

Wound closure by skin traction: an application of tissue expansion

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Summary—A speedy and simple technique of wound closure for use with multiple casualties is described. K wires are passed through the skin on either side of the wound and these are connected across the wound by silver wire. Daily twisting of the silver wire slowly approximates the wound edges to healing.

In a wartime situation the plastic surgeon is sometimes called upon to deal with a large number of cases needing attention. Problems of soft tissue loss are common, many are complicated by bone exposure and some are already infected so split skin grafts cannot be used for cover. There are often large areas of skin damage such as result from a mine explosion or shrapnel injury so that local or distant flaps are not available, besides which raising flaps is time-consuming. A simple, speedy and effective way of dealing with these wounds is needed.

This paper describes a technique which is suitable for such a situation. Gibson, in 1977, described the visco-elastic properties of skin which are important to this method. There are two such properties, "creep" and "stress relaxation". Creep occurs when a piece of skin is stretched and the stretching force is kept constant. The skin will continue to extend depending on the forces involved.

Stress relaxation, the corollary of creep, occurs when a piece of skin is stretched for a given distance and that distance held constant. The force required to keep it stretched gradually decreases.

Technique

Skin traction can be performed under local anaesthetic. The wound is cleansed and limited undermining carried out but the wound edges are not excised unless they are infected.

Several Kirschner wires, 2 mm in diameter, are inserted into the skin, passed through the dermis for some distance and then out of the skin again. This is done in such a way as to encircle the wound (Fig. 1A). Two fine silver wires are looped around the cross points of the K wires at the shorter

diameter of the wound. They pass under the skin edges to meet and are twisted together at the centre of the wound. This action of twisting the wires will bring the wound edges together. Twisting is continued until the skin blanches.

The wound is left open for daily inspection. The wires are twisted tightly each day, advancing the wound edges by 3 to 4 mm. Twisting is discontinued as soon as the edge blanches. Sometimes it is possible to move the edges 10 mm if the skin is not tight and does not blanch. If, however, the skin is pale and appears tight, the wires are left for 2 to 3 days without twisting. When advancement is recommenced it is advisable to attempt only 2 to 3 mm per day at first.

At the end of the procedure the Kirschner wires lie almost parallel and the wound edges are approximated (Fig. 1B). The K wires are left in place for a few days so that healing may be completed, and are then removed. Sometimes at this stage it is possible to trim the wound edges and suture them.

Material

Twenty-three cases were treated by skin traction technique. Eleven involved the upper third of the leg where there was skin and soft tissue loss with bone exposure. In five cases the injury was situated in the middle third of the leg (Fig. 2) and three in the lower third of the leg. There was one case of soft tissue loss in the calf and one patient had a severe ankle injury with skin and partial bone loss (Fig. 3). In another case there was a deficiency of forehead skin, with exposure and damage to the frontal bone (Fig. 4), and there was skin and soft

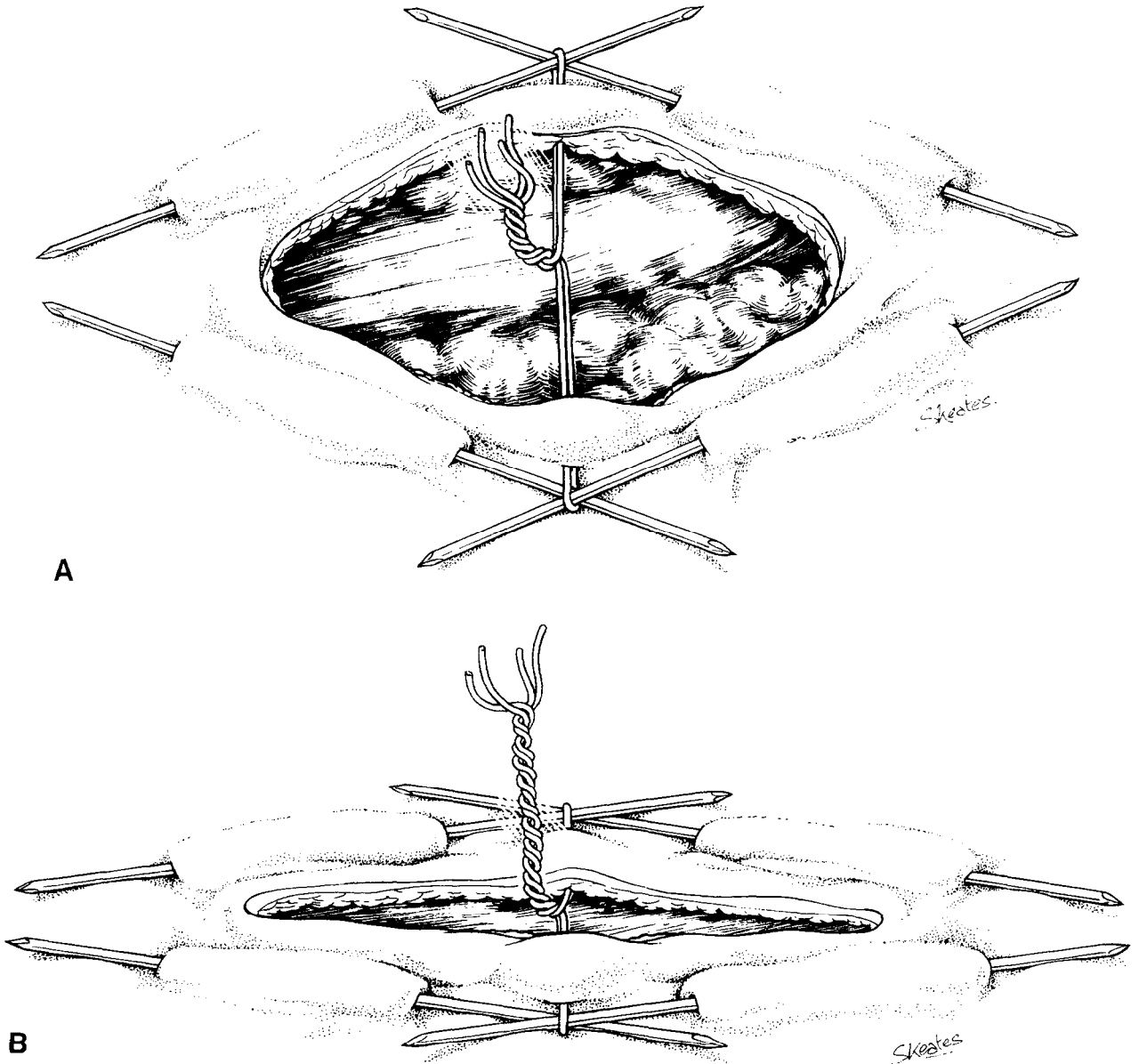


Fig. 1

Figure 1—(A) Kirschner wires surrounding the wound. The silver wires are looped round the crossing points of the K wires and pass through the skin to the centre of the wound where they are twisted on each other. (B) The wound almost closed.

tissue loss with bone exposure in the upper third of the forearm in one case.

Results

All the cases treated by this method had a satisfactory conclusion. In one case there was

necrosis of the edge of the skin due to the pressure of the wire and in this case a pause of 5 days was allowed before resuming traction by twisting the wire. The final result was satisfactory. In all cases the final scar was aesthetically acceptable. The largest wound closed by this technique was 13 × 5 cm and the smallest wound was 3 × 3 cm. The

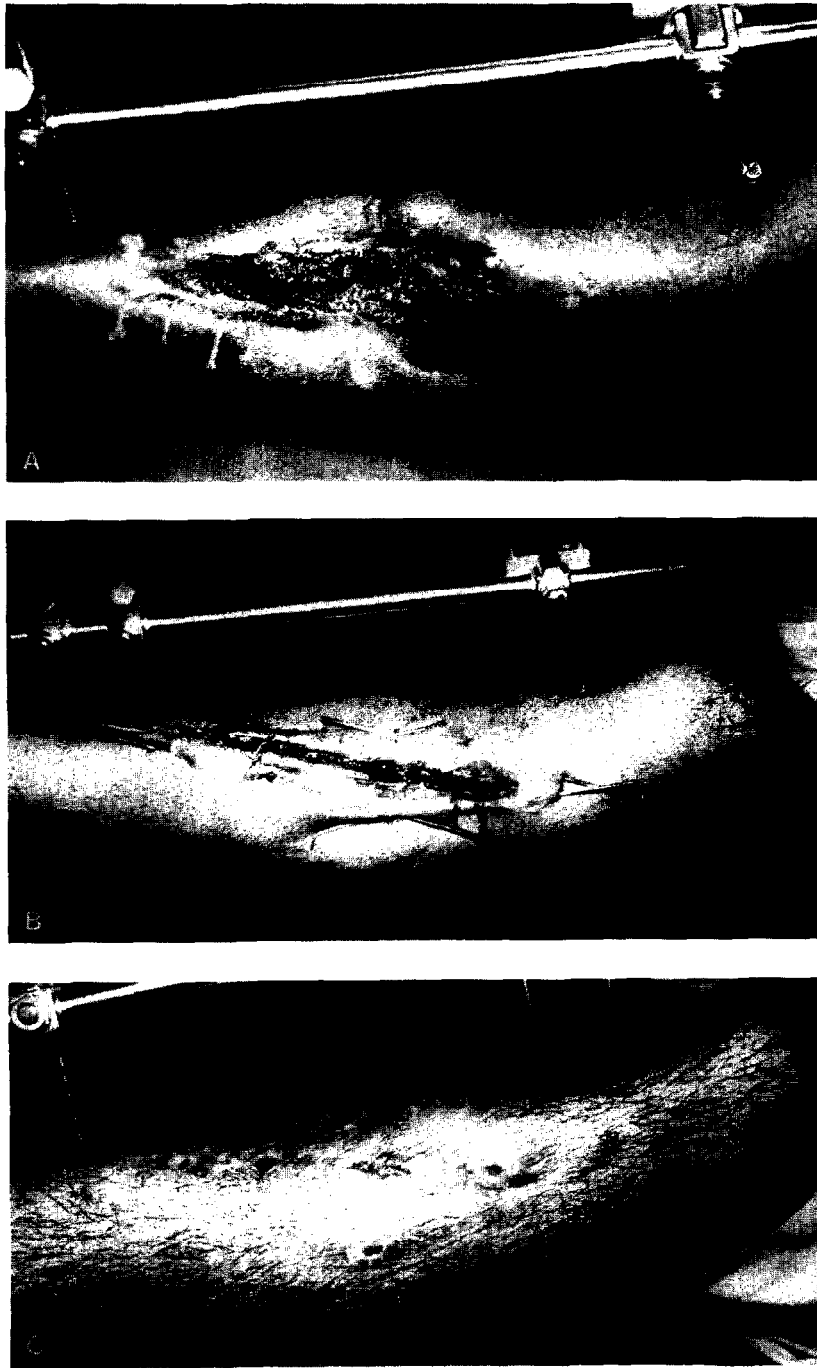


Fig. 2

Figure 2—Shrapnel injury to the middle third of the leg, with skin and soft tissue loss (13×5 cm), fracture of the tibia and partial bone loss. (A) Before treatment. (B) Wires in place. (C) 25 days later.

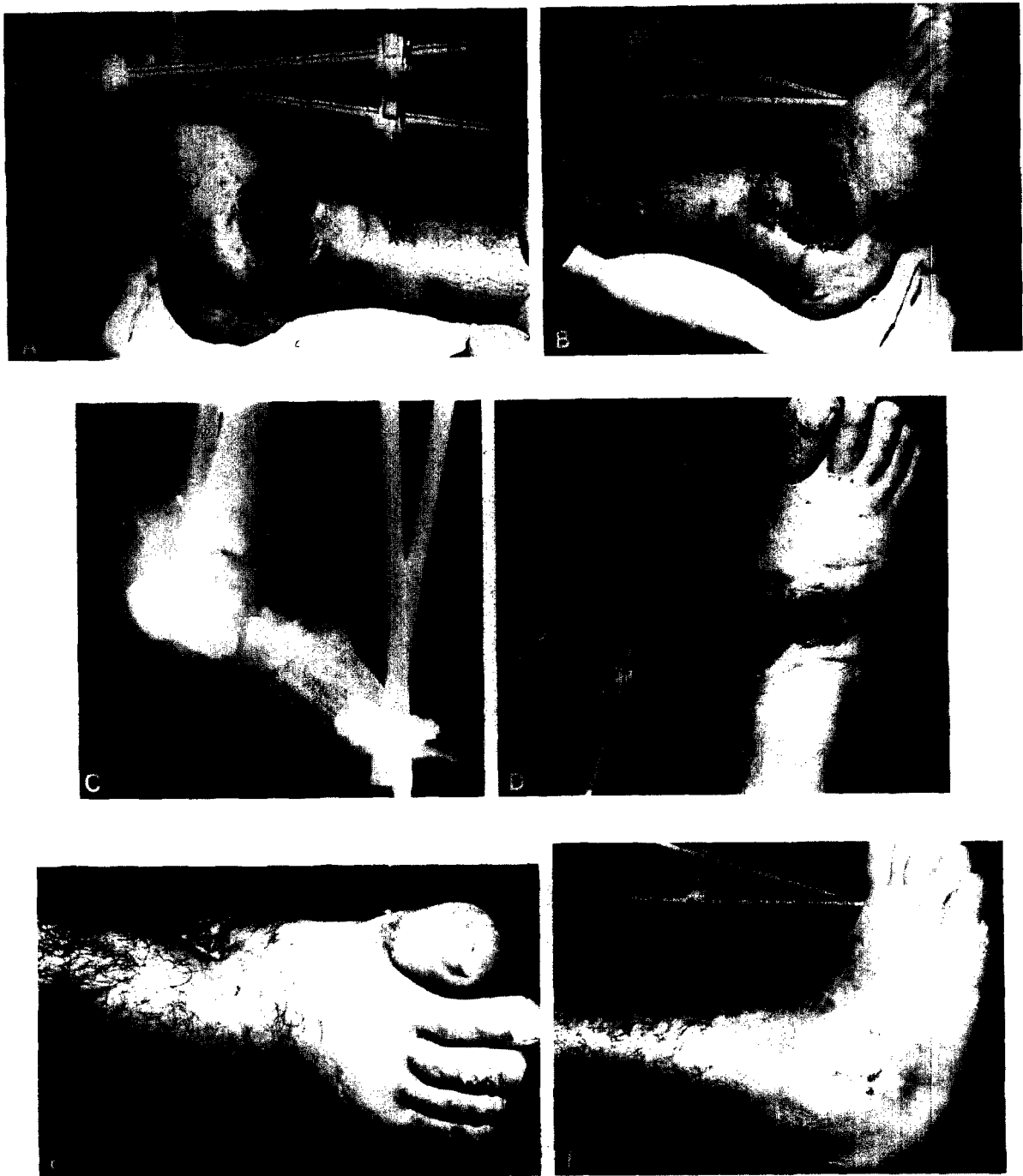


Fig. 3

Figure 3—Injury to the right ankle joint from a mine explosion, with skin and soft tissue loss and partial bone damage. On admission the wound measured 3.5 cm at the ankle and 6 cm across the foot. The wound was 18 cm long. The raw areas at the sides were skin grafted but the area where bone loss was evident was treated by skin traction. (A) and (B) The wound from different views. (C) X-ray showing bone damage. (D) Wires in place. (E) and (F) Postoperative results 3 weeks later.



Fig. 4

Figure 4—Shrapnel injury to the forehead, with skin loss and bone exposure. (A) Before treatment. (B) Wires in place. (C) Postoperative result 19 days later.

longest duration of retention of the K wires was 17 days.

Discussion

The advantages of skin traction are that it is simple, easy to perform and requires no general anaesthetic. It can be carried out on the battlefield by junior doctors as it is safe and does not take a long time to

perform. In the cases described the procedure took less than 15 minutes. It is suitable for dealing with mass casualties.

Another advantage is that it does not need a donor area for flap or skin graft and aesthetically it gives satisfactory results. It is not applicable to very large wounds although the technique can be used to reduce these in size.

Acknowledgement

I would like to thank Mr B. D. G. Morgan, Consultant Plastic Surgeon, University College Hospital, London for his kind help in reviewing this paper.

References

Gibson, T. (1977). The physical properties of skin. In Converse, J. (Ed). *Reconstructive Plastic Surgery*. 2nd edition. Philadelphia: W. B. Saunders.

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Requests for reprints to the author.

Paper received 26 February 1987.

Accepted 24 March 1987.