INSTRUMENTS AND TECHNIQUES*

Treatment of purulent wounds and fistulae with an adhesive wound irrigation device

A multicentre trial of 100 patients

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Summary

There has been little change in the treatment of established wound infection for many years. This paper describes an adhesive wound irrigation device designed to facilitate the care of discharging wounds or fistulae normally requiring several changes of dressings daily. We report the use of this device in a selected group of 100 patients and discuss briefly the methods of irrigation available. The device described offers certain practical advantages over conventional wound dressing and has proved acceptable to the patient.

Introduction

An increasing range of preventive measures have so far failed to eradicate sepsis and breakdown in contaminated accidental or surgical wounds, yet the treatment of a purulent discharging wound remains unsatisfactory in many ways. Frequent changing of soiled dressings becomes a tedious and time-consuming procedure, unpleasant for both patient and nurse alike. Handling and disposal of bulky, offensive dressings requires great care if transmission of pathogenic organisms is to be avoided, and the skin surrounding a discharging wound or fistula needs constant attention to prevent maceration and excoriation. Lastly, patients without evidence of bacteraemia or septicaemia are often prescribed expensive or dangerous antibiotics to combat a localised and accessible condition.

Irrigation of purulent wounds with an antiseptic solution has been practised since the time of Lister *(1)*. The usual method is to remove the dressings and irrigate by hand a wound exposed to the atmosphere. The device described here (Squibb Surgicare) was designed to establish a closed system for irrigation and to facilitate the nursing care of patients with postoperative wound infection and dehiscence requiring several changes of dressing daily *(2)*. Its use has since extended to the management of traumatic wounds and fistulae, and various techniques of irrigation with antiseptic solutions, amino-acids, and gases have evolved.

This paper records the use of the device in 100 patients and illustrates different methods of irrigation by reference to 3 case histories.

Materials, patients, and methods

The device (Fig. 1) consists of two parts, an adhesive sheet of Stomahesive to which is fused a transparent plastic cover. This cover is transversely ribbed to increase flexibility and, once in place, defines a closed chamber over the wound which has entry and exit ports for supply of the irrigating fluid and escape of the fluid and wound exudate respectively. The entry port accommodates a standard intravenous giving set, while the exit is connected to a drainage bag which may be emptied through a tap (Fig. 2). Both ports may be closed with a spigot when not in use.

Stomahesive is a preparation of gelatin, pectin, sodium carboxymethylcellulose, and polyisobutylene which is non-allergenic and sticks avidly to moist skin as a protective cover and to excoriated skin to promote rapid healing. During the past 2 years we have used this device to replace conventional dressings in 100 patients with purulent discharging wounds or enterocutaneous or urinary fistulae. The table shows the nature of the wounds treated. In every case the wound or fistula required at least 2 dressing changes daily.

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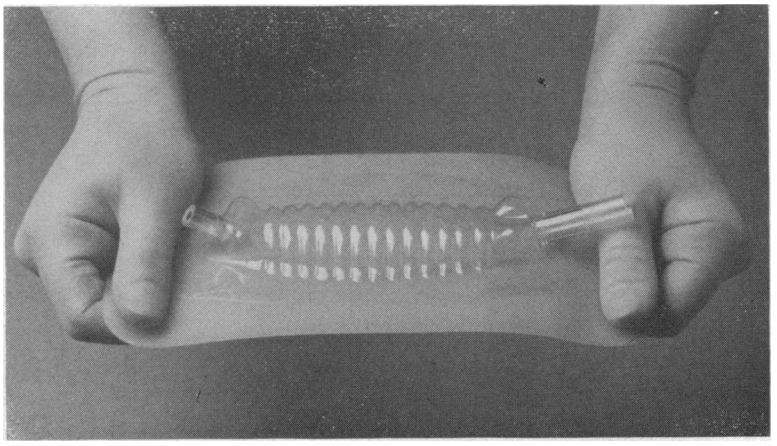

FIG. 1 *Wound irrigation device*

The wound was sampled for bacteriological culture and debridement carried out in the usual way. Then, using the slit provided beneath the plastic chamber, a hole in the Stomahesive sheet was cut to the shape of the wound or fistula under treatment, thus ensuring skin protection to the very edge of the wound. The parchment backing was then peeled off, the chamber positioned accurately over the area of wound breakdown, and the Stomahesive pressed down on to the skin around it. Sutures adjacent to the area of dehiscence were not removed unless this was necessary for drainage. With the device in place the patients were kept quietly in bed for 3–4 h before the first irrigation. This allows a firm bond to form between skin and Stomahesive, sufficient to prevent leakage of the irrigating fluid. After this the patients were freely ambulant. A drainage bag was connected to the outlet to collect purulent discharge of fistula effluent during the interim if necessary. Otherwise both entry and exit ports were spigotted between periods of irrigation, so that the patients could walk about the ward without fear of disseminating infection.

Irrigation was carried out with the patient lying in bed or sitting in a chair. This was either continuous or intermittent, usually 3 times daily (generally giving 500 ml of solution over 5–10 min) until discharge lessened and the appearance of the wound improved. The rate of irrigation was controlled by the drip set and the effluent removed from the drainage bag after each irrigation. In this way handling of infective material was kept to a minimum since all contaminated effluent was kept within a closed system. Further bacteriological samples were obtained from the effluent or by swabs taken through the exit port.

Solutions used for irrigation varied according to the nature of the wound and its bacteriological flora. Topical Varidase, a preparation of streptokinase and streptodornase, was used in some cases to loosen slough and debris. Physiological saline and solutions of noxythiolin or aqueous chlorhexidine were used to clean the wound and on a few occasions oxygen was passed through the chamber in an attempt to discourage the growth of anaerobes. Amino-acid solutions were used in

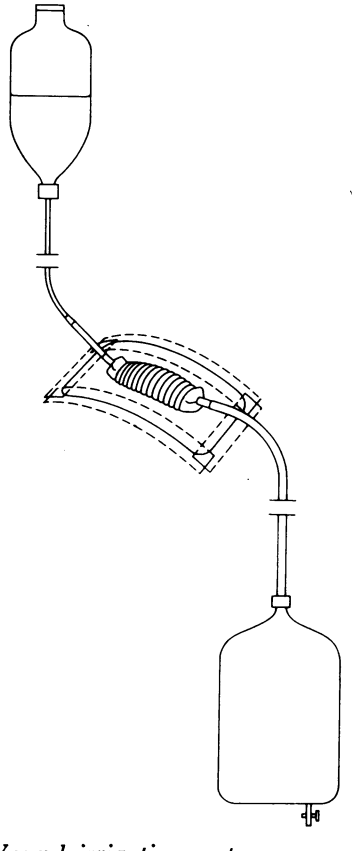

FIG. 2 *Wound irrigation system*

Distribution of wounds treated

Nature of wound	*No of patients*
Surgical	
Median sternotomy	4
Posterolateral thoracotomy	8
Thoracoabdominal	6
Laparotomy — transverse	5
vertical	23
Appendicetomy	18
Herniorrhaphy	5
Pfannenstiel	2
Nephrolithotomy	2
Ureterolithotomy	1
Exposure of hip joint	8
Traumatic	
Trunk	2
Limbs	6
Fistulae	
Faecal	1
Small bowel	2
Biliary	3
Pancreatic	1
Urinary	3
Total	100

a small group of patients with poorly healing wounds in an attempt to promote proliferation of granulation tissue and healing.

The following cases are described to illustrate these methods.

Patient 1

An 18-year-old soccer player suffered a 15-cm gash to the left shin from an opponent's boot. This laceration reached the periosteum of the tibia and, though contaminated by mud, was cleaned and sutured that same afternoon. Two days later the patient returned feverish with a tense, red, and oedematous shin. He was admitted to hospital and after the surrounding skin had been shaved all sutures were removed and bacteriological swabs taken. An irrigation device was applied to the gaping wound and Varidase instilled to loosen purulent exudate and slough. Aqueous chlorhexidine (500 ml of 1% solution) was then used to irrigate locally every 6 h and in view of his pyrexia and the nature of the laceration parenteral penicillin and flucloxacillin were prescribed. After 48 h his wound and overall condition improved sufficiently for him to be discharged with conventional dressings.

Patient 2

A 78-year-old woman presented with profuse rectal bleeding and underwent laparotomy through a right paramedian incision. Crohn's disease of the large bowel was discovered and the abdomen closed without further intervention. One week later the wound became inflamed and *Escherichia coli* was grown from the serous discharge. When the sutures were removed the superficial layers dehisced and pus discharged.

For 3 weeks gauze and wool dressings were applied 3 times daily, but the wound remained infected without formation of granulation tissue. At this stage an irrigation device was applied and the wound irrigated twice daily with 500 ml of 1 or 2.5% noxythiolin solution followed by 100 ml of Aminoplex 14 (Geistlich; a mixture of amino-acids, vitamins, and minerals). The latter was left to dwell in the chamber for 1 h before drainage.

After the wet, offensive, and bulky dressings were replaced by the device the morale of the patient improved dramatically, the unpleasant smell disappeared, and her appetite returned. The infecting organism was eradicated, though the wound was later colonised by yeasts. Irrigation was stopped after 2 weeks, by which time healthy granulation tissue was present. The wound was fully healed in 4 weeks. Each device lasted 4–5 days before change was required.

Patient 3

A 43-year-old man underwent oesophagogastrectomy with splenectomy for carcinoma of the oesophagus. Six days later a localised swelling developed in his thoracoabdominal incision. After removal of sutures a profuse serous discharge appeared and the surrounding skin became reddened and excoriated. Bacterial cultures remained sterile and when chemical analysis of the discharge showed a high amylase content a pancreatic fistula was diagnosed. Conventional gauze and wool dressings were then replaced by a wound irrigation device. This was applied accurately around the wound edges and all exudate collected for estimation of protein and electrolyte loss. About 100 g of protein daily was lost in the early stages. During the next 3 weeks the discharge lessened progressively and the wound healed. The surrounding skin healed rapidly beneath the Stomahesive cover.

Results

In 94 patients selected for treatment the wound irrigation device provided a satisfactory alternative to conventional dressings. In 6 patients adverse skin contour would not allow irrigation without leakage and the method was abandoned. The device proved suitable in a wide variety of different sites and when properly applied remained in place for periods of 3–7 days, after which leakage usually precipitated removal or replacement. The unpleasant task of change and disposal of wet, soggy, and contaminated dressings was exchanged for a closed system of irrigation which was simple, quick, and clean and could be performed in the ward without fear of spread of infection. This resulted in an overall saving of nursing time.

An unexpected advantage of this system was elimination of smell, which proved of particular benefit for patients with faecal fistula or faeculent wound discharge. For treatment of enterocutaneous and urinary fistulae the device combined effective skin protection with a drainage system

which allowed all effluent to be collected for analysis. This greatly facilitated replacement of protein and electrolyte losses. Sinograms and fistulograms were performed by introducing a catheter through the inlet port. Excess contrast medium then emptied into the drainage bag, thus avoiding mess.

Preliminary investigations have shown that irrigation of purulent wounds by this method rapidly inhibits bacterial growth, and though colonisation with yeasts occurred in a small number of cases, on no occasion did this delay wound healing. Lastly, all patients found this form of dressing both convenient and comfortable.

Discussion and conclusions

Wound infection is both distressing for the patient and expensive in terms of bed occupancy, nursing time, antibiotics, and dressing materials. The wound irrigation device serves to eliminate soggy dressings and produces a local barrier nursing system around the wound itself. This enables wounds to be treated with inexpensive topical antiseptics rather than antibiotics in those cases in which there is no evidence of bacteraemia or septicaemia.

Stomahesive has been used routinely to protect the skin around colostomies, ileostomies, and ileal conduits so that application to the surround of discharging wounds *(2)* and fistulae *(3,4)* is a logical extension in its sphere of use. For slowly healing wounds in chronically debilitated patients such as those taking corticosteroids we used local tissue nutrition similar to that described by Viljanto and Raekallio *(5)*. The device provides a clean and effective method of applying these solutions to the wound surface and Aminoplex 14 was used because its composition was closest to that used by the Finns. They showed that the activity of aminopeptidase, adenosine triphosphatase, and alkaline phosphatase was raised by the use of topical amino-acids and that this reflects proliferation of granulation tissue cells *(6,7)*. Our impression was that this method accelerates healing, though it is not possible to confirm this objectively. The device has recently been used to deliver a stream of oxygen to the surface of wounds contaminated by anaerobic organisms and is also effective as a primary dressing for contaminated wounds left open at the time of surgery.

From this study we found the wound irrigation device to convey the following advantages over conventional dressings:

a) Provides a closed system for wound irrigation.
b) Reduces exposure of purulent wounds to the atmosphere and eliminates handling of contaminated materials.
c) Prevents maceration of the surrounding skin by soggy dressings or fistula effluent.
d) Eliminates unpleasant smell.
e) Proves cost-effective by saving nursing time spent on change of dressings.
f) Provides a system for the evaluation of topical antiseptics, antibiotics, and other solutions or gases in the treatment of sepsis and promotion of wound healing.

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CORRECTION

The work described by Dr E Ll Lloyd in his paper entitled 'A rational regimen for peroperative steroid supplements and a clinical assessment of the requirement', published in the January issue of the *Annals* (p. 54), was supported by a grant awarded by the South Lothian District of the Lothian Health Board and not directly by the Scottish Home and Health Department as stated.