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EXPERIENCE WITH THERMOPLASTIC SPLINTS IN THE POST-BURN HAND

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THE management of deep burns of the volar aspect of the hand in children involves prolonged splintage to prevent flexion contractures. In adults an occasional complication of burns of the dorsum of the hand is the appearance of hypertrophic scarring. Our experience in the use of Neoprene splints for treating both conditions over the past 2 years is described below.

Scar compression has long been a recognised form of treatment; Shoemaker (1888) stated "that absorption (of keloids) will occasionally follow slight compression with an ordinary patch such as one of resin or soap". Nason (1942) described the use of compression on hypertrophic scar and scar contracture by means of dental compound and adhesive strapping. Larsen (1970) demonstrated the beneficial effect of traction on burns scarring followed by compression using Isoprene splints. He has shown, by serial punch biopsies, that, during compression, realignment of the disordered collagen framework to a more regular arrangement occurs.

TECHNIQUE

A sheet of Neoprene $\frac{1}{8}$ inch thick, is cut to the desired shape and immersed in water at 140°F for 15-20 seconds. The pliable splint is then allowed to cool for 1 minute and applied directly to the contracture or hypertrophic scar by an elastic crêpe bandage. We have recently obtained Isoprene as a splint material which has similar properties but is easier to mould and is slightly more rigid in use. After application the splint becomes semi-rigid in 5 to 10 minutes. Parents are shown the simple technique and are often anxious to participate in treatment. Remoulding of the splint may be necessary once weekly initially as the degree of contracture becomes less. This may be carried out at home if there is difficulty in attending the out-patient department. Fabrication and remoulding of the splints may be carried out by the physiotherapy or occupational therapy departments when adequate time is not available in a busy clinic. The splint is removed daily for washing and exercise. A degree of maceration of the scar appears to be necessary for maximum results, and we have found that powdering the splint reduces its effectiveness.

RESULTS

Prevention of contracture. Fourteen children with thermo-electric burns of the volar aspect of the hand due to grasping a hot electric fire bar have been treated in the last 5 years. The burns were treated by exposure where possible, otherwise closed dressings were applied. Necrectomy was routinely performed on the 14th day and skin grafts applied if a suitable bed was available.

In 6 patients Neoprene splints were used in the immediate post-burn phase, being applied when a stable graft was attained: these were worn continuously for an average period of 6 months. Mean follow-up time was 20 months. The time of splintage corresponded to the attainment of a stable, soft scar without flexion contracture.

Eight children had been treated in the immediate post-burn phase by non-compressive splinting but had Neoprene splints after secondary scar contracture release.

Average time for splintage was 4·5 months and the maximum follow-up, 4 years 7 months. The results from this small series suggest that fewer secondary procedures are required when Neoprene splints are used immediately the burn has healed.

Treatment of hypertrophic scars. Hypertrophic scars of the dorsum of the hand (24 post-burn and 4 post-traumatic) were treated with Neoprene splints for an average time of 5 months at which a flat, stable scar resulted. The average follow-up time was 1 year 4 months although 2 patients refused treatment after 3 weeks and 3 others after 6 to 8 weeks. Allergy to the splint occurred in one patient.

Evaluation of the treatment is difficult, but comparison of the time to achieve a flat stable scar by spontaneous resolution in untreated areas of the same person showed that these usually took 12 to 18 months to achieve the same result. Pain and pruritus were often relieved after 24 to 48 hours following application of the splint.

Case Report

Figure 1 shows the right hand of a 3-year-old boy who grasped the hot bar of an electric fire; full thickness loss of the skin on the flexor aspect of the fingers and distal palm required skin grafting, after which a Neoprene splint was applied for 6 months continuously. The web spaces (Fig. 2) required surgical release and a splint was again applied for 3 months. The final result (Figs. 3 and 4) shows a hand with skin of soft texture. Some atrophy of the skin is often apparent at this stage but this diminishes after removal of the splint. Over the past 6 months there has been no recurrence of the contracture.

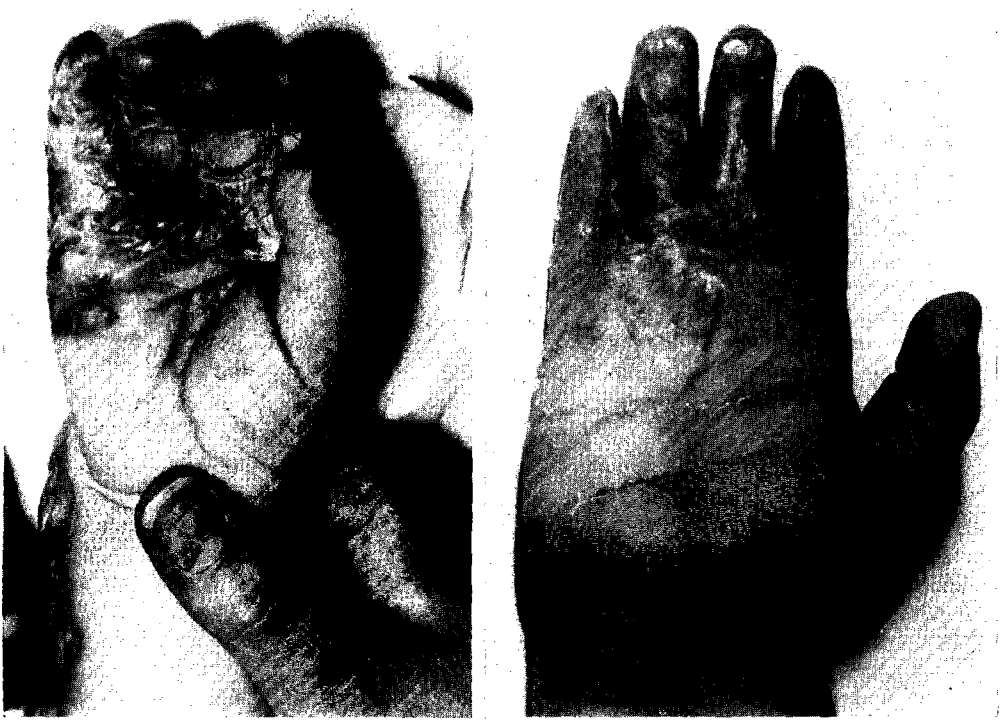


Fig. 1. Right hand of a 3-year-old boy with thermo-electric burn of the flexor surface.

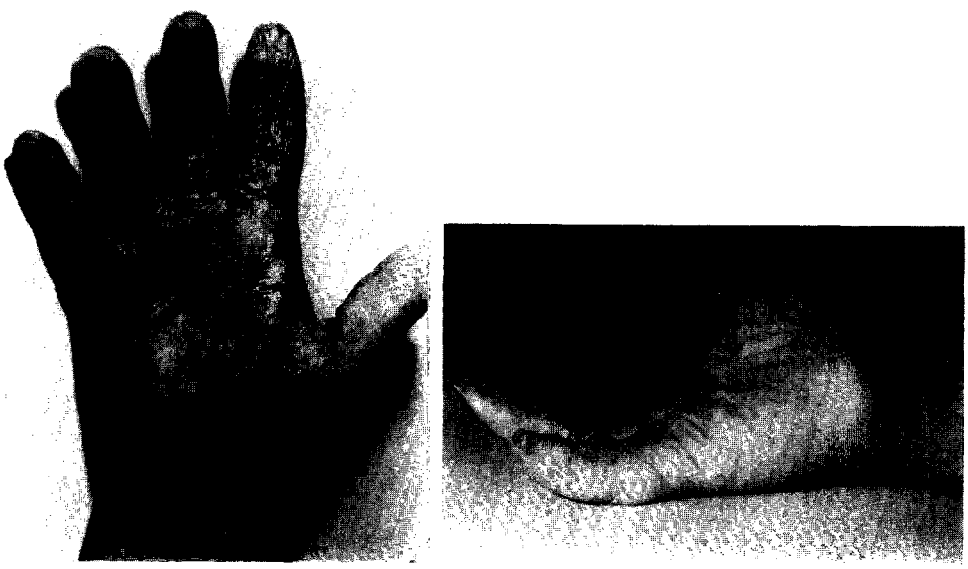
Fig. 2. Same hand after 6 months splinting with Neoprene and before surgical release of the web spaces.

Figure 5 shows a hypertrophic scar on the dorsum of the hand of a 14-year-old girl who sustained full thickness loss of skin from a hot wax burn 2 months previously. Skin grafting was necessary. A Neoprene splint was fitted (Fig. 6) and worn for 7 months. The result at this time is shown in Figure 7 and 5 months later in Figure 8.

A 16-year-old youth who sustained an electrical burn of the left ring finger 15 years previously presented with the finger contracted down into the palm; this required surgical release followed by Neoprene splinting. Figure 9 shows serial splints during the post-operative period of 8 months, at the end of which a soft stable scar was achieved with minimal contracture.

Discussion

The advantages in the use of these splints were described by Thomson (1974): simplicity of fabrication and application, lightness, rapid relief of symptoms and few



Figs. 3 and 4. Final result 6 months later, having been splinted for 3 months post-operatively.

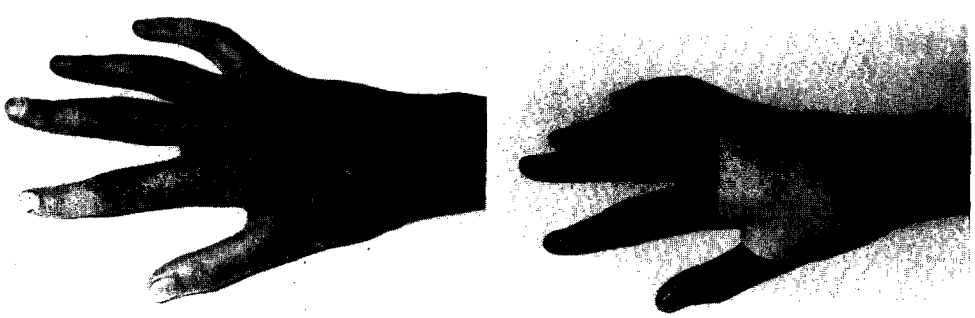


Fig. 5. Hypertrophic scar on the dorsum of the right hand of a 14-year-old girl.

Fig. 6. Neoprene splint in position after moulding.

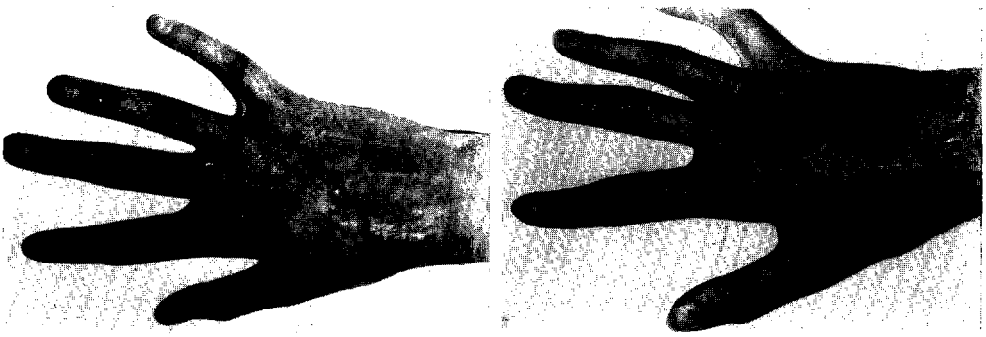


FIG. 7. Result after 7 months compression.

FIG. 8. Final result at 1 year.

FIG. 9. Series of splints (from left to right) of the left ring finger of a 16-year-old boy after secondary release of a burns contracture.

complications. We have not found stiffness of the fingers, even in adults, to be a problem; this may be due to the "dynamic" action of a semi-rigid elastic splint which permits a degree of movement of the fingers. Occasional maceration of the skin with malodour occurs while allergy is rare. Ulceration may occur if the splint is applied to unstable skin. Larsen (1970) states that the probable effect of compression is ischaemia which diminishes the proliferative phase of repair in the burns scar. Pressure applied during the pre-hypertrophic phase would appear a logical corollary: we have used Tubigrip compression in this context with favourable results.

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Note.—Neoprene (Prenyl) splints are no longer manufactured. Isoprene (Orthoplast) is manufactured by Johnson and Johnson, Bath Road, Slough, Bucks. We have used this material for splinting contractures and compressing scars in recent months; the material is similar to Neoprene in technique and effect.

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