In the out-patient series it was found practicable to manage most minor wounds and lacerations by sutureless closure without the use of local anaesthesia. Gentle cleaning of the wound and excision of small areas of devitalized tissue were usually possible without causing discomfort to the patient. Because of the ease of application of the strips and lack of necessity for local anaesthesia, this method has many advantages for small wounds of the kind usually treated in general practice or in an out-patient department. Indeed, the very simplicity of the technique engenders a risk that wounds in which full exploration is required may be closed *ab initio*. Careful assessment of traumatic lesions is therefore necessary before proceeding to sutureless closure without anaesthesia.

The combined results of this clinical trial have demonstrated that steri-strip tape is a reliable and practical means of skin closure for the majority of wounds and incisions. We would particularly advocate the use of tape closure in the following circumstances: (1) where incisions transgress skin devitalized by ischaemic or venous disease, or whenever there is a special risk of infection; (2) incisions and wounds in children; (3) suitable traumatic wounds; and (4) fixation of small skin grafts.

CLOSURE OF SKIN WOUNDS WITH ADHESIVE TAPE

PRELIMINARY REPORT BASED ON USE OF TAPE IN 100 SURGICAL CASES

BY

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The idea of closing skin wounds with adhesive tape instead of sutures or metal clips is not new. The disadvantages of using sutures and the advantages of using tape for the closure of wounds have been critically assessed by Gillman *et al.* (1955) and Gillman (1958). The lack of suitable materials, however, has prevented it from being exploited except on a very limited scale. Recently I have had an opportunity of testing two forms of a new type of microporous surgical tape,* which is permeable to water vapour and, it is claimed, does not cause skin reactions even in patients who are hypersensitive to conventional adhesives. Apart from the roll form, supplies of the tape in a sterile pack† are available, the latter being designed for the tape closure of wounds as an alternative to skin sutures. Sterilization is carried out by ethylene oxide gas.

Method of Application.—The deep layers of the wound are closed in the usual way: subcutaneous sutures were inserted in this series only when a change in direction of the wound occurred or when skin flexures were crossed. The skin around the wound is thoroughly cleaned and dried, preferably with ether. Pieces of tape are applied at right angles to the wound, one side being applied first and firmly pressed down. The edges of the wound are then drawn together and the tapes firmly pressed down on the other side. For further security the tapes may be criss-crossed and reinforced at the edges. The taped wound is dressed with dry gauze and secured with an adhesive tape, or it can be left exposed. The manufacturers‡ supply a surgical tape in roll form of the same non-irritating material as the wound-closure strips, which can be used instead of existing plasters. The microporous surgical tape is ideal

Summary

A clinical trial of a new form of adhesive tape was carried out to assess its use in skin closure.

The results obtained in 157 wounds and lacerations in out-patients and 124 operation incisions in in-patients are given. Satisfactory primary healing was obtained in most of the patients, and the reasons for any delay in healing are analysed. The advantages of the tape are discussed and certain indications are given for its use.

We wish to thank Sister P. E. M. Cocking for her help in the out-patient trial and the photographic department of St. Bartholomew's Hospital for the illustrations. The steri-strips were supplied by the Minnesota Mining & Manufacturing Co. Ltd. through Mr. W. D. C. Padfield.

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for this purpose as it does not adhere to itself. If wound inspection is required the outer dressings must be removed in such a way as not to disturb the tapes.

Results

The present report is based on 100 cases in which tape was used for the primary or secondary closure of skin wounds after a variety of surgical procedures or the repair of facial lacerations (see Table). In general it was found that the tape was easy to apply, but the importance of applying it to dry clean skin is stressed. In patients with

Types of Operation

Lumbar sympathectomy ..	14	Hemicolecotomy ..	1
Appendicectomy ..	29	Retropubic prostatectomy ..	3
Herniorrhaphy (inguinal or femoral) ..	12	Reduction of ectopic testes ..	2
Laparotomy for intestinal obstruction ..	6	Biopsy of breast tissue ..	1
Partial gastrectomy ..	3	Nephrectomy ..	2
Gastroenterostomy ..	1	Excision of submandibular gland ..	1
Closure of perforated peptic ulcer ..	5	Facial lacerations ..	2
Amputations ..	4	Secondary repair of wounds ..	14

a greasy skin it was found that the adhesive qualities of the tape were enhanced by painting the skin with compound tincture of benzoin. Some difficulty was experienced when the tapes crossed skin flexures such as those in the groin or neck, where subcutaneous sutures were found inadequate to hold the skin edges together. In these cases Michel clips were applied as a temporary means of opposing skin edges; the tapes were placed in position between the clips, which were then removed immediately taping was completed.

Of the 100 cases presented the tapes gave satisfactory results in 94. In comparison with a sutured wound they were easier and quicker to apply, and they produced a fine linear scar with no suture marks (see Fig.). There was a

*3M "Micropore" surgical tape No. 1530.

†The strips are identified as 3M brand "steri-strip" skin closures.

‡Minnesota Mining and Manufacturing Co. Ltd., 3M House, Wigmore Street, London W.1.

more even pull on the skin edges, and the tapes could be applied on reddened or oedematous skin, thereby eliminating the danger of skin sutures cutting out. The risk of infection was reduced by the avoidance of introducing surface bacteria by needle punctures. Several patients had gross post-operative abdominal distension due to intestinal ileus; in all cases the wounds healed normally, and without infection or increased scarring caused by sutures cutting through the skin.

Photograph showing bilateral herniorrhaphy wounds at tenth post-operative day.

It was found advisable in all cases to cover the tapes in order to avoid curling up of the edges in bed. Fixation of a drain with tape was found to be unsatisfactory.

The failures can be analysed as follows. In four cases the procedure was abandoned at operation: in one case because the weight of fat in a sympathectomy wound made coaptation of the skin edges impossible without sutures; in another because of persistent mild oozing from the wound edges which was more easily controlled by skin sutures; and in two others because excessive loss of weight had resulted in an atrophic wrinkled skin.

In two cases the tape failed subsequent to operation because of excessive persistent oozing of blood from the skin of the wound edges. The tapes were found to be lying on the top of a large blood clot, and in one instance the clot was evacuated and the wound edges were re-taped without adverse effect on final healing; in the other case the wound had to be sutured to control the oozing.

Six patients with bilateral wounds (inguinal hernia repairs or bilateral lumbar sympathectomies) had one side sutured and the other closed with tape (see Fig.). The sutures and tapes of the hernia wounds were removed on the tenth post-operative day, and in two of the sympathectomies the sutures and tapes were removed on the fourteenth day. The other two had their closure materials removed on the twenty-first day.

In each of these six cases a wound biopsy was carried out under local anaesthesia at the time of removal of the closure materials. It was found that with sutured wounds there was an invasion of epithelium along the suture tracks—as originally described by Gillman *et al.* (1955-6) and Gillman and Penn (1956)—which naturally was absent in the taped wounds. Tissue hyperplasia and fibrous reaction was noted in both types of section but was less abundant in the taped wounds. By the twenty-first day the areas adjacent to the wounds which had been closed with tapes had almost returned to normal.

D

Discussion

The clinical results in this series have been encouraging, and in many situations the tape appears to be superior to conventional closure materials. It is easy to apply and to remove; even when hair has regrown there is no discomfort on removal of the tape. It was found to be quicker to close wounds with tape than with sutures, and the end-result of a fine linear scar has been most encouraging. The absence of skin reaction has been impressive: several patients showed a skin reaction to other adhesive material used to maintain the outer dressings in place, yet the skin under the tape was normal. One patient who had an extremely sensitive skin had several tapes applied to her forearm and abdomen for three weeks continuously without any apparent reaction. She was able to take a daily bath without dislodging the tapes. The tape has been found particularly useful in secondary closure of wounds where sutures tend to cut out because of oedema or infection. If necessary, fresh tape can be applied daily for gradual drawing together of a defect.

Where the viability of the skin is in doubt—for example, in amputation for arteriosclerotic gangrene—the tape has been found to be preferable to sutures because its width prevents cutting of the skin and does not constrict the already poor blood supply.

A reduced incidence of infection in wounds closed with tape was noted, and was probably due to the absence of needle punctures.

Summary

The results of wound closure with a new form of surgical tape are presented. Of the 100 cases in the series the results were satisfactory in 94.

The generous supply of tape from the Minnesota Mining & Manufacturing Co. Ltd. is gratefully acknowledged; also the advice and co-operation of Professor M. F. A. Woodruff, in whose wards this trial was carried out.

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“In Aberdeen in recent years the segments of population that make the biggest demands on both preventive and supportive services have risen sharply—for example, old-age pensioners, expectant mothers, pre-school children, school pupils, and persons recently discharged from hospital. Simultaneously many additional duties have devolved on health and welfare workers—for example, in the field of prevention: reduction of maladjustment, delinquency, child neglect, home accidents, road accidents, rent arrears, whooping-cough, poliomyelitis, and the effects of phenylketonuria. Also in 1962 a national decision increasing annual leave reduced by more than 2% the effective working time of health visitors, midwives, etc. The disease-preventing and health-promoting staff in Aberdeen has not yet been increased to cope with enlarged populations, new duties, and reduced working time: for instance, the establishment of health visitors has not been raised for eight consecutive years. . . . For workers in Aberdeen's Health and Welfare Department, 1962 was therefore a grim year—a year of strenuous improvisation and reallocation of priorities to minimize the harmful effects on the people of continued staff inadequacies; a year—in consequence of relative decrease of preventive services—of steeply rising demands on the supportive services; a year of continuation and acceleration of the disquieting trends mentioned in the report of 1961.” (Report by the Medical Officer of Health for Aberdeen for 1962.)