# Successful Management Of Ileostomies In An Infant With Abdominal Wounds Using Negative-Pressure Wound Therapy

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## Abstract

A 13-month-old child presented to our burn center with 50% total body surface area burns, including burns over his entire abdomen. During the initial resuscitation and treatment of these burns, he had complications from his injuries, necessitating emergency bowel resection and stoma placement. Care of the child's abdominal wounds were difficult secondary to leakage of intestinal contents onto the laparotomy incision impairing healing. Our team successfully designed a system to protect his wounds and separate the stomas from the surrounding injured abdominal wall with the use of negative-pressure wound therapy.

# INTRODUCTION

Bowel ostomy care has challenges. During standard care, an ostomy bag is attached to the skin around the bowel opening with an adhesive, with the goal to prevent any bowel output from coming in contact with the surrounding skin. Leakage of liquid around the bag, especially enzyme-rich ileostomy output, causes skin irritation and pain, which is often exacerbated by the adhesives used to secure the edges of the device.1 In severe cases, skin breakdown, bleeding, ischemia, necrosis, and dehiscence of the mucosal-cutaneous junction can occur. Even milder cases can be distressing for patients due to dermatitis-related pain and itching. 2,3,4 Management of ostomies becomes significantly more difficult if the skin near the stoma is already compromised. Patients with burns, or incisions have skin that lacks the normal barrier function, leading to skin that is especially sensitive to any irritant.

Negative-pressure wound therapy (NPWT), also known as wound VAC (vacuum-assisted closure,) is a therapeutic technique using a vacuum dressing to promote healing and to protect the area of injury in acute or chronic wounds, including second and third degree burns. Wound VAC therapy promotes wound healing by removing infectious materials and exudates, while improving perfusion as well as granulation tissue formation. We present the innovative case of a small child with life threatening burns and ostomies, whom we were able to manage using VAC to separate the ostomy output from the damaged skin, allowing for improved healing of the wounds and reduced pain and irritation.

# **CASE REPORT**

A 13-month-old boy was admitted to the regional burn center for 50% total body surface area (TBSA) partial thickness scald burns to the abdomen, flanks, buttocks, genitals and bilateral lower extremities. He had been intentionally dipped into a scalding hot bathtub by a caregiver. His course was complicated by abdominal compartment syndrome, necessitating an urgent exploratory laparotomy nine days after admission. His condition at the time of surgery required resection of a 45 cm section of the mid small bowel and the placement of two ostomies. The ostomies were located at the ends of the midline incision site; the proximal stoma was approximately 4 cm above the umbilicus, and the distal end was about 2 cm below the umbilicus (figure 1.) Both stomas were completely surrounded by skin that had sustained third-degree burns. Management of the stoma sites was difficult. The ostomy bags could not be well secured to the patient's burned skin. Ileostomy output leaked around the ostomy bags onto the damaged abdominal skin and ex-lap incision. This caused

tissue breakdown, a non-healing incision and significant pain to the child.

#### Figure 1



Due to the limited options available, a decision was made to use a wound VAC. Application of the VAC device was complicated by the need to have it separated from the stomas. A novel application of the VAC was designed and applied to the patient's abdomen (figure 2 & 3.) Details of the application of this device, separating the ostomy collection bag from the VAC device, are described below.

#### Figure 2



Figure 3



A schematic diagram of the entire system is shown in figure 2. To begin the procedure, the wound was cleaned and dried thoroughly. The first layer applied was a sheet of Acticoat<sup>TM</sup>, a silver impregnated wound dressing, directly on the on the abdominal skin, with holes cut out for the stomas. This provided an antimicrobial effect directly to the burn. For the next layer, a wound VAC sponge with a hole was fit around each ostomy site, covering the rest of the abdominal wound. Adjacent to the stoma, Duoderm Tegasorb Hydrocolloid<sup>™</sup> dressing with an adhesive border was applied directly to the allograft covering burned skin. This was the barrier layer used to attach the ostomy appliance. The next, and technically most difficult to place layer, was the clear plastic dressing that allows the wound VAC to make a seal over the sponge. The clear plastic has a sticky underside, which allows it to stick to intact skin. The skin on the flanks of the abdomen, and superior and inferior border was healed and the clear plastic was able to stick to this skin. Holes were cut in the clear VAC dressing and it was laid down completely surrounding the stoma, up to the ostomy edge, over the Duoderm<sup>TM</sup>. The baseplate of the ostomy appliance was then placed over the clear plasticcovered Duoderm<sup>TM</sup> and the bag was attached (Figure 3.) Once the dressing application was completed, the VAC suction was turned on to -125 cm H2O. The portion of the clear VAC dressing[AB1] adjacent to the stomas would leak from time to time (likely due to moisture,) requiring application of additional clear sticky dressings, (Tegaderm<sup>TM</sup>) to maintain adequate suction. The ostomy bag was emptied frequently, to decrease the dressing suction leak, and its output recorded.

The wound VAC was changed every three days along with the Duoderm<sup>TM</sup> and Acticoat<sup>TM</sup>. The burned skin and abdominal wound was thus protected from the ostomy output preventing tissue breakdown and allowing for healing. There was a decrease in pain and analgesic requirements immediately following VAC placement, which continued throughout the NPWT. After 3 weeks, autologous split-thickness skin grafting was performed over the abdominal wall, and the same series of steps was followed to protect the fresh graft from ostomy output. Once the incision site and grafted skin healed, the wound VAC was discontinued.

The ostomies were taken down after six months, and remainder of the wound healed without further complications (figure 4).

## Figure 4



# DISCUSSION

Protection of the skin surrounding a stoma site can be challenging. Skin irritation from ostomy output can be a serious issue for people with stomas, leading to pain, breakdown of skin and potential secondary infections. The situation is obviously compounded if the skin near the stoma is already compromised. Avoidance of dermatitis of any type in the initial days following ostomy placement is paramount as this dermatitis can inhibit pouch adhesion, leading to further leakage, skin inflammation, and pain for the patient. Bowel surgery requiring stoma placement is not a common circumstance in a person with extensive abdominal burns, but when it does occur, management of stoma output can be significantly more difficult. Lack of intact skin, need for cadaveric allograft and use of antimicrobials can make it difficult to secure devices such as ostomy bags, that ensure skin is protected from ostomy output and contact dermatitis is avoided. In our case, we initially attempted to manage our patient with various traditional stoma care plans, plans that

we were most familiar with. However, he developed serious issues with pain and leakage of bowel contents onto his already damaged skin with further breakdown of his skin. This irritation, nearly led to breakdown of the abdominal incision and intestinal evisceration, which likely would been fatal in this critically ill child.

Negative pressure wound therapy (NPWT) became clinically available about 20 years ago, in the mid 1990s. The various devices on the market provide constant gentle suction (generating pressure in the range of -80 to -125 mmHg) to a foam matrix that is covered by an occlusive plastic dressing that prevents entrainment of room air, enabling subatmospheric pressure at the wound site. The NPWT device removes wound exudate and excess fluid, and reduces the risk of wound desiccation, tissue break down, and exposure to environmental infectious factors. These elements allow for granulation tissue formation and optimal healing conditions. Wound VACs are used in both adults and children 5,6, and have been found to be effective and safe to use on a variety of wound classes6,7,8. In fact, burn injuries (especially fresh autografts) are the class of wounds that have some of the best outcome data for use of NPWT9,10. In this case the NPWT device provided several advantages to our patient; providing a barrier to ostomy output, minimizing the chance of secondary infections, improving healing of the freshly placed ostomy and facilitating healing of the incision, underlying burn and subsequent autograft[AB1].

NPWT has been used to facilitate healing of infected and necrotic stomas12, in the management of enterocutaneous fistulae, and in complex abdominal wounds14. Byrne-Bowens and Franczyk describe using NPWT in a premature infant with a complex abdominal wound and jejunostomy stoma and a mucous fistula on either side of the wound14 with good results, but their patient's stomas were not surrounded by compromised skin as was ours. After a thorough literature search, we believe that this is the first reported case of the use of NPWT to isolate enteric output from compromised skin in the case of bowel stomas encompassed by burned abdominal wall.

## CONCLUSIONS

We present the case of a 13-month-old child who had ostomies draining onto burned skin and an abdominal incision. We used NPWT with a wound VAC on top of layers of Acticoat<sup>TM</sup> and Duoderm<sup>TM</sup> to allow separation of the wound from the stoma output. This allowed complete healing and decreased pain. In cases where skin protection is necessary, using a NPWT system is an excellent option to promote rapid healing. Frequent NPWT dressing changes may be necessary to maintain a seal in the system where the device comes into contact with the stoma.

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