Silicone foam sponge for pilonidal sinus: a new technique for dressing open granulating wounds

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Summary

A silicone foam sponge has been used to replace the daily packing of deep granulating wounds with moist sterile gauze. In the treatment of pilonidal sinus use of the sponge demands less nursing time and is more comfortable for the patient than the excision and open granulation technique. Patients can usually return to work soon after operation. The method has many applications in surgery, and widespread application of the technique to the management of granulating wounds could result in considerable savings to the NHS in money and skilled nursing time.

Introduction

Healing of an excised wound is by granulating tissue and epidermal migration. Initially, the tissue is highly vascular, consisting of blood vessels, fibroblasts, and other infiltrating cells derived from dermal fat. These newly formed vessels leak protein and it is thought that this provides suitable medium for the fibroblastic growth.[1] Though granulation tissue formation is most rapid when the wound is undressed,[2] the classical management of granulating wounds is to pack the defect once or twice daily with eusol-moistened gauze dressings, which allow the deep wound to heal slowly while preventing the more actively growing skin from bridging over the defect. The disadvantages of this method of treatment are the long time the patient spends in hospital and the amount of time required by skilled nurses in packing the wound, first in hospital and later at home. The pack tends to become uncomfortable during the day as it changes from a soft dressing to a hard uncomfortable mass. The patient may suffer considerable discomfort each time the pack is removed, and during this process delicate capillary loops are torn from the tissues with bleeding and interference with healing.

With the method reported here a silicone foam elastomer is used to replace the gauze pack. It is constituted by mixing with a catalyst and poured into the open granulating wound. The sponge can be immediately and painlessly removed and replaced again, much to the surprise of the patient, who often expects a painful procedure.

Pilonidal sinus proved an excellent testing ground for the use of foam elastomer in granulating wounds, and the technique may be used equally well for elective operations and for patients presenting with acute abscesses.

Techniques

The surgical technique used is similar for acute abscesses or chronic sinus. Under general anaesthesia the patient is placed in a prone position and the buttocks strapped lightly apart. The sinus, if chronic, is probed carefully to outline the sinus tract. The sinus with no more than 0·5 cm of skin on either side of the tract is excised until all the sinus tract and associated chronically inflamed fat has been removed. Bleeding is controlled and the wound packed lightly with 1-in (2·5-cm) gauze roll soaked in flavine emulsion. An acute abscess is incised and the necrotic skin and debris removed. The clean cavity is packed in the same way with a gauze roll and the patient is given tetracycline 500 mg four times a day. The pack is sutured in place with monofilament nylon sutures on a Colt's needle.

Next day the patient takes a salt bath and continues this regimen twice daily for four days. On the fourth day the pack is removed in the ward (with some discomfort), leaving a clean open granulating wound with firm walls that show no tendency to fall together (fig. 1). Into this cavity is poured the constituted foam elastomer sponge, which expands to fill all parts of the granulating wound.

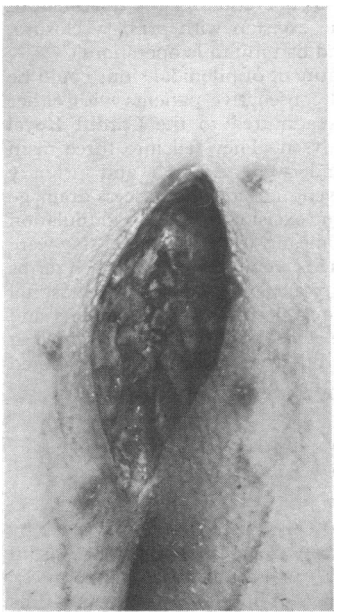

FIG 1—Clean open granulating wound after removal of pack.

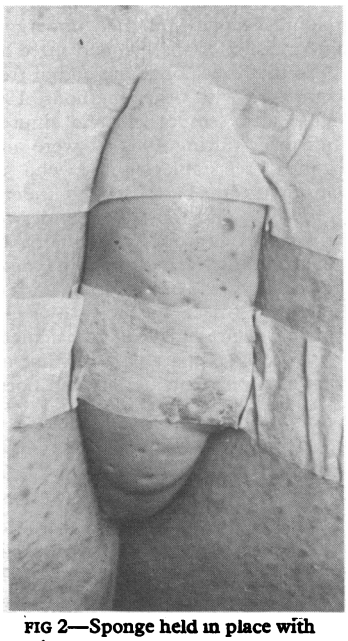

FIG 2—Sponge held in place with micropore tape.

CONSTITUTION OF ELASTOMER

The elastomer is constituted by stirring vigorously 10 ml elastomer (silicone elastomer No. 386, Dow Corning) with 0·6 ml of the catalyst, or larger volumes in the same proportions. The viscous fluids are measured by drawing up the elastomer and catalyst into separate 20-ml and 2-ml syringes, and they are then mixed in a small bowl with a wooden spatula. The elastomer is poured into the granulating wound while the skin edges are drawn slightly apart. During this period the foam expands to four times its original volume, setting to a soft and pliable foam in about two minutes.

AFTERCARE

The sponge is immediately taken out of the cavity to show the patient how painless sponge removal can be. It is then replaced and secured with a strip of 1-in (2·5-cm) micropore tape (fig. 2). The patient is instructed to have two salt baths a day and to remove the sponge. This is then washed out under running water, squeezing it as one

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would a rubber washing-up sponge, and a final rinse is given in aqueous chlorhexidine (Hibitane) solution.

The patient returns the sponge to the cavity himself, and surprisingly quickly masters the technique (only one patient has required more than two baths before being confident to leave hospital on the sixth day after operation). Patients are seen once a week in a clinic, when shaving is done as required to prevent implantation of hairs. As the granulating wound heals it contracts and gradually extrudes the sponge. At the weekly visit portions of the sponge are cut off with a pair of scissors or a knife, so that the sponge once again fits the healing cavity. Some patients can trim their own sponges, for slight bloodstaining on the surface indicates that there has been too much pressure on the granulating tissue. Alternatively, a new sponge can be made each week.

When the sponge has been completely extruded by healing of the cavity the wound is held apart by a folded gauze square which the patient places between the buttocks after each salt bath. This allows continued drainage of the wound and leaves it open to the air, until epithelialisation is complete.

Patients

We studied the sponge technique in unselected consecutive patients who were either referred to the surgical unit outpatient department at the University Hospital of Wales or admitted to the Cardiff Royal Infirmary with acute abscesses during 1972 and 1973. Of the 40 patients (24 men and 16 women) 14 presented with an acute abscess and nine had had at least one previous operation for the treatment of pilonidal sinus (four had undergone excision with primary closure, two incision of abscess, and three had had multiple operations).

So that the sponge method of treatment of pilonidal sinus could be compared with other methods, 100 consecutive patients with either acute abscesses or chronic sinuses admitted to the Cardiff Royal Infirmary during 1969-72 were analysed. They fell into three main groups (see table): those who underwent excision and primary closure (group 1); those who underwent incision and abscess drainage (group 2); and those who underwent excision and open granulation with packing (group 3). Median and mean values of hospital stay were calculated for each group. The methods were then compared in terms of benefit to the patient (median hospital stay) and cost of the hospital treatment (mean hospital stay). Group 3 contained 72 patients and this number enabled us to calculate a median healing time, which at 84 days is comparable with that in other series. It should be noted that many patients underwent more than one procedure.

Results

The table shows details of the 40 consecutive patients treated by excision and granulation with a silicone foam sponge in the Cardiff Royal Infirmary from August 1972 to September 1973 (group 4). All these patients spent exactly six days in hospital. The median time the patient dressed his open granulation wound with a silicone sponge was 17 days, and the median healing time was 44 days. There were no failures of primary healing and no recurrences at one year's follow-up.

Lesions treated by excision and sponge took significantly less time to heal completely than those treated by excision and packing (group 3) ($P < 0.0001$ on the Mann-Whitney test). In groups 1, 2, and 3 the mean ($\pm$SD) stays in hospital were 11.0 ± 7.8, 11.3 ± 8.9, and 11.8 ± 8.2 respectively, compared with 6 days in group 4. Obviously the cost of the foam procedure is less than that of the other procedures.

Results of treatment in patients with pilonidal sinus treated at Cardiff Royal Infirmary during 1969-73

Procedure	No. of Patients	Hospital Stay (Days)			Median (Range) Healing Time (Days)	Failure of Primary Healing: No (%) Needing Further Treatment
		Median	Mean	Range		
Group 1	26	9	11	3-31		12 (46)
Group 2	34	7	11	1-31		24 (73)
Group 3	72	10	11	2-31	84 (23->365)	10 (14)
Group 4	40	6			44 (15-124) (Sponge time: 17 (10-59))	None

An impression, though not statistically significant, was that the lesions of the patients who were the least regular attenders at follow-up clinics for shaving and inspection took the longest time to heal. Those who failed to bathe at least once a day also had some delay in healing. Thus good aftercare, with shaving and twice-daily baths, seems to be essential if steady healing of granulation tissue is to be maintained and full advantage gained from the use of foam sponge.

Discussion

The foam elastomer is one of a large family of silicones, which first became available in 1943. Silicone 386 is the most satisfactory substance for making the sponge because it is soft and resilient enough to simulate the consistency of normal tissue. The same springy resilient character allows the patient to sit on a sponge within a pilonidal excision cavity without discomfort and without pressure necrosis of the healing granulation tissue. Foam elastomer, though a foreign substance, is much less reactive and irritant than a gauze pack, and, unlike an intermittently obstructing pack, it allows good drainage of the wound along its sides throughout the 24 hours. There is no evidence to suggest that they are carcinogenic.[4]

The argument against open granulating healing of pilonidal sinus has been the long expensive stay in hospital (21-28 days) and the number of days needed to heal the wound completely (42-84 days).[5-7] Many surgeons have advocated primary closure (because of its potential for rapid complete healing) by a variety of techniques, but a review by Foss[3] showed that healing by primary closure has a failure rate of about 16% and a recurrence rate at five years of 16%. These figures have been produced by experienced workers using scrupulous technique; possibly overall results might be even less encouraging. The silicone elastomer technique can allow the open granulation technique to be practised with no greater demands on health care facilities than primary closure and considerable saving in hospital facilities and nursing time over other open granulation techniques.

The advantages of this technique in comfort and economy are obvious, even though the two Cardiff series were not strictly comparable because they were not part of a controlled trial. While the primary closure group could have been sent home earlier, the low incidence of primary healing in this group would have dictated a significantly longer overall stay for the group. In assessing the validity of the statistical analysis it is important that no patient in group 4 required a hospital stay longer than the stipulated six days.

Instead of a young, fit, working patient remaining in hospital for daily packing, inpatient treatment can be kept to six days with the foam elastomer sponge. The patient quickly becomes independent of nursing staff and can look after his own medical care. The simplified aftercare and comfort of the sponge enable the patient to return to work soon after discharge from hospital. This is facilitated if the weekly clinic is held on a Saturday morning. The financial gain to the National Health Service would be great if every patient with a granulating wound could be discharged even one day earlier from hospital. The savings in nursing services would be enormous, with an average decrease of six weeks in nursing care per patient. Both hospital and district nurses could be directed towards more essential needs.

This technique may be applied to a wide variety of granulating wounds, ranging from infected abdominal wounds to perineal wounds, from bed sores to diabetic gangrene of the foot. Results and techniques in such conditions will be reported elsewhere.

We thank the department of medical statistics at the Welsh National School of Medicine for their help with the statistical analysis and Dow Corning International for supply of the foam elastomer. Dow Corning International are co-operating in the organisation of a multicentre trial to further evaluate the technique. We are also grateful to the department of medical illustration at the Welsh National School of Medicine, who produced the illustrations for this paper.

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Atenolol and bendrofluazide in hypertension

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Summary

The effect of atenolol, a new beta-1-adrenergic receptor blocking agent, was studied in a double-blind cross-over trial in 24 carefully selected hypertensive outpatients. After a four-week run-in period on matching placebo each patient received atenolol 200 mg/day, atenolol 400 mg/day, a combination of atenolol 200/mg day with bendrofluazide 5 mg/day, and bendrofluazide 5 mg/day alone, according to a random sequence.

Atenolol at either dose produced a significantly greater reduction in all blood pressure levels except standing systolic pressure than bendrofluazide alone. There was no statistically significant difference between the effects of the two atenolol doses on either blood pressure or pulse rate. The addition of bendrofluazide to atenolol resulted in a further significant lowering of the blood pressure. A significant effect of thiazide on weight was noted.

The study shows that atenolol, a cardioselective beta-blocker of similar potency to propranolol in animals but without membrane-stabilizing or partial agonist activity, is an effective and well-tolerated hypotensive agent.

Introduction

Atenolol (Tenormin, I.C.I. 66082) is a new cardioselective adrenoceptor beta-blocking agent of similar potency to propranolol in animals that lacks partial agonist activity and membrane stabilizing effects. We report here the findings of a study that was designed to compare the efficacy of atenolol, bendrofluazide, and combined treatment with atenolol and bendrofluazide in a carefully selected group of hypertensive outpatients.

Patients and methods

SELECTION OF PATIENTS

Patients, aged 21-65 years, referred for investigation of raised blood pressure were assessed in hospital after at least 14 days off any drug treatment. Patients were excluded if there was a history of recent myocardial infarction, evidence of cardiac failure, heart block, or gross ischaemia, grade III or IV retinopathy (Keith-Wagener), diabetes mellitus, gout, impaired liver function, creatinine clearance less than 60 ml/min, or if they were on any other drug treatment.

During a 36-48 hour hospital admission routine haematological, bacteriological, and biochemical investigations and chest *x*-ray examination, intravenous pyelography, and electrocardiography were performed. Lying and standing blood pressures were recorded every four hours. The observers in the trial (D.B.G. or J.C.P.) also measured the blood pressures with Hawksley random-zero sphygmomanometers on two separate occasions on the evening of admission (20.00-21.00 hours) and after a 10-hour overnight rest (08.00-09.00 hours). On both these occasions the number of 12 in steps required to produce an increment of standing pulse of 30 beats/minute was determined using electrocardiographic control. Patients were invited to participate in the trial if the morning lying diastolic pressures were over 90 mm Hg and under 105 mm Hg, and all other outpatient and ward blood pressures confirmed persistent readings above 90 mm Hg. The nature of the trial was explained and all suitable patients gave their consent.

Before discharge from hospital the patients were familiarized with a standard questionnaire about general health and the occurrence and severity of several symptoms. The methods of access to the doctors conducting the study were outlined.

CONDUCT OF TRIAL

After discharge from hospital the patients were seen at the hypertension clinic within two weeks. The protocol excluded patients from further participation in the trial if the lying diastolic blood pressure fell below 90 mm Hg after a four-week outpatient run-in period on a matching placebo. After the run-in period a double-blind cross-over method was used to assess the effects on lying, standing, and post-exercise blood pressure of the following four treatments, each provided by two identical-looking tablets and given twice daily:

(*a*) Atenolol 100 mg; (*b*) atenolol 200 mg; (*c*) bendrofluazide 2·5 mg; (*d*) atenolol 100 mg and bendrofluazide 2·5 mg; each treatment was given for four weeks and each patient received the four treatments. Open pilot work had shown that no further hypotensive effect of atenolol occurred after two weeks, but we chose a four-week period to confirm this with a double-blind technique. The order of administration was determined by a random code which ensured that each of the 24 possible permutations of four treatments was given to one of the 24 patients. Thus each treatment period followed or preceded any other treatment period on six occasions. Two-week supplies of drugs were supplied to each patient in prepacked and paired containers.

The patients were seen every two weeks and the blood pressure of each patient was recorded using Hawksley random-zero sphygmomanometers under standard conditions at the same time of day by the same observer (D.B.G. or J.C.P.), except on a few occasions when a deputy substituted (J.W.). The mean of two or three blood pressure readings (same arm) after three to five minutes lying and two to three minutes standing was recorded. A single reading was taken after performance of the predetermined exercise load specified for each patient. The diastolic end point was taken as the phase-4 muffle. Between-observer comparisons of the blood pressure readings were made at intervals throughout the trial.

The observer not recording the blood pressure completed the questionnaire on symptoms in another room. Separate forms were

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