

These flaps make use of the elasticity of the skin and soft tissues to repair the wound. The flap is elevated and moves forward in to the defect without any lateral movement.

Such flaps have a very long history and were described, with diagrams by Aulus Cornelius Celsus in his book *De Medicina libri octo* [1].

Now new substance is not produced at the place itself, but is drawn from the neighbourhood; and when the change is small this hardly robs any other part and may pass unnoticed, but when large, it cannot do so. Celsus c 25 BC—c 50 AD.

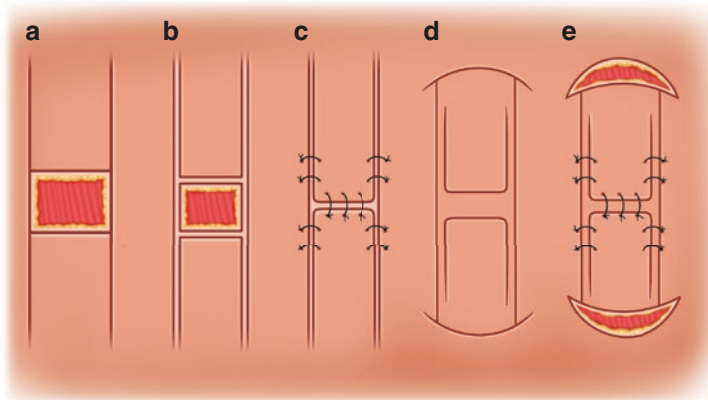


Fig. 5.1 Diagram of Celsus advancement flap

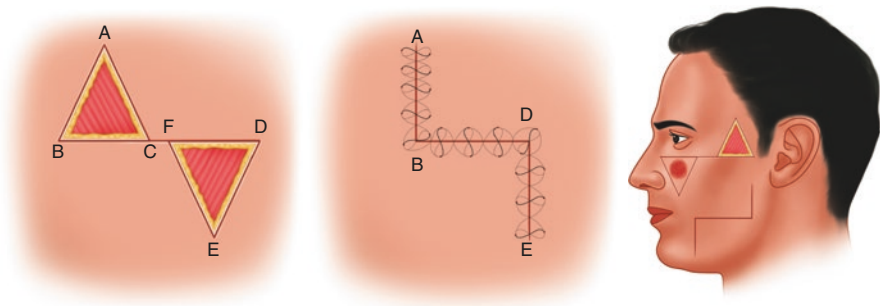


Fig. 5.2 Closure of defect by the method of lateral triangles after Burow [3]

A common technique in flap surgery is the excision of Burow's triangles [2, 3].

Early versions of the advancement flap left dog-ears at the base. Solutions to this problem by removing the dog-ears and further advancing the flap were made by Camille Bernard in 1852 and Karl Burow in 1855. Both surgeons proposed that a triangle of skin be excised from each side of the flap's base in order to facilitate its advancement and improve the final appearance of the repair. This technique is known as the Burow-Bernard technique, or in the English literature as Burow's triangles. Limberg [4] describes this technique as a supplementary plastic manoeuvre to close triangular and quadrangular defects. He noted that it was paradoxical that in order to close a defect, a nearby triangle of healthy skin, equal in size to the initial defect, was to be discarded.

Single Pedicle Advancement Flaps

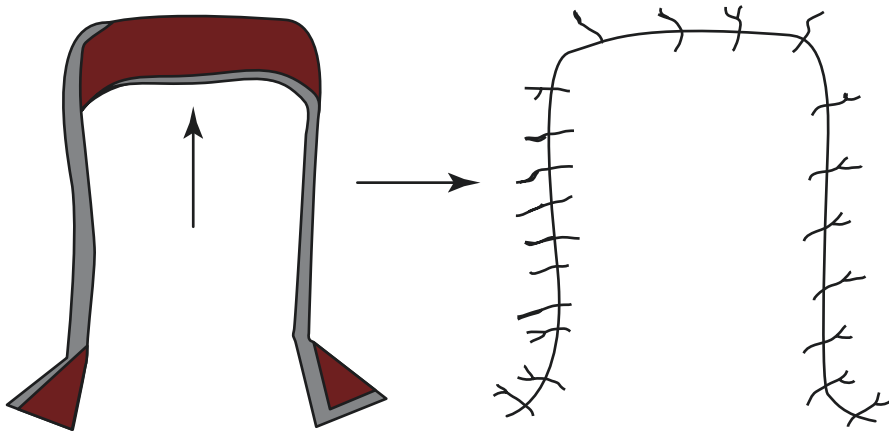


Fig. 5.3 Classical advancement flap with Burow's triangle excisions at base.

This flap is useful where there is laxity of the skin confirmed by the ‘pinch test’. Burow’s triangles have been drawn at the flap base to allow further advancement of the flap and eliminate dog-ears (Fig. 5.3). Theoretically the increase in the length of the advancement flap should be equal to the length of the lower side of the triangles.

The flap is created by making two parallel incisions extending from the rectangular surgical defect, ideally along the relaxed skin tension lines (RSTLs). The flap is elevated, and the margins of the wound and flap donor site are undermined. The flap is then advanced into the defect. This creates a discrepancy in length between the flap and the flap plus the length of the surgical wound.

Repair is by the principle of halves to spread the tension between the uneven sides of the wound. If dog-ears persist at the flap base, these can be excised by using Burow’s triangles (extending laterally from the flap base) which would have the benefit of lengthening the shorter sides of the wound and preserving the maximum width of the flap base (where the blood supply enters) [5, 6].

In the past, much research was done on the ideal and safe ‘length to breadth’ dimensions of single pedicle advancement flaps. The tension on this flap produced by advancement decreases the blood flow to the flap. It is recommended that this flap be used in areas with an excellent blood supply such as the nose and scalp.

Where there is tension, but not significant enough to cause skin necrosis, atrophy can occur at the subcutaneous level to produce a depressed contour at the distal end of the flap.

Dorsal Nasal Flap

Classification: Advancement flap/single stage

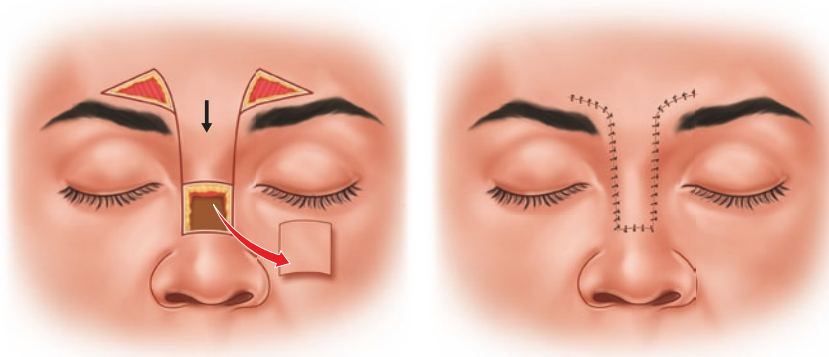


Fig. 5.4 The glabellar/dorsal nasal advancement flap with Burow’s triangles [7]

Clinical case scenario: Basal cell carcinoma infiltrating supra tip of the nose in a 91-year-old man. Nasal skin laxity was an advantage in selecting this flap repair.

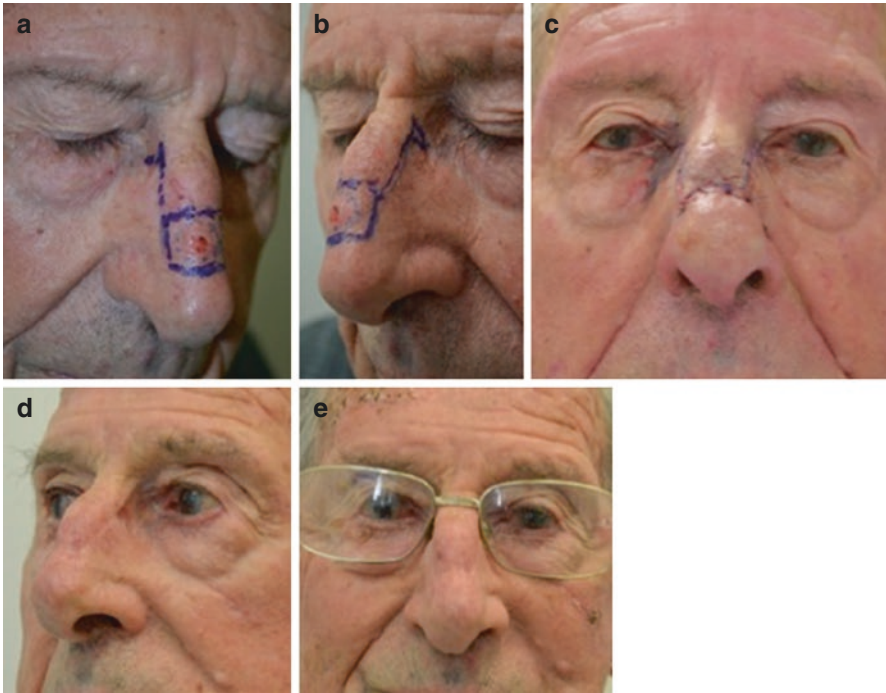


Fig. 5.5 Dorsal nasal advancement flap with associated Burow's triangles (a, b), early (c) and 2-year result (d, e)

Surgical method: The lesion was excised to create a rectangular-shaped defect incorporating the lower section of the dorsal nasal aesthetic unit. A dorsal nasal flap with Burow's triangles at its base was planned, raised and advanced in to the defect. Initially the nose looked foreshortened, but this improved with time, and the final result after 2 years is acceptable.

Mucosal Advancement Flap

Classification: Direct single pedicle advancement flap/one stage can be combined with a wedge resection of the lip.

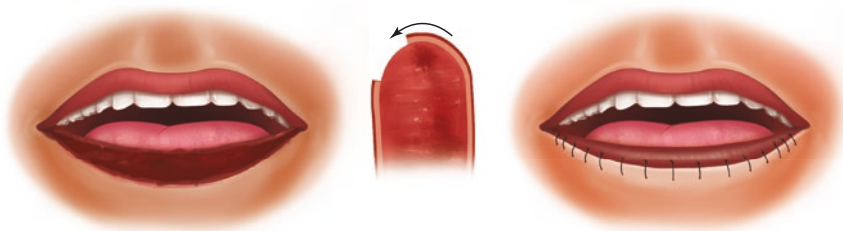


Fig. 5.6 Vermillionectomy (lip shave) with mucosal advancement [7]

Clinical case scenario: This 49-year-old male presented with a well-differentiated squamous cell carcinoma in the vermillion of the lower lip, associated with severe adjacent solar epithelial dysplasia.

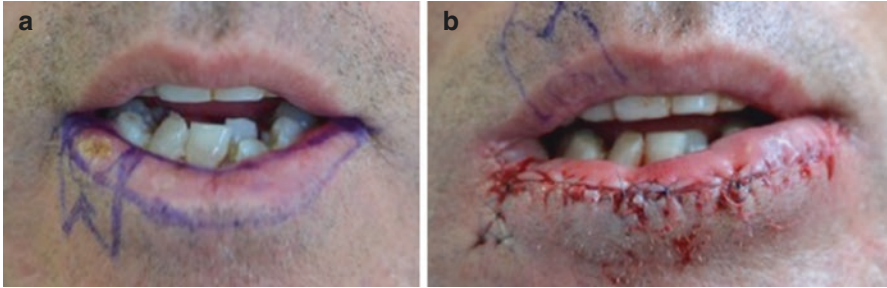


Fig. 5.7 Vermillionectomy (lip shave) of dysplastic lower lip combined with a wedge excision of SCC (a). An M-plasty is incorporated in the wedge excision. Immediate result (b)

Surgical method: The procedure was planned to include a full thickness wedge excision of the carcinoma and vermillionectomy in-continuity. The wedge excision was repaired directly, incorporating an M-plasty. A limited undermining of the inner lip mucosa was then done, and the mucosal flap advanced to cover the vermillion defect.

Notes

The combination of a tumour on the vermillion of the lower lip and extensive solar damage to the remainder of the lower lip vermillion is not uncommon. The excision includes the white roll of the lower lip plus the dry vermillion. Following this type of repair, the hair-bearing skin of the lower lip is in contact with the new vermillion.

Some authorities strongly advise that undermining of the mucosal advancement flap is unnecessary. The decision to undermine or not can be made at the time of surgery. We believe that several millimetres of undermining of the flap are helpful for its advancement and to avoid a tendency to post-operative entropion of the lower lip.

Double Advancement Flap

Biwinged Flap

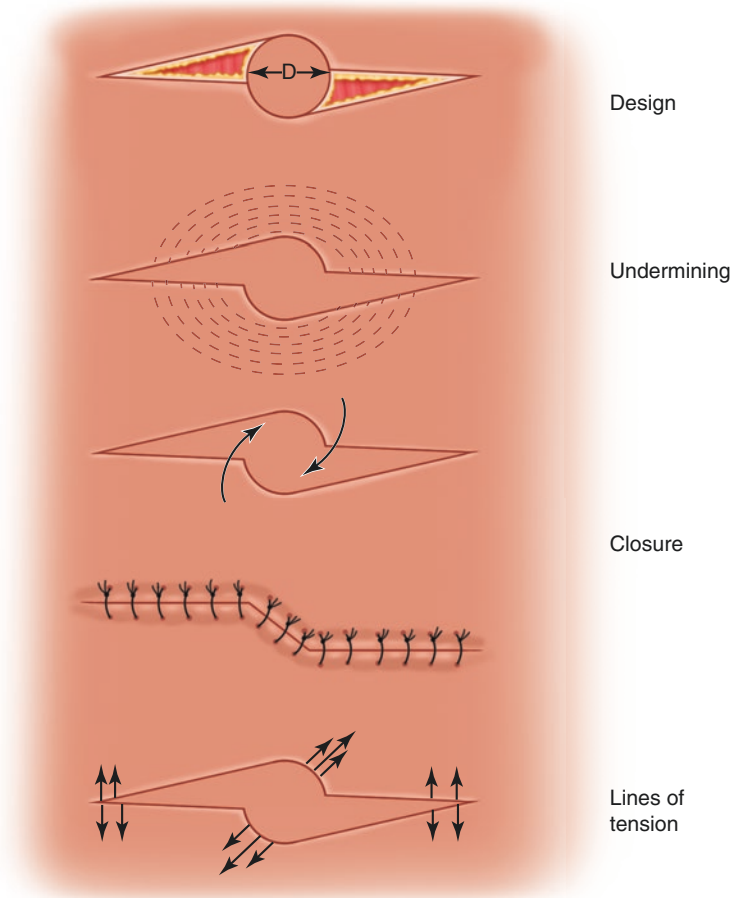


Fig. 5.8 Biwinged flap

Mathematical Analysis

For a 1 cm circular excision and the two wings equivalent to half an ellipse

Area of circular excision: 0.8 sq. cm

Area of square excision: 1 sq. cm

Area of one wing (half ellipse): 0.38 sq. cm

Area of both wings plus discrepancy between circular and square excision $0.38 + 0.38 + 0.2 = 0.96$ sq. cm

Percentage of normal skin excised in this repair is almost 55% of total excision

This compares with 75 % for an elliptical excision

Clinical case scenarios: Infiltrating basal cell carcinoma of the forehead



Fig. 5.9 Two clinical cases where biwinged excision techniques were used, to avoid distortion of the hairline and eyebrow. The upper is a nodulocystic BCC of the right upper forehead (a, b), and the lower is a sclerosing BCC of the right mid-forehead (c, d)

Notes

This technique is a variation of the elliptical excision. The wings of the ellipse can be placed according to the local landmarks. In this situation the wound is closed by advancing tissue on either side in to the defect and repairing the remaining wounds as sliding flaps. Differential suturing, taking a wider suture bite on the longer side, than the shorter side, is required to equalise the skin tension and give a linear scar. The final scar can be skewed on either side of the surgical excision, and this effect can be used to avoid distorting the hairline and eyebrow.

Perialar Crescentic Advancement Flaps

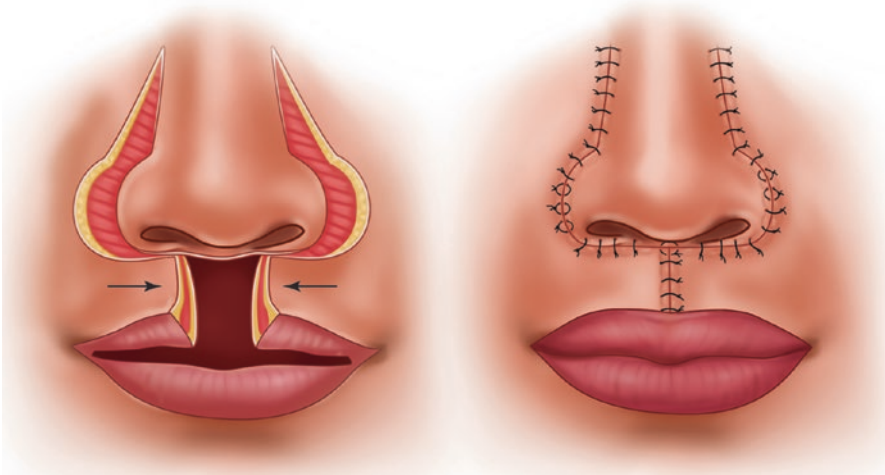


Fig. 5.10 Perialar crescentic excisions to facilitate repair of full and partial thickness defects of the upper lip [8]

Classification: Bilateral advancement flaps

Clinical case scenario: Squamous cell carcinoma upper lip

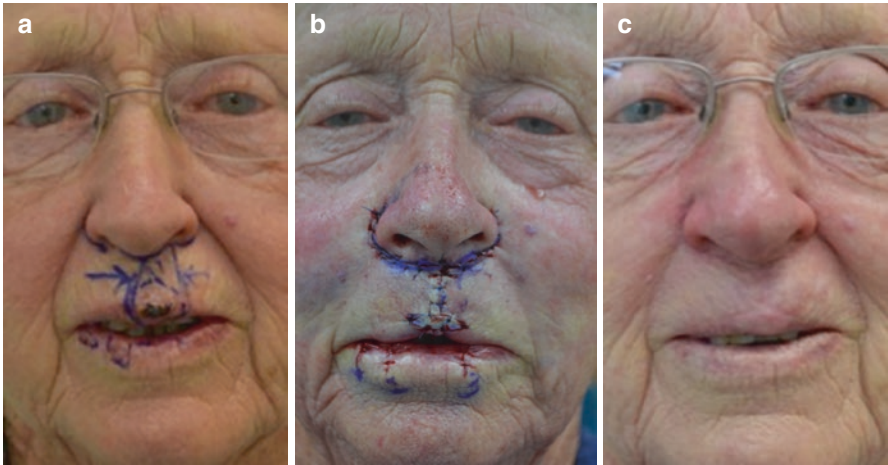


Fig. 5.11 SCC of central upper lip and philtral region, involving Cupid’s bow (a), excised and repaired with bilateral perialar advancement flaps (b). Result at 6 months (c)

Surgical method: The squamous cell carcinoma was excised with a minimum 5 mm margin. The large central lip defect was then repaired using bilateral perialar crescentic advancement flaps. A small full thickness skin graft was used to recreate the Cupid’s bow of the upper lip.

Notes

This is a good technique to repair larger full thickness defects in the central upper lip where direct closure is not possible. For more lateral lesions, the flap can be planned on one side only. Spare tissue for this flap is obtained from the nasolabial cheek fold. The alar base groove is retained. In the illustrated case, the pillars of the philtrum have been lost.

Double Advancement Flaps

H-plasty [5, 6]

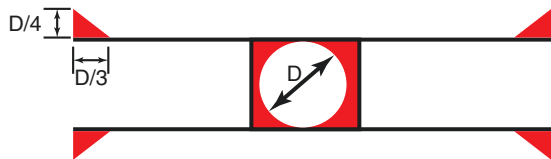


Fig. 5.12 H-plasty with Burow’s triangles

This flap repair has two symmetrical rectangular advancement flaps, each covering half of the defect. The area of forehead above each eyebrow has more laxity than the upper forehead and, with the relaxed skin tension lines parallel with the frown lines, is an ideal location for this repair.

Classification: Double opposing direct advancement flaps with Burow's triangles

Clinical case scenario: A nodulocystic basal cell carcinoma right forehead
A direct sliding flap closure in a frown line would have elevated the eyebrow.



Fig. 5.13 H-plasty for BCC right forehead (a), 1 month (b) and 5 month results (c)

Surgical method: The surgical excision was planned to create a square defect. The H-plasty flaps, incorporating basal Burow's triangles were elevated in the direction of the horizontal frown lines. These flaps were then advanced to meet each other in the centre of the defect.

Notes

The forehead is an ideal place for this type of repair. The main flap scars are in the direction of the horizontal frown lines. If the flaps are too narrow, they can develop an unsightly trapdoor effect. This will tend to improve with the passage of time but will never completely disappear.

Flaps Involving V-Y Advancement [5, 6]

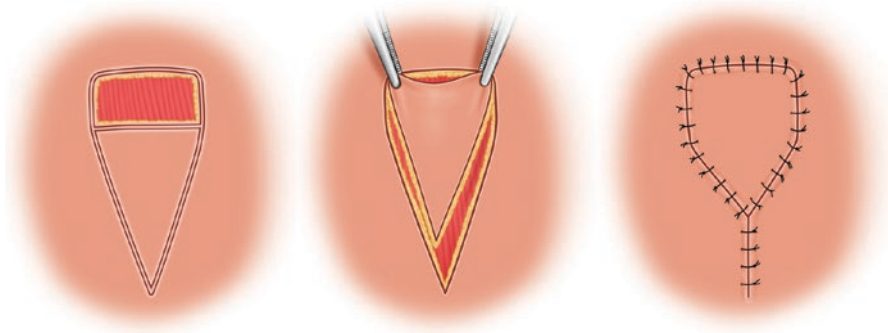


Fig. 5.14 V-Y advancement design. Gentle traction on the advancing flap should be done with skin hooks.

The principle is to plan a V incision with its linear base at the base of the rectangular surgical defect and advance the resulting triangular flap in straight advancement fashion towards the surgical defect.

The flap is based on the widest diameter of the surgical wound, and the amount of advancement required is the shortest length of the wound. In practice the excisional wound is converted to a rectangle. Where there is reasonable elasticity in the skin, the flap will be an isosceles triangle with an apical angle of about 30°.

Where there is poor skin elasticity, the triangular flap needs to be longer with a narrower angle at its apex to achieve the necessary advancement.

This flap is completely cut off from the subdermal vascular plexus, becoming an *island*. It receives its blood supply from the attachment of the flap to its subcutaneous tissues.

Undermining can be done on either side of the V flap to facilitate closure of the flap donor site as a Y.

There is an overall increase in skin tension in all directions, and the procedure does not give a great deal of advancement. The triangular flap is not stretched or pulled in to the recipient site but rather achieves its advancement by recoil or by being pushed forward. All the advancement occurs in the skin surrounding the V flap where it is sutured to create the stem of the Y.

This technique can be used to elongate structures like the columella, lower eyelid, lip and finger defects in the correction of Dupuytren's contracture. It can also be used to repair the philtrum or eliminate minor notches in the lip.

Nasalis Flap

Classification: V-Y advancement/single stage/island pedicle

Clinical case scenario: Small basal cell carcinoma lateral side of nose

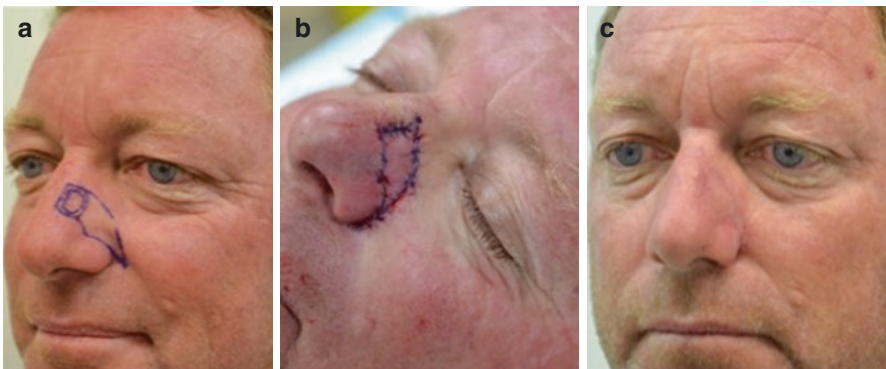


Fig. 5.15 V-Y advancement flap, lateral side of nose (a, b). Result at 3 months (c)

Surgical method: The BCC was excised with a 3mm margin up to the dorsal nasal subunit. A triangular flap was designed to follow the superior alar margin and crease. This flap was advanced in to the defect and the flap donor site repaired to create a final Y-shaped scar.

Upper Lip Case

Classification: V-Y advancement/island flap on subcutaneous pedicle

Clinical case scenario: Squamous cell carcinoma involving the Cupid's bow of the upper lip

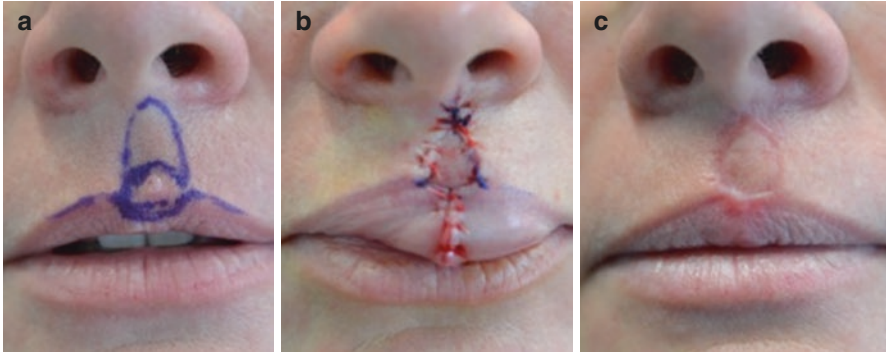


Fig. 5.16 V-Y flap in the philtrum of the upper lip for SCC in a 38-year-old woman (a, b). Early result 4 weeks after surgery (c)

Surgical method: The small squamous cell carcinoma close to the Cupid's bow was excised with a 5 mm margin. Reconstruction was performed with a V-Y advancement flap planned within the limits of the philtral aesthetic unit

Notes

This is a useful technique for repairing small skin defects or for structures that require some lengthening.

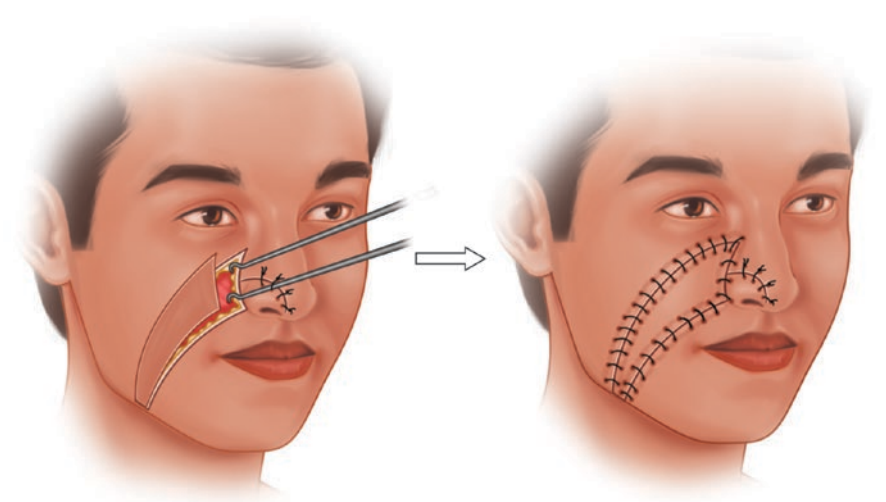


Fig. 5.17 Nasolabial subcutaneous pedicle flap

The V-Y advancement flap technique has been extended further for the repair of many facial defects.

Greater mobilisation can be obtained by converting the flap into an island on a subcutaneous pedicle. Careful dissection of the pedicle allows significant advancement, and the flap incisions are curved to follow the facial contours [9].

Sigmoid Oblique Advancement Flap [10]

Classification: Island pedicle advancement flap/single stage

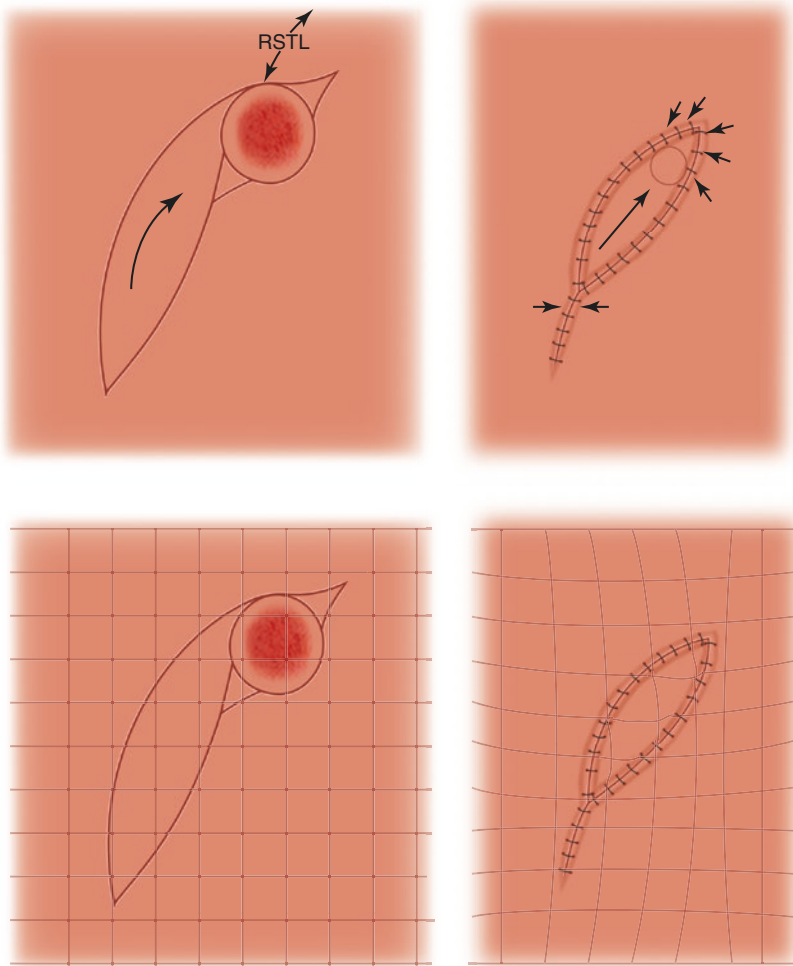


Fig. 5.18 Oblique island pedicle flap design and grid pattern foam block simulation from Ono's original article [10]

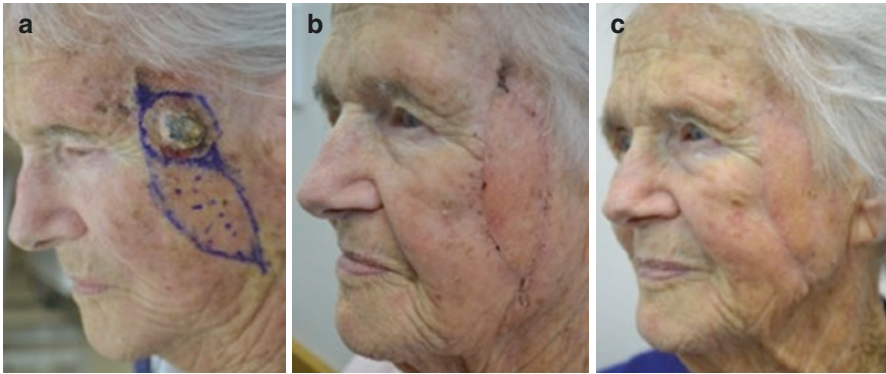


Fig. 5.19 Sigmoid advancement flap for an SCC lower left temple of a 91-year-old woman (a). Early result at 4 weeks (b) and 3 months (c)

The lesion is excised as a circle along with two small triangular flaps 1–2 mm in length in a direction corresponding to the RSTL or facial crease.

A sigmoid-shaped island flap having an S-shaped edge facing the defect and a spindle shape on the opposite side is planned. It has a width equal to that of the defect and is based on the proximal half of the defect, parallel with the crease line. The flap is raised on a subcutaneous pedicle and advanced obliquely in to the defect. The flap donor site is then repaired by the V-Y technique.

This flap has avoided some of the pitfalls of facial surgery such as trapdoor formation, depressed scars and dog-ears.

Placing the apex of the flap adjacent to the midpoint of the excisional defect reduces the amount of advancement required to repair the wound.

Surgical method: This large squamous cell carcinoma on the left temple was excised with a 5mm peripheral margin. The repair was planned according to the method of Ono. A large elliptical flap incorporating some loose preauricular skin was raised on a subcutaneous pedicle and advanced into the surgical defect. The flap donor site was repaired by V-Y advancement.

Smaller sigmoid oblique advancement flap for the face.

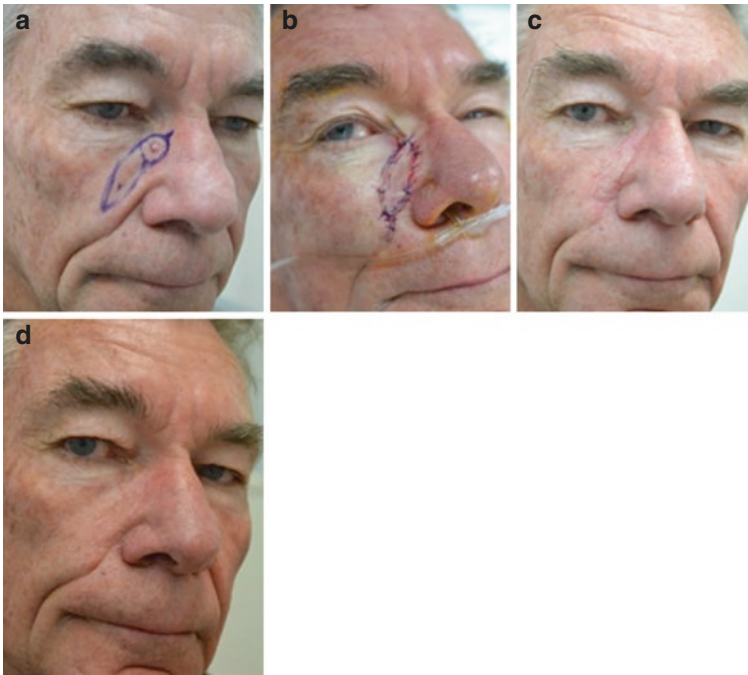


Fig. 5.20 Sigmoid oblique advancement flap for repair of a defect resulting from wide excision of nodulocystic BCC right nasojugal region in a 63-year-old man (a). The post-operative image shows the efficacy of the procedure where there is little skin laxity. Immediate (b), 1-month (c) and 2-year results (d). There is no post-operative ectropion of the lower eyelid

Double V-Y Flaps

Kite Flaps [11, 12]

In this procedure, two triangular flaps are raised on either side of the rectangular surgical defect. The flaps are incised down into the subcutaneous tissue, tapering outwards.

The two triangular flaps are then sutured together, and the defect was closed in V-Y fashion. The tension of the closure lies in the wound on either side, and the flap has minimal tension. Double sigmoid oblique advancement flaps of Ono can be used in a similar fashion.

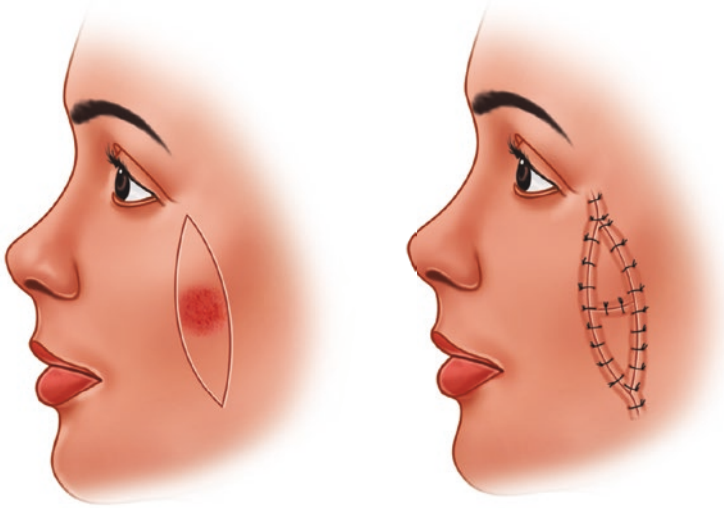


Fig. 5.21 Double kite flaps

V-Y Technique for Closing Surgical Wounds

A number of flap repairs leave a triangular donor defect. These can be closed directly by a V-Y plasty. These include the Hatchet flap, keystone perforator island flap and others.

The V-Y Technique for Releasing Scar Contractures [5, 13]

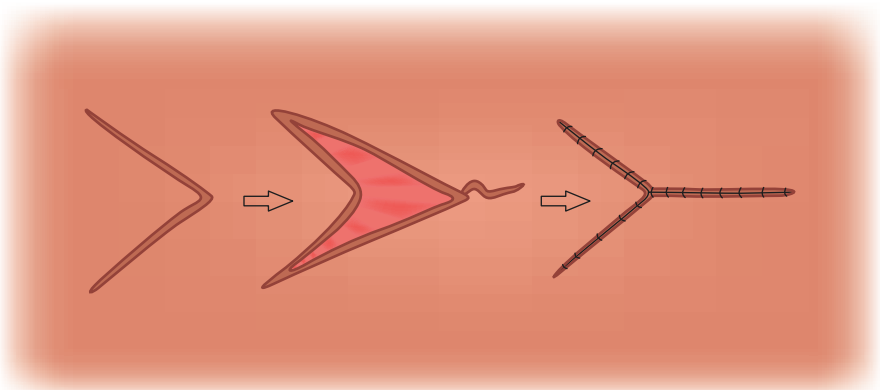


Fig. 5.22 V-Y design for scar release

V-Y advancement as an adjunct to Z-plasty.

In severe Dupuytren’s disease, considerable improvement can be obtained to contractures with Z-plasties. In some situations the transposed triangular flap will not reach the apex of the wound, and a V-Y repair is necessary.

Y-V Advancement [5]

This is the opposite to the V-Y advancement. The main purpose is to gain width at the expense of length. The wider the angle of the triangular flap, the greater the increase in width. However, this is associated with increased difficulty in advancing the flap.

This type of repair can be used to correct epicanthal folds, digital contractures in Dupuytren’s disease and some burn scar contractures.

A Y-shaped incision is made forming a triangular flap. This is then advanced into the stem of the Y, and the wound is then sutured as a V. The lateral skin borders of the triangular flaps are shorter than the total length of the Y, and there will be redundant tissue present after the advancement. To prevent this, Burow’s triangles are excised on each side.

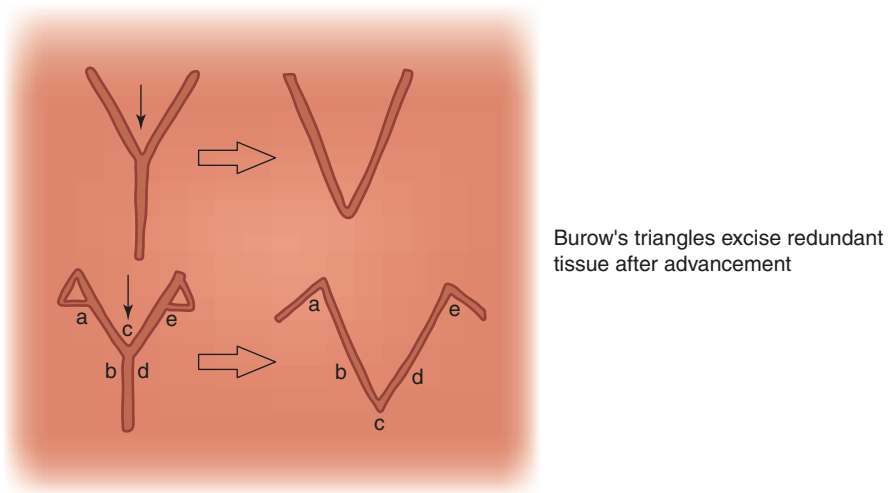


Fig. 5.23 Y-V advancement concept design

Multiple Y-V Advancement Flaps [5]

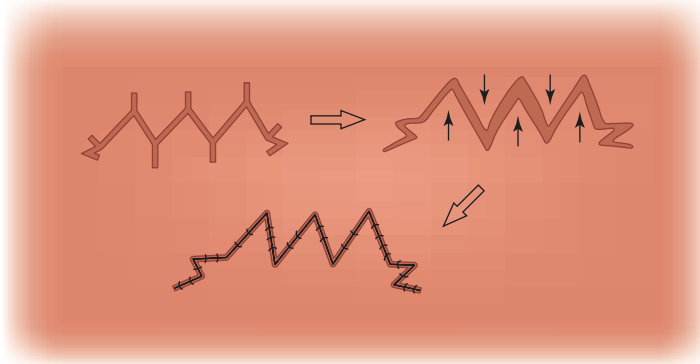


Fig. 5.24 Multiple Y-V design for scar release

The redundant tissue on each side of the advancement was excised as Burow's triangles, and these wounds were repaired with Z-plasties.

This technique can be used to improve broad scar contractures, especially lateral trunk burn scars, where Z-plasties would not be indicated.

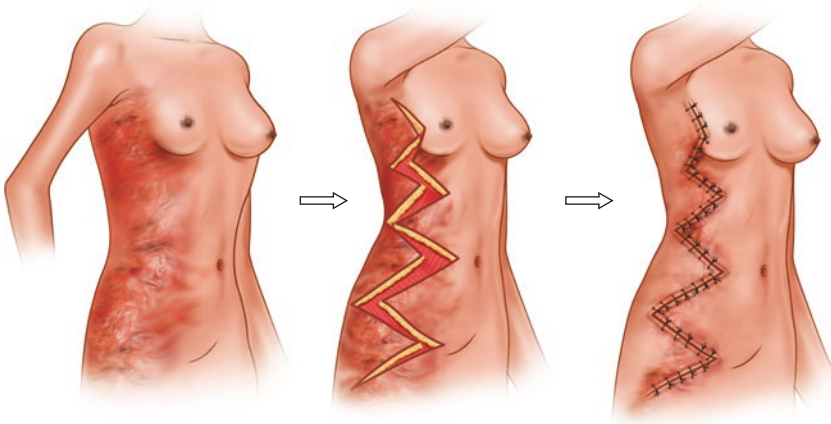


Fig. 5.25 Multiple Y-V advancement flaps for lateral chest burn scar contractures

Bipedicle Advancement Flap [5]

This strap-shaped flap is simple to plan and execute, having theoretically excellent viability due to its two pedicles. It can be regarded as two separate flaps joined at the centre EF.

The pivot points are A and C. When advanced, the midpoint of the flap F could fall short of the midpoint of the defect G unless under tension.

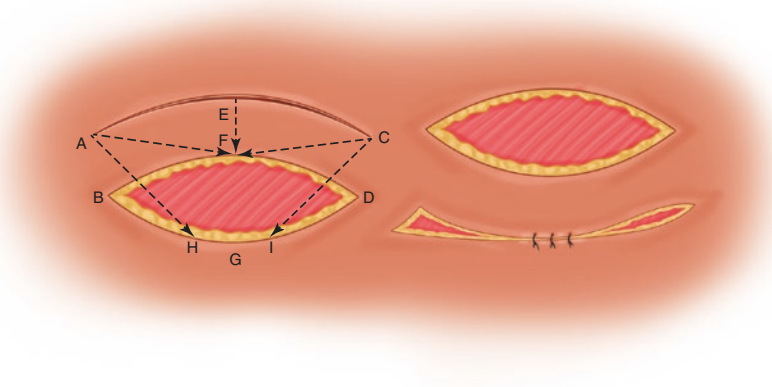


Fig. 5.26 Bipedicled skin flap design

Note

Many years ago, the bipedicle advancement flap was frequently advocated for repair of trochanteric pressure areas and exposed bone over the tibia following trauma. Unless the defect was very narrow or the skin was very lax, this type of repair was seldom successful. The amount of tension required to advance the flap into the defect resulted in wound dehiscence or vascular insufficiency. Safer flaps are now available for correcting these defects.

This flap is useful in lower eyelid repair, with the flap raised in the very extensible skin and underlying orbicular muscle in the upper eyelid [14]. As the flap has to pass over the eye to the lower lid, it is best classified as an interpolation flap.

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