SUCTION DRAINAGE—A USEFUL SURGICAL AID

JOSEPH KATZ, M.B., F.R.C.S. (EDIN.) and BERNARD GOODMAN, M.B., B.CH. (RAND)

'Behold the wounds, the most unnatural wounds'
Henry VI, Part I, III, iii, 50

'Dead-space' is the bugbear of surgeons. In places where it is obvious, as in empyema, liver abscess and subdural collections, various methods have been evolved to deal with it. This paper deals with the potential post-operative 'dead-space' in cases requiring large skin flaps and cases where there is much fibrosis and chronic infection.

The sequelae of dead-space collections of serosanguineous fluid are (1) delay in healing by primary intention, (2) infection, further delaying healing, (3) a prolonged post-operative recovery period, (4) an uncomfortable, and often painful, recovery period for the patient.

For many years, the insertion of a drain, whether corrugated, cigarette, Penrose, or other, into the area of operative trauma, together with tight bandaging providing external pressure, was the preventive measure in use. Recently the addition of parenteral haemostatic agents, such as adrenochrome semicarbozone (chromozin or adrenosem), has lessened the complications.

None of the methods proved entirely satisfactory for the following reasons:

1. The dressing was bulky and uncomfortable.
2. The pressure the dressing provided was irregularly distributed, so that not all parts of the wound were equally compressed.
3. The haemostatic agents did not adequately lessen the ooze.
4. The risk of disturbing the pressure appliance made it inadvisable to observe the wound daily.

Various authors have suggested the use of mild continuous negative suction drainage post-operatively. The first exponent of this method was Raffl[1] who, in 1952, advocated the use of continuous suction drainage in radical mastectomy. Lattimore and Koontz[2] used the technique in ventral herniоplasty with tantalum gauze sheets. Cassie,[3] Smith Carey[4] and Connolly[5] confirmed that the method was most successful in radical mastectomy. Silvis[6] applied it to a variety of surgical wounds where dead-space was a prominent feature. Maxeiner *et al.*,[7] summarizing their experiences with suction drainage at Minneapolis, found it to be the ideal technique for obliterating dead-space in extensive surgical wounds.

The use of continuous suction drainage is thus well established as a preventive measure in the collection of serosanguineous effusions in extensive surgical wounds with much dead-space.

So far those who practice this method of drainage have confined its use chiefly to cases requiring large skin flaps, such as mastectomies, but it has been felt that the method might prove useful in smaller operations where there was evidence of fibrosis or chronic infection.

In the African, with his predisposition to lay down fibrous tissue, it is often difficult to ensure complete haemostasis at operation in cases with long histories, and the result is that haematomata are of relatively common occurrence.

Material

This paper describes the use of this method of drainage in a series of 19 cases. All were patients admitted to the surgical wards at the Non-European General Hospital, Johannesburg, from the surgical out-patients department.

Nine patients were cases of hernia—7 either indirect or direct inguinal hernia, 1 a direct inguinal hernia associated with a femoral hernia, and 1 an incisional hernia. None of these had a history of less than 5 years, and in 3 cases the history was longer than 15 years. The patient with the incisional hernia had undergone 2 repairs—both unsuccessful.

Five were cases of either unilateral or bilateral hydroceles of over 5 years' duration. One patient had a history of 15 years, another of 36 years. All the hydroceles had been previously drained more than once, either in surgical out-patients or through some interference by scarification (witch-doctor).

One was a case of lipoma of the thigh of over 15 years' duration, 2 of thyroid disease, and 2 of breast carcinoma.

The inguinal hernias were repaired by the Bassini method. The femoral hernia was not repaired; only the sac was obliterated. The incisional hernia was repaired with tantalum wire. The hydroceles were repaired by the Jaboulay method. In one of the thyroid cases total thyroidectomy was performed, and in the other partial thyroidectomy. In the cases of breast carcinoma, the breasts were removed by simple mastectomy.

In all the cases haemostasis seemed complete at operation and was achieved with catgut ligatures and sutures. None of the cases received antibiotics of any sort either pre- or post-operatively.

The cases included in this small series are mainly those where the lesion operated on was of long standing; in some

of the cases, too, a fibrotic field was present, in the production of which previous interference may have played a part. This fibrotic field required a great deal of dissection, having a twofold consequence, viz. (1) the creation of dead-space, resulting in serous effusion and (2) slight bleeding from extensive trauma (no matter how perfect the haemostasis appeared to be), leading to a collection of sanguineous fluid.

Technique

The technique of suction drainage used in this series varied only slightly from previously described techniques.

Catheters of sizes 12 - 24 F were specially prepared by puncturing numerous perforations into them, extending from the tip to a distance of approximately 3 inches from the tip. The catheters were sterilized in the usual way.

At operation, one of these catheters of a size suitable to the wound (the bigger the wound, the bigger the catheter) was inserted through a separate stab incision. The wounds were closed in the usual way and dressed with either a spray dressing or a single layer of gauze. The stab wound was sealed off with 'aeroplast' or 'nobecutane', making it air-tight. A spigot was placed into the open end of the catheter. In the ward the catheter was attached to a suction device consisting of a Wangensteen 2-bottle system, elevated 3 feet from the floor and supplying a negative pressure of approximately 5 lb. per square inch.

Suction was maintained for 24 - 96 hours, sometimes longer, until the fluid collected in 24 hours was less than 20 c.c. When drainage had ceased, the catheter was clamped off. The perforations in the catheter became sealed off with fibrin in a few hours and the drain could then be removed.

Results

1. In no case did a serosanguineous collection of fluid distend a wound. No haematomata resulted.
2. No infection in the depths of the wound or in the course of the catheter resulted.
3. The comfort of the patients was enhanced.
4. Stay in hospital was shortened.
5. The continuous suction did not give rise to fresh bleeding.

Discussion

The rationale of this technique is to apply a negative pressure to the dead-space thus removing any free fluid. Atmospheric pressure can now compress the skin against the underlying structures and so promote rapid healing. Since the compressing agent is distributed equally to all parts of the skin, irregularities of body contour do not alter the satisfactory end-result.

In this series the method was applied to herniorraphy, hydrocele repair, removal of a lipoma, thyroidectomies and simple mastectomies. The hernias, hydroceles and lipoma operated on were all of very long duration and the fibrosis expected was indeed present at operation. Consequently it was impossible to be certain of haemostasis at operation despite careful and thorough technique. The fact that haemostasis was not complete and that a serosanguineous ooze was collecting daily was well shown by the regular drainage of 100-200 c.c. for the first 24 hours, diminishing to 5-15 c.c. by the third 24 hours. The average length of suction time required was just over 72 hours.

No haemotomata in the wounds resulted. Infection did not arise at any stage. Healing was rapid and by primary intention. Post-operative recovery was rapid and comfortable and consequently cooperation on the part of the patients was better. In addition, the state of the wound from day to day could easily be visualized without removing the conventional dressings.

SUMMARY

1. The problems of dead-space and fibrosis in the prevention of healing of operation wounds are mentioned.
2. The history and literature of the subject are discussed.
3. A technique of air-tight continuous suction drainage is described.
4. The technique has been applied to long-standing lesions where much fibrosis was present and the necessary surgical dissection created dead-space.
5. The results obtained indicate that continous suction drainage is a very useful procedure in avoiding the collection of fluid in potential cavities left by surgery, and its sequelae.

Our thanks are due to the Superintendent of the Johannesburg General Hospital for permission to institute this method, to Dr. P. Keen for his guidance, advice and help, and to Drs. J. O. Gardiner and T. Brandon for their cooperation in the carrying out of this technique.

REFERENCES

1. Raffl, A. (1952): Ann. Surg., **136**, 1048.
2. Lattimore, J. and Koontz, R. (1954): J. Amer. Med. Assoc., **155**, 1333.
3. Cassie, G. F. (1954): Brit. Med. J., **2**, 452.
4. Carey, C. K. S. (1954): *Ibid.*, **2**, 811.
5. Connolly, J. E. (1955): J. Amer. Med. Assoc., **1571**, 1490.
6. Silvis, R. S. (1955): Ann. Surg., **142**, 252.
7. Maxeiner, S. R. Jnr. and Maxeiner, S. R. (1956): Minnesota Med., **39**, 4.