

INSTRUMENTS AND TECHNIQUES*

A combination of subcuticular suture and sterile Micropore tape compared with conventional interrupted sutures for skin closure

A controlled trial

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Summary

We have conducted a controlled trial to compare skin closure using conventional interrupted sutures with a combination of subcuticular suture and sterile Micropore tape in 169 patients undergoing appendicectomy, inguinal herniorrhaphy, or saphenofemoral ligation. We have found that the combination technique consistently gives a better cosmetic result and that the tape acts well as a dressing, is convenient, and is well tolerated by patients.

Introduction

We have recently evaluated by means of a controlled trial a method of skin closure that was described by Lord in 1974 (1). This technique consists of a subcuticular suture over which a porous sterile adhesive tape (Micropore Surgical Tape (3M Ltd)) is applied. The tape serves to maintain skin apposition, anchors the ends of the subcuticular suture, provides additional support for the healing wound, and acts as the wound dressing.

A study was undertaken to assess the resultant appearance of healed cutaneous wounds using this technique and to compare it with that obtained when interrupted sutures were used for skin closure.

Methods

A total of 169 patients who underwent either acute appendicectomy (Lanz incisions), inguinal herniorrhaphy, or saphenofemoral ligation were included in the trial. The age range was from 15 to 78 years; 103 patients were male and 66 female. (Table I)

Each patient was allocated at random to one of two groups. Group A had their wounds closed with interrupted 2/0 Prolene (polypropylene) sutures while those in Group B had theirs closed with the subcuticular 2/0 Prolene suture and sterile Micropore tape combination.

TABLE I Allocation of patients to Groups A (interrupted sutures) and B (combination technique)

| Operation | Group A | | Group B | | Totals |
|-------------------------|---------|--------|---------|--------|--------|
| | Male | Female | Male | Female | |
| Appendicectomy | 25 | 15 | 22 | 27 | 89 |
| Herniorrhaphy | 19 | 2 | 23 | 1 | 45 |
| Saphenofemoral ligation | 8 | 12 | 6 | 9 | 35 |
| Totals | 52 | 29 | 51 | 37 | 169 |

Preoperative cleansing of the skin at the operation site was by means of 0.5% iodine in spirit. No protective plastic drapes were used. Closure of the layers deep to the skin was determined by the nature of the operation; deep closure was uniform for each type of operation. Closure of subcutaneous fat layers was only performed (using interrupted chromic catgut sutures) if this layer was more than 1 cm deep. Portex drains were, if indicated, brought out through separate stab incisions below the main appendicectomy wound. Two surgeons were involved in the trial (MT and RP).

In Group A interrupted sutures were placed at 1–1.5 cm intervals. The wound was covered with a non-adhesive dressing (Melolin) held in place with non-sterile Micropore tape. This dressing was replaced as indicated postoperatively. On the 7th day all sutures were removed.

When the combination closure method (Group B) was used the subcuticular suture was inserted to obtain accurate apposition of the skin edges. The adjacent skin was then cleaned and dried. While an assistant held both ends of the subcuticular suture under slight tension the sterile Micropore was applied gently without further tension on the skin so that the whole wound and an area of at least 3 cm of surrounding skin was covered. The Prolene suture was then trimmed at either end so that the cut ends were covered by the Micropore completely (Figs. 1–4). No anchorage beads were used and no dressing other than the Micropore was used.

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FIG. 1 The subcuticular suture is in place and held under slight tension by an assistant. In this case a right upper paramedian (cholecystectomy) wound is illustrated. The technique is the same for all incisions.

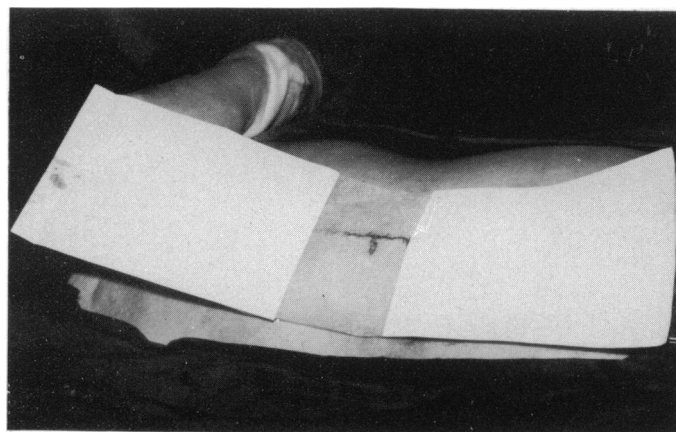


FIG. 2 The sterile Micropore tape is applied by peeling back the halves of the liner on which it is presented.

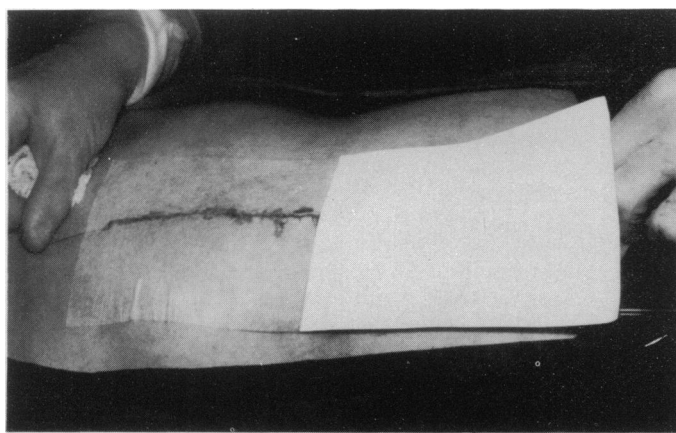


FIG. 3 Half of the liner is removed and the incision is partly covered by the Micropore. The second half is being removed.

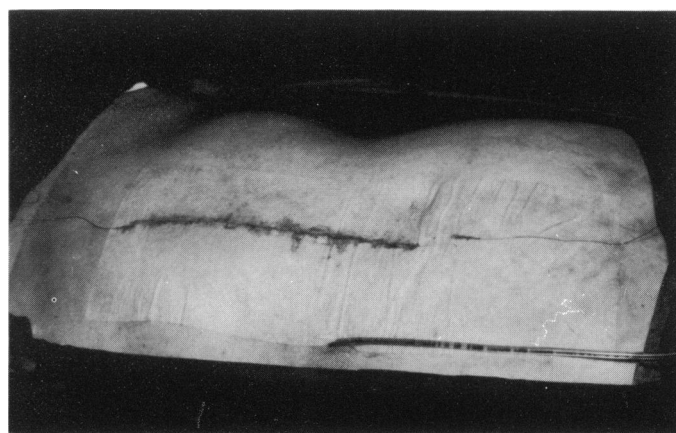


FIG. 4 The Micropore is in position over the entire incision. The suture ends are anchored by the tape adhesive. The translucency of the tape allows easy examination of the wound.

The wound was then left undisturbed for 7 days until the subcuticular suture was removed. This was done by lifting up an edge of the Micropore tape and pulling the suture out from one end. The Micropore was then smoothed back into place.

The Micropore was left in situ until 2 weeks had elapsed after the operation. Patients were allowed to bathe or shower as they desired, even with the Micropore still in place. The semi-transparent nature of the Micropore allowed recognition of complications (for example, infection), which were recorded. A wound was defined as infected if it discharged pus (2).

Trendelenburg operations were day-case procedures except when medical conditions dictated a longer stay. Herniorrhaphies required postoperative stays of 2–3 days and appendicectomies about 4 days.

All wounds were reassessed at the end of the 4th post-operative week in the outpatient department. The cosmetic result was assessed in the manner described by Eaton (3). The patient was asked to grade the scar as 'excellent', 'good', 'fair', or 'poor'. The scar was similarly assessed by the surgeon and by an independent assessor (a retired surgical ward staff nurse). The surgeon and the independent assessor were unaware of each other's grading. In the final analysis, however, the gradings ascribed to the last two categories were aggregated to a single 'fair/poor' category (Tables II–IV) because of the small numbers in each of these two categories. At the termination of the study, the 'excellent' and 'fair/poor' ratings were analysed by the χ^2 method to

TABLE II Comparison of assessments of herniorrhaphy wounds in Groups A ($n = 21$) and B ($n = 24$) at 4 weeks after operation. Results expressed as percentages. Statistical analysis by χ^2 test; NS = not significant

| Assessor | Groups | Excellent | Good | Fair/poor |
|-------------|--------|-----------|------|-----------|
| Patient | A | 32 | 48 | 20 |
| | B | 67 | 29 | 4 |
| Surgeon | A | 19 | 57 | 24 |
| | B | 58 | 29 | 13 |
| Independent | A | 43 | 33 | 24 |
| | B | 63 | 29 | 8 |

TABLE III Comparison of assessments of saphenofemoral ligation wounds in Groups A ($n = 20$) and B ($n = 15$) at 4 weeks after operation. Results expressed as percentages. Statistical analysis by χ^2 test; NS = not significant

| Assessor | Groups | Excellent | Good | Fair/poor |
|-------------|--------|-----------|------|-----------|
| Patient | A | 35 | 45 | 20 |
| | B | 53 | 41 | 6 |
| Surgeon | A | 40 | 40 | 20 |
| | B | 53 | 41 | 6 |
| Independent | A | 45 | 40 | 15 |
| | B | 47 | 47 | 6 |

TABLE IV Comparison of assessments of appendicectomy wounds in Groups A ($n = 40$) and B ($n = 49$) at 4 weeks after operation. Results expressed as percentages. Statistical analysis by χ^2 test: NS = not significant

| Assessor | Groups | Excellent | Good | Fair/poor | |
|-------------|--------|-----------|------|-----------|------------|
| Patient | A | 20 | 53 | 27 | NS |
| | B | 65 | 29 | 6 | |
| Surgeon | A | 25 | 42 | 33 | $p < 0.01$ |
| | B | 71 | 23 | 6 | |
| Independent | A | 20 | 35 | 45 | $p < 0.01$ |
| | B | 73 | 21 | 6 | |

determine statistically significant differences between the wound closure methods.

Results

For all three operations the respective gradings indicated a marked preference for the combination technique (Group B) over interrupted suture (Group A). With appendicectomies (Table IV) the statistical analysis indicated that Group B had a significantly higher proportion of 'excellent' ratings by each assessor and a significantly lower proportion of 'fair/poor' ratings (except for the patient assessment) when compared with Group A. Comparable trends can be seen for the herniorrhaphy and the saphenofemoral ligation wounds, although only the surgeons' assessment of the herniorrhaphy wounds showed a statistically significant higher proportion of 'excellent' ratings (Table II). It is possible that the samples for these two surgical procedures were too small (one-half the size of the appendicectomy group or less) for the observed differences to be regarded as statistically significant.

In 7 cases the wounds became infected, 2 after herniorrhaphy (1 Group A, 1 Group B) and 5 after appendicectomy (3 Group A, 2 Group B). There were no other wound complications.

Discussion

The purpose of any skin closure technique is to hold the skin edges together for a sufficient time to allow proper healing to occur. The following factors are important in comparing the various methods that are available: (1) incidence of complications (for example, infection); (2) cosmetic results; (3) patient comfort and acceptability; (4) ease of postoperative care (wound dressing, wound inspection), ease of dealing with complications should they occur, and ease of removal of sutures etc.; (5) time taken to close wound.

Interrupted sutures are prone to suffer from the disadvantage of producing disfiguring cross-hatched scars. It is interesting that patients, surgeons, and assessor alike all felt in this study that the subcuticular suture/Micropore combination closure was consistently more acceptable in all three operation categories but particularly so in the appendicectomies. Possibly this reflects higher expectations regarding appendicectomy scars than those from herniorrhaphy or saphenofemoral ligation. If this is so, then the results from appendicectomies reflect the strictest test of the two methods and the true reflection of the preferability of the combination method.

Interrupted sutures are reliable, but epidermal cells and bacteria can be introduced into the deeper layers of the wound along the needle tract (4) resulting in possible increases in the infection rates. Subcuticular sutures avoid this, but the two ends of the suture generally require some form of anchorage (usually beads). Should this anchorage fail there may be wide dehiscence of the wound. With the use of Micropore the need to secure the ends of the subcuticular suture with beads is avoided, the anchorage being provided

by the tape adhesive. Beads used as anchorage are a common source of discomfort as they tend to dig into the skin when postoperative oedema develops. Infection, should it occur, may be difficult to deal with as the sutures may need to be removed, with consequent wide dehiscence of the wound. When a subcuticular suture is used in combination with sterile Micropore, as in our trial, infected wounds are easily identified through the Micropore and dealt with. The suture is removed, but the Micropore is left in situ and any pus present may be evacuated by cutting a window in the tape over the appropriate part of the wound. The adhesive nature of the Micropore prevents wound dehiscence after the suture has been removed.

Although in our trial we have only considered transverse incisions, this combination technique of skin closure has been routinely used for the closure of vertical incisions with entirely satisfactory results. It has also been used routinely after mastectomy, thyroidectomy, and other head and neck operations. We have found that sterile Micropore can be used alone very satisfactorily for the anchorage of drainage tubes. One of us (PHL) uses 2/0 Dexon (polyglycolic acid) sutures which, being absorbable, do not need to be removed, rather than Prolene.

Tape closure alone has been shown to give a good cosmetic result (5). In addition, the uniformity of tension along the length of the wound promotes faster healing of the wound in its early stages (6). Recently Eaton (3) reported that the use of an adhesive polyurethane membrane (Op-Site) gave good cosmetic results and was quick and easy to use. Some authors have found that sutureless closures can be unreliable, and Gibson and Poate (7) found that skin edges were often difficult to approximate accurately.

There are advantages associated with the use of sterile Micropore *per se* as a wound dressing. Micropore is very rarely associated with any form of skin reaction. When it is removed there is no depilation and removal is therefore painless (8). Its porosity allows prompt evaporation of fluid from the surface and any excess fluid can be mopped off. In cases in which exudate release is particularly heavy it can be absorbed into a supplementary pad laid on top of the Micropore and removed separately, but in our experience this is seldom needed. The dressing is not dislodged by showering or bathing.

Bacteriological studies have shown that the growth of bacteria under Micropore tape is actually inhibited (9). This is in contrast to most forms of dressings and tapes, under which bacteria proliferate. There is probably an antibacterial property associated with the acrylic adhesive used on Micropore tape.

The use of this combination of subcuticular suture and sterile Micropore offers many of the advantages of both of these methods when used alone. In addition many of the disadvantages already indicated are eliminated. The combination is also suitable where tape closure alone is not—for example, in wounds that are not straight or for wounds in difficult areas, such as underneath skin folds.

The removal of sutures is an event which patients frequently view with foreboding. The extreme ease with which the subcuticular suture can be removed without disturbing the Micropore is, in our experience, a frequent source of relief to patients. Nor should we underestimate the beneficial effect of covering the wound from the patient's view for 14 days, particularly in the unattractive early stages of healing. When the dressing is finally removed the wound is almost completely healed.

The results of our trial and the experience of many surgeons who have worked at Wycombe General Hospital in recent years have led us to believe that this method of skin closure has many advantages. However, the combination is not used widely, perhaps because sterile Micropore has not hitherto been made available by the manufacturers. Now that it is available in this form we believe that this technique could, with advantage, achieve great popularity.

We should like to thank Mr J Grogono and Mr B Higgs, consultant surgeons at Wycombe General Hospital, for allowing their patients to be included in this trial. We should also like to thank 3M Ltd for providing the Micropore and Mr G Jessamine for his invaluable assistance.

References

- 1 Lord PH. Day case surgery. *Proceedings of the Royal Society of Medicine* 1974;67:998-1000.
- 2 National Research Council. 1964.
- 3 Eaton AC. A controlled trial to evaluate and compare a sutureless skin closure (Op-Site Skin Closure) with conventional skin suturing and clipping in abdominal surgery. *Br J Surg* 1980;67:857-60.
- 4 Gillman T, Penn J. Studies on the repair of wounds with reference to epidermal reaction to sutures and pathogenesis of carcinoma in scars. *Med Proc* 1956;suppl.2:121-49.
- 5 Skoog T. Porous tape in wound closure, skin grafting and wound dressing. *Acta Chir Scand* 1973;126:1-8.
- 6 Forrester JC, Zederfeldt BH, Ahren C. Healing of tape closed and sutured wounds: a comparison by tensiometry and scanning electron microscopy. *Br J Surg* 1970;57:729-37.
- 7 Gibson EW, Poate WJ. The use of adhesive tape in plastic surgery. *Br J Plast Surg* 1964;17:265-70.
- 8 Goldon T. Non-irritating, multipurpose surgical adhesive tape. *J Surg* 1960;100:789-96.
- 9 Marples RM, Kligman AM. Growth of bacteria under adhesive tapes. *Arch Dermatol* 1969;99:107-10.

Notes on books

The Dying Patient edited by E Wilkes. 336 pages, illustrated. MTP Press, Lancaster. £18.50.

Much of what is said about the management of dying patients is meretricious nonsense propounded by people who do not directly look after dying patients. However this book is a series of essays by people dealing with particular aspects of dying patients, at home and in hospital. The book would make a good introduction for a young surgeon, trying to achieve an attitude to dying patients, although most clinicians eventually conclude that each patient is a separate unique problem.

The Management and Prevention of Pressure Sores, by Anthony Barton and Mary Barton. 96 pages, illustrated. Paperback. Faber and Faber, London. £2.75.

This book emanates from the Pressure Sore Unit at Canterbury and is produced in association with the Multiple Sclerosis Society of Great Britain and Northern Ireland. The authors show how those at risk may be detected using radiometry and thermography and they expound new approaches to treatment.

1981 Year Book of Urology edited by J Y Gillenwater and S S Howards. 356 pages, illustrated. Year Book, London. £25.50.

As the Editor points out the best way to keep up to date with advances is to read current medical literature but this is an impossible task for an individual. This book represents the 10% of important articles abstracted from 3000 articles in the World Literature that were reviewed. After articles concerning infection, calculi, diagnosis and other topics, the papers are arranged in an anatomical manner from the adrenals down to the urethra.

A Manual of Systematic Eyelid Surgery by J R O Collin. 134 pages, illustrated. Paperback. Churchill Livingstone, Edinburgh. £10.

The book is directed at ophthalmologists and general surgeons. It offers advice on selection for surgery, selection of operation and technique of operation. It is well illustrated with clear line drawings.

Ischemic Enterocolopathies by F B Huber. 110 pages, illustrated. Paperback. Hans Huber, Bern. SF 26.

This is translated from the original German edition dated 1981. It reviews the difficult problem of abdominal angina, ischaemic enteritis and colitis and intestinal infarction. The pathology, clinical features and treatment are reviewed and there is an extensive bibliography.

A Practice of Cardiothoracic Surgery by M P Holden. 432 pages, illustrated. Wright PSG, Bristol. £24.50.

In his preface the author rightly points out the pitfalls of gastric surgery which remained almost stationary since the days of Billroth, only to be rendered largely impotent by the pharmaceutical industry. In a fairly short book he reviews the surgical management within the wide scope of cardiothoracic surgery. There are 4 sections. The first on pulmonary, pleural and chest wall surgery, the second on oesophageal surgery, the third on acquired cardiac disease, and the 4th on congenital cardiac disease. The illustrations are mainly simple clear line drawings. At the end of the book is an excellent list of books for browsing.