

## TANGENTIAL EXCISION AND GRAFTING FOR BURNS OF THE HAND

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FOR many reasons the hand should be given priority over most other parts of the body in the overall management of burned patients, especially when these are young males whose future occupation may depend on the use of their hands.

We present here our experience with early aggressive excisional treatment of burned hands in young men injured during the October 1973 war in Israel. Our aim was to obtain as rapid healing as possible and thus reduce infection, preserve maximally non-affected structures and shorten morbidity.

### TECHNIQUE

Tangential excision and grafting is already well documented (Janzekovic, 1970; Jackson and Stone, 1972; Monafo *et al.*, 1972). Our personal modifications are as follows:

**Emergency escharotomy.** In the hands and fingers there is a definite indication for escharotomy in deep burns even when only semi-circumferential. Superimposed on the unyielding palmar skin, a partially constricting eschar and the oedema beneath it are sufficient to compromise the vascular supply and lead to ischaemia and gangrene. In addition the venous drainage of the fingers and hand depends largely on the vessels running dorsally along the fingers and the back of the hand. In the deep semi-circumferential dorsal hand burns these vessels may thrombose and thus aggravate the oedema caused by the burn.

The escharotomy incision should go beyond the borders of the burned area, and in fingers it is important that it reaches the tip. The whole thickness of the eschar is divided until viable subcutaneous tissue is reached. There is no danger in performing an escharotomy and it is preferable occasionally to perform one unnecessarily than to omit it when vital.

**Tangential excision of the burns** began generally on or after the 3rd day when the patient had been completely resuscitated; all full thickness and deep second degree burns of fingers, hands and forearms were so treated. The presence of thrombosed sub-dermal vessels was an absolute indication of a full thickness burn in which case full thickness skin was excised.

In deep second degree burns importance is attached to the preservation of the partially viable deep dermis, since over-grafting of this tissue imparts to the grafted skin almost normal texture and helps to prevent subsequent scarring and contracture. Lawrence and Carney (1973) have shown too that skin grafts can be successfully placed over dermis whose viability may be in question and which would subsequently slough if left exposed.

A tourniquet was employed in some cases but we then found it difficult to assess correctly the depth of excision. We prefer to use a hand-stand (Fig. 1) which by elevating the limb reduced somewhat the amount of bleeding. Pin-point diathermy to secure virtually complete haemostasis was done with care. Although this is both a

time-consuming and laborious procedure, no short cuts appear to be available at present. Although some damage to the dermis must be caused by the diathermy it did not appear to affect the take of skin grafts adversely.

Early excision and grafting was performed in stages in extensive cases in order to reduce the trauma which could aggravate the patient's general condition. This staged procedure was carried out at intervals of 1 to 2 days; on each occasion some 3 to 4 per cent of the burn surface was excised.

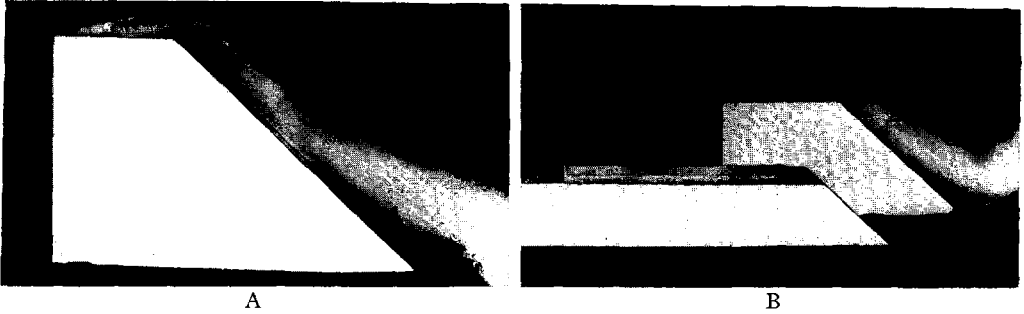


FIG. 1. Elevation hand-stand. A, At its full height. B, Taken apart with hand raised at a lower level.

**Skin cover.** Immediate skin cover is an integral part of early tangential excision; "there is no benefit in tangentially excising a burn and not covering it with skin grafts; the exposed residual dermis will form a slough as if it had never been excised" (Jackson and Stone).

The retention of viable dermis in deep dermal burns of the hand permits the use of intermediate split thickness skin cover, whereas in full thickness burns, thick skin replacement is mandatory if contractures are to be avoided.

Where there was any doubt about the possible take of autograft skin or the patient's general condition prohibited its acquiral, we delayed autografting and used lyophilised pig skin<sup>1</sup> for the initial cover. When autografting any remaining necrotic tissue could be tangentially excised. Skin in large and wide sheets was used to avoid any possible exposure of residual deep dermis. For the same reason meshed grafts were not used in the hand. In other situations where mesh-grafts were used, they were in turn covered by Lyoderm in order to avoid exposure of the deep dermis in the interstices of the mesh.

Various antibacterial agents were applied as dressings to the grafted area and included Furacin gauze, gauze soaked in Povidone Iodine (Betadine) solution, and a 3.9 per cent aqueous solution of sulfamylon acetate instilled into the dressings (Amir *et al.*, 1974, Hirshowitz *et al.*, 1975).

#### CLINICAL MATERIAL

During a period of 3 weeks, 63 burned casualties were admitted for treatment; 4 had between 95 and 100 per cent full thickness burns, and died within the first 24 hours. The remaining 59 cases survived, including 12 who suffered from 40 to 60 per cent full thickness burns. All of the patients were males and their ages were between 19 and 35 years. The majority of the burns involved hands, face and other parts of the body. Only 4 patients suffered from burns confined only to the hands. There were 69 hands in which the burns were of partial or whole thickness dermal loss and which

<sup>1</sup> Lyoderm-Lyophilised Porcine Skin, Armour-Dial Intl., Greyhound Tower, Phoenix, Arizona 85077.

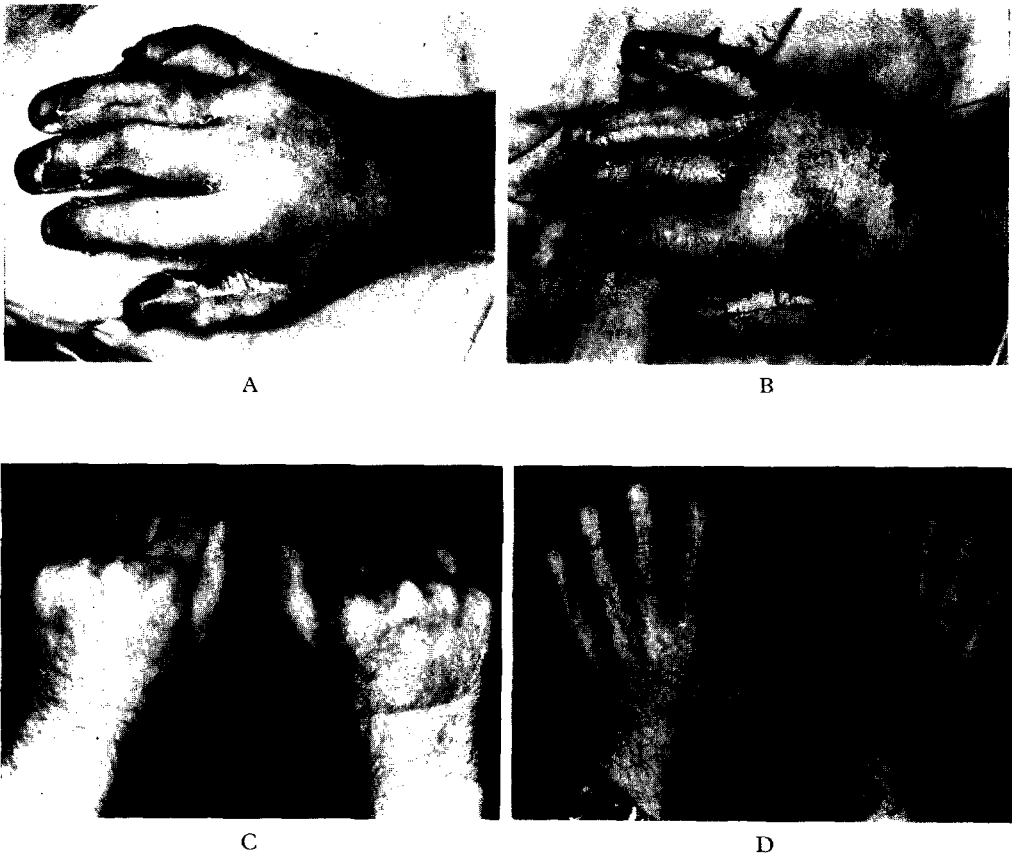


FIG. 2. Deep burns of dorsum of both hands. A, Right hand prior to tangential excision on the 3rd day. B, Following tangential excision and haemostasis. C and D, One month after injury; full skin cover was complete by the 8th day.

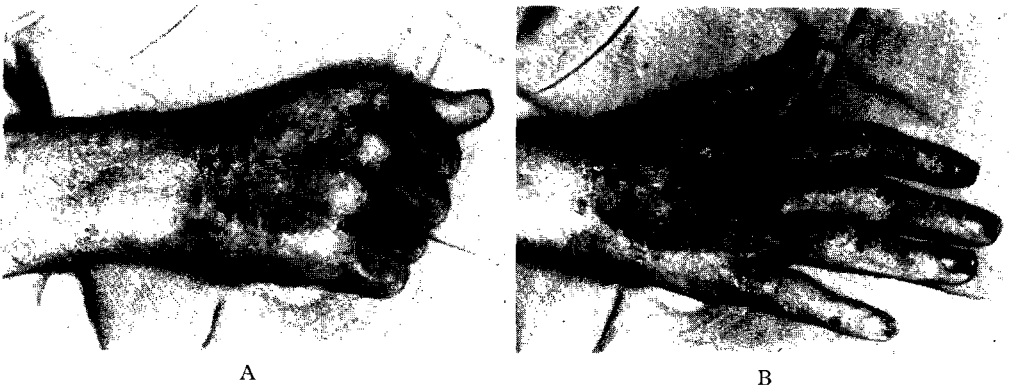


FIG. 3. A and B, Appearance of dorsum of hand 12 days after burning with full take of skin graft following tangential excision on the 4th day.

required tangential excision. Practically all of the fingers, and in most, part of the fore-arms were burnt as well. Only in a few was skin grafting required on the palm.

Early excision in the hands started on the average on the 5th day. The earliest was on the 3rd day and the latest on the 11th. Obviously the earlier excision, the better the results.

## RESULTS

There were hands which were completely skin grafted and beginning mobilisation on the 8th day (Fig. 2). Only 4 hands have remained with severe invalidity, and notwithstanding secondary reconstruction some limitation will most likely remain. In 3 hands, 1 or 2 fingers were left partially incapacitated, and further surgical intervention will be required. All other hands healed with practically no functional disability. Sixty-two of the 69 hands were completely healed by the 21st post-burn day (Fig. 3).

## DISCUSSION

Early tangential excision of deep burns has many advantages particularly in hands: the oedema and infection which accompany spontaneous desloughing are eliminated; pain is abolished; there is no need for lengthy splinting or fixation; hospital stay is reduced to days rather than weeks.

At first sight, it might seem to be an unnecessary procedure in deep dermal burns which would heal spontaneously in 3 to 4 weeks. But the fact that in many cases dermis which would otherwise slough may be saved fully justifies its use. Furthermore the hypertrophic scarring which often ensues in such cases treated conservatively and which would in any event require later excision and grafting, does not occur.

This improves with time but may be completely erased by dermabrasion. Small epithelial retention cysts also occur which eventually rupture and disappear, although again dermabrasion will speed the process.

It has been our distinct impression in this series of 69 burned hands that normal to near normal hand function was achieved with more speed and certainty than would have been obtained by all other methods previously employed in our service.

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