulcers, chronic wounds such as diabetic foot ulcers, post-traumatic and postoperative wounds, soft-tissue injuries, injuries with bone exposure, open abdominal wounds; it is also used to secure skin grafts^{6,7}. Accumulating evidence indicates that the VAC therapy is useful for the management of infected wounds including NF^{5,8-10}. The cyclical application of negative pressure can accelerate wound healing, where optimized blood flow increases local oxygenation and promotes fibroblast stimulation and granulation formation, decreases local tissue edema, and accelerates removal of excessive fluid from the wound bed, which in turn facilitates the removal of bacteria from the wound^{11,12}. A previous comparative study between conventional treatment, using initial debridement followed by wet-to-dry dressings with saline, and VAC treatment for a patient with NF demonstrated that both treatments were equally effective in healing wounds, whereas with the use of VAC, patients had fewer dressing changes, less pain, fewer skipped meals, and greater mobility⁵. Another case series among patients with NF demonstrated that the VAC therapy is effective in cleaning the wounds, interrupting the fasciitis process, and reducing the hospital stay and patient discomfort⁹. Chiummariello et al. analyzed 135 patients who underwent the VAC therapy for acute and chronic wounds closure and showed that the VAC therapy led to a higher rate of wound healing while reducing the hospitalization period as well as the costs, resulting in increased patient comfort and satisfaction⁷.

Our patient suffered from diabetes mellitus and malignancy, which are both established risk factors for developing NF¹³. Other risk factors for NF include trauma,

wound infections, decubitus ulcers, alcoholism, carcinoma, peripheral vascular disease, smoking, and intravenous drug abuse. The bacterial spread to the fascia from the sustained deep infection around sacral bone bears significant relevance to our case and should be another causative factor of NF.

Given its rapid and widespread progression, an early diagnosis for NF is critical¹. Suspicion of NF is mandated in a patient presenting with cutaneous infection that causes swelling, pain, and erythema in the presence of co-morbidity with diabetes or liver disease. CT scan and MRI are sensitive for the diagnosis of NF and the differential diagnosis includes other causes of soft tissue infection, such as abscesses³. In our case, the presence of bullae and gas on plain X-ray and/or CT scan was diagnostic.

In the light of the findings presented above, we emphasize the advantageous use of the VAC device that successfully expedited wound healing for the patient with NF.

Conflict of Interest: The authors declare no conflict of interest.

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