Elliptical Excision and Sliding Flap Repair

4

Elliptical excision and sliding flap repair is the basis of all traditional local flap repairs and is one of the most common minor surgical procedures. Whilst it could be argued that such a procedure could be defined as a double advancement flap repair, it does not require any additional importation of skin to repair the wound or surgical defect.

The steps in this procedure are:

1. Assess the lesion and surrounding skin.
2. Outline the lesion.
3. Outline the proposed excision margin.
4. Determine and mark the relaxed skin tension lines (RSTLs).

   On the face, mark the facial creases with the patient sitting up or standing. On other parts of the body, mark natural creases or use Flint's circles.
5. Draw an ellipse to encompass the lesion and its excision margin.

   The long axis of the ellipse follows the relaxed skin tension lines (RSTLs) or facial creases when smiling or according to the Flint's circles, and perpendicular to the lines of maximum extensibility (LMxE).

   The ratio of length of the ellipse to the diameter of the lesion and excision margin should be no less than 4:1, to avoid dog-ears in the repair. The procedure is wasteful of normal skin amounting to about 75% of the total excision area.
6. Excise the ellipse of tumour-bearing skin.
7. Undermine the margins of the wound through subcutaneous tissue at the level of the base of the excision preserving the subdermal plexus and vascularity of the flaps. The amount of undermining is inversely proportional to the skin laxity. This undermining creates sliding or double advancement flaps.

   On the face, undermining should be kept just deep to the dermis, to avoid the underlying facial muscles and branches of the facial nerve. Undermining in other parts of the body can safely be done at the subdermal level for small excisions without compromising blood supply. For larger excisions, undermining of the scalp can safely be done in the plane between the galea and the pericranium, and in the trunk and limbs, the undermining plane should be either superficial or deep to the deep fascia.

M.F. Klaassen et al., *Simply Local Flaps*,
https://doi.org/10.1007/978-3-319-59400-2_4

8. The wound margins are drawn together, initially with skin hooks to assess the amount of advancement obtained. The wound is then sutured to create a linear scar.

In a true ellipse, both sides of the wound are of equal length. Gentle handling of the skin edges and suturing by taking equal increments of skin and skin eversion should result in a good scar.

Mathematical Analysis

For a 1 cm diameter circular excision and an ellipse of 4 cm

Area of circular excision of lesion = 0.8 sq. cm

Area of ellipse = 3.14 sq. cm

Area of normal skin removed = 2.34 sq. cm

This is the equivalent of almost 75% of the total elliptical excision

Modifications of the Ellipse

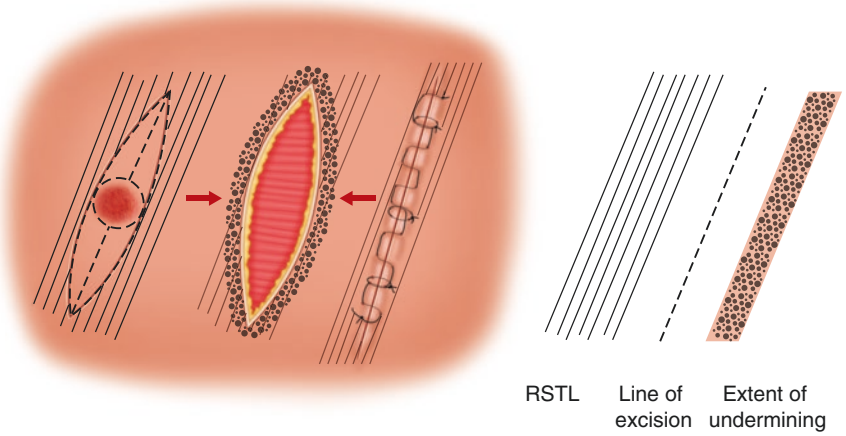


Fig 4.1 Elliptical excision and double advancement flaps. The lesion (e.g. BCC) with excision margins and 4:1 ellipse in the RSTLs. Symmetrical undermining in subcutaneous plane and direct closure with double advancement (sliding) local flaps

In repairing an elliptical excision, symmetrical undermining is done on each side of the wound. In order to prevent distortion of significant landmarks, undermining on one side only is a good solution.

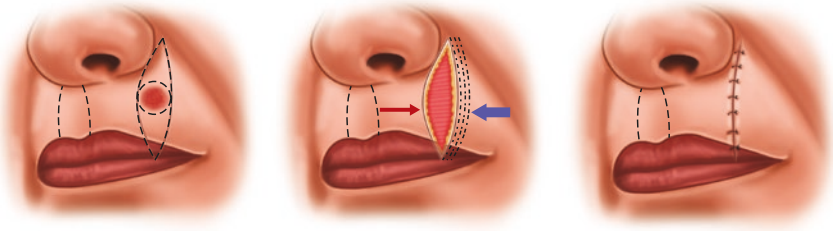


Fig. 4.2 Left upper lip tumour with excision margins drawn, a 4:1 elliptical excision in the RSTLs and closure after undermining the lateral wound edge for 4–5 mm to prevent distortion of the left alar base and Cupid's bow

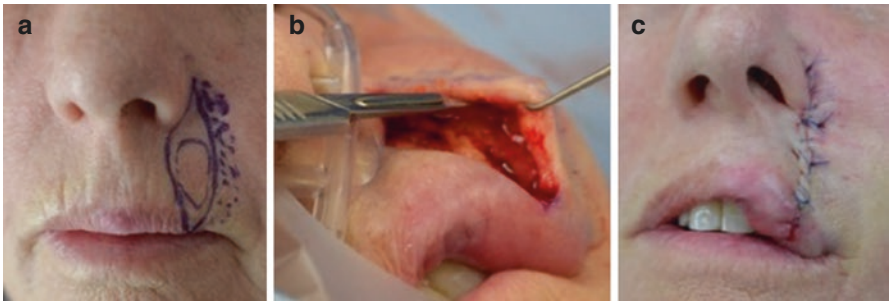
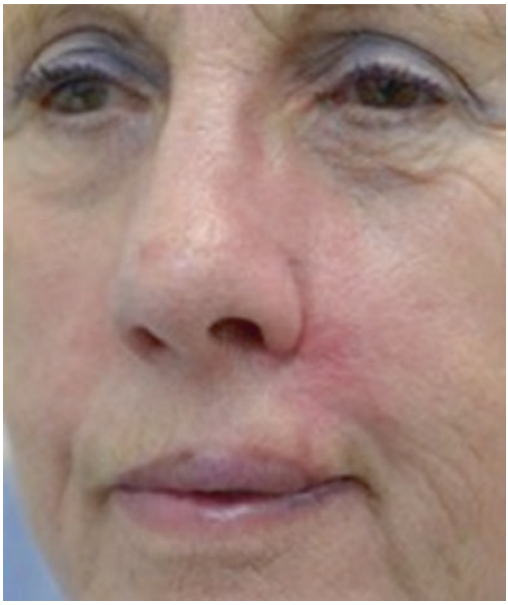


Fig. 4.3 Clinical example of a unilateral simple sliding flap from left medial cheek to left upper lip to prevent distortion of key anatomical landmark Cupid's bow in a 65-year-old woman (**a**). Unilateral undermining at the lateral edge (**b**) and final repair (**c**)

Fig. 4.4 Result 1 month following a unilateral sliding cheek flap to left upper lip



Crescentic Ellipse

The repair of a classical elliptical excision of a skin lesion invariably results in a straight line scar. In certain areas of the face, the ideal surgical scar should be curved, to fit in perfectly with the lines of facial expression or RSTLs. In order to achieve this, the ellipse can be modified in a crescentic fashion. When the lesion is excised in this manner, both sides of the ellipse are of equal length. Only the inner side of the ellipse is undermined before suturing.

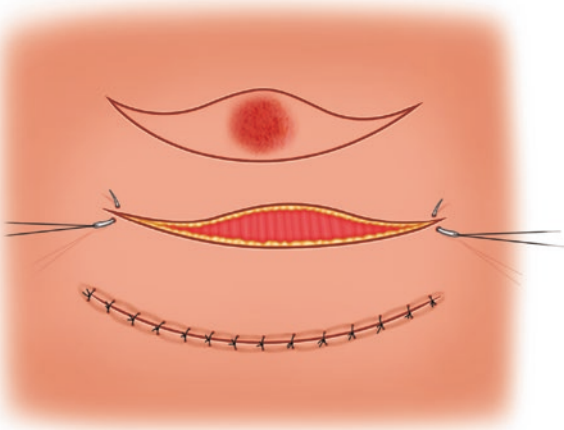


Fig. 4.5 Crescentic ellipse design and scar

Asymmetrical Ellipse

In situations where there is an asymmetrical ellipse, with one side longer than the other, direct repair with sliding flaps may be difficult or even impossible, without producing a prominent dog-ear deformity. Where the difference in length of each side of the ellipse is not great, it is possible to carefully suture the wound by placing the sutures on the longer side, wider than those on the shorter side. In this way, the sides will equalise without producing a ruffle effect. Where the difference in length is greater, equalising the two sides can be achieved by reducing the length on one side or increasing it on the other. The longer side can be shortened by excising one or more triangles of skin from along its length. These are known as Symanowski's triangles [1].

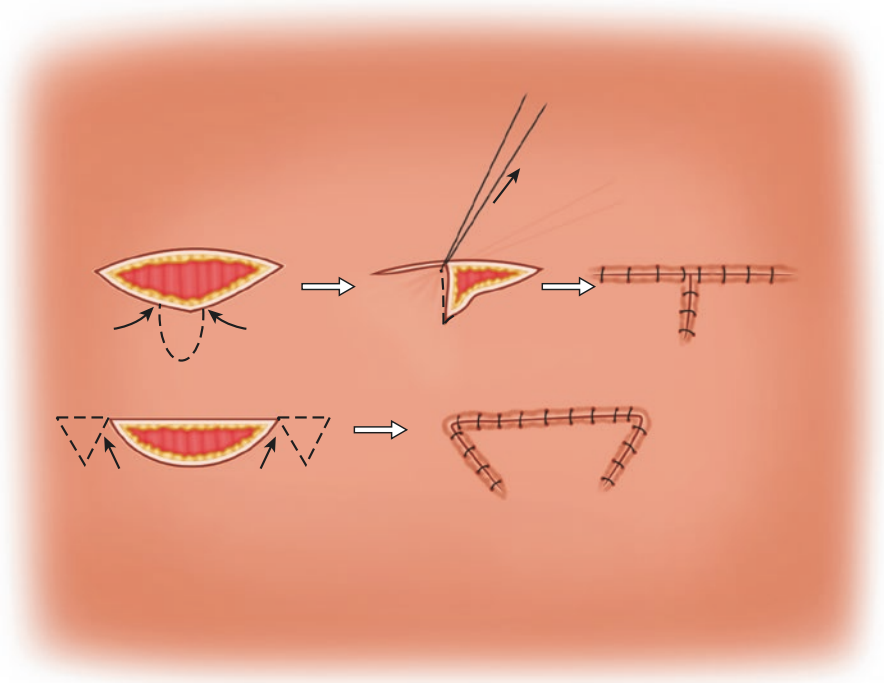


Fig. 4.6 Asymmetrical ellipse

Wedge Excision

This can be regarded as half an ellipse and applies to multilayered structures such as the lips, eyelids and ear [2].

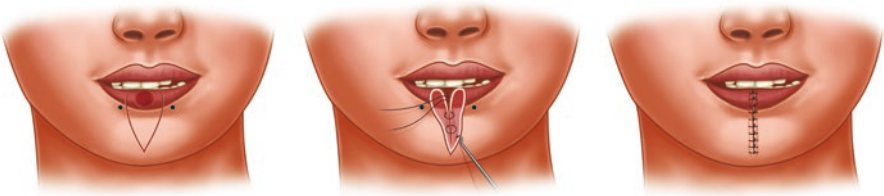


Fig. 4.7 Classic wedge resection/excision of SCC lower lip margin. The excision can be combined with an M-plasty and or vermillionectomy (lip shave) [3]

M-plasty [4, 5]

By converting the elliptical excision to a double M-plasty, the amount of normal skin sacrificed in the repair is reduced to about 50% of the total elliptical excision. The initial markings for the excision are as for an elliptical excision. A triangular flap with its apex of about 30° is planned on one or both ends of the surgical site. Undermining is done under the long margins. These sliding flaps are then advanced, and the wound is repaired.

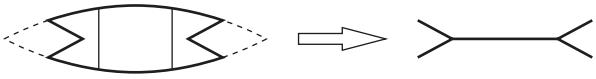


Fig. 4.8 Design of double M-plasty

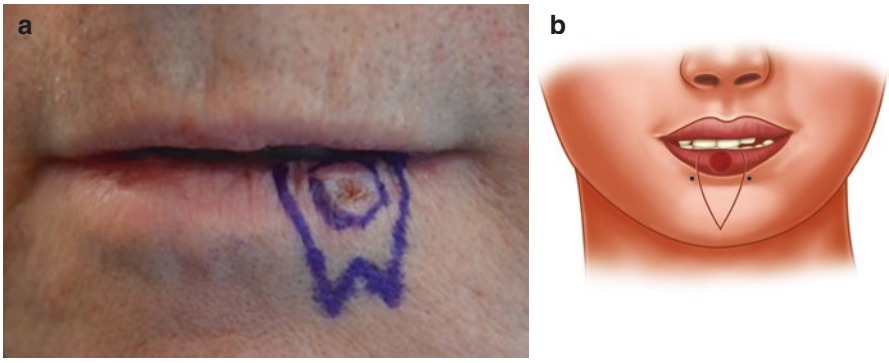


Fig. 4.9 Wedge excision planned for this SCC of the lower lip in a 55-year-old man and repair with M-plasty design (**a**). Classic tissue-wasting wedge excision, shown for comparison (**b**) [1]

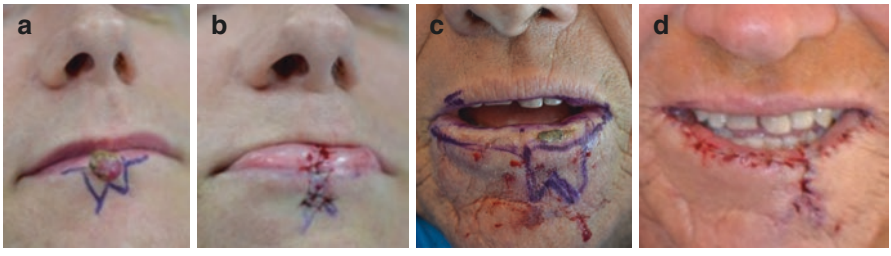


Fig. 4.10 Clinical examples of simple superficial M-plasty for pyogenic granuloma lower lip (**a**, **b**) and deep wedge excision combined with lip shave + mucosal advancement for SCC and dysplasia of the lower lip (**c**, **d**)

Crown Excision [6]

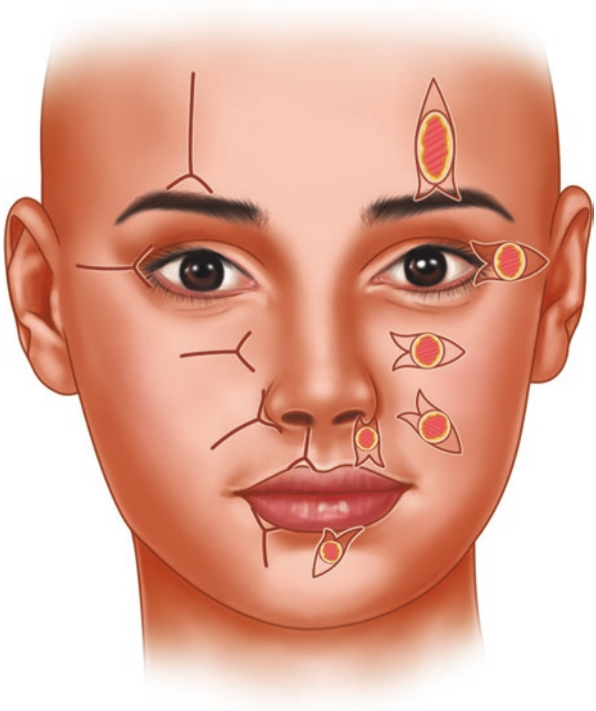


Fig. 4.11 Design and scars produced by the Robbins crown excision

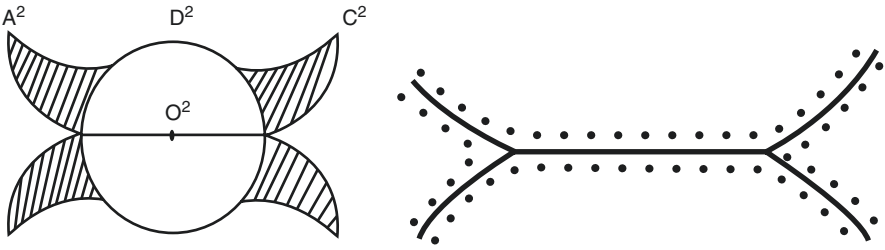


Fig. 4.12 Design of crown excision

This is another modification of an elliptical excision. It is particularly useful to repair wounds close to important anatomical landmarks, where an elliptical excision would distort these landmarks. Like the M-plasty it can be used as a double flap repair on both ends of the excision, or as a single flap repair. Its planning allows for skin edges of equal length ($A^2O^2C^2$ is equal to $A^2D^2C^2$) to be approximated.

Modifications of the Wedge Excision [4, 5]

The usual wedge or triangular excision involving free margins of structures such as the lips, eyelids or ear is wasteful of normal skin and can produce a notch at the free margin, if not repaired accurately in layers.

Clinical scenario: A basal cell carcinoma close to the right lower eyelid margin

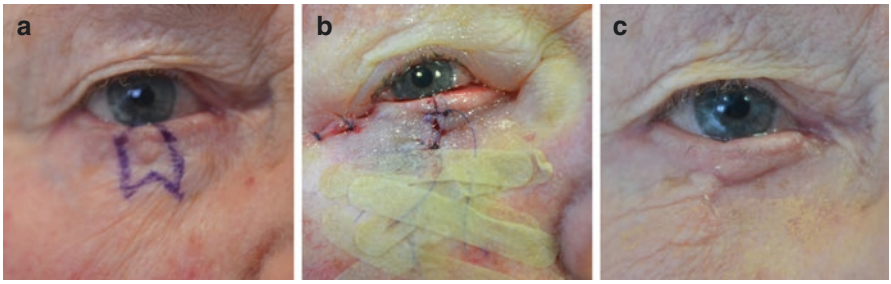


Fig. 4.13 Wedge excision of micronodular BCC right lower eyelid in a 70-year-old woman (**a**). Repair with M-plasty, double eyelid advancement flaps and three-layered Mustardé eyelid repair. Immediate (**b**) and 2-week post-operative result (**c**)

Surgical method: For this micronodular basal cell carcinoma near the right lower eyelid, a wide full thickness wedge excision was performed incorporating the M-plasty design to preserve tissue. Fine iris scissors are best for making the cuts either side of the cancer, and a lateral canthotomy is also performed, to achieve tensionless repair of the eyelid margins. A Mustardé three layer repair of the eyelid was performed with a continuous pull-out 5/0 Prolene to the tarsoconjunctival layer, orbicularis oculi approximation with 5/0 Vicryl and finally interrupted nylon to the outer layer [7].

The suture ends are left long and Steristripped down to avoid suture irritation of the cornea. The free margin of the eyelid is repaired carefully to avoid future notching.

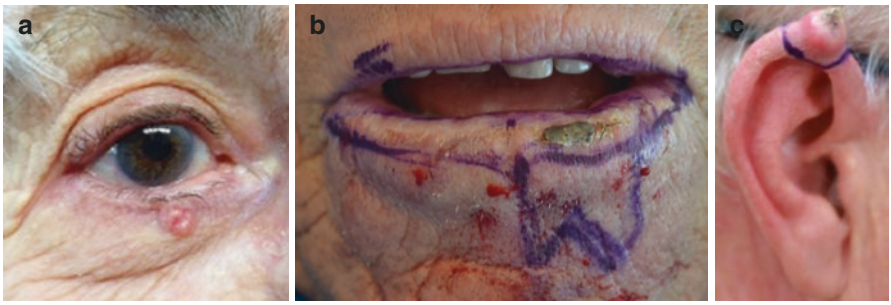


Fig. 4.14 Clinical examples of BCCs and SCCs at the free margins of eyelid (**a**), lower lip (**b**) and superior helix of the ear (**c**), where notching may result from a standard wedge resections

The method of rotation-advancement can be used to reduce the amount of normal tissue excised and reduce the possibility of a notch forming at the free margin (See Page 73, Fig. 6.18). More scarring is introduced, however, especially in the lower lip.

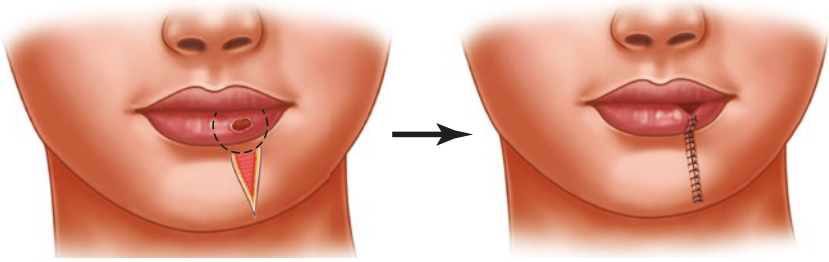


Fig. 4.15 Skin markings for wedge excision lower lip with notch result at free margin

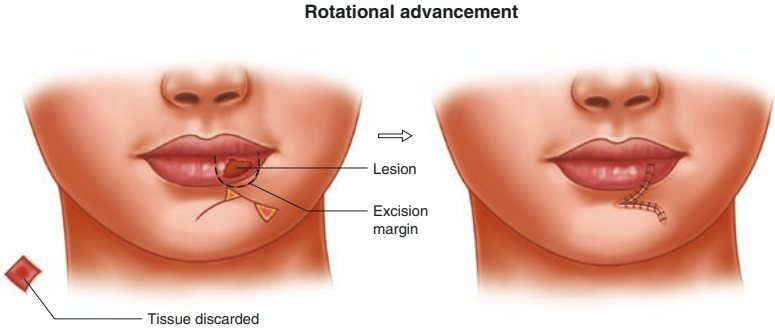


Fig. 4.16 Rotation-advancement technique to reduce tissue wastage and risk of notching

Notes

When the surgical defect is created, the margins of the wound can be tested for skin laxity, gently pulling each with skin hooks. Should there be little or no laxity in the skin and the wound edges cannot be opposed, an alternative method of closure should be chosen.

In some cases there may be a temptation to oppose the skin edges under tension, to avoid a more complex repair. This can result in wound dehiscence or a hypertrophic scar.

In a true ellipse, both sides of the wound are of equal length. Gentle handling of the skin edges and suturing by taking equal increments of skin and skin edge eversion should result in a good scar.

In a wedge excision (or half an ellipse), the wastage of normal skin in the excision can be reduced by incorporating an M-plasty in the repair.

Where the lengths of the sides of the excision are unequal, it is possible to absorb the extra length by the *technique of halving* [4, 5]. The first suture is placed halfway between the ends of the wound. The next sutures are placed halfway between the central suture and the ends of the wound. Suturing is continued in this fashion until the wound has been completely sutured.

Discrepancies in wound length greater than those corrected by the halving technique require other methods to equalise the wound length.

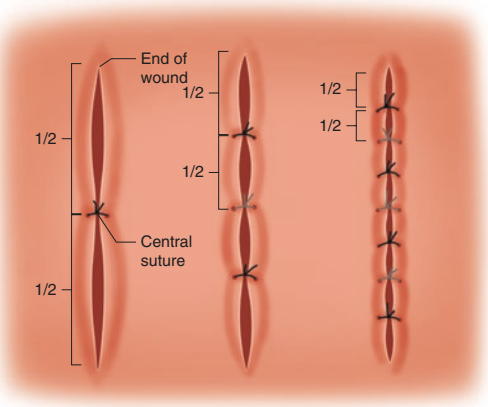


Fig. 4.17 Technique of halving when suturing a wound

Dog-ears

These are standing cones of skin at each end of a sutured wound due to bunching of the skin. These can occur because the ellipse is too wide, too short, the wound sides are asymmetrical or the repair has not been done carefully.

The best time to correct a dog-ear is at the time of surgery [8]. The pucker in the skin is most unlikely to resolve with the passage of time as the surgical scar matures.

The simplest way of treating the dog-ear is to elevate the apex of a folded triangle of skin with a skin hook. Draw a line along the base on one side. An incision is then made along this line in line with the existing suture line. This creates an open triangular flap of skin that can be excised and the skin margins sutured.

This procedure will lengthen the final surgical scar.

If this measured approach to dog ear removal is not adopted, other methods can result in a much longer, uneven suture line. This approach is known as ‘chasing the dog ear’.

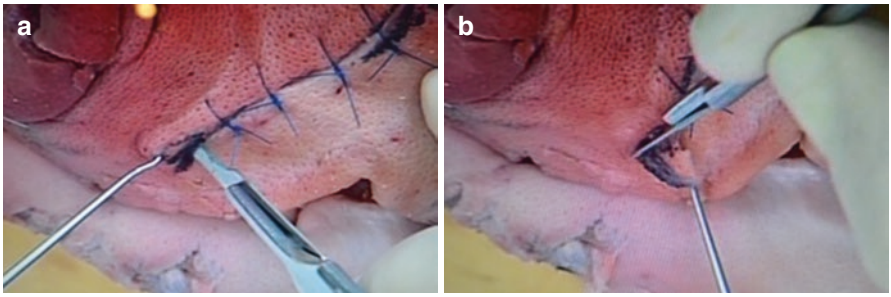


Fig. 4.18 Teaching demonstration of dog-ear excision on a porcine surgical model (**a**, **b**)

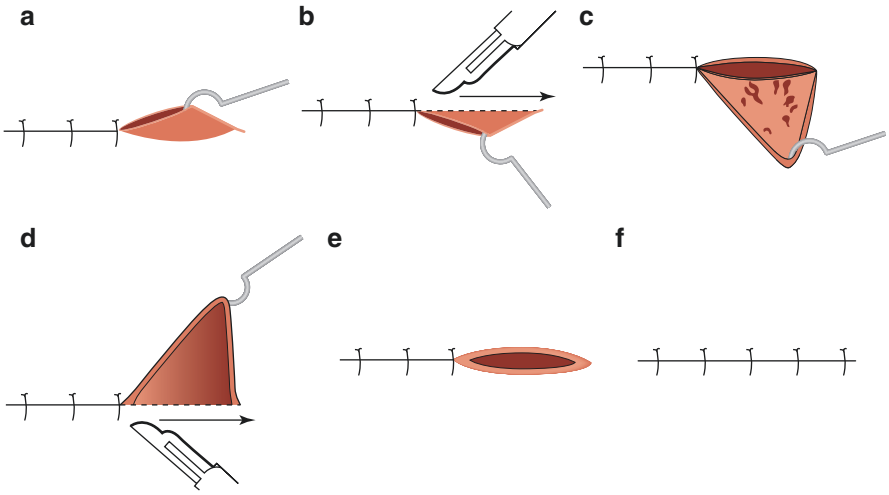


Fig. 4.19 Demonstration of one technique for dog-ear excision

Summary

The elliptical excision and repair is the basis of all surgical repairs. All the other local flap methods that follow are a natural progression or continuum, of this simple principle.

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