

CONSIDERATIONS IN THE USE OF TUBED PEDICLE FLAPS

*C. P. Sawhney

With recent developments in the use of local flaps, axial pattern flaps, myo-cutaneous flaps and free flaps, the role of tubed pedicle flaps in the reconstruction of missing tissues has diminished. There are however situations where this procedure holds the key to a good result. It is the purpose of this paper to reemphasise this aspect of tubed pedicle flaps. The procedure in addition is easy, versatile, and safe. Therefore in our circumstances with insufficient expertise available in face of enormous reconstructive problems its utility assumes importance. The main disadvantage however is the prolonged hospitalization required. Where as the technique of raising and transfer of tubed pedicle flaps is well standardised there are certain facets of the technique which are not clearly understood and need reiteration.

1. Flap design

(a) Length breadth ratio. The safe recommended ratio is 1:2 to 1:3 but critically analysing our experience it has been found that this holds true up to a limit. The cutaneous vessels are of a limited caliber and supply the skin only up to a certain distance. Increasing the width of the flap to get increased length may increase the number of vessels included in the base of such wide flaps but does not increase the length of skin effectively supplied by these (Crawford

1965) to prevent ischemic necrosis. Tubed flaps longer than 8" are not therefore safe irrespective of the width of flaps and this agrees with finding of strang (1975). If however there is a necessity to increase the length of such flaps a delay procedure is mandatory.

On the other hand decreasing the width of the flap below 2" may also be unsafe except perhaps in neck. Ordinarily the width of the flap should be such as to permit tubing without compression of the subcutaneous tissue within the tubed flap. In geometrically circular figures the circumference of a circle (a tubed flap in cross section is a circle) equals $2\pi r = 2 \times 22/7 \times r$ i.e. about 6 times r or radius. A flap raised for tubing has variable thickness depending on the amount of subcutaneous tissue which is liable to considerable post operative reactionary swelling/oedema. Taking postoperative swelling into account it would be apparant that the anatomically the flap width has to be about 10 times wider than the thickness of subcutaneous tissue. Any deficiency in the width, therefore, will not only make tubing technically difficult but also is likely to produce compression of tissues enclosed within. However, elasticity and extensibility of the skin, and compressibility of the subcutaneous tissue to some extent may allow tubing without undue compression if width of skin is deficient

*Professor and Head, Department of Plastic Surgery, Postgraduate Institute of Medical Education and Research, Chandigarh 160011.

marginally. We have found it unsafe to raise tubed pedicle flaps of less than 2" in width except perhaps at sites with scanty subcutaneous tissue i.e. neck. It is therefore recommended to have wider flaps for tubing even though requirements of reconstruction demand narrow flaps.

This leads us to the question of raising such flaps in obese. The inclusion of full thickness of subcutaneous fat in such cases is likely to create problems for tubing, undue tension on sutures, compression within the tube and vascular insufficiency (Fig. 1) on the other hand cutting through subcutaneous fat may ensure easy tubing but is likely to jeopardise the vascular supply. We have found over the years that raising wider but shorter flaps, and thinning judiciously to facilitate tubing is safer. These may be lengthened subsequently to required dimensions by delay procedures.

(b) While calculating the length of the tube required we must take into consideration (i) requirements of reconstruction and (ii) length of the carrier segment.

It is preferable to have a slightly longer tube than calculated as a shorter tubed flap may lead to inconvenient positioning of the patient during transfer, kinking and angulation of the tube, increased tension on suture line and consequent vascular insufficiency at the point of inset.

2. At inset :

(i) Detach the tube at the junction of tubed with the untubed portion. The untubed portion beyond this has not been delayed and consequently has not reorientated its blood supply through the tubed portion and thus may not survive if carried with the tubed portion.

(ii) Transfer the detached end of the tube only if there is adequate blood flow from the cut

end. When in doubt reattach it to its bed and transfer subsequently. Inadequate bleeding from the cut end means poor vascularisation of this end through the tube, which may be further affected by opening up of tube for inset, angulation and twisting during transfer and slight tension at suture line.

(iii) Avoid using scarred skin or skin graft as a turn back flap during inset, unless they carry adequate normal subcutaneous tissues. The skin grafts or scars do not have axial blood flow and are likely to undergo necrosis when raised thin.

(iv) Primary inset should be over a wide area and on an adequately vascularised bed to ensure early and adequate pick up of blood supply for subsequent safe transfer, especially when reconstructing amputated fingers/thumb.

while inseting a tubed flap it is better to open it fully, excise all scar tissue and defatten it within vascular safety limits so that flap after inset does not look bulky, requiring subsequent staged thinning procedures. As the main blood vessels run in the subdermal plane it is possible to thin the flap adequately. Secondly in most situations it is not necessary to transfer full component of fat in tubed flaps, for functional and cosmetic needs.

Indications for use of tubed pedicled flaps :

1. Reconstruction of face defects :

Manoeuvrability of a delayed tubed flaps is far more than any direct flap and they can withstand angulation and twisting to a limited extent which may not be avoidable for reconstructing lip, nose, cheek and/or forehead in an individual. They also permit easy transfer of lining and cover at the same sitting especially in reconstructing associated cheek defects. There

being soft and pliable it is easy to ensure convenient and comfortable positioning of the patient during such procedures (Fig. 2—5).

2. *Transfer of large amount of tissue*

The supply of skin by this means is unlimited as very long tubed flaps can be raised. Thus there is no limit to the tissue loss that can be reconstructed by this means irrespective of its size and shape. Although there is enough local skin available in the vicinity of face i.e. neck, forehead, its use would lead to mutilation of an important aesthetic component of face. The use of large tubed pedicle flaps also produces tissues deficiency and distortion at the donor site by replacement skin grafts but it is of no consequence as it is in areas which remain hidden and relatively less important from cosmetic point of view.

3. *Treatment of skin loss/unstable scars with non union of fracture leg bones.*

There have been recent advances in the use of muscle flaps, myocutaneous and free flaps to resurface such areas but their use is restricted to coverage of small areas of exposed bone, and they require greater expertise. The cross leg flaps are useful but have their limitations and hazards. Tubed flaps however can transfer large amount of skin for covering such areas and thus may perhaps be the only solution in some instances.

4. *Reconstruction of mutilated hands :*

Replacement of skin over mutilated hands before undertaking major reconstruction of deeper structure is the first essential. Where as direct flaps are now being used more frequently, tubed flaps are more suitable when fingers/thumb require to be reconstructed simultaneously.

5. *Reconstruction of amputated fingers.*

There is a growing trend to achieve this by transfer of parts of remaining digits but in the

absence of such spare digits i.e. metacarpel hand, tube pedicle bone graft reconstruction provides a good alternative to restore function.

6. *Transfer of skin from specialized areas.*

Medial side of arm is an important area which is aesthetically acceptable for reconstructing nose or facial skin because of its matching skin texture and colour, skin elasticity and scanty subcutaneous fat. The skin at this site has random pattern of vascular supply and has to be tubed for transfer. Tubing of a flap allows development and orientation of vasculature in desired directions and therefore permits transfer of skin from any one region to another depending on skin availability.

7. *Release of post burn contractures :*

In gross contractures with partially lost digits requiring reconstruction, lost, damaged or contracted musculotendinous units, it becomes necessary to use skin flaps by these means although such indications have become rare now a days.

Where as newer techniques are now being employed for some of above listed indications they require sophisticated equipment, specialised training and may not be as fool proof as tubed flaps.

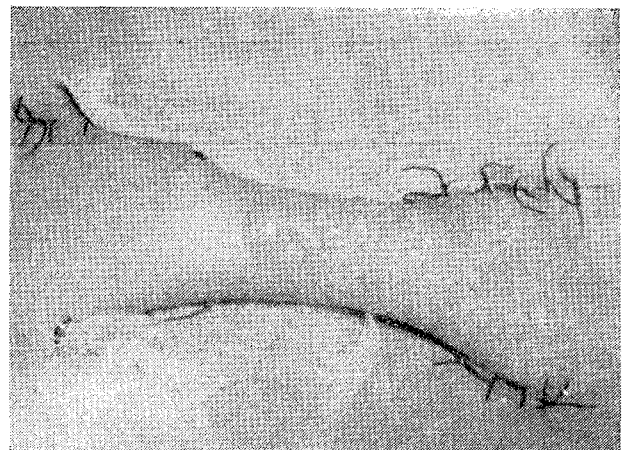


Fig. No. 1 Illustrating vascular insufficiency and blisters due to tight suturing in a narrow width tube in an obese patient.



Fig. No. 2



Fig. No. 3



Fig. No. 4



Fig. No. 5

Fig.No. 2-5 Illustrating reconstruction of large facial defects involving lips and cheek reconstructed by tubed pedicle flaps.



Fig. No. 6



Fig. No. 7

Fig. No, 6-7 Illustrating reconstruction of scalp and skull defect following electrical burns using tubed pedicle flap.

Comments :

Attempt has been made to highlight the pitfalls during raising and transfer of tubed pedicle flaps on the basis of experience gained and suggestions made to prevent these hazard and ensure safety of the procedure. Specific indications for the use of tubed pedicle flaps have been discussed to point out their usefulness.

Bibliography :

1. Grawford : The management of tube pedicle. British J. Plast. Surg. 18 : 387, 1975.
2. Strang M. F., Labiander H., Ray, A. A review of 196 tube pedicle. British J. Plastic Surgery 28 : 54-58, 1975.