CASE REPORTS

Vacuum assisted closure system in the management of enterocutaneous fistulae

C Cro, K J George, J Donnelly, S T Irwin, K R Gardiner

Background: A very important yet often troublesome element in the conservative management of enterocutaneous fistulae is the protection of the surrounding skin from contact with the effluent. This report describes the successful use of a vacuum assisted closure (VAC) system in dealing with this problem.

Methods: The results of using the VAC system were studied in three patients with moderate or high volume output enterocutaneous fistulae where conventional treatment had failed to prevent skin excoriation.

Results: The VAC system was found to be highly effective in controlling fistula effluent and in promoting healing of excoriated skin in all three patients. Complete healing of the fistula was also achieved in two of the three patients.

Conclusion: The VAC system can be an effective and economically viable method of containing fistula effluent and protecting the skin of patients with enterocutaneous fistulae. Contrary to conventional thought, the VAC system may also actually promote healing of the fistula.

Enterocutaneous fistulae are abnormal communications between the gastrointestinal tract and the skin. They can be related to underlying disease such as inflammatory bowel disease, appendicitis, diverticular disease, intestinal ischaemia, perforation of duodenal ulcer, or develop postoperatively due to iatrogenic intestinal injury or anastomotic failure. Enterocutaneous fistulae have a significant mortality and morbidity as a result of associated sepsis, malnutrition, and fluid imbalance.

Management of the skin surrounding enterocutaneous fistulae is a difficult challenge because of the effect of moisture and chemical irritation on the skin. A key element in the conservative management of enterocutaneous fistulae is the protection of the surrounding skin from contact with the effluent.

We describe the use of the Vacuum Assisted Closure (VAC) system (KCI Medical, Witney, Oxfordshire, UK) in three patients who developed postoperative enterocutaneous fistulae (table 1).

<table>
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<th>Case 1</th>
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<tr>
<td>A 54 year old woman developed a high output (1 litre/day) proximal enterocutaneous fistula through a midline abdominal wound created at the time of laparotomy and small bowel resection for adhesive intestinal obstruction and reopened 18 days later to drain an intra-abdominal abscess and resect an ischaemic segment of small intestine. Abnormal contouring of her abdominal wall from multiple previous operations prevented adherence of a wound management bag. The VAC system used with a Jackson Pratt drain controlled the fistulous output effectively but left her bed bound. After five weeks, drainage and skin condition had improved and the VAC system was replaced with a wound drainage bag. By three months, the fistula output had decreased to less than 200 ml/day and complete wound healing was achieved by five months.</td>
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<th>Case 2</th>
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<td>A 64 year old man was transferred with enterocutaneous fistula through midline and right iliac fossa abdominal wounds after preoperative radiotherapy, low anterior resection of rectum, and two subsequent laparotomies for suspected anastomotic leakage and intestinal obstruction respectively. The high volume output (more than 1 litre/day) and increasing skin excoriation led to repeated dislodgement of wound drainage bags. A sponge in VAC system was applied to both wounds using a Y connector to control intestinal losses and to protect the skin. After five weeks, drainage and skin condition had improved and the VAC system was replaced with a wound drainage bag. By three months, the fistula output had decreased to less than 200 ml/day and complete wound healing was achieved by five months.</td>
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Table 1: Summary of fistula characteristics and effect of VAC treatment

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<tr>
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<th>Patient 1</th>
<th>Patient 2</th>
<th>Patient 3</th>
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<tbody>
<tr>
<td>Diagnosis</td>
<td>Rectal cancer</td>
<td>Adhesive intestinal obstruction</td>
<td>Recurrent vulval angiomyxoma</td>
</tr>
<tr>
<td>Cause of fistula</td>
<td>Leakage from inadvertent enterotomy during relaparotomy for postoperative intestinal obstruction</td>
<td>Leakage from enter enteric anastomosis during relaparotomy for intestinal ischaemia and intra-abdominal sepsis</td>
<td>Leakage from enter enteric anastomosis fashioned after construction of ileal conduit</td>
</tr>
<tr>
<td>Site of fistula</td>
<td>Mid-small intestine</td>
<td>Proximal small intestine</td>
<td>Distal small intestine</td>
</tr>
<tr>
<td>Output of fistula</td>
<td>More than 1 l/day</td>
<td>1 l/day</td>
<td>300 ml/day</td>
</tr>
<tr>
<td>Duration of VAC</td>
<td>5 weeks</td>
<td>5 weeks</td>
<td>3 weeks</td>
</tr>
<tr>
<td>Effect of VAC</td>
<td>Improved skin condition and reduced fistulous output</td>
<td>Improved skin condition and reduced fistulous output</td>
<td>Complete healing of fistula in 3 weeks</td>
</tr>
</tbody>
</table>

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Vacuum assisted closure system and enterocutaneous fistulae

**Case 3**

A 40 year old woman underwent excision of a recurrent aggressive vulval angiomyxoma with en bloc resection of peri-neal structures down to glutesium maximus, bladder, rectum, sigmoid, and the major portion of the right pelvic bone. Reconstruction of the perineum was performed using a myocutaneous rectus abdominis flap, the ureters were reimplanted from the midline wound from a leak from the enteroenteric organs. This report describes the successful use of the VAC system. The VAC system is thought to work by several different mechanisms. Active removal of excess interstitial fluids from tissues may decompress small blood vessels allowing increased tissue oxygenation and angiogenesis similar to the Ilizarov technique. The VAC also leads to reduced bacterial colonisation by anaerobic organisms through increasing tissue oxygen concentrations. Neutrophils use the increased oxygen to kill bacteria. Bacterial colonisation was decreased by 1000-fold compared with non-negative pressure exposed wounds after four days of treatment. The VAC system could prove to be an extremely valuable tool to study changes in the wound micro-environment by analysing timed aliquots of the fluid removed.

The pump currently costs around £3800 to purchase or £15.00 a day to hire. In addition to this, a pack of 10 dressings cost between £150 to £235. This has to be balanced against the savings produced by reductions in length of hospital stay, frequency of dressing changes, and by accelerated healing. Enterocutaneous fistula is usually considered a contraindication to the use of the VAC system.

In conclusion, it has been considered that the use of sub-atmospheric pressure is contraindicated in the treatment of enterocutaneous fistulas as it has been believed that it may delay closure of the fistula and may cause damage to internal organs. This report describes the successful use of the VAC system in controlling fistula effluent and in promoting healing of excoriated skin (by keeping skin dry and free from effluent) in three patients with enterocutaneous fistulae. The VAC system may also promote healing of the fistula.

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