

# Combing a novel device and negative pressure wound therapy for managing the wound around a colostomy in the open abdomen

## A case report

Xiaofang Sun, MD<sup>a</sup>, Shaohan Wu, MD<sup>b</sup>, Ting Xie, PhD<sup>c</sup>, Jianping Zhang, MD<sup>a,\*</sup>

### Abstract

**Rationale:** An open abdomen complicated with small-bowel fistulae becomes a complex wound for local infection, systemic sepsis and persistent soiling irritation by intestinal content. While controlling the fistulae drainage, protecting surrounding skin, healing the wound maybe a challenge.

**Patient concerns:** In this paper we described a 68-year-old female was admitted to emergency surgery in general surgery department with severe abdomen pain. Resection part of the injured small bowel, drainage of the intra-abdominal abscess, and fashioning of a colostomy were performed.

**Diagnoses:** She failed to improve and ultimately there was tenderness and lot of pus under the skin around the fistulae. The wound started as a 3-cm<sup>2</sup> lesion and progressed to a 6 × 13 (78 cm<sup>2</sup>) around the stoma.

**Interventions:** In our case we present a novel device for managing colostomy wound combination with negative pressure wound therapy.

**Outcomes:** This tube allows for an effective drainage of small-bowel secretion and a safe build-up of granulation tissue. Also it could be a barrier between the bowel suction point and foam.

**Lessons:** Management of open abdomen wound involves initial dressing changes, antibiotic use and cutaneous closure. When compared with traditional dressing changes, the NPWT offers several advantages including increased granulation tissue formation, reduction in bacterial colonization, decreased of bowel edema and wound size, and enhanced neovascularization.

**Abbreviations:** BMI = body mass index, NPWT = negative pressure wound therapy, OA = open abdomen.

**Keywords:** a novel device, colostomy, negative pressure wound therapy, open abdomen, ostomy

## 1. Introduction

An open abdomen (OA) could result from severe peritonitis, postlaparotomy wound dehiscence, surgical management of

trauma, and other abdominal emergencies. The most critical complication of OA is the formation of a small-bowel fistula.<sup>[1,2]</sup> It was reported that this complication occurs in 25% of patients with a mortality rate of 42%.<sup>[3]</sup> An OA complicated with small-bowel fistulae becomes a complex wound for local infection, systemic sepsis, and persistent soiling irritation by intestinal content. While controlling the fistulae drainage, protecting surrounding skin and the wound maybe a challenge.

Negative pressure wound therapy (NPWT; KCI USA Inc, San Antonio, TX) is a popular method for the treatment of acute and chronic wounds. Also it was proved to be an effective and common method in dealing with complications of OA.<sup>[4]</sup> NPWT could not only increase angiogenesis, peripheral nerve response, stimulation of cell division, granulation tissue formation but also reduce bacterial contamination, remove exudates, and securely preserve residual vital tissues in the wound.<sup>[5]</sup> However, high-pressure suction applied on the foam around the wound could be risky. The wall of the bowel could become necrotic tissue or the soiling could not drain from the fistulae. Safety of the surrounding granulation tissue and bowel is a major problem. In the following sections, we are describing a novel device for managing the wound around ostomy with exposed small bowel in combing with NPWT.

## 2. Material and methods

### 2.1. Material

A female was 68 years old and her body mass index (BMI) was 31.6. Her medical history was notable for 10 years diabetes

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XS and SW contributed equally to this work.

Compliance with ethics guidelines: This study was conducted according to the Declaration of Helsinki and its amendments, and was approved by the Ethical Committee of the Second Affiliated Hospital of Jiaxing College (Ethical Committee number CZJ 300; Chairperson professor Liqin Jiang) on 26 December 2016.

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<sup>a</sup> Department of Dermatology, <sup>b</sup> Department of General Surgery, The Second Hospital Affiliated to Jiaxing University, Jiaxing, Zhejiang, China. <sup>c</sup> Wound Healing Department, Shanghai 9th People's Hospital, Shanghai Jiao Tong University School of Medicine, Shanghai, China, 200011.

\* Correspondence: Jianping Zhang, Department of Dermatology, The Second Hospital Affiliated to Jiaxing University, No.1518, Huancheng North Road, Jiaxing, Zhejiang, China, 314000 (e-mail: doctorjzhang@163.com).

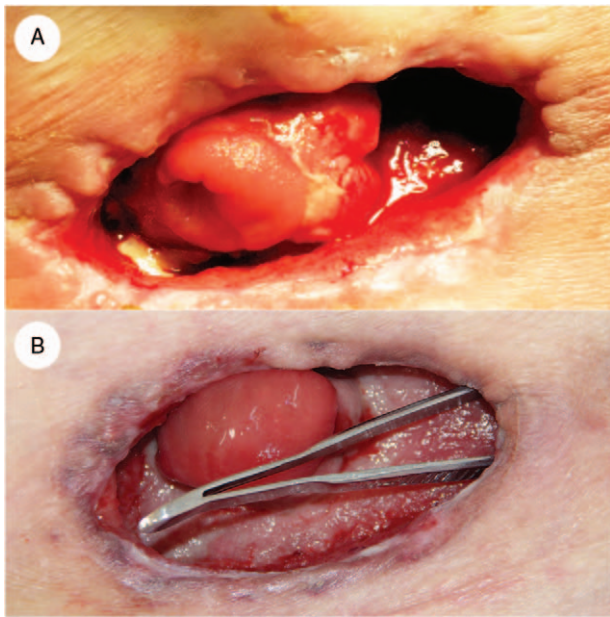
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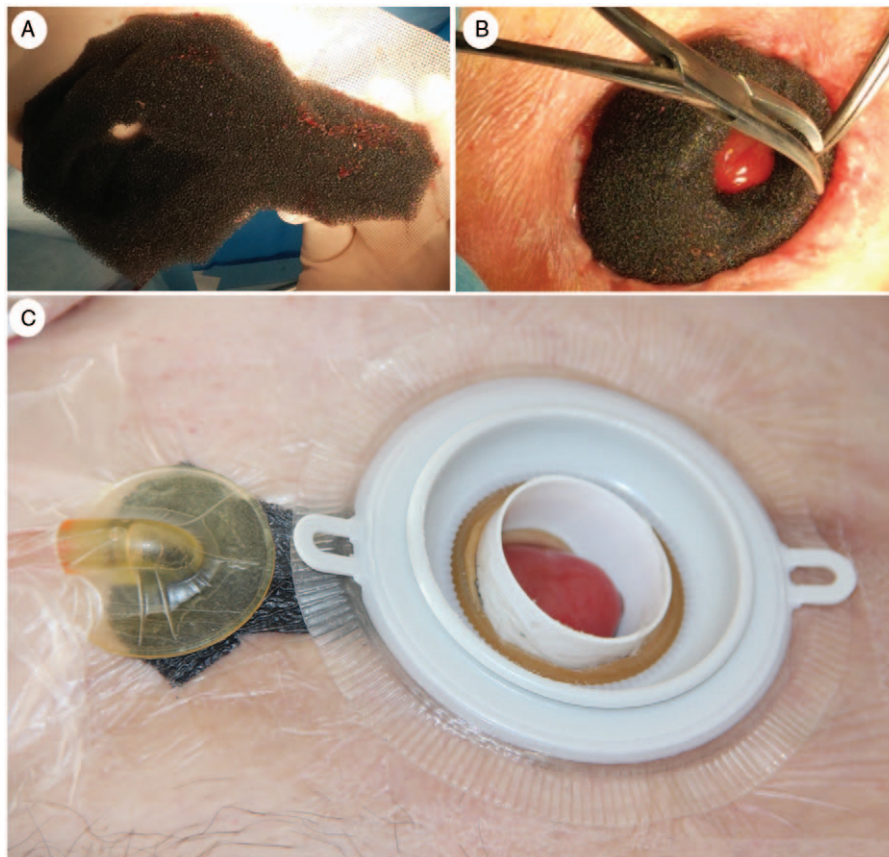
**Figure 1.** (A) 68-year-old obese patient who underwent colostomy and developed wound around the stoma with lot of pus.(B) The surgical debridement was done to remove necrotic tissue then a 6 cm undermining wound could be seen around skin.

and 40 years hypertension. She also had colon polyps and appendectomy. She had under gone left thigh schwannoma resection surgery.

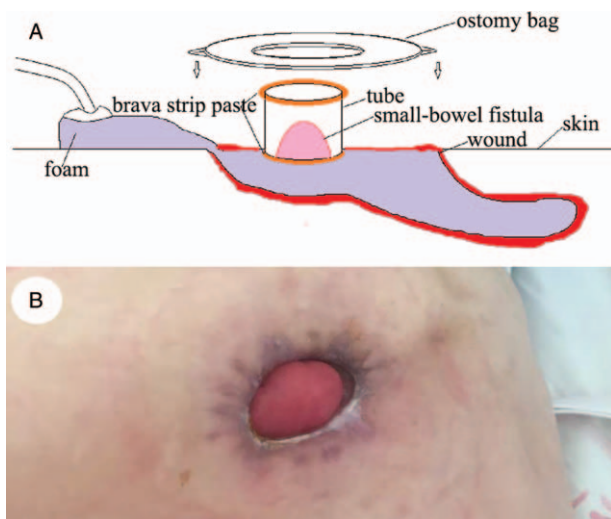
She was admitted to emergency surgery in general surgery department with severe abdomen pain. She had an enteroscopy for colon polyps by a gastroenterologist 30 minutes prior to this presentation and was feeling unwell since then. She had tachycardia of 102 beats per minute and blood pressure of 105/50 mm Hg, and a random blood glucose of 16.2 mmol/L. On abdominal examination she had generalized pain, absent bowel sounds and guarding with board-like rigidity. The diagnosis of acute peritonitis was made. After resuscitation and general anesthesia, she underwent an emergency open abdomen surgical exploration and was found to have an injury of the small bowel leading to generalized purulent peritonitis. Resection part of the injured small bowel, drainage of the intra-abdominal abscess, and fashioning of a colostomy were performed. She failed to improve and ultimately there was tenderness and lot of pus under the skin around the fistulae. The wound started as a 3 cm<sup>2</sup> lesion and progressed to a 6 × 13 cm (78 cm<sup>2</sup>) around the stoma (Fig. 1A)

## 2.2. Methods

The wound around the fistulae was rinsed with saline irrigation. Then surgical debridement was done to remove necrotic tissue. A 6 cm wound could be seen under the around skin (Fig. 1B). The foam was cut into the shape of the wound (Fig. 2 A and B). The



**Figure 2.** (A) A piece of foam was cut into the similar size of the wound. (B) This foam was put into the wound according to its shape. (C) The Brava Strip Paste (Coloplast) was used at the bottom around bowel, creating a tight seal between tissue and a 4 cm high tube around the bowel. Another piece of foam was placed onto the foam next to the wound to minimize direct suction on the bowel. The foam was covered with an adhesive drape creating a sealed environment. Then continuous negative pressure wound therapy was applied.



**Figure 3.** (A) The working principle of this combining method. (B) Four weeks later, the wound volume decreased and granulation tissue surrounded the stoma. The edema of the bowel also decreased.

Brava Strip Paste (Coloplast) was used at the bottom around bowel, creating a tight seal between tissue and a 4 cm high tube around the bowel. Another piece of foam was placed onto the foam next to the wound to minimize direct suction on the bowel. The foam was covered with an adhesive drape creating a sealed environment. Then continuous negative pressure at 125 mm Hg was applied (Fig. 2C). Finally, an ostomy bag was placed over the tube assisting with Brava Strip Paste. The NPWT dressing was changed at the bedside every 5 or 7 days based on the condition of the wound and the patient. Surgery with fistula closure and abdominal closure was planned 8 weeks later. The working principle of this method could be seen in Figure 3A.

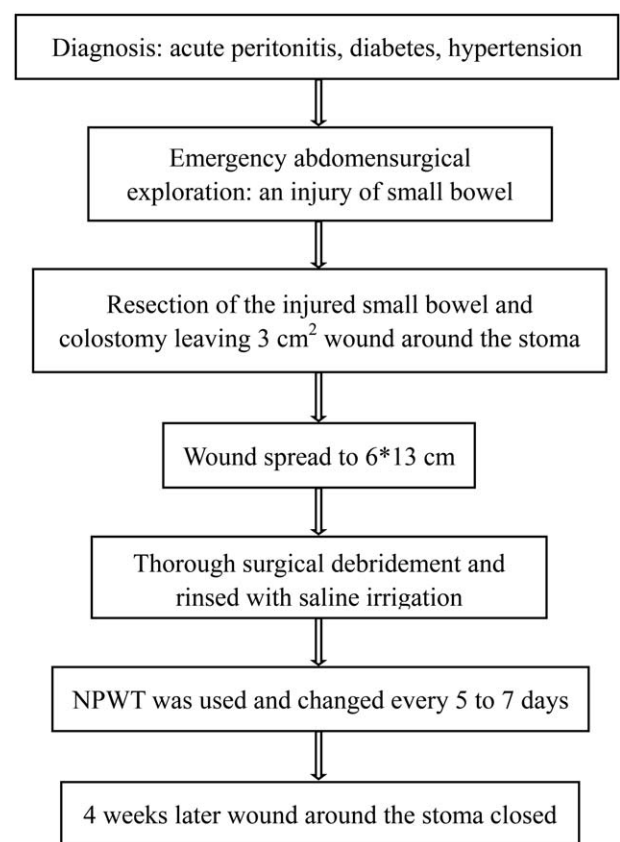
### 3. Result

This patient underwent minor bedside debridement during NPWT dressing changes. The duration of NPWT for her was 4 weeks. The wound volume could be seen markedly decrease during NPWT. Four weeks later granulation tissue surrounded the stoma (Fig. 3B). Before the use of NPWT bowel wall edema was observed and it was improved during the period of NPWT. The patient reported less pain with NPWT dressing changes than with gauze dressing changes. The diagnosis and interventions of this patient could be seen in Figure 4.

### 4. Discussion

Treating a patient with colostomy and open abdomen wound is a challenging task for the surgeon. The goals include restoration of the abdominal wall integrity, protection of exposed bowel from desiccation and necrotic, control of any local and systemic infection, debridement of necrotic tissue, and preparation of the wound for cutaneous closure.

Management of open abdomen wound involves initial dressing changes, antibiotic use, and cutaneous closure. When compared with traditional dressing changes, the NPWT offers several advantages including increased granulation tissue formation, reduction in bacterial colonization, decreased of bowel edema and wound size, and enhanced neovascularization.<sup>[6]</sup> Patient who was treated with open abdomen wounds for planned serial



**Figure 4.** The diagnosis and interventions of this patient.

re-explorations or for abdominal compartment syndrome benefited from temporary abdominal closure with NPWT.<sup>[7,8]</sup> However, there are several reports suggest a higher fistula rate when NPWT is used to treat the OA.<sup>[9,10]</sup> Also there was a case reported the wall of the bowel could become necrotic if the high pressure suction applied on the foam at the middle of the wound.<sup>[11]</sup> Besides, there was a systematic review and meta-analysis of the OA and temporary abdominal closure techniques in non-trauma patients. They found that although NPWT could achieve the best results in terms of risk of entero-atmospheric fistula, the overall quality of the available evidence was poor, and uniform recommendations cannot be made.<sup>[12]</sup> Cirocchi R performed an up-to-date systematic review on the management of OA which including the most recent published nonrandomized and randomized controlled trials to explore the effectiveness of NPWT in patients with OA. The data revealed that NPWT seems to be toward better outcomes compared to the use of no NPWT.<sup>[13]</sup> The data does indicate the evidence presented in current systematic review, however, this research lack of heterogeneity and statistical significance between studies. So we highlight the need for a randomized controlled trial having homogeneous which including criteria to assess the use of NPWT for the deal with OA. Literature retrieval found a meta-analysis involving only randomized controlled trials showed that NPWT with continuous fascial closure was superior to NPWT alone for definitive fascial closure.<sup>[14]</sup> Therefore, it was concluded that NPWT does effectiveness in deal with OA.

What is more, the treatment strategy for fistula or small bowel should be multifaceted and multidisciplinary. Surgical treatment is the most often multistep and should be tailored to the patient,

according to the characteristics and type of the fistula, following its correct classification and identification.<sup>[15]</sup> A variety of therapeutic methods exists to separate the fistula or small bowel from the surrounding wound. Combing using NPWT seems to be most effective. But none of the method used will match every situation. In our case we present a novel device for managing colostomy wound combination with NPWT. This tube allows for an effective drainage of small-bowel secretion and a safe build-up of granulation tissue. Also it could be a barrier between the bowel suction point and foam. Besides, we shifted the suction point through a foam bridge outside the wound. This combing method also supports split thickness skin grafting around the ostomy wound or small-bowel fistula. Although NPWT was effective in our case and a lot of researchers have reported its functions and mechanism. There would be some bias due to lack of publications in other than English language and the unpublished works.

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