Indian Journal of Plastic Surgery (1988), 21(1), pp. 13-20

A NEW CONCEPT IN FLAP TRANSFERS—TRANSPOSITION AND ROTATION OF FASCIOCUTANEOUS AND MYOCUTANEOUS FLAPS

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SUMMARY

A new technique of safely transferring tissues has been tried in three cases. This technique combines the principle of local transposition and rotation flaps in the transfer of fasciocutaneous and myocutaneous flaps, in such a way that the advantages of both the principles are complimented and disadvantages eliminated. The results in the cases treated are being presented.

(*Key Words* : Flaps—Fasciocutaneous, Myocutaneous, Transposition and Rotation)

Transposition and rotation flaps (McGregor, I. A., 1962) formed the bread and butter of old and conventional Plastic Surgeons, while fasciocutaneous (Ponten, B., 1981) and Myocutaneous flaps (Nahai and Mathes, 1982; Orticochea, 1972; Owens, N., 1955; and Tansini, I., 1906) that of young and new. Over the years both have played a significant role in the field of reconstructive surgery. However failures have been observed with both the methods. Traumatic dissection around the vascular pedicle causing vascular spasm or twist and tension on such a pedicle are the causes of failure in myocutaneous and fasciocutaneous flaps. Transposition and rotation flaps get in trouble because they have compromised vascularity and thereby they do not stand slightest tension, twist and infection. The need for transferring tissues especially of composite nature more safely, was therefore, realised. I have evolved a technique, working at Postgraduate Institute of Medical Education and Research, Chandigarh, India, during 1984 to 1987, in which basic principles of both the methods are combined to suppliment each others merits and eliminate the demerits.

Material and Method

16 cadaveric dissection studies were performed. Geometry of transposition and rotation was drawn on each of the five types of myocutaneous units described by Nahai and Mathes (1982) and with each of the three types of vascularity pattern 'A', 'B', 'C' of fasciocutaneous flaps described by Cormack and Lambarty (1984). Out of all these combinations only three were found to be feasible for clinical transfer. We shall refer to these combinations as:

1. Geometrical Vascularity Type I Flaps
2. Geometrical Vascularity Type II Flaps
3. Geometrical Vascularity Type III Flaps

Geometrical Vascularity Type I Flaps (G/V Type I) : These are the flaps where the geometry of transposition flap is combined with Type I vascularity (Nahai and Mathes) myocutaneous flaps such as Lat. Dorsi muscle.

Geometrical Vascularity Type II Flaps (G/V Type II) : These are the flaps where the geometry of the rotation flap is combined with myocutaneous flap of vascularity Type V (Nahai and Mathes) such as External Oblique muscle.

Geometrical Vascularity Type III Flaps (G/V Type III) : These are the flaps where the geometry of the rotation flap is combined with the fasciocutaneous flap of vascularity Type 'C' of Cormack and Lambarty, using mainly its septocutaneous part, such as radial forearm flap.

Flap Designing

G/V Type I (Fig. 1) : This is a myocutaneous transposition flap. Geometry of the cutaneous conventional transposition flap is so designed that its drawing limits itself in the safe territory of the underlying myocutaneous

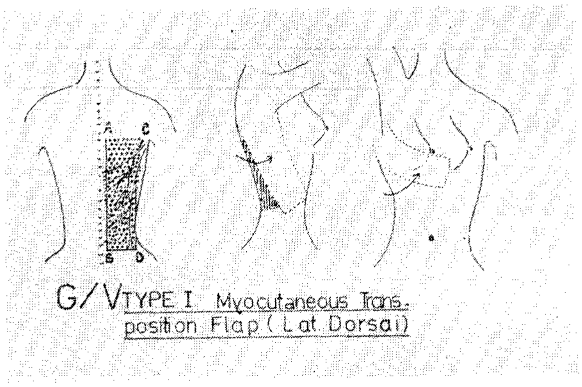

Fig. 1. Design of Geometrical Vascularity Type I Myocutaneous Transposition flap. An example of drawing on the Latissimus Dorsi muscle.

unit. The main vascular pedicle of the myocutaneous unit is included at the base of the flap. Example is given here where the transposition is designed on Latissimus Dorsi muscle. A

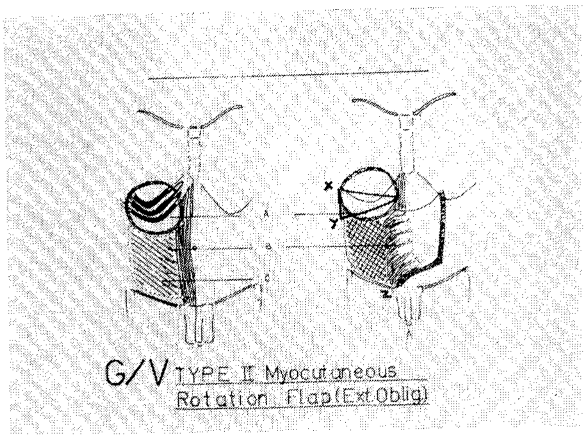

Fig. 2. Design of Geometrical Vascularity Type II Myocutaneous Rotation flap. An example of drawing on External Oblique muscle. 'A' is the defect, 'B' are the myocutaneous perforators, 'C' is the rotation flap, 'XY' is the shortest limb of the triangle on which 'YZ' arc of rotation is created.

vertical line AB is drawn 2 cms lateral to and parallel to thoracolumber spines. Another line CD is drawn to parallel line AB, but 2 cms lateral to posterior axillary fold. The lower most limit of the flap is up to the level of iliac crest. In an adult it usually gives a size of 12 cms × 30 cms, giving a proportion of 2.5 : 1. In the case of Lat. Dorsi muscle, which has its main supply from the Thoracodorsal vessels, the vessels enter into the flap 2 cms medial to the point 'C'. This flap would easily cover a defect on the flanks, ipsilateral abdominal and chest wall.

G/V Type II (Fig. 2) : Example of the design is given here when the geometry of the rotation is drawn over External Oblique muscle.

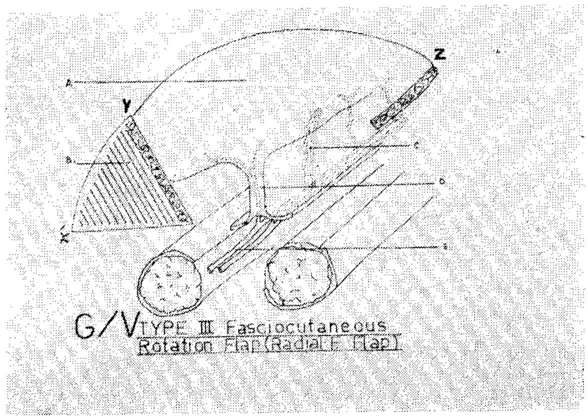

Fig. 3. Design of Geometrical Vascularity Type III Fasciocutaneous Rotation flap drawn on the forearm. 'B' is the triangulated defect, 'A' is the rotation flap, 'XY' is the shortest limb of the triangle, 'YZ' is the arc of rotation, 'E' is the radial artery, 'C' are septocutaneous perforators running in the septum 'D'.

The arc of rotation 'XZ' is drawn on the flanks laterally so that the myocutaneous perforators situated medially around the umbilicus are preserved. The arc of rotation is taken at least three times the distance 'XY', which is the shortest limb of the triangulated defect.

G/V Type III (Fig. 3) : This is basically a septocutaneous rotation flap. An example of the design drawn on the radial forearm flap is given here. Vascular Axis of the radial artery and the location of the septum between brachioradialis and flexor carpi ulnaris by palpation of the cleft between the two is marked on the forearm. The defect on the forearm is triangulated in a manner that its shortest limb 'XY' lies in the long axis of the limb. Arc of rotation 'XZ' is then drawn either on the radial or the ulnar border of the limb. This drawing should be such that the vascular mesentery which is finally going to supply this flap (the septocutaneous perforators from the radial artery), lies at the centre of the flap longitudinally. This mesenteric attachment moving in the sagittal plane after a careful dissection distally or proximally according to the requirement is the life line of this flap. The great advantage being that the radial artery need not be sacrificed. It remains intact at both the ends.

Case Reports

Case 1 (Fig. 4-7) : A 50 years old female presented with a chondrosarcoma arising from the lower thoracic cage on the left side. Two surgical attempts earlier at other hospital to remove the tumor failed to remove the tumor completely. When she presented to us with a recurrence she had a tumor of 15 cms × 18 cms size projecting from left flank (Fig. 4). It was involving the 8th, 9th, 10th and the 11th ribs. The overlying skin was involved. After excision of the tumor which included the involved ribs, the involved skin on the tumor, and the underlying peritoneum (8 cms × 8 cms), a full thickness chest wall and abdominal wall defect was created. Skin defect measured 18 cms × 18 cms. This extensive chest wall and the abdominal wall defect was covered by a Latis-

Fig. 4. Recurrent chondrosarcoma of the chest and the abdominal wall.

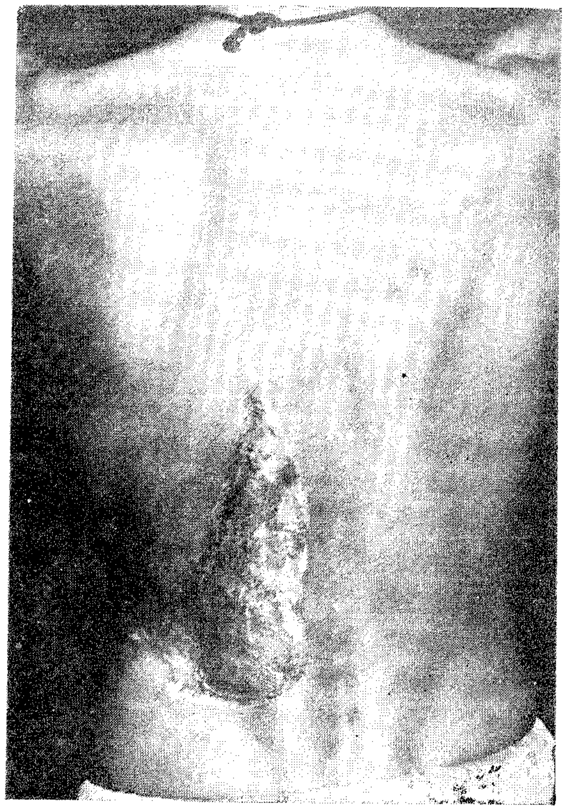

Fig. 5. Donor area of the Lat. Dorsi Transposition flap 4 weeks after surgery.

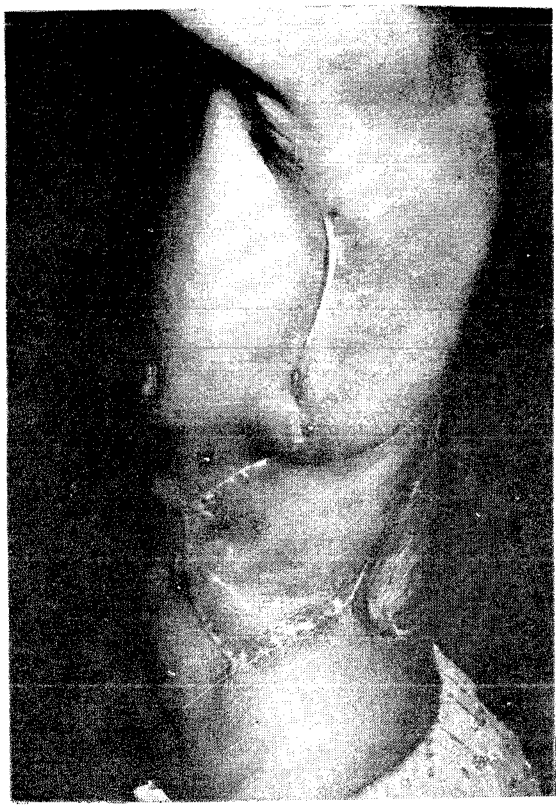

Fig. 6. Lat. Dorsi Transposition flap one year after surgery.

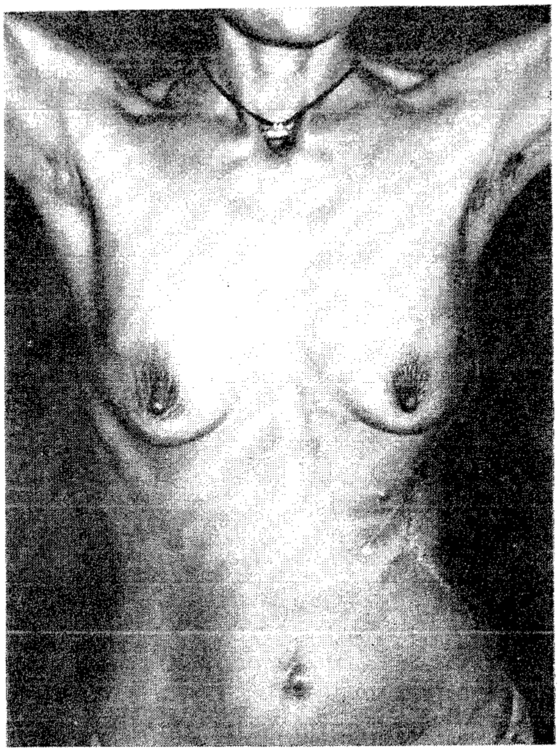

Fig. 7. Same patient as in figure 6 from the front.

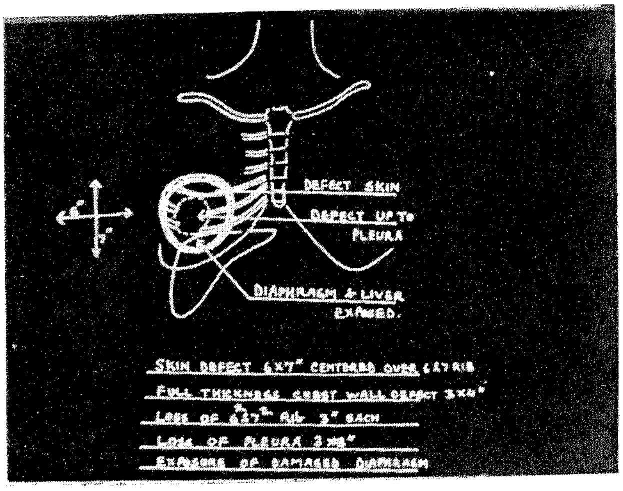

Fig. 8. Schematic drawing of the chest wall defect.

Fig. 9. Chest wall defect after excision of burned tissue. A deltopectoral flap has been raised.

Fig. 10. Deltopectoral flap transferred into the defect.

simus Dorsi Transposition flap (35 cms × 18 cms) according to the design already described (Fig. 1). Marlex mesh was used to provide support to the abdominal wall under this flap. Flap healed uneventfully in 10 days time. The donor area of the Lat. Dorsi Transposition flap, which was skin grafted took 4 weeks to heal (Fig. 5). By our description this flap belonged to G/V Type I flap. Review one year after surgery revealed that patient was tumor free and had no chest or abdominal wall problem (Fig. 6, 7).

Case 2 (Fig. 8-12) : A 20 years old linesman received 11000 Watt electric current through accidental contact on 31st March 1984 and sustained electric burns over the chest. Coagulation necrosis extended in an area about 20 cms in diameter over the right side of the lower chest. This has charred 7th, 8th and 9th ribs, and has burned the pleura and diaphragm (Fig. 8). Primary excision of the burned area was performed which created a full thickness chest wall defect of about 20 cms diameter (Fig. 9). The Lat. Dorsi Myocutaneous unit could not be utilised because of its earlier division during resuscitative efforts by the cardiothoracic team. This defect was covered by an External Oblique Rotation flap based on myocutaneous perforators arising at the lateral border of Rectus Abdominis muscle, according to the design already described, and by a deltopectoral flap from the same side of the chest of unusual proportions taking 2nd to 5th perforators and the nipple along

Fig. 11. Ext. Oblique myocutaneous flap rotated into the defect.

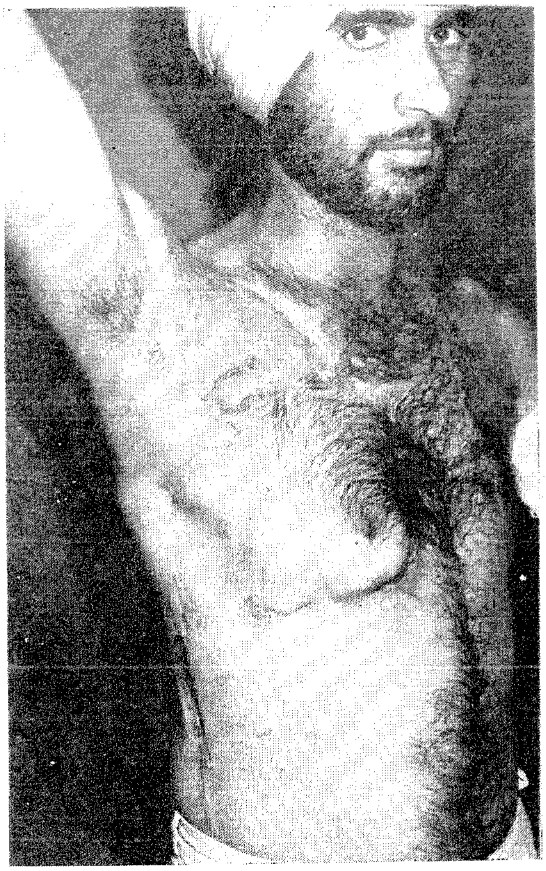

Fig. 12. Patient three years after the chest wall reconstruction.

with it (Fig. 10-11). Post-operative course was uneventful and all wounds healed in three weeks time. Patient when last seen 3 years after reconstruction leads a normal life and is free of any chest trouble (Fig. 12). This case represents our design of G/V Type II flaps.

Case 3 (Fig. 13-14) : A 28 years old man suffered from electric burn and sustained deep burns over the volar aspect of right wrist. Primary excision was performed which exposed median nerve, and superficial flexors of the fingers and that of wrist. This created a defect of 6 cms diameter. Defect was triangulated according to the design already described and a radial forearm septocutaneous rotation flap was rotated into the defect (Fig. 13).

Since this flap was based on septocutaneous perforators, radial artery was left intact. Flap healed in 10 days time and the hand was back to full sensory and motor function in 4 weeks time after the burn (Fig. 14). This case represents our design of G/V Type III flaps.

Discussion

Some degree of failure is always associated with conventional cutaneous random pattern flap such as rotation and transposition flap (McGregor I. A., 1962) and this is true for newer techniques as well such as myocutaneous flaps (Nahai and Mathes, 1982; Orticochea, 1972; Owens, 1955; Tansini, 1906) and fasciocutaneous flaps (Cormack and Lambarty, 1984; Ponten, 1981). Failure has been associated with the vascular

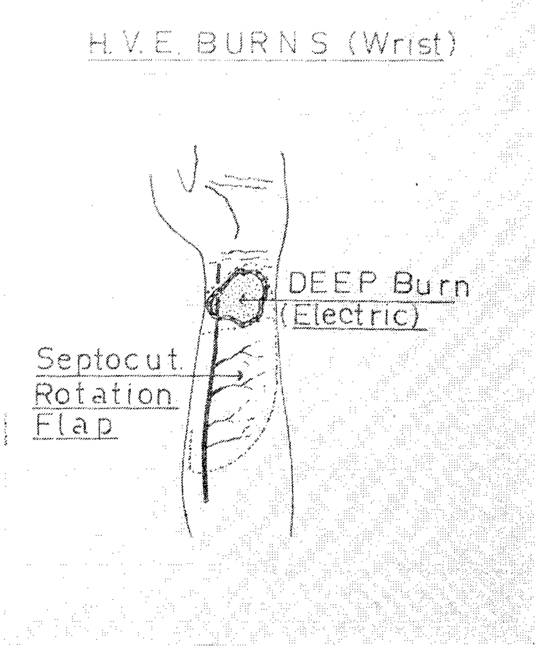

Fig. 13. Schematic drawing of the electric burn over the volar aspect of the wrist, and the design of the septocutaneous rotation flap.

Fig. 14. Radial forearm septocutaneous rotation flap well healed in 4 weeks time.

spasm, vascular damage, twist, torsion, tension and faulty planning with the fasciocutaneous and myocutaneous flaps. The reasons for the failure with the conventional transposition and rotation has mostly been related to the precarious vascularity on which these flaps survive and hence are not able to withstand slightest infection and tension.

It, therefore, seems logical to combine the merits of the new and the old and have flaps which are absolutely safe. In combining the two, the demerits of both the techniques are automatically eliminated and advantages cummulated. These flaps are not only more reliable but are easy and quick to raise since no vascular pedicle dissection is required.

Conclusions

Since the cutaneous designs get the benefit of the geometry and the raising of the flap takes advantage of the increased vascularity through underlying fasciocutaneous or muscle units, we have performed three cases successfully after cadaveric trials. It will be reasonable to expect many more such combinations to emerge in future as and when more work is done in this direction.

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