Laparostomy (leaving the abdomen open after an abdominal operation) may be used in patient cases where surgical re-exploration is desirable and/or closure is not possible due to severe edema. Laparostomy also provides a practical way to manage patients with severe intra-abdominal infection because it facilitates repeat exploration of the abdominal cavity, fluid drainage and collection, and/or debridement of intra-abdominal infection.

Managing the open abdomen can be challenging. Most often, this is the time-consuming responsibility of the intensive care specialist physicians and nurses. Management of leaking wound fluid is particularly cumbersome — the fluid irritates adjacent skin and must be drained. “Simple” treatment involves wet gauze and self-adhesive dressings to protect the surrounding skin, leaving the wound to heal by granulation and contraction. Other more advanced techniques have been developed, such as the “zipper,” where the sides are sutured to the fascia to provide easy access to the abdominal cavity; this has been proven a good device for wound management.

The use of a plastic sheet to cover abdominal contents in case of a laparostomy was first introduced by Londoni, a chief resident in Bogotá, Colombia; it consists of an opened, sterilized 3-L genitourinary irrigation bag sewn (with a 1-0 or 2-0 running monofilament nylon suture) to the patient’s fascia. This Bogotá bag technique has been described in combination with vacuum-assisted closure therapy. Manufactured topical negative pressure (TNP) abdominal dressing systems consist of a fenestrated nonadherent piece of plastic with encapsulated foam that is placed over

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Drs. Steenvoorde, den Outer, and Neijenhuis are affiliated with Rijnland Hospital Leiderdorp, Leiderdorp, The Netherlands. Please address correspondence to: Pascal Steenvoorde, MD, MSc, PhD, Rijnland Hospital Leiderdorp, Simon Smitweg 1, 2353, GA Leiderdorp, The Netherlands; email: psteenvoorde@zonnet.nl.
the abdominal organs and beneath the peritoneum of the abdominal wall. This is overlaid with an additional layer of polyurethane foam and covered by an adhesive drape to create a seal (see Figures 1 through 4). The TNP system used in combination with sutures has been described in larger series, mainly in trauma patients.

Based on expert opinion, Swan and Banwell advocate the use of a TNP abdominal dressing system for the treatment of an open abdomen in cases of intra-abdominal sepsis, exposed bowel, or exposed omentum. This system has many advantages over earlier versions of TNP utilized in combination with the Bogotá bag and has made the treatment of the open abdomen much simpler. For example, one of the problems with the Bogotá bag is the need to suture the bag to the fascia, potentially damaging the fascia if repeated often. Another advantage of the abdominal TNP system is that the primary drape can act as an anti-adhesive layer between bowel and fascia; this is not the case of the combination of TNP with the Bogotá bag. However, the abdominal TNP system has shortcomings, especially with use in obese patients. It may be difficult to approximate the abdominal wall with the TNP, perhaps due to the weight of the skin/abdominal wall tearing the abdominal wall to the patient’s side. Also, application of the primary plastic layer (the fenestrated nonadherent piece of plastic with encapsulated foam) could be more difficult in patients with a colostomy — ie, the primary layer needs to be secured carefully to avoid damage to the stoma.

The abdominal TNP system is a good choice for the patient in the ICU because it does not require frequent dressing changes and protects the surrounding skin from abundant fluid. However, in patients with a colostomy, traction and tugging of the primary drape might loosen the stoma on the medial side. This complication occurred in three patients in the authors’ care. Although treating patients with concurrent laparostomies and colostomies is fairly uncommon (this occurs three to five times per year in the authors’ facility), the authors have found a potentially simple strategy that might prevent this complication.

The purpose of this case series is to describe three cases of stomal dehiscence following application of TNP to manage open abdomens in patients with a stoma.

### Table 1. Patients with colostomy dehiscence in combination with negative pressure abdominal dressing system

<table>
<thead>
<tr>
<th>No.</th>
<th>Gender</th>
<th>Age</th>
<th>Primary operation</th>
<th>Laparostomy indication</th>
<th>Solution</th>
<th>Final Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Male</td>
<td>65</td>
<td>Perforated diverticulitis of the sigmoid: sigmoid resection and colostomy</td>
<td>Fascial dehiscence due to iatrogenic suturing of small bowel to fascia</td>
<td>Surgery — new sutures were placed on the medial side, abscess drained para-colic left</td>
<td>Abdominal wall reconstruction and reversal of colostomy (8 months later)</td>
</tr>
<tr>
<td>2</td>
<td>Male</td>
<td>53</td>
<td>Laparoscopic sigmoid resection for diverticulitis</td>
<td>Anastomotic failure, for which a Hartman was performed</td>
<td>Recurrent laparostomies, with abundant abdominal washout with normal saline</td>
<td>Abdominal wall reconstruction and reversal of colostomy (6 months later)</td>
</tr>
<tr>
<td>3</td>
<td>Male</td>
<td>59</td>
<td>Sigmoid cancer with ileus and ingrowth in jejunum: en bloc resection</td>
<td>Anastomotic failure, for which a colostomy was performed</td>
<td>Re-laparotomy with abundant rinsing</td>
<td>The patient became septic in the ICU and died shortly after</td>
</tr>
</tbody>
</table>

### Key Points
- The authors of this case series describe three patients with stomal mucocutaneous dehiscence following the application of topical negative pressure to manage abdominal wounds.
- This serious complication was believed to be the result of excessive tension and the authors describe a potential solution to help prevent this complication.
- Clinicians must carefully consider TNP usage and methods in patients with complicated wounds.

### Treatment Procedure

The TNP abdominal dressing system (VAC® Abdominal Dressing system, KCI Netherlands, Houten) used in the authors’ facilities consists of a fenestrated nonadherent piece of plastic with encapsulated foam (see Figure 1), which is placed between the abdominal organs and the peritoneum of the abdominal wall. An additional layer of polyurethane foam (black foam) is placed on top and covered by an overlying adhesive drape to create a seal. All TNP therapy is performed in the ICU or operating room; the suction drain is placed in the middle of the dressing and the continuous pressure is always 75 mm Hg to 100 mm Hg, according to manufacturer instructions.
This dressing system was used for more than 10 patients, including the three with a stoma cases described, during the same approximate time period (2007), but the presence of a colostomy presented unique challenges.

**Case Reports**

During the first half of 2007, three patients managed with TNP (see Table 1) had medial loosening of the stoma. All three patients were male (53 to 65 years old). In two cases, anastomotic failure occurred after colonic resection; in the other patient, there was an iatrogenic suturing of small bowel to fascia. In all patients, stomal dehiscence and subsequent leakage of fecal material into the abdominal cavity led to extra contamination, necessitating additional surgery and antibiotic treatment. Patient 3 died within a week from septicemia at the time of the complication. Patients 1 and 2 survived the septic period and were treated with abdominal wall reconstruction and reversal of their colostomies. Patient 1 underwent six and patient 2 underwent eight surgeries during their septic period before split-skin grafting and final reconstruction.

**Patient 1.** Mr. G was a 65-year-old man with perforated diverticulitis of the sigmoid who underwent sigmoid resection and temporary colostomy. He was undernourished, nonobese, nondiabetic, with a history of smoking; he had a perforated diverticulitis with faeces in all four quadrants of the abdomen. He experienced fascial dehiscence because his small bowel was iatrogenically sutured to fascia. To address the complication, new sutures were placed on the medial side; the defect in the small bowel was oversutured and the subsequent abscess was drained via the left paracolic. Stomal dehiscence occurred within 2 to 3 days after application of TNP. He was discharged home in-between each procedure during the reconstruction phase. After 8 months, his abdominal wall was reconstructed and his colostomy was reversed.

**Patient 2.** Fifty-three-year-old Mr. H, an otherwise healthy man, underwent a laparoscopic resection of the sigmoid to address recurrent diverticulitis. An anastomotic dehiscence occurred and he needed repeat surgery. The anastomosis completely failed, requiring creation of a colostomy. Initially, a Bogota bag was sutured in the fascia, but his management was changed to the TNP system after he developed recurrent abscesses in the abdominal cavity that necessitated several surgical drainage procedures. When this problem resolved, new abscesses developed because the stoma loosened; fecal material could run freely into the abdomen (see Figures 2 and 3). Eventually, Mr. H’s condition was stabilized during ICU admission and re-suturing. Subsequently, Mr. H was managed with TNP for 21 days (six dressing changes were performed in the OR). A vicryl mesh was sutured on skin level, after which Mr. H received a split-skin graft. Six months later, an abdominal reconstruction was performed and the colostomy was reversed.

**Patient 3.** Mr. K was 59 years old with sigmoid cancer with ileus and ingrowth in the jejunum addressed with en bloc resection. After anastomotic failure, he had a colostomy. Despite this surgery, the laparostomy wound opened in the ICU, necessitating open abdominal treatment. Several laparostomies were performed; subsequently, Mr. K became septic and died within a week.

**Challenges and Possible Solution**

Traction inside the abdomen on the proximal bowel of the stoma can pull the stoma back into the abdomen. Eventually, the sutures will break, leading to partial or total dehiscence and allowing the stomal contents to run freely in the abdomen. To lessen the traction on the stoma, the authors cut
Figure 3. Patient 2: note that some of the sutures are loose, most likely the result of some form of traction.

Figure 4. The primary drape (with the black encapsulated foam clearly visible) is cut to facilitate the stoma.
the primary drape of the TNP dressing (see Figure 4) to create two dressing flaps that could be draped around the stoma (see Figure 5). This technique was used in one patient in the second half of 2007 (the only patient treated in the authors’ hospital with a laparostomy in combination with a colostomy during that time). In this case, stomal dehiscence did not occur and the patient recovered well. This approach may represent a solution to prevent stomal dehiscence. Although the premise is only speculative, the authors advise careful and gentle application of the primary drape, at the very least.

Discussion

Because this is a retrospective study comprising only three cases, it cannot be determined with certainty that the observed stoma complications were caused by the TNP dressing. Stoma complications occur regularly, regardless of TNP use. For example, according to the literature, the absorbable suture material used in all the authors’ patients (Vicryl®, Ethicon, Inc., Somerville, NJ) is known to increase stoma problems when compared to nonabsorbable sutures. However, this complication was not observed in other patients with colostomies and an open abdomen who were not treated in the ICU with TNP and did not occur before provision of TNP, leading the authors to conclude that complications were the result of the TNP dressing, not something related to surgery.

TNP has proven to be of value on the management of the open abdomen. However, as shown in these case reports, it may have complicated already complex cases. Although stomal dehiscence and subsequent leakage prolonged ICU length of stay and necessitated additional surgeries, their exact influence was not clear. Because of the diversity of the patients and their conditions, calculating the number of additional operations, days in ICU, and costs is difficult; it is not known how long they would have stayed in the ICU had they not experienced the TNP/open abdomen complication.

Conclusion

These case reports, as well as information in the literature, suggest that clinicians should be concerned about stomal dehiscence when using TNP in the management of patients with an open abdomen and a stoma. Based on the authors’ observations, dressing flap modifications to accommodate the stoma may help prevent this serious complication. This approach was tried successfully in one patient. Proactive approaches and ingenuity are necessary when treating large wounds in patients with concurrent mitigating conditions. Additional research involving a larger sample will enhance clinician confidence in utilizing TNP in the management of complicated wounds.

References