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Effective management of incisional and cutaneous fistulae with closed suction wound drainage

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INTRODUCTION

Management of incisional and cutaneous fistulae is a multifaceted problem requiring a team approach and attention to detail. Nutritional requirements, quantitative and qualitative analysis of fistula drainage, radiographic localization of the fistula, appropriate treatment of sepsis, management of the cutaneous aspect of the fistula, and local skin care are basic tenets defined in the literature.[1-5]

Wound management in patients with ventral incisions complicated by enterocutaneous fistula has been a particularly challenging problem. Containment of the effluent is technically difficult due to the wound configuration and abdominal contour. Since the advent of enterostomal therapy at the Cleveland Clinic in the 1950s, most draining wounds have been managed with ostomy pouches or, more recently, large sophisticated drainage pouches made specifically for wound management.

At our institution, in conjunction with the enterostomal therapy (ET) service, we have devised a closed suction wound drainage system that 1) is effective in collecting drainage from the most difficult sites, 2) obviates skin damage, 3) improves wound granulation and contraction, and 4) minimizes the dressing and nursing requirements and dramatically reduces the cost associated with wound management and containment.

Similar systems have been described by Montgomery, Everett, and Betancourt; however, these clinicians have not attempted to design a dressing that conforms to the wound bed.[6-8] We believe this conformation and the effectiveness of the continuous closed suction are critical to fistula closure and wound contraction. Perhaps the most important facet of our system is its ability to continually remove the effluent from the wound bed. By removal of this effluent, we have noted a profound decrease in the inflammatory response and the localized tissue necrosis. This aspect of our system, in conjunction with an occlusive dressing, maintains adequate hydration of the tissue, preventing eschar formation. The effect of this system is to decrease the inflammatory phase of wound healing and prevent eschar formation, a mechanical barrier to wound healing.[9] This, in turn, decreases the degree of fibroplasia, i.e. granulation tissue. The result is to increase the rate of reepithelialization.

MATERIALS AND METHODS

When a fistula has been detected, collaboration

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between the surgical staff and the enterostomal therapy service begins. The surgeon and the ET team assess the wound and devise a treatment plan. The ET nurse becomes responsible for the initial placement of the closed suction system, monitoring its efficacy, and changing it.

The following dressing package has been developed by our ET service: one Jackson-Pratt Mini-Snyder hemovac drain, one two by two inch square, four by four inch gauze squares, normal saline, one small "Christmas tree" adapter, skin sealant, transparent adhesive film dressing to seal wound site, Stomahesive Paste, pink tape, continuous suction system.

The closed wound drainage system is created in the following manner and illustrated in Fig. 1-4:

1) Irrigate wound bed thoroughly with normal saline via a 30ml syringe with a 19-gauge needle.

2) Open completely one two by two inch square. Lay this across the wound bed.

3) Place Jackson-Pratt drain in wound bed. Shorten the fenestrated drain as necessary so that the flat drain is confined to the wound bed. (The drain is never placed into the fistula tract)

4) Open four by four inch gauze squares. Saturate with normal saline. Fluff into wound to completely cover the drain and fill the defect to skin level.

5) Apply skin sealant to all skin that will be covered by transparent adhesive film dressing. Allow to dry until slick.

6) Cut transparent adhesive film dressing or select size to allow at least one inch of intact skin beyond wound edges. Place film dressing over packed wound. Split one end of the film dressing sheet in order to bring each "arm" around the Jackson-Pratt tubing. Crimp the edges of the film dressing around the tube.

7) At tube exit site, squeeze a small amount of Stomahesive Paste where film dressing meets tube to seal an air-tight closure.

8) Reinforce this juncture with pink tape as illustrated.

9) Turn your attention to the connection of the Jackson-Pratt tube to continuous suction system. A small "Christmas tree" connector is ideal to connect the end of the drain to the wall suction tubing. (Do not attempt to use the bulb of the Jackson-Pratt system unless you are transporting the patient for a short period of time.) If you cannot locate a small "Christmas tree" connector, you can cannabilize IV tubing to get a small plastic adapter.

10) Turn on continuous suction to the upper range of the low setting, approximately 60-80mmHg, and observe the wound site. The dressing should contract noticeably. If it does not, you do not have a closed system and wound drainage will override it.

Critical to the efficacy of our system is the moist gauze packing in the wound. This packing obliterates the dead space known to be an impediment to wound closure, and it is an imperative component in the suction system. We noted, as we modified our system with the first patients, that elimination of the gauze packing, the use of dry gauze packing, or gauze packing insufficient to fill the wound, all resulted in faulty and unpredictable suction efficiency.

The system is changed every three to five days, depending on the viscosity of the effluent and the surgeon's desire to examine the wound bed. The cost of the materials to establish this system and maintain it for one week is approximately $205 at our institution. Conventional dressings, such as abdominal pads and gauze sponges, changed four to six times a day, may run as high as $1400 per week. The amount does not include the cost of bed linen changes and nursing time. At our institution, the cost of changing a soiled bed and the patient's gown is $4.67, including the nurse's time to make the change. No price can be placed on a patient's suffering from malodorous dressings, frequent disturbances to make the dressing changes, and the discomfort associated with denuded skin secondary to fistula drainage.

PATIENT PROFILE

From 1984 to 1986, seven patients with eight fistulae have been managed with the closed suction wound drainage system. Six of the fistulae were intestinal, one was renal, and one a lymph fistula

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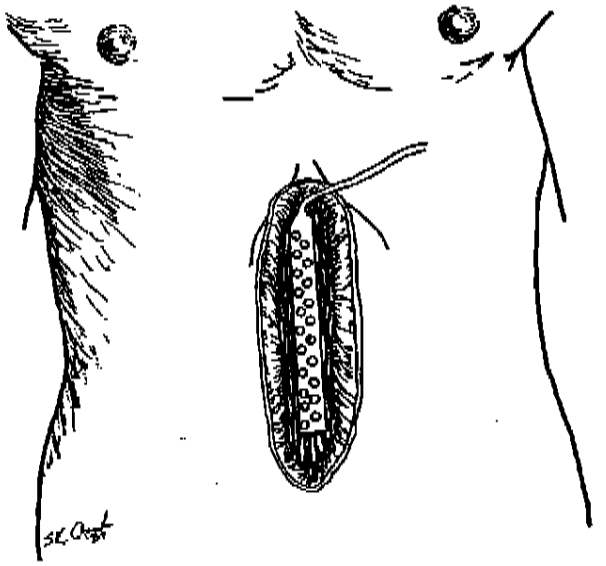

Fig. 1 A two by two inch gauze square is opened and the wound bed is protected by the gauze overlay. A Jackson-Pratt Mini-Snyder flat hemovac drain is placed in the wound bed. It is shortened as necessary.

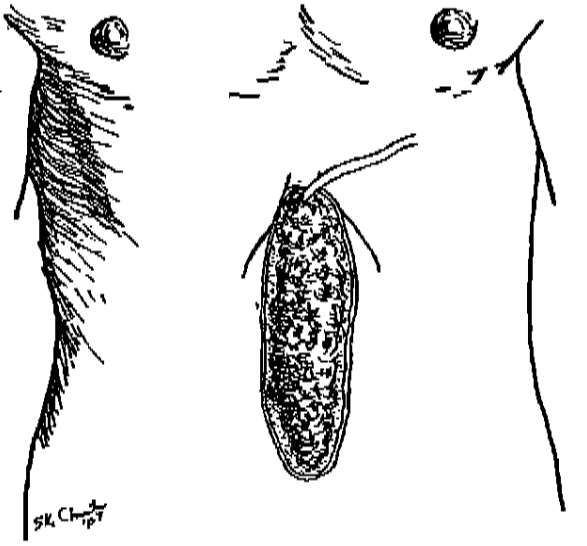

Fig. 2 The gauze overlay is tucked into the wound edge. Moist saline-soaked gauze sponges are fluffed into the wound to completely cover the drain and fill the defect to skin level.

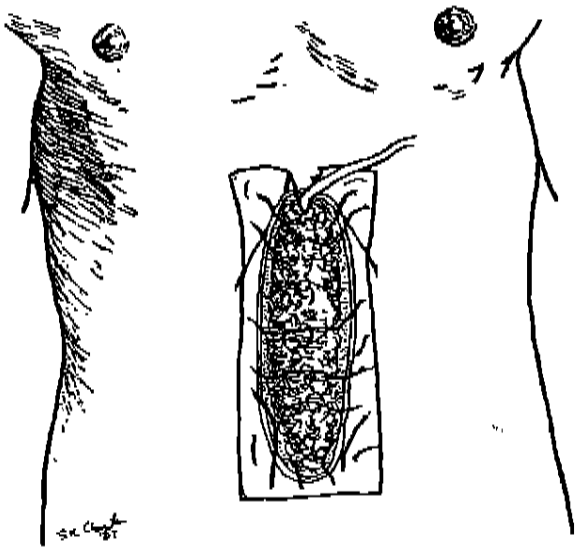

Fig. 3 A transparent adhesive film dressing is cut or a presized dressing is selected to allow at least one inch of intact skin beyond the wound edge. The dressing is split to allow the tube exit and crimped around the tube to seal.

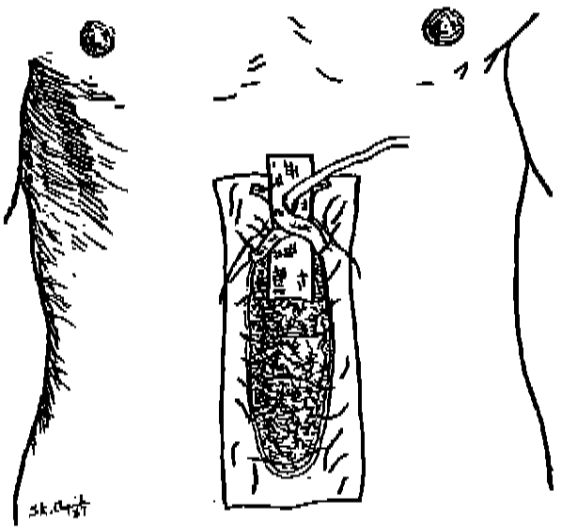

Fig. 4 After caulking the tube exit site with Stomahesive Paste, the juncture is reinforced with a waterproof pink tape.

Incisional fistulae *continued*

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located in the groin. All wounds managed with this system closed in a mean time of 16 days with a range from 8-23 days. All the fistulae were classified as small-output fistulae with a peak mean daily output of 440ml. All patients had been managed for at least one episode of intraabdominal sepsis and all patients received hyperalimentation. The mean age of the group of patients managed with this system was 57 years.

Four of seven patients in this study were discharged with closed fistulae and no recurrences. One patient was discharged from the hospital wearing a drainable colostomy pouch to collect her minimum fistula output. This fistula closed approximately one week after discharge. Two patients with enterocutaneous fistulae died as a result of congestive heart failure, but both fistulae had closed prior to death.

In the case of our renal fistula patient, use of an ostomy-type pouch would have been difficult because of the size and location of the incision. Further, it would have been impossible to estimate the amount of urine loss. In fact, it was concluded during the first three days of management with the closed suction wound system that all of the urine produced by the left kidney was draining from the flank. Once the fistula closed, the flank healed rapidly, the wound contracted, and a small scar remains.

The patient with the lymph fistula in the groin was very restless and edematous. Without our wound drainage system, collection of the effluent would have been a tedious and time-consuming challenge.

Significant in the evaluation of this wound drainage system is the comfort afforded all of these patients and the ease of their nursing care. Generally speaking, all that is required of the patient's nurse is maintenance of careful records of the output of the fistula. All patients were very sick and required a great deal of time and attention. With the closed wound drainage system, the nurse is freed to attend to the more critical elements of patient care. Usually, all that is required of the staff nurse is intermittent assessment of the system to ascertain its patency. Occasionally, if the effluent thickens, irrigations with normal saline are required.

DISCUSSION

Continuous drainage from an abdominal wound is a common clinical problem. From the days of drainage through ostomy pouches to the current use of suction systems there has evolved a closed suction system incorporating current moist wound management principles with the benefits of the inert silicone drain to maximize wound healing.

Two basic problems in wounds complicated by draining enterocutaneous fistulae in our study are full thickness and partial thickness tissue defects. Our system contributes to wound closure by second intention. In order to have an effective closure in terms of strength and durability, wound contracture is required to allow dermal structures to approximate.[10] By limiting fibroplasia, the amount of epithelial migration required to cover the granulating bed is kept at a minimum. The third tenet of wound healing affected by our system is that of inflammation, minimized by the closed suction system. The facets of wound healing that our system influences are best discussed by reviewing each component of the system as well as our wound management approach.[11]

Eschar formation, a problem seen with dry dressing and open air techniques, is minimized with the use of moist wound healing principles reviewed by Alper.[12] The negative effects of eschar formation, as discussed by Rovee,[9] are prevention of wound contracture, inhibition of epithelialization and enhancement of the inflammatory phase of wound healing.[9,12,13]

Bernard was early in demonstrating the negative effects of gastrointestinal contents on living tissue.[14] The effect of enterocutaneouos fistulae effluent on open wounds is to stimulate fibroplasia, thus inflammation. The result is a hypertrophic granulating bed.[15] The main advantage of the continuous suction is almost total elimination of the caustic effluent from the wound. The effluent removal is enhanced with the use of an overlay gauze as seen in Fig. 2. Also, constant removal of the inflammatory infiltrate, neutrophils and macrophages that are concentrated under the vapor permeable membrane, may lessen the degree of fibroplasia.[15]

In terms of dressing changes, the system is

changed at three to five day intervals, which is another advantage of continuous suction. By minimizing changes, granulation is again limited. This method allows for wound contracture and epithelialization during the period of fistulae drainage.

Another fine point is our use of normal saline to irrigate the wounds at the time of dressing change. Lineaweaver, et al.[17] have demonstrated the inhibitory effects on fibroblast activity of agents such as 3% H_2O_2, 1% povidone-iodine, 0.25% acetic acid, and 0.5% sodium hypochloride. In experimental models, the chronic use of these agents appear to decrease the overall strength of a healing wound. We think these agents may have some role in the initial treatment of an infected and necrotic wound, but their cytotoxic effects appear to have potential for delaying wound closure.

SUMMARY

Our closed suction wound drainage system has revolutionized the management of enterocutaneous fistulae complicating ventral abdominal wounds, which have up to a 60% mortality in some studies.[18] This technique eliminates the old "bridge" method described by Gross and Irving.[19] It is more effective and less cumbersome. The same system has been a boon in one patient with a urinary fistula in a deep flank incision and another with a cutaneous lymph fistula. We have used it in a small group of patients; however, our initial evaluation has demonstrated that it minimizes morbidity secondary to a draining fistula, reduces time-consuming nursing requirements, and it results in significant cost reduction. It limits the degree of fibroplasia, which improves wound contracture and augments reepithelialization.

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