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Cephalic venous flap

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Summary—A case is reported in which an island fasciocutaneous flap from the radial side of the forearm, with only the cephalic vein connecting it to the rest of the body (Fig. 1) was successfully transposed to cover part of a defect on the ulnar side of the elbow. An earlier case in which such a venous flap was raised but not used for cover is also detailed. A brief discussion speculating on the way this flap survived without any arterial inflow and only proximal venous drainage is included.

Case reports

Case 1

A young adult female was admitted to our unit with a hypertrophic, painful, unstable scar about 10 × 4 cm along the medial side of the left arm and forearm (Fig. 1). This scar was excised under general anaesthesia, leaving a large defect which, in our opinion, needed skin flap cover near the elbow joint and split skin cover over the rest of the area.

A flap 6 × 3.5 cm along and either side of the course of the cephalic vein was marked (Figs 2 and 3). The flap was first cut distally and during this dissection the distal end of the cephalic vein was identified, ligated and cut.

Fig. 1

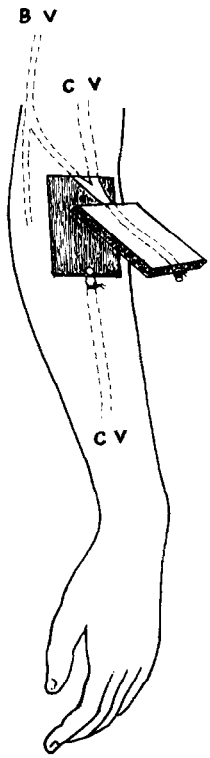

Fig. 2

Fig. 3

Figure 1—*Case 1*. A hypertrophic scar on the medial side of the arm and forearm, following deep thermal burn. Figure 2—The design of the cephalic venous flap. BV—Basilic vein, CV—Cephalic vein. The vein joining the two is the median cubital vein. The flap is a fasciocutaneous island. Figure 3—The scar has been excised. The cephalic venous flap is marked. The white arrow shows the caudal cephalic vein and the black arrow the cephalic vein cephalad. The black arrow is also in line with the elbow joint.

Fig. 4

Fig. 5

Fig. 6

Fig. 7

Figure 4—The flap has been cut on the medial lateral and distal sides and is in the process of being converted into a venous island flap. The oblique arrow points to the median cubital vein, the vertical arrow points to the location of the cephalic vein not yet fully isolated. Figure 5—The island completed and draped for the photograph. The fat occupying the superior edge of the flap bulges at the junction of the cephalic and median cubital vein. Figure 6—The island cephalic venous flap transposed across the defect and sutured. The cephalad edge of the flap is also sutured with skin stitches. Figure 7—A fully viable flap and a complete take of split skin graft on the tenth postoperative day.

The flap was then raised as a fasciocutaneous flap up to the elbow and then converted into an island (Figs 4 and 5) except for the cephalic vein and the median cubital vein which sprang from the cephalic vein. This island flap was quite easily transposed and placed transversely across the central one-third of the defect left by excision of the burn scar (Fig. 6). The rest of the raw area, including the one created by the movement of the flap, was covered by split skin grafts. The venous flap exhibited no abnormal colour or texture changes throughout its postoperative course and the area appeared to be heading for sound healing on the 10th postoperative day with a full survival of the flap and a complete take of grafts (Fig. 7). Surgery in this case was performed without tourniquet. The patient received 5000 IU of heparin subcutaneously the night before, and the morning of, surgery. Postoperatively the patient received acetyl salicylic acid 300 mg per day for 10 days.

Case 2

In an earlier case a 30-year-old female was admitted to our unit with a defect in the lower third of the leg occupied by an exposed metal plate used for fixing a fracture of the tibia. The defect needed flap skin cover.

Encouraged by our work on the saphenous venous flap in the dog (Thatte and Thatte, 1987), it was decided to use for this defect a free radial artery forearm flap in which an arterial anastomosis was not contemplated after transfer but only venous continuity was to be established by inserting a polyethylene tube in the proximal cephalic vein of the flap, the other end of the tube being fed into the long saphenous vein of the leg.

According to plan, a 6×4 cm radial artery forearm flap was raised and the radial artery and its accompanying veins tied and cut proximal and distal to the flap (Fig. 8). The cephalic vein distal to the flap was tied and cut and the flap was left attached only by the proximal cephalic vein (Fig. 9). At this stage an argument arose about the ethics of the decision to transfer this as a free venous flap when our work on the dog involved a venous flap only *in situ*. The free transfer of this venous flap was therefore abandoned and the flap was sutured back with only a single vein (cephalic) connecting it to the body. The flap showed no untoward effects in the postoperative period and the area was healed soundly at the end of 10 days (Fig. 10). This patient also received heparin and acetyl salicylic acid in the same dosage as in the earlier case.

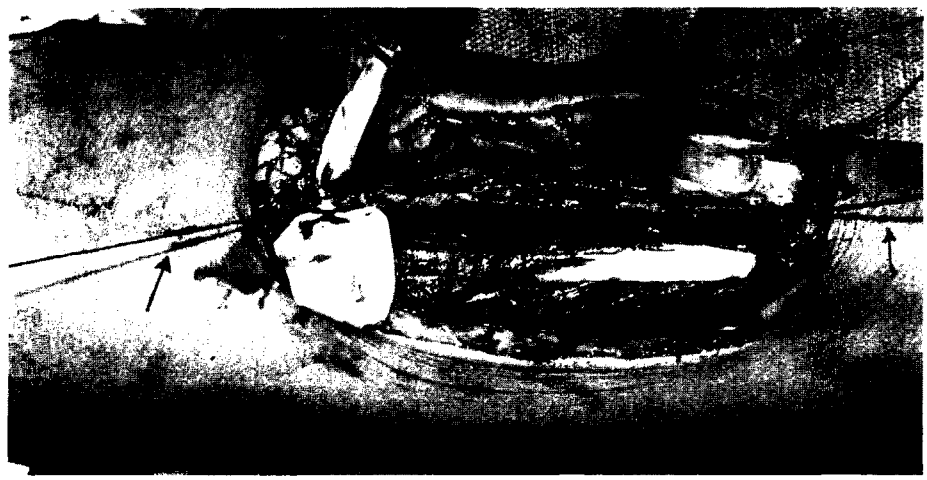

Fig. 8

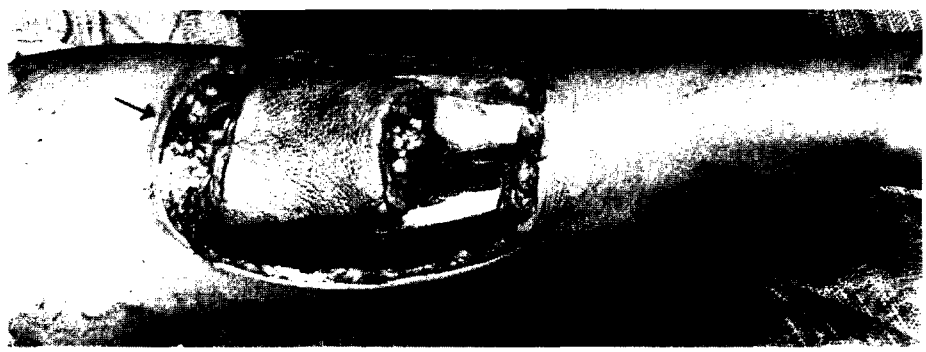

Fig. 9

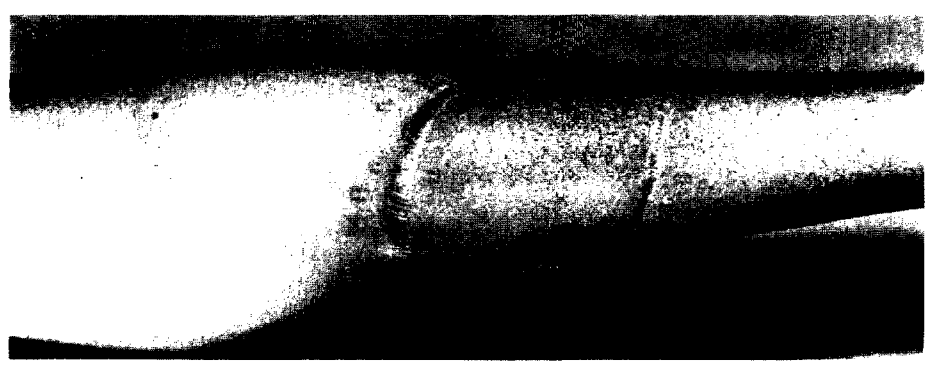

Fig. 10

Figure 8—*Case 2.* A radial artery forearm flap is raised. The network connection between the radial vessels and the flap is not disturbed but the radial artery and its accompanying veins are tied by linen ligatures (arrows). Figure 9—The same flap as an island with the radial vessels tied and the distal (caudal) cephalic vein ligated. The flap's only vascular umbilical cord to the body is the cephalic vein (arrow shows location). Figure 10—A complete survival of the flap.

Discussion

The ethics of mutilation of a forearm (Case 2) on account of improper planning will inevitably invite some strong criticism. In Case 1 we could be accused of being adventurous in attempting an unsafe procedure. Fortunately both the flaps survived and some redemption is due to us because something remarkable was achieved. A flap without any arterial inflow has not only survived (Case 2) but in the first case it has withstood movement and served a purpose.

The skin is the largest organ in our body and the word "organ" befits it because it serves diverse and complex functions, ranging from immune mediated defence to temperature control and even expression of emotional responses. Its diffuse vascularity, and the consequent per unit area perfusion and oxygen utilisation, is also quite high and the fact that the blood is carried to the dermis through a complex and profuse system of channels all interlinked to each other is proof enough that Nature must value this organ very highly. However, in contrast to other organs, skin is more vulnerable to external injury and conversely, therefore, Nature has also bestowed on it the ability to survive under extreme conditions of deprivation. Under these circumstances, its complex functions cease automatically and the skin can survive by hovering on a delicate balance between its aerobic and anaerobic metabolism till help arrives through restoration of old supply routes or realisation of new ones through neovascularisation.

The island fasciocutaneous venous flap succeeded because we, perhaps inadvertently, played by some of Nature's unwritten rules. A possible scenario of how these flaps survived could be as follows:

(1) A thick fasciocutaneous flap means that a fair amount of oxygenated blood is contained within the flap at the time of elevation.
(2) The fascia and fat have low metabolic rates. When the flap is raised, the skin reduces its metabolic requirements.
(3) With the reduction in metabolic rates the rise in percentage of reduced haemoglobin will be slow. In numerous clinical conditions unreduced haemoglobin levels of up to 4 gm percent can support biological activity.
(4) Somehow the veins allow a to and fro movement of blood, preventing sludging, and if anaerobic metabolic products do not exceed those of aerobic metabolism the flap manages to survive till neovascularisation is re-established.

Every word in this scenario is conjectural but in the absence of any sophisticated instruments to measure blood flow and estimate cutaneous oxygen uptake in our unit, this is the best that can be offered.

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Reference

Thatte, R. L. and Thatte, M. R. (1987). A study of the saphenous island flap in the dog without arterial inflow using a non-biological conduit across a part of the length of the vein. *British Journal of Plastic Surgery*, **40**, 11

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