Application of negative pressure therapy to fistula wounds: a case study

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Abstract

The use of negative pressure wound therapy (NPWT) is commonly embraced in the treatment of different types of wounds, in many countries. However, in parts of Asia the use of alternative modified wall suction systems and filler dressings of foam, non-adherent dressings and special sponges are frequently used when commercial products are not available or cost-prohibitive. In Hong Kong, the use of such adapted systems is frequently employed in the management of gastrointestinal fistulae. The case studies discussed in this paper outline the need and use of innovative NPWT applications.

Introduction

Negative pressure wound (NPWT) can promote wound healing in different types of wounds by removing wound fluids as a result of the creation of a vacuum within a well-sealed wound area. The use of NPWT is reported to aid wound contraction, increase circulation and decrease bacterial burden within a wound[1,2]. There are several different kinds of commercially available NPWT systems available and they use foam or gauze as the wound filler agents. However, in parts of Asia the use of alternative modified wall suction systems and filler dressings of foam, non-adherent dressings and special sponges are frequently used when commercial products are not available or are cost-prohibitive. In Hong Kong as elsewhere, NPWT can be applied to a wide range of wounds, such as fasciotomy wounds, skin grafts, pressure ulcers, venous, arterial and mixed aetiology leg ulcers as well as diabetic ulcers[3]. However, NPWT is also applied to other wounds such as fistulae and NPWT has been used for the management of fistula wounds in Queen Mary Hospital, Hong Kong, for a long time. The use of NPWT in the treatment of fistulas in Hong Kong is exemplified by the case studies below.

Case 1

Mr Chan (*a pseudonym*), aged 78, suffered from peptic ulcer and underwent an emergency partial gastrectomy. His postoperative course was complicated by a severe chest infection and he was put on ventilatory and inotropic support. On day 5, the abdominal wound was found to be erythematous and draining large amounts of purulent discharge. His sutures were removed and the wound was laid open for intensive cleaning and frequent dressings. On day 7, greenish discharge was noted from the wound (Figure 1) and an anastomotic leak and fistula formation were confirmed. Because of multiple underlying medical problems, Mr Chan was deemed not suitable for further surgery to repair the fistula. Therefore, conservative treatment of the fistula was decided to be the best option. Since the fistula faecal fluid contained irritant enzymes, protection of surrounding skin was an essential component of his wound care[4]. The objectives of management were:

1. Maintenance of optimal nutritional support.
2. Maintenance of skin integrity.

Figure 1. Large amount of greenish fluid came out via wound bed.

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3. Accurate assessment of fluid balance and effluent output;.
4. Promotion of fistula closure and wound healing.

Overall management plan

The interventions employed to optimise Mr Chan's healing potential included:

1. Commencement of total parenteral nutrition (TPN).
2. Blood investigations for electrolyte imbalance which was critical since large amounts of gastrointestinal fluid were lost via his fistula.
3. Provision of psychological support for Mr Chan, who was expected to have a prolonged hospital stay.

Wound management

The interventions employed to manage Mr Chan's wound included:

1. The application of a protective film skin barrier over the peri-fistula skin to protect against skin damage.
2. The application of a wound collector which was applied to the fistula and surrounding wound. The suction tubing was anchored to the skin barrier wafer inside the appliance.
3. A non-adherent dressing (Urgotul™ by Urgo) was applied over the wound as a wound contact layer for protection. The open-mesh dressing allowed fistula fluid to pass through the dressing into the appliance. Saline-impregnated gauze was used to cover the multiple holes in the suction tubing. The gauze dressing also acts as a capillary wicking conduit to draw the fistula fluid towards the suction tubing, which was connected externally to wall suction (Figure 2). The negative pressure was maintained at 150–200 mmHg (continuous suction). Low suction is not perceived to be as effective for copious, thick gastrointestinal effluent.
4. An opening in the top of the appliance was made to allow the nurses to change the wound dressing daily and facilitate observation of the wound bed without having to change the entire system. The whole system could be kept in situ for 5–7 days.
5. Around 500–700 ml of gastrointestinal content was drained daily for the first three days. However, the

Figure 3. Two weeks later, negative pressure was continued.

Figure 2. Suction catheter secured over wound bed inside wound collector and connected to wall suction.

Figure 4. Another week later, negative pressure discontinued and Aquacel™ applied.

amount gradually decreased over the following days and there was no more greenish fluid drained eight days after the use of suction.

Results

The care outcome for Mr Chan was very positive. Two weeks after commencing NPWT, the fistula completely healed and granulation tissue covered the wound bed (Figure 3). However, negative pressure was continued for one more week at 125 mmHg. The patient's condition improved and he resumed a fluid diet. He tolerated enteral feeding well and there was no new fistula output. One week later, granulation tissue filled the wound bed (Figure 4) and negative pressure was discontinued and a hydrofibre (Aquacel™ by ConvaTec) dressing was applied and used until healing occurred. The patient began to eat a normal diet and he was transferred to a convalescence hospital for recovery.

Case 2

Mr Wong (*a pseudonym*), aged 72, suffered from carcinoma of the oesophagus and underwent surgery that resulted in an oesophagectomy in January 2011. Although the patient had a gastrostomy tube inserted for continuous feeding, his postoperative course was complicated by an anastomotic leakage. His fistula was managed with wound drainage appliances until three months later, when he underwent surgery and a pectoralis major flap repair and reconstruction was carried out. Unfortunately, the flap wound dehisced and saliva drained from an oesophageal fistula (Figure 5). The patient was too weak to have another operation to repair the fistula. A naso-entriflex tube was inserted endoscopically for continuous milk product feeding and he was not allowed to eat or drink by mouth.

Figure 5. Saliva draining from fistulae.

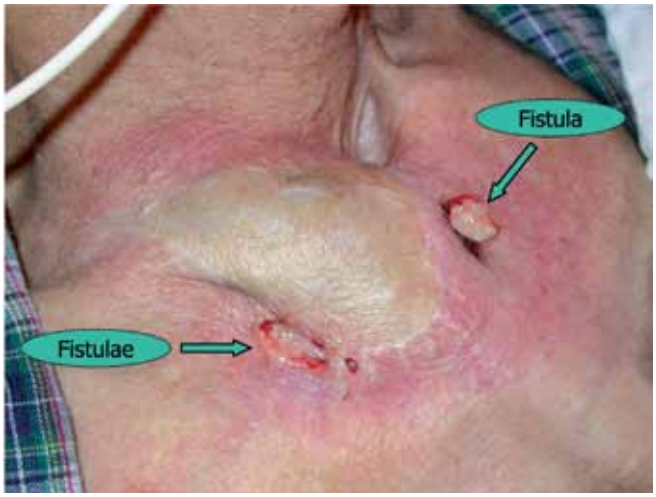

Figure 6. Three fistulae surround the pectoralis major flap.

Wound management

Mr Wong had three fistulae on both sides of the flap (Figure 6) and his wound management interventions included:

1. Cleansing of the peri-fistula skin and the application of soft hydrocolloid skin barriers (Coloplast Ostomy Barriers™) for skin protection prior to the application of two small paediatric pouches. Again, suction tubes were inserted into the pouches and connected to wall suction. The negative pressure was kept at 150–200 mmHg (continuous suction) in order to ensure good drainage (Figure 7).
2. The whole system was changed every three days.

Results

The care outcome for Mr Wong was also very positive. Four weeks after commencing the adapted NPWT suction dressings, the fistulas healed (Figure 8). Negative pressure was, however, continued for one more week to promote total wound healing. He had a methylene blue test by mouth and endoscopy to ascertain fistula closure and this was confirmed. After confirmation of the healing of fistulas, Mr Wong resumed an oral fluid diet for three days and then commenced a normal diet without further complications.

Discussion

For the above patients, the fistulae responded well to the use of non-commercial NPWT and both patients avoided further invasive surgery for the fistula repair. The pathophysiology

Figure 7. Suction catheters drain via collector outlet.

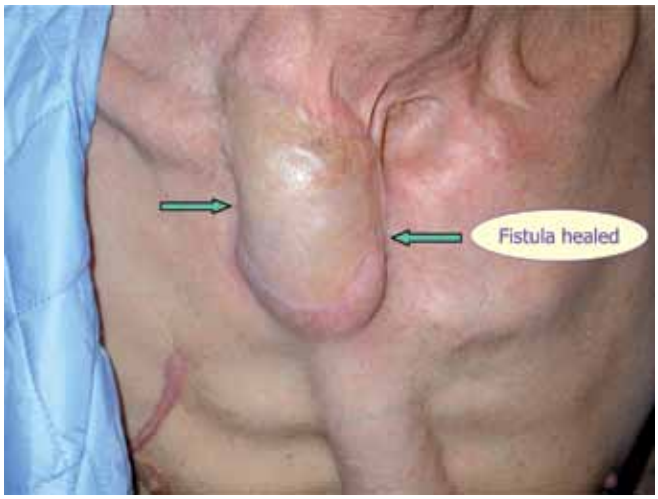

Figure 8. Four weeks later.

of fistula healing when using NPWT is still unknown. However, it could be assumed that as in other wound types it can remove wound fluids and effluent, aid wound contraction, and increase local wound circulation, thus aiding fistula closure. However, personal experience shows that continuous negative pressure is essential for fistula healing, which is different from reports in previous studies that suggest an intermittent mode of negative pressure can be more effective. If intermittent negative pressure is used in the presence of fistulae, the enzyme-rich intestinal fluid will continue to irritate the wound tissues during the rest cycle and this appears to have a deleterious effect in the healing process. However, some advantages and disadvantages are to be noted in the use of modified wall suction for fistula healing as listed below.

Advantages of modified wall suction

1. The cylinder of wall suction can contain up to two litres of fluid. It is more convenient than the commercial NPWT devices in situations where large amounts of gastrointestinal content may present during the first few days. The smaller containers that constitute components of commercial NPWT devices may required frequent changes.

2. It is also more economical to use the cylinders of wall suction than the small containers of NPWT.

Disadvantages of modified wall suction

1. Since the wall suction is used, the mobility of the patients is restricted and their activities are thus confined to the area around the bed.

2. There are no alarm systems incorporated into wall suction; therefore, frequent checking of the sealed system must be performed in order to avoid accidental leakage and failure of the system. More nursing time may be required as compared to that required when using the commercial NPWT devices.

3. Since the negative pressure of wall suction is centralised in the hospitals, the pressure may be unstable in busy wards and this reduces the effectiveness.

Conclusion

Gastrointestinal fistulae can be very frustrating and difficult to manage. Clinical challenges are associated with loss of body fluids and associated fluid balance, nutritional and electrolyte disturbances. Skin irritation and ulceration can be problematic if effluent is not well contained and patients may suffer from the effects of long-term hospitalisation and potential depression. Further studies are required to better understand the fistula healing process to benefit these patients.

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