CASE REPORTS

Vacuum assisted closure system in the management of enterocutaneous fistulae

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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).

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Case 1

A 64 year old man was transferred with enterocutaneous fistulae 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.

Case 2

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, the skin condition improved and the fistulous output decreased and the VAC system was replaced by a Foley catheter connected to a drainage bag. After four months, the fistulous output fell to less than 200 ml/day. She has since undergone further laparotomy, resection of the fistula, and intestinal reanastomosis with complete healing of her abdominal wound.

Table 1 Summary of fistula characteristics and effect of VAC treatment

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

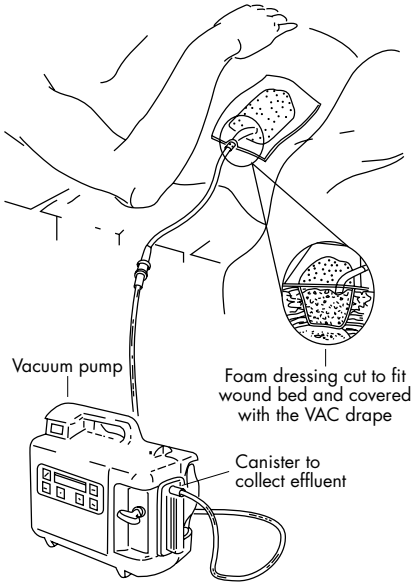

Figure 1 The VAC system.

Case 3

A 40 year old woman underwent excision of a recurrent aggressive vulval angiomyxoma with en bloc resection of perineal structures down to gluteus 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 into an ileal conduit, and an end colostomy was fashioned.

On the fourth postoperative day, faecal contents discharged from the midline wound from a leak from the enteroenteric anastomosis and continued to drain in the region of 300 ml/day. After three weeks' treatment with the VAC system, the fistula healed completely.

DISCUSSION

The seriousness of an enterocutaneous fistula depends on the volume and nature of its output. Low volume output is defined as less than 200 ml/24 hours, moderate output as 200–500 ml/24 hours, and high output as greater than 500 ml/24 hours.[1] Despite treatment, the mortality rate is approximately 20%.[2] Of the survivors, 30% have spontaneous healing of their fistulae while the remaining 70% require operative closure. Definitive surgery is not usually recommended until at least six weeks as most fistulae that close spontaneously will do so within this time period. Skin management is the major challenge of conservative treatment.

Enterocutaneous fistulae can cause severe inflammation of the surrounding skin because of persistent moisture and chemical irritation by effluent. The characteristic symptoms of this condition are odour, wetness, burning pain, and discomfort. The goals of skin management are to maintain skin integrity and to contain effluent. Numerous methods of protecting the skin have been described in the literature including pouches, skin barriers, and transparent dressings.[3]

Low output fistulae may be managed using a skin barrier and absorbent dressing whereas high output fistulae are usually managed with a skin barrier and pouches. However pouches may prove unsuitable to contain high volume effluent if an adequate seal to the skin cannot be maintained.

The VAC system (see fig 1) consists of a portable pump for creating negative pressure, collection tubing, and a canister. The dressing kit includes an open cell polyurethane foam dressing which is cut to fit the wound bed and a semipermeable adhesive membrane known as the VAC drape which is used to seal the foam dressing. A tube coming out of the foam dressing is connected to an adjustable vacuum source via a canister which collects the exudate. Low level vacuum (about 125 mm Hg) is applied either continuously or cyclically (five minutes on and two minutes off has been proved to be more effective[4]) to the wound. The dressing is changed at 48 hour intervals.[5 6]

The VAC system has been used for chronic non-healing wounds (pressure ulcers, venous and arterial ulcers, diabetic ulcers), subacute non-healing wounds (dehisced incisions), acute and trauma wounds, meshed grafts and flaps, graft and donor flap sites, and other wounds such as burns, snake bite, spider bite, frost bite.[7]

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 incremental increases of blood flow and therefore improve supply of oxygen and nutrients for tissue repair. The increased blood flow speeds up granulation tissue formation by 63% over non-VAC treated wounds.[5] Mechanical stress may also play a part by switching on a mechanism which increases cellular proliferation and angiogenesis similar to the Ilizarov technique.[5] 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.[5] The VAC system could prove to be an extremely valuable tool to study changes in the wound microenvironment 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 will cost between £150 to £235.[8] This has to be balanced against the savings produced by reductions in length of hospital stay, frequency of dressing changes, nursing time, and by accelerated healing. Enterocutaneous fistula is usually considered a contraindication to the use of the VAC system.[7]

In conclusion, it has been considered that the use of subatmospheric 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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