

## Multiple seagull flaps for digital contractures in electrical burns

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**Summary**—Following legislation in the early 1970s, electrical bar fire burns are much less common in the UK than 20 years ago. However, their long-term effects are still encountered as microdactyly, syndactyly and digital flexion contractures. A case is described in which multiple seagull flaps were used as a single stage procedure to achieve sustained improvement in function in a severely affected hand, 10 years after injury, without prolonged postoperative daytime splintage.

### Case report

A 22-month-old boy sustained full thickness burns of the whole of the palmar surface of his right hand and fingers when he grasped the bar of an electric heater. All burns were excised and split skin grafted.

Healing was complete one month after surgery and extension splints were applied. Despite this, rapid contracture necessitated release of all digits with further split skin grafting. Restriction in function was tolerated until 1983 when the boy, now aged 12 and a keen right-handed sportsman, sought improvement. The effect of burn contracture on growth had become manifest as microdactyly (average reduction in digital length 1 cm), as syndactyly in the 2nd, 3rd and 4th web spaces and as a severe extensor deficit in all fingers due to axial scarring on the flexor surface (Fig. 1). This scarring was maximal at the base of each digit, although it was appreciated that some of the flexion contracture was due to intrinsic shortening at interphalangeal joint level.

Under general anaesthesia and tourniquet control, the flexion contractures at the base of index, middle, ring and little fingers were released by a transverse incision down to unscarred tissue, preserving neurovascular bundles. Particular care was taken to avoid damage to the dorsal vascular bundles supplying the dorsal skin over the proximal phalanges and arising at the base of each web space (Fig. 2).

To repair the palmar digital defects caused by contracture release, the technique for single web space syndactyly correction, described by Smith and Harrison (1982), was elaborated so that three seagull flaps were raised in parallel. Dorsal syndactyly skin in the 2nd, 3rd and 4th web spaces was preserved to form the central body of each seagull flap, and adjacent skin overlying the dorsum of each proximal phalanx was raised to provide the "wings" of each flap (Fig. 3). The dorsal phalangeal skin was divided longitudinally in the midline of index and little fingers to allow all mobilised skin to be brought through on the three web space "syndactyly pedicles" on to the palmar surface of the fingers to be sewn into place (Figs 4 and 5). The dorsal surfaces were grafted with split skin (Fig. 6).

Extension splintage was maintained for 10 days, by which time complete healing had occurred. Intensive physiotherapy was then instituted in conjunction with the application of a customised pressure garment (Jobst Ltd). Night splints were worn for 3 months. A year post-operatively, full flexion and grip were recorded and the remaining 5 degrees of extensor deficit was observed to



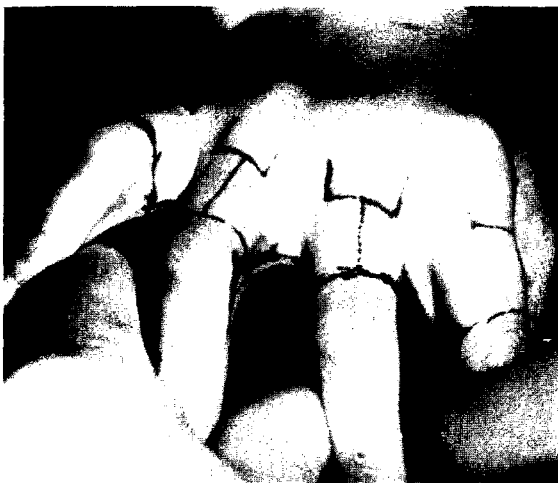
Fig. 1

Figure 1—Preoperative view of flexion contractures, syndactyly and microdactyly in the right hand 10 years post-burn.



**Fig. 2**

Figure 2—The defects over the palmar surface of the proximal phalanges after transverse incision of the contracture bands.



**Fig. 3**

Figure 3—The three seagull flaps marked out and based respectively on the 2nd, 3rd and 4th web spaces.

be due to the intrinsic unoperated interphalangeal joint contractures, which were causing no functional impairment (Fig. 7).

The patient, who is intelligent and well motivated, found that the procedure gave him a rapid, adequate and sustained increase in the range of movements he required and is well satisfied. The grafted donor areas have resulted in a minor cosmetic blemish (Fig. 8).

### Discussion

In the United Kingdom, the introduction of formal standards and statutory requirements for electrical fireguards in the early 1970s (British Standards Institution, 1971; Consumer Protection Act, 1973), together with the increased use of central and night storage heating, have reduced the incidence of electrical bar fire burns from approximately 2.5% of all burns admissions before that time to less than 0.25% of all burns admissions from 1975 to 1984



Fig. 4



Fig. 5

Figure 4--The three seagull flaps raised in parallel, each based on a dorsal "syndactyly" pedicle. Figure 5--The seagull flaps sewn into position to fill the palmar digital defects.



Fig. 6

Figure 6—Split skin grafts on the dorsal digital donor areas.

inclusive (personal communication, Office of Population Censuses and Surveys).

Nevertheless, long-term functional disability, the true incidence of which is unknown, remains a clinical reality demanding surgical correction. Our patient re-presented 10 years after injury, requesting improvement in function despite an apparently satisfactory result when discharged from follow-up aged six. This suggests that cases with deep and extensive electrical fire burns need regular inspection until the hand is fully grown.

A variety of procedures have been recommended for release of secondary flexion contracture of the fingers, including split and full thickness skin grafts, Z-plasties and local flaps, such as cross-finger flaps (Jackson and Brown, 1970). The importance of adequate splintage has also been stressed, methods ranging from the application of acrylic plates (Wyn Williams, 1954) to plaster-of-Paris



Fig. 7

Figure 7—Palmar view 1 year postoperatively to show maintenance of contracture release. Figure 8—The appearance of the dorsal digital donor areas 1 year postoperatively.



Fig. 8

(Stone, 1973) and K-wires (Jackson and Brown, 1970; Craig, 1972). We share the view of Craig (1972) that the cross-finger flap has a limited place and should only be considered when a single finger release is planned. Full thickness skin grafts generally yield good postoperative results but demand at least 3 months' continuous splintage to prevent relapse.

In the case reported here, we were prompted to employ multiple seagull flaps in preference to other techniques to meet the patient's desire for a single operation and early return to sporting activities without prolonged daytime splintage. Healing was straightforward and allowed very early commencement of physiotherapy. The extension achieved without any additional procedure has been maintained by a combination of night splintage for 3 months and a compression garment to the hand, worn continuously for a year. Axial contracture at the junction of the "wings" of the seagull flaps on the palmar surface of middle and ring fingers has not occurred, presumably due to the effect of continuous compression.

This technique did not allow resurfacing of the ulnar half of the palmar surface of the base of the little finger or of the radial half of the index finger: it was considered too hazardous to extend the "wing" length across the dorsal midline in these two digits and the flap therefore only reached the midline of the palmar surface in each of these fingers once the flaps had been raised. The cosmetic blemish at the healed flap donor areas has not disturbed our patient, but it is appreciated that this aspect might reduce the appeal of this method for a female patient. Despite these reservations, the mul-

multiple seagull flap technique provides a useful alternative for the correction of severe post-burn flexion contracture/syndactyly deformities for the patient seeking a single stage procedure without subsequent daytime splintage.

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