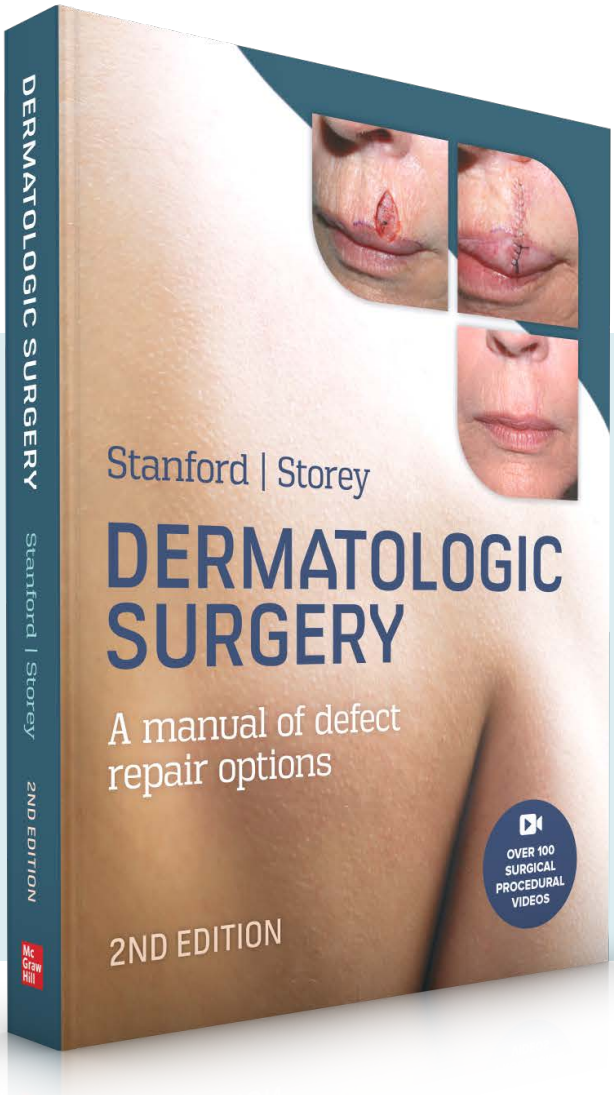
Duncan Stanford & Leslie Storey

DERMATOLOGIC SURGERY 2ND EDITION



Sample

FOREWORD

The main attraction of this text is its simplicity. The text assumes a significant level of basic surgical skill and was produced as a teaching aid for doctors of any discipline involved with skin cancer management who wish to expand their skills in defect repairs by providing experience on a whole range of repair options for cutaneous defects without the need to see each one firsthand in an operating theatre. The layout is designed so the practitioner can look up very easily, prior to any surgery, the chapter covering that particular anatomical subunit and see a list of all the different repairs used successfully in that area with written descriptions, associated images and accompanying short videos showing the planning and the procedure for each repair option.

The second edition offers the reader a number of significant improvements on the first edition. Multiple authors from a variety of countries have reviewed each original anatomical subunit repair option chapters and added, where appropriate, some new repairs, new images and new graphics. This gives the new edition a broader international perspective.

There are also two new chapters, one examining complication prevention and management and the other examining a multidisciplinary approach to managing cutaneous malignancy. These two chapters provide a greater depth of information related to preparation and planning prior to surgery, as well as how to manage postoperative difficulties if they arise. Much of the preparation and planning outlined is a guide to producing the best possible outcome for patients, and minimising the risk of complications.

The chapter on complications begins by describing both early and late complications and how to anticipate and avoid them, then goes on to describe in detail how to manage each specific problem if it does occur. This is essential knowledge for those who are starting out in dermatologic surgery. It also provides in detail the current standards of preparation and care for more experienced surgeons.

The chapter on the multidisciplinary approach to dermatologic surgery describes all the other specialised disciplines that may be required in managing difficult or complicated cutaneous neoplasia. The authors have provided clearly defined indications for considering involvement of Mohs surgery, radiation oncology, plastic and oculoplastic surgery and others. Generally, involvement of other disciplines in skin cancer management is best anticipated and arranged beforehand. However, sometimes difficulties can't be anticipated. It is therefore wise for the practitioner managing cutaneous malignancy to have strong relationships with members of these other disciplines to be able to call on their expertise at any stage during the management timeline to achieve the best possible outcome for the patient.

It is with great pleasure that I recommend the second edition of this text to you and I congratulate Associate Professor Duncan Stanford and Dr Leslie Storey for their efforts in successfully moulding the input of a large number of authors into a wonderful text that is a substantial improvement on its first edition.

Associate Professor Robert Paver
MBBS, FACD, FACMS

CONTENTS IN BRIEF

CONTENTS IN FULL

Legend
✦ Preferred option when a standard side-to-side closure is not possible
✦✦ Sometimes a side-to-side closure can still be used for a medium to large defect

CONTENTS IN FULL

CONTENTS IN FULL

CONTENTS IN FULL

PREFACE

THE AIM

It has now been over a decade since the publication of the first edition of *Dermatologic Surgery: A Manual of Defect Repair Options*. There remains a need for this style of 'how-to-do-it' manual for the busy clinician. The second edition is available in both print and ebook format. We continue the extensive use of diagrams and clinical images to supplement the many video demonstrations, to best illustrate the repair techniques described in the text.

It is clear from the sales of the first edition, and the feedback received, that our target audience is broader and more international than we had anticipated. To reflect this wider interest, new contributors from around the globe have taken on the role of reviewers, updating and improving the original chapters and bringing their collective wisdom and experience to this publication. Doctors Stanford and Storey have taken on an editorial role, while Associate Professor Paver has left us with his invaluable legacy from his involvement in the first edition (in particular, the video archive). We have sought to replace suboptimal images where possible and to add new clinical photos, diagrams and videos. More images have been included that demonstrate typical early results (e.g. at 6 to 8 weeks), and in some cases later outcomes (e.g. 3 months to a number of years). 'Follow-up' is a powerful tool for learning and improvement, in particular to understand how well the patient's expectations have been met as well as to deal with complications proactively.

The manual still assumes the reader has basic skills in cutaneous surgery. It remains focused on repairs that can be done under local anaesthesia. However, new repair options have been added to include those appearing in more recent journal publications, as well as those deemed useful and reliable by our now-larger group of contributors. Mohs defects remain an ideal teaching tool as they represent the closest approximation to the true size, shape and depth of the skin cancers we excise. In the end, the repair options apply to the *defect* that remains after the lesion, whether benign or malignant, is removed (hopefully completely and definitively). Mohs defects are often smaller than those resulting from complete excision using standard margins and this may allow for a simpler repair. Of course, they are at times considerably larger than anticipated and a great challenge for the reconstructive surgeon. This manual covers repair options for this broad range of defects we see in the Mohs unit and thereby, we hope, will help both the trainee getting started as well as the more experienced practitioner trying to expand their repertoire.

While the first edition was aimed primarily at surgical dermatologists, a new chapter discussing the multidisciplinary approach to management of skin lesions highlights the overlapping and specialised skills of other disciplines involved. This team effort, particularly in dealing with complex or advanced skin cancers, best ensures quality care that is individualised, timely and cost-effective. We hope there is something in this new edition that will help trainees and practitioners from all the disciplines performing dermatologic surgery. As in the first edition, key surgical risks and complications, where relevant to the various body regions, are highlighted at the start of each section or chapter. In this second edition, a standalone chapter, authored by Clinical Professor Shyamala Huilgol, is dedicated to this essential subject and covers, additionally, prevention and management aspects.

THE FORMAT

The manual is now divided into 10 sections. The new chapters are incorporated into Section 10 with the remaining 9 sections representing the various body regions. The nose, forehead and temple, perioral, cheek, ears and periocular sections are each further subdivided into chapters representing the cosmetic subunits of each region. The final sections cover the scalp, neck and mastoid, and trunk and limbs regions.

Each chapter starts with an overview and a list of the common repair options for that region or subunit. Preferred options are still indicated in that list to highlight repairs that are common and especially useful in that body region. Next, each repair option is discussed by listing advantages and disadvantages, followed by a stepwise description of the technique for each procedure. Practical tips are highlighted, and risks and complications are mentioned where relevant. The book is extensively illustrated with photos and diagrams. This is supplemented by over 100 concise video demonstrations with commentary in order to provide a 'bird's-eye view' of the key points of the procedure. It is intended to simulate looking over the shoulder of an experienced mentor. Although observing a procedure, then performing it with a mentor offering advice along the way, is certainly the best way to learn dermatologic surgery and a key part of specialist training programs, it is simply not possible for all the repair options covered in this book.

For this second edition, we have standardised the order of repairs across the book to maintain a more consistent systematic approach. Trainees may find it helpful to have this 'checklist' to structure their deliberations when determining the best repair for a defect to be managed. The following schema has been used: primary closure, second intention, flaps (advancement, rotation, transposition, island pedicle and interpolation), grafts (including full-thickness and split-thickness skin, cartilage and chondrocutaneous, and mucosa) and combined (unless covered as a subsection of a preceding repair). In addition, we have opted to avoid space-consuming repetition by cross-referencing to other sections where the repair has already been covered. Although this is unlikely to concern users of the ebook who can use a hyperlink to the cross-referenced page, print edition readers may need some page turning to find the relevant page.

We hope you find the additions and improvements in this second edition helpful and the new format user-friendly.

The editors

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We would like to acknowledge The Skin Hospital, Westmead (previously known as the Skin & Cancer Foundation Australia) for the training opportunities we both received. In fact, it was the venue that brought us all together. The Mohs Surgery Unit has provided training for many of Australia's current Mohs surgeons and has an enormous database that has generated benchmarking statistics for the benefit of the international dermatologic and Mohs surgery community.

Thank you to the new contributors who have reviewed the chapters in this edition and shared their experience and insight with the editors to improve the quality of this publication. Thanks also to those who have provided clinical images; you are acknowledged in the relevant figures in this text.

The team at McGraw Hill has once again been extraordinary in their industry and professionalism. Special thanks go to Rochelle Deighton, Martina Vascotto and Leanne Peters for seeing this project through. Our appreciation also goes to Caroline Hunter, Diane Gee-Clough and Apeksha Rao for their help along the way. We are also grateful to illustrators Chris Welch (first edition) and Alan Laver (second edition) for their brilliant diagrams that clarify the sometimes difficult design concepts behind many of these repairs that we discuss.

Finally, it is hard to adequately thank our families for their love and support over the last 2 years as they have had to share us with our computers! To Lucie, Amelie and Eloise Stanford as well as to Wes, Bella, Calvin and Talia Threlkeld—our deepest love and gratitude.

Duncan Stanford & Leslie Storey

CHAPTER 2

NASAL ALA

Edward Upjohn

The nasal ala is a common location for skin cancers but is a difficult area to reconstruct. Ideally, closures should be confined to the ala and not cross over cosmetic boundaries. If the defect is near the alar crease, a closure that places the sutures in the alar crease is optimal. If the defect is small and shallow, secondary intention may be used. Larger defects within the alar cosmetic unit may be closed with a full-thickness skin graft. If the defect is at or near the alar rim, the scar may contract and ultimately lead to alar rim elevation. In this case, a composite graft may be considered in order to provide a framework of cartilage to preserve the alar rim contour.

Full-thickness defects must be closed in a manner which prevents significant distortion of the nasal contour and minimises any nasal obstruction. Repair of a full-thickness defect needs to be considered in three distinct layers—mucosa, cartilaginous support structure and skin. For some defects a composite graft or a nasolabial turnover hinge flap (Spear flap) is able to reconstruct all three layers with one repair. In general, composite grafts are used for smaller, full-thickness defects (less than 1 cm in diameter). Spear flaps work quite well for defects in which the alar base has been lost. Other closures may combine mucosal repairs and support structure repair with skin flaps, such as a nasolabial transposition flap or interpolation flap.

Potential adverse outcomes to consider when repairing defects in this site include alar rim elevation, contour deformity, decreased nostril patency and reduced air flow. Alar notching or retraction can occur if tension on this free margin is not considered.

An important complication from the repair of some nasal defects is internal nasal deformity, which may lead to nasal valve insufficiency.[1] This occurs when the closure is tight and leads to internal puckering. It is a difficult deformity to treat. Intralesional steroids, injected percutaneously or intranasally, may be attempted to soften the area. If the deformity is severe, the patient may need to be referred to an ear, nose and throat surgeon for internal revision of the problem. This possible outcome should always be mentioned to patients prior to the surgery as a potential problem. Preventive measures at the time of surgery include the use of suspension sutures and cartilage grafts.

REPAIR OPTIONS:

NASAL ALA REPAIRS FOR PARTIAL-THICKNESS DEFECTS

- Side-to-side closure
- Second intention
- Spiral rotation flap
- Transposition flaps
  - Rhombic
  - Bilobed (medially or laterally based)
  - Tri- (or multi-) lobed (usually laterally based)
  - Nasolabial (Zitelli variation)
    - Turnover variant
- Island pedicle flaps
  - Subcutaneous (and reversed variant)
  - Myocutaneous (nasalis-based)
  - Transposed
  - Shark
- Two-stage nasolabial interpolation flap
- Full-thickness skin graft

NASAL ALA REPAIRS FOR FULL-THICKNESS DEFECTS

- Nasolabial turnover island pedicle (Spear) flap
  - Tunnelled (Kearney) variant
- Composite graft
- Combined procedure—mucosa, cartilage and skin

Preferred options when standard side-to-side closure is not possible

NASAL ALA REPAIRS FOR PARTIAL-THICKNESS DEFECTS

SIDE-TO-SIDE CLOSURE

ADVANTAGES

- Simple repair
- Minimum scar

DISADVANTAGES

- Only useful for quite small defects
- Can produce buckling inside the nostril

TECHNIQUE

1. Side-to-side closures on the ala need to be oriented perpendicularly to the nearest edge of the ala to prevent any contour deformity.
2. Using the scalpel, undermine the surrounding skin to allow it to slide without indenting or causing buckling inside the nostril.
3. After haemostasis is achieved, insert an absorbable suture to close the defect.
4. Insert the superficial sutures.

Courtesy of Clin A/Prof Duncan Stanford

Figure 2.1 Side-to-side closure for an alar defect. Note: the orientation is perpendicular to the adjacent alar rim. **A** Mohs defect. **B** Postop. **C** At 6 weeks.

SECOND INTENTION

ADVANTAGES

- Ideal for defects confined to the alar crease or groove
- No extra surgery or suturing required
- Scarring confined to defect area
- Will decrease in size by contracting approximately 30%

DISADVANTAGES

- Best for shallow defects
- Daily open wound care for approximately 4 to 6 weeks
- Scar may be a different colour from surrounding skin or form an indentation or puckering
- Contraction of free margins a risk

TECHNIQUE

Partial side-to-side closure with an absorbable guiding suture reduces the risk of alar rim retraction (see Fig. 2.3). Further, it allows repair of somewhat larger or deeper defects and those extending further from the alar groove. Consider aiming to create a very slight outward pucker of the alar rim that will correct with wound contraction. Occasionally, this will not resolve if the pucker size is misjudged (but can be revised).

1. After the wound has been cleansed and haemostasis achieved, apply antibiotic or plain ointment to the wound. Do not leave any form of haemostatic bandage (gel foam or calcium alginates) on the wound.
2. Apply a non-stick dressing with a gentle pressure dressing on top for the first 24 to 48 hours.
3. After this, the patient is instructed to cleanse the wound twice daily and apply petrolatum with or without a dressing.
4. A wound check 1 week postoperatively should be offered to all patients; otherwise follow up approximately 6 weeks postoperatively.
5. Hydrocolloid dressings can be used after 1 to 2 weeks to accelerate the healing and improve the appearance for the patient. Stop if overgranulation occurs.

Courtesy of Dr Chris Kearney

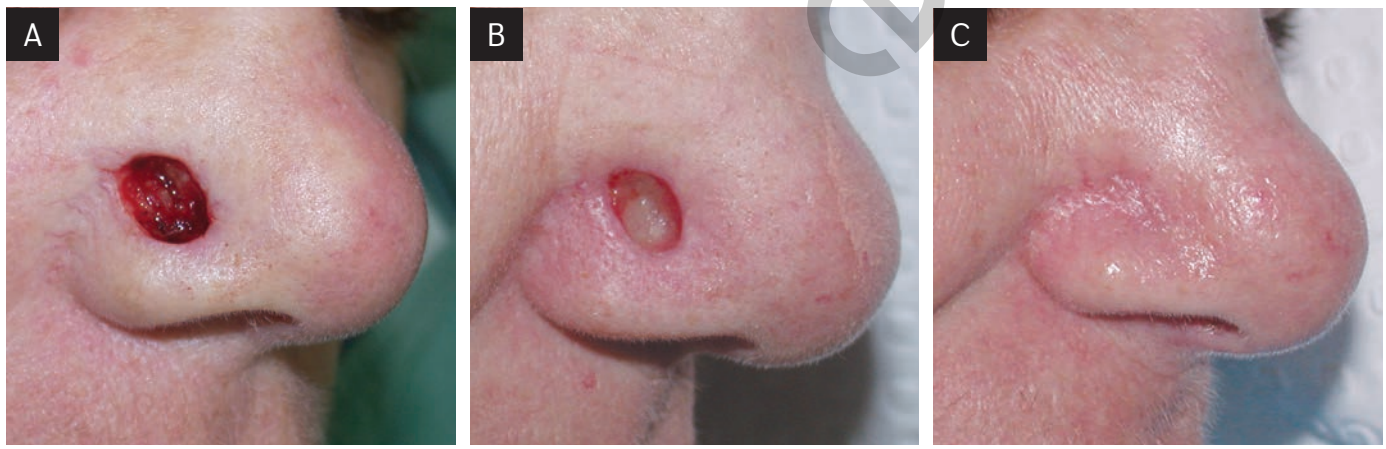


Figure 2.2 Alar crease second intention healing. **A** Mohs defect. **B** At 2 weeks. **C** At 2 months.

continued

SECOND INTENTION *continued*

Courtesy of Clin A/Prof Duncan Stanford

Figure 2.3 Second intention for alar defect. Note: the more linear scar in the alar groove at 2 years follow-up may improve cosmetic outcome. **A** Mohs defect before. **B** After the guiding suture to prevent alar rim notch. **C** At 2 years.

SPIRAL ROTATION FLAP[2,3]

ADVANTAGES

- Minimal wastage of donor skin (Burow's triangles)
- Curvilinear design mimics the curvature and convexities of the ala nasi
- Single-stage repair
- Good colour and texture match
- Robust vascular supply

DISADVANTAGES

- Risk of alar lift and nasal valve dysfunction if poorly planned or executed
- Risk of trapdoor appearance

TECHNIQUE

1. For smaller defects, the flap may be designed within the alar subunit; for larger defects, it may extend onto the nasal side wall.
2. The flap is designed either as an Archimedean or logarithmic (nautilus-type) spiral. The advantage of the logarithmic spiral is a broader vascular pedicle.
3. The spiral usually originates from the inferior border of the surgical defect. It then extends anteriorly parallel to the ala and then arches superiorly and then posteriorly.
4. The alar groove should be recreated by the advancing edge of the flap as it folds over onto itself.
5. The primary sutures should begin the spiralling process by suturing the advancing edge of the flap back onto its proximal base.

Courtesy of Dr Edward Upjohn

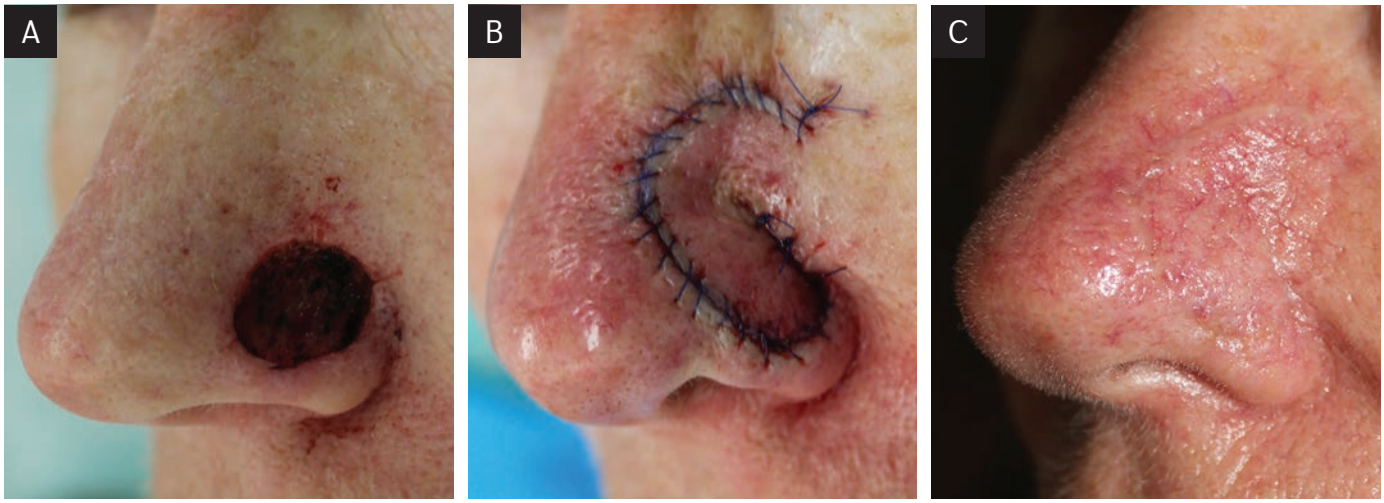


Figure 2.4 Spiral rotation flap preserving the alar groove. **A** Mohs defect. **B** Postop. **C** At 6 weeks.

TRANSPOSITION FLAPS

RHOMBIC TRANSPOSITION FLAP

SEE VIDEO | RHOMBIC TRANSPOSITION FLAP

See p. 69 for description of technique.

BILOBED TRANSPOSITION FLAP

SEE VIDEO | BILOBED TRANSPOSITION FLAP (VERTICAL)

ADVANTAGES

- Able to utilise redundant skin from the upper nasal sidewall or cheek
- May avoid blunting the alar groove
- Good skin match

DISADVANTAGES

- Extra scarlines
- Can obscure the alar groove, particularly with laterally based flaps
- Prone to trapdoor deformity

TECHNIQUE

1 Determine which direction to draw the flap (medially based or laterally based). Medially based flaps tend to be used for defects on the lateral aspects of the ala (Fig. 2.5), while laterally based flaps tend to be used for the defects on the alar rim and anterior to the alar crease (Fig. 2.6).

2 The flap is performed in the same manner as described on pp. 11–13. For defects close to the alar rim where rim elevation is a concern, the vertically oriented variation of the flap is a good option also described on p. 13. (See Fig. 2.6).

continued

TRANSPOSITION FLAPS *continued*

Courtesy of Clin A/Prof Duncan Stanford

Figure 2.5 A medially based bilobed flap with horizontal orientation for a defect positioned more laterally on the ala. **A** Mohs defect. **B** Postop. **C** At 8 months (after intralesional corticosteroid to lower lobe pincushioning).

Courtesy of Clin A/Prof Duncan Stanford

Figure 2.6 Laterally based bilobed flap with vertical orientation for defect on the medial ala. **A** Mohs defect. **B** Postop. **C** At 6 weeks.

TRILOBED AND MULTILOBED TRANSPOSITION FLAPS

ADVANTAGES

- Useful for defects that involve the alar rim
- Most often used for medial alar defects (and therefore usually laterally based)
- A larger, often multilobed, flap can gain extra reach to wrap around the nasal sill or even onto the soft triangle
- As with a bilobed flap, the curvilinear scar can 'hide in plain sight'

DISADVANTAGES

- Prone to pincushioning
- Lateral alar defects are more easily repaired with a nasolabial transposition flap

TECHNIQUE

See pp. 14–15 for description of technique.

Courtesy of Clin A/Prof Duncan Stanford

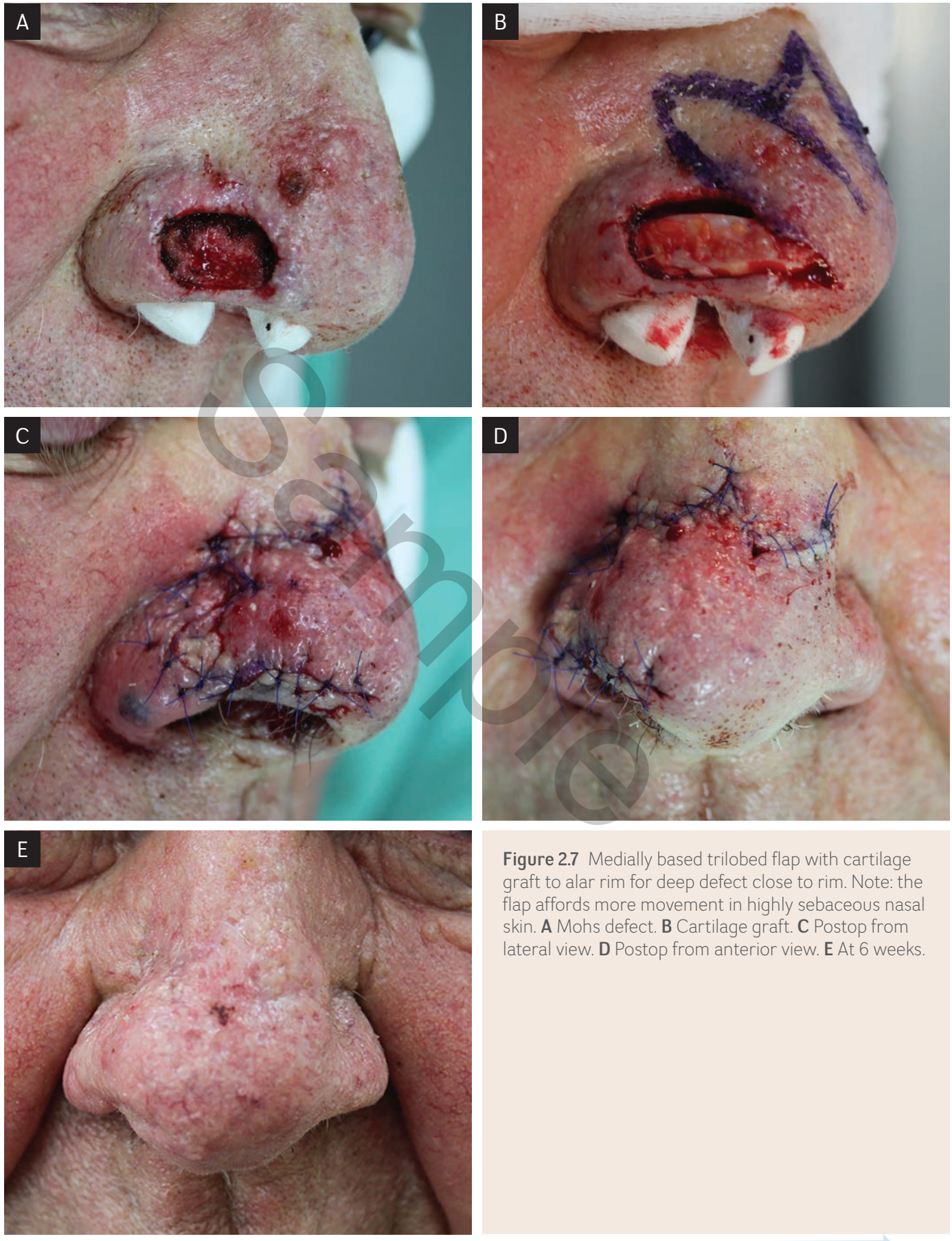


Figure 2.7 Medially based trilobed flap with cartilage graft to alar rim for deep defect close to rim. Note: the flap affords more movement in highly sebaceous nasal skin. **A** Mohs defect. **B** Cartilage graft. **C** Postop from lateral view. **D** Postop from anterior view. **E** At 6 weeks.

continued

TRANSPOSITION FLAPS *continued*

NASOLABIAL TRANSPOSITION FLAP (ZITELLI VARIATION)[4]

SEE VIDEO | NASOLABIAL TRANSPOSITION FLAP

ADVANTAGES

- Able to utilise redundant skin from the cheek
- Good skin match
- Turnover variant is a useful single-stage repair for full-thickness rim defects (see Fig. 2.10); the thickness of two layers of flap skin is usually rigid enough to avoid needing cartilage support

DISADVANTAGES

- Can obscure the alar groove
- Trapdoor deformity may occur

TECHNIQUE (See Fig. 2.8)

1. From the alar base, draw a line inferiorly along the nasolabial fold.
2. Measure the width of the alar defect. Then measure the same distance laterally onto the cheek from the nasolabial fold at the level of the centre of the defect.
3. From this point, draw a line down to intersect the nasolabial fold at an angle of 30 degrees.
4. Draw a triangle on the lateral sidewall of the nose above the alar defect with a 30-degree angle at its apex and the alar defect at its base. Removing this standing cone of skin redundancy will allow the flap to move into place as it advances from the cheek into the defect.
5. Anaesthetise and incise the flap (including the standing cone of skin). Thin the flap to the desired thickness. Be cautious not to compromise the blood supply to the flap.
6. Place an absorbable suture up into the dermis from the subcutaneous side and 5 to 10 mm back from the advancing edge to pull the cheek medially onto the nasofacial sulcus. This is done first to allow for easy access.
7. Place an absorbable suture from the lateral alar base to the cheek, closing the secondary defect along the nasolabial fold. Now place a buried suture to close the flap on the sidewall of the nose. Now that everything is sitting in position, another buried suture can be placed to pex the flap to the base of the defect, recreating the alar crease. It should be oriented parallel to the long axis of the flap to reduce constriction of the blood supply. Caution must be used to avoid excessive blanching of the flap. If this occurs, remove the buried suture.
8. Place some absorbable sutures to close the donor site along the nasolabial fold and the remainder of the flap except for the tip.
9. If necessary, trim the flap to fit into place.
10. Insert the superficial sutures.

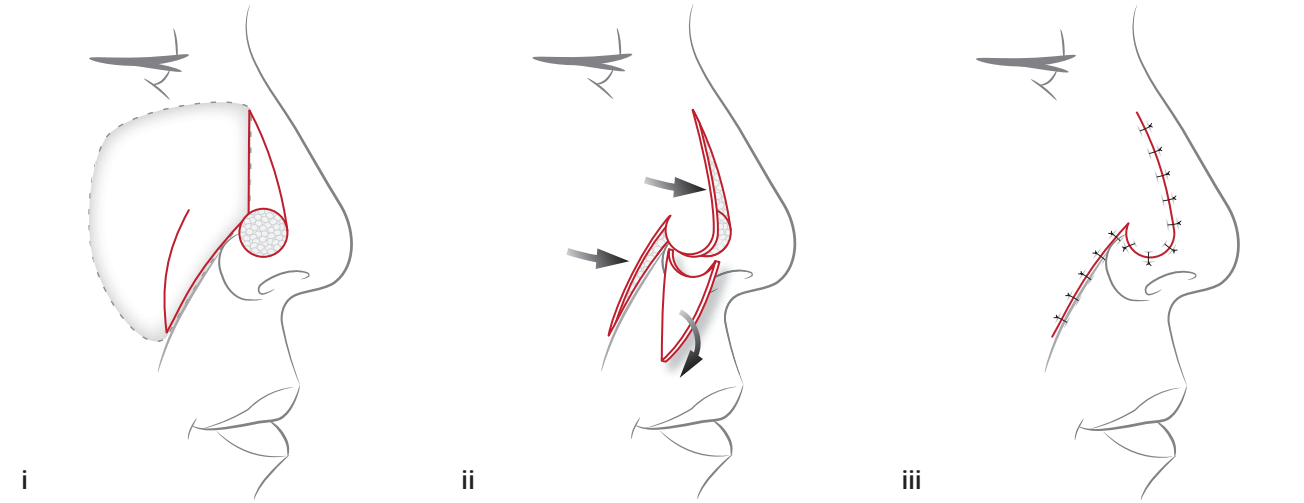


Figure 2.8 The nasolabial transposition flap for nasal sidewall or alar defects

Courtesy of Clin A/Prof Duncan Stanford

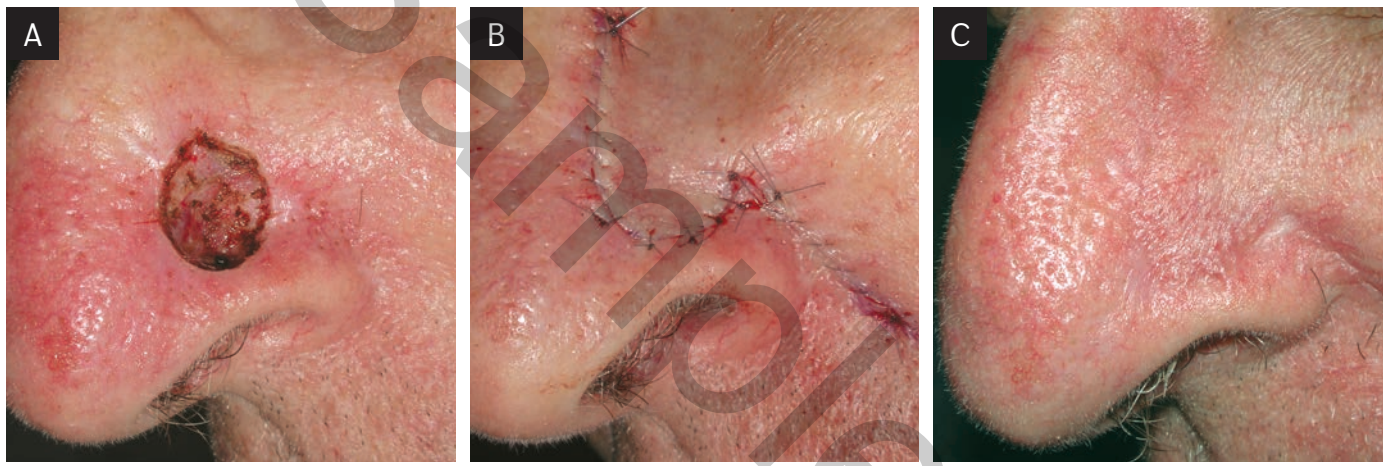


Figure 2.9 Nasolabial transposition flap. **A** Mohs defect. **B** Postop. **C** At 2 months.

Courtesy of Clin A/Prof Duncan Stanford

Figure 2.10 Nasolabial transposition flap with turnover to repair full-thickness alar rim loss in single stage. **A** Mohs defect. **B** Postop. **C** At 3 months.

ISLAND PEDICLE FLAPS

SUBCUTANEOUS ISLAND PEDICLE FLAP

ADVANTAGES

- The closure remains within the alar subunit
- A portion of the island pedicle can be hidden in the alar crease

DISADVANTAGES

- Only appropriate for smaller, deep defects
- Possibility of alar rim elevation or narrowing of the nasal vestibule

TECHNIQUE

1 Draw the island pedicle with a slight curvature. One side of the flap should be drawn in the alar crease.

This intra-alar design is usually drawn with the flap extending out laterally from a medial alar defect (Fig. 2.11). However, a reversed variant is useful to repair more lateral defects, in particular those that are taller than they are wide (Fig. 2.12).

2 Incise the flap and undermine around the flap. Tease the flap loose by using the surgical scissors perpendicular to the incision lines.

3 Place one absorbable suture to pull the flap across the defect. Place a few absorbable sutures around the flap.

4 Place the remaining superficial sutures around the periphery of the flap. Sutures are removed 5 to 7 days postoperatively.

Courtesy of A/Prof Leslie Storey

Figure 2.11 Intra-alar subcutaneous island pedicle flap. **A** Mohs defect. **B** Postop. **C** At 2 months.

Courtesy of Dr Edward Upjohn

Figure 2.12 Reversed intra-alar subcutaneous island pedicle flap. **A** Mohs defect and design. **B** Postop. **C** At 3 months.

MYOCUTANEOUS ISLAND PEDICLE FLAP

Unilateral myocutaneous island pedicle flaps can be very useful for nasal alar defects, especially anteriorly towards the nasal tip.

Refer to the technique described for a myocutaneous flap on pp. 18–20.

Courtesy of Clin A/Prof Duncan Stanford

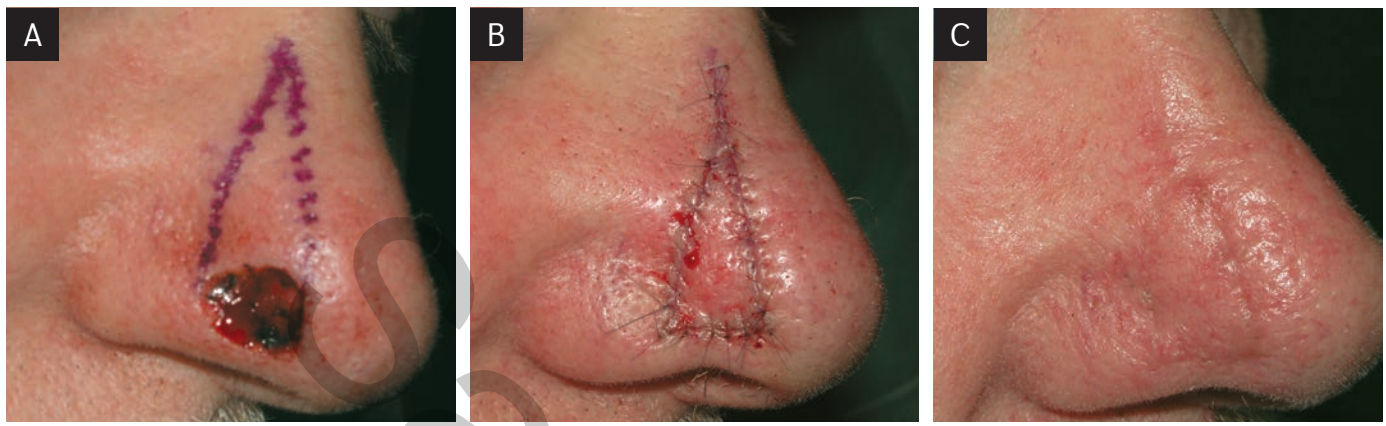


Figure 2.13 Unilateral myocutaneous island pedicle flap for an anterior nasal alar defect. **A** Mohs defect. **B** Postop. **C** At 6 weeks.

TRANSPOSED ISLAND PEDICLE FLAP[5]

SEE VIDEO | TRANSPOSED ISLAND PEDICLE FLAP

ADVANTAGES

- Very versatile flap for deep defects on the lateral and dorsal regions of the nose
- Single-stage procedure
- Good tissue match

DISADVANTAGES

- Trapdoor deformity may occur
- Contour fullness at the buried pedicle site

TECHNIQUE

1. Draw the flap down the nasolabial fold in a design similar to a nasolabial transposition flap.
2. The superior end of the flap, however, extends like an ellipse up the nasofacial sulcus, forming an elliptical island which touches the lateral edge of the alar defect.
3. After anaesthesia, incise the flap and undermine the surrounding skin in a superficial plane.
4. Now undermine the distal three-quarters of the flap in a superficial plane, at approximately one-quarter of the way from the proximal end. At this point the undermining dives deeply to the muscle plane, and superiorly under the skin and fat lateral to the nasofacial sulcus, forming the subcutaneous fat and muscle pedicle. Loosen the pedicle all around so that it can swing like a pendulum arm. The defect may need to be enlarged and deepened at the lateral edge to accommodate the pedicle.
5. After haemostasis is achieved, swing the flap through 45 to 90 degrees to sit in the defect.

continued

ISLAND PEDICLE FLAPS *continued*

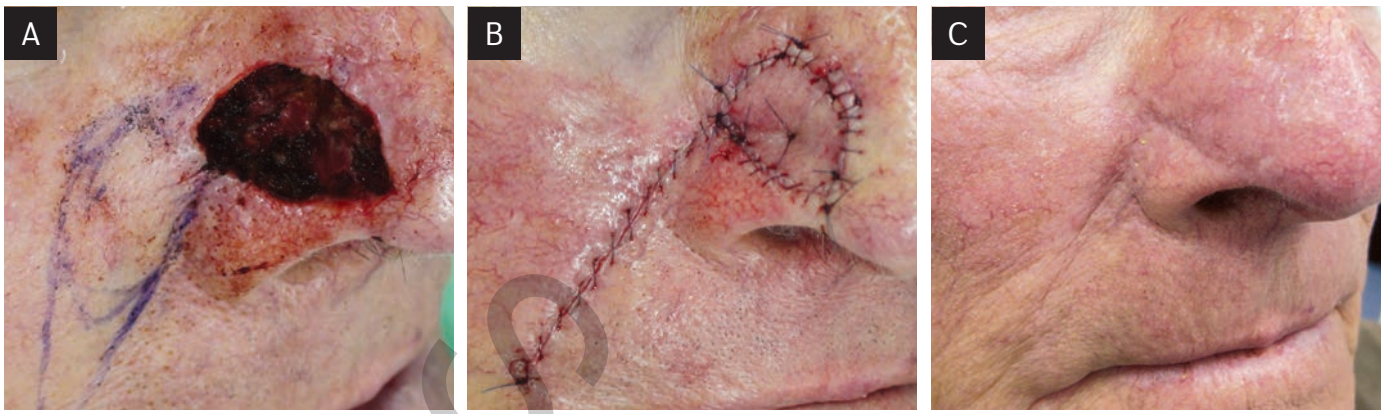
6 Close the donor area along the nasolabial fold and nasofacial sulcus with absorbable sutures using the 'rule of halves' principle.

7 Place a pexing suture through the flap into the base of the defect to recreate the alar crease.

8 Place absorbable sutures around the flap.

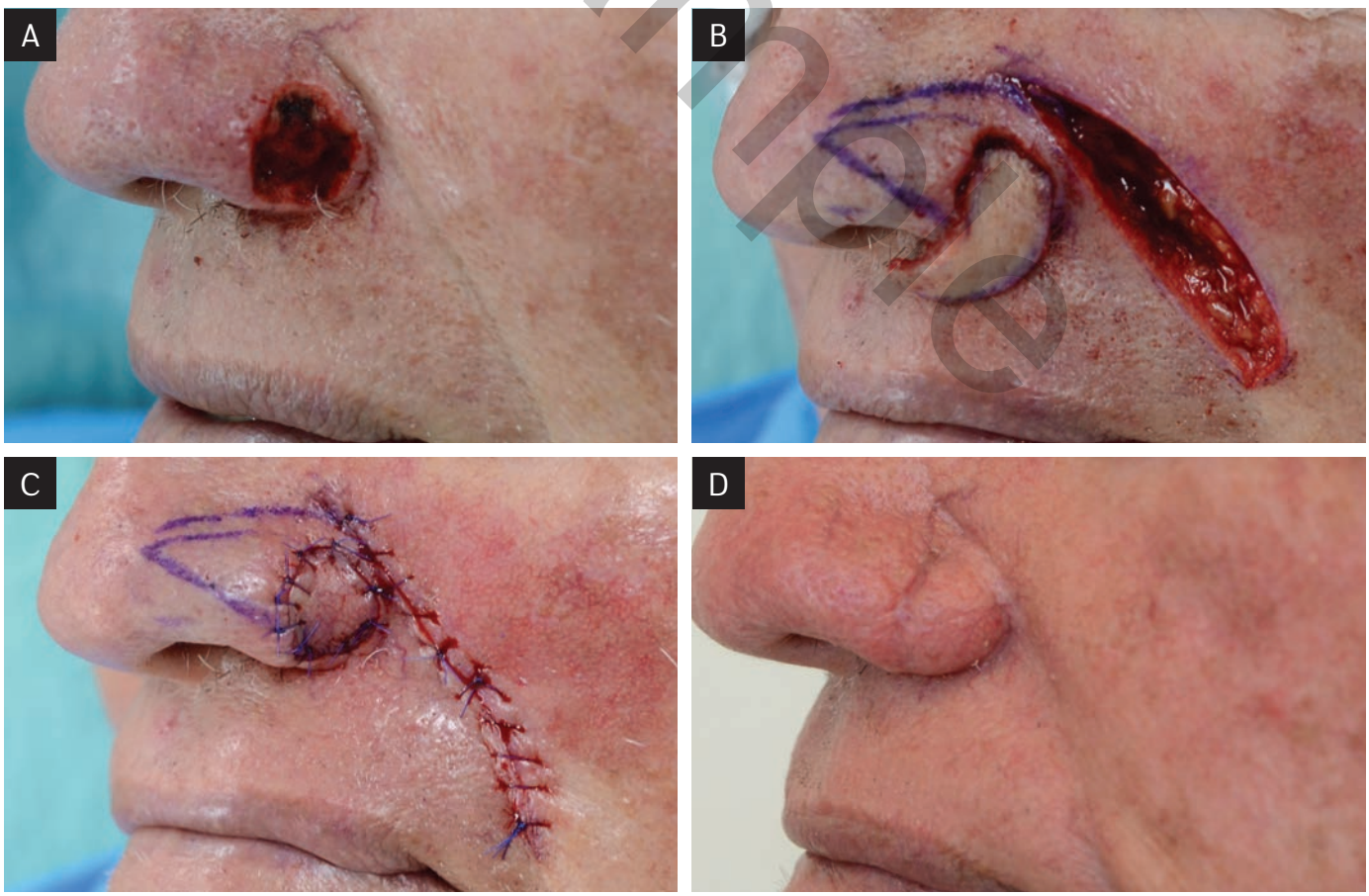
9 Insert the superficial sutures.

A tunnelled variant shown in Fig. 2.15 will preserve the alar groove when it is still intact after excision of the lesion.



Courtesy of A/Prof Robert Paver

Figure 2.14 Transposed island pedicle flap for large alar defect extending across the alar groove. **A** Mohs defect. **B** Postop. **C** At 6 weeks.



Courtesy of Dr Gilberto Moreno Bonilla

Figure 2.15 Tunnelled variant of transposed island pedicle flap to preserve the alar groove. **A** Mohs defect. **B** Intraop. **C** Postop. **D** At 2 months.

SHARK ISLAND PEDICLE FLAP[6]

SEE VIDEO | SHARK ISLAND PEDICLE FLAP

ADVANTAGES

- Closes deep defects occupying the ala
- Recreates the lateral alar cosmetic boundary

DISADVANTAGES

- Technically difficult
- Possible shark nose tip necrosis
- Pincushioning can be quite marked

TECHNIQUE

1 Draw the flap by measuring the width of the defect from the lateral alar sulcus to the medial edge of the wound. This area will become the width of the 'shark's snout'. The 'body of the shark' extends down the cheek with the inferior portion of the island pedicle. Draw the medial edge of the flap on the nasolabial fold.

2 Incise the flap. Undermine carefully in order to preserve the musculature at the base of the pedicle on the snout area.

3 The first deep suture pulls the back of the shark up to the nasofacial sulcus, allowing the 'head' and 'snout' to drape down into the defect. The second deep suture pulls the shark's snout down to the inferior border of the defect.

4 Sew the remainder of the flap into place using superficial interrupted or continuous suturing.

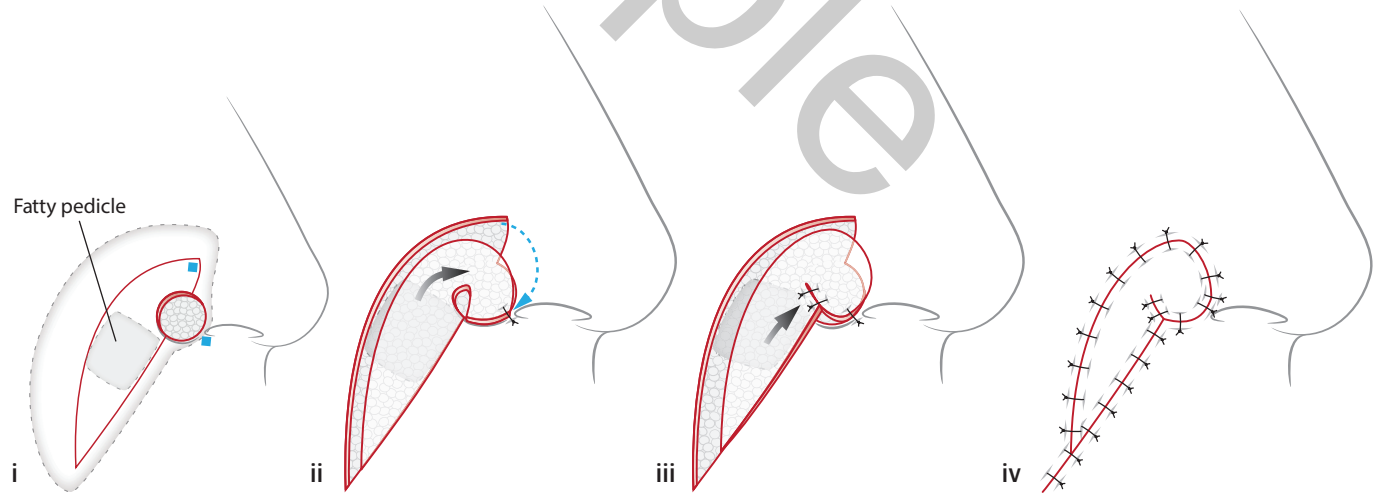


Figure 2.16 Shark island pedicle flap design

continued

ISLAND PEDICLE FLAPS *continued*

Courtesy of Clin A/Prof Duncan Stanford

Figure 2.17 Shark island pedicle flap for a nasal alar defect. The shark's mouth closes to recreate the lateral alar groove. **A** Mohs defect. **B** Postop. **C** At 6 months.

TWO-STAGE NASOLABIAL INTERPOLATION FLAP

SEE VIDEO | 2-STAGE NASOLABIAL INTERPOLATION FLAP

Two-stage flaps for the nasal ala are typically from the nasolabial fold or the paramedian forehead. Paramedian flaps are reserved for larger defects encompassing more than the ala. Nasolabial flaps are random pattern transposition flaps with blood supply from branches of the facial and angular arteries that perforate the levator labii muscle.

ADVANTAGES

- Suitable for closure of large, deep defects
- Skin colour match good
- Can reconstruct some full-thickness loss
- Can be placed over bare cartilage

DISADVANTAGES

- Two-stage procedure
- Wound dressing daily
- Prone to pincushioning requiring debulking at second stage

TECHNIQUE—STAGE 1

1. Create a template of the defect. Consider enlarging the defect to encompass the entire alar subunit if the defect is already quite large. The contralateral ala can be used as a guide for the template if required.
2. Using a ruler or gauze square to measure how far the flap must travel, mark the template on the cheek. The superior border of the template will sit on the nasolabial fold and the inferior border of the template sits lateral to the fold. This will then rotate when the flap turns through 90 degrees to sit on the nasal ala. The flap must be long enough to reach the defect without tension on the vascular pedicle, and wide enough to cover the defect.
3. The skin and subcutaneous portion of the flap remain intact to increase the blood supply to the flap.
4. Thin the distal portion of the flap and transpose it into the defect.
5. Suture the flap into place using non-absorbable sutures. The cheek donor area is repaired as a layered closure with absorbable interrupted sutures and superficial sutures. The pedicle is wrapped with petrolatum-impregnated gauze. Alternatively, a bismuth-impregnated gauze can be used to reduce bacterial growth and odour. The sutures are removed after 5 to 7 days.

Courtesy of Clin A/Prof Duncan Stanford

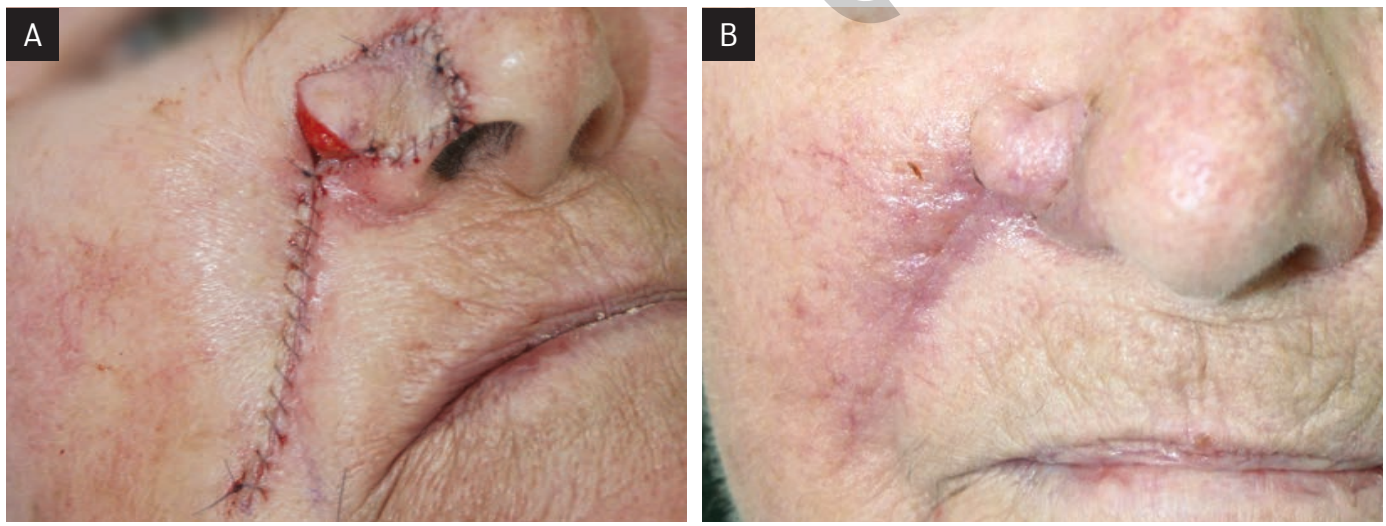


Figure 2.18 **A** A two-stage nasolabial interpolation flap is sutured into position. **B** After 3 weeks, prior to the second-stage revision.

continued

TWO-STAGE NASOLABIAL INTERPOLATION FLAP *continued*

TECHNIQUE—STAGE 2

The pedicle is divided at 2 to 4 weeks after the first stage.

1 Amputate the redundant component of the flap. Thin and trim the remaining flap to recreate the alar contour and suture with non-absorbable sutures.

2 The cheek portion is usually closed by amputating the pedicle entirely and closing the resultant defect side to side. Reinserting the pedicle into the donor area and trimming to fit is another, less frequently used option.

3 All sutures are removed at 5 to 7 days postoperatively.

Courtesy of Clin A/Prof Duncan Stanford

Figure 2.19 **A** Immediately after the second stage. **B** At 6 months.

FULL-THICKNESS SKIN GRAFT[7]

SEE VIDEO | BUROW'S FULL-THICKNESS SKIN GRAFT WITH CHEEK ADVANCEMENT FLAP

Full-thickness skin grafts without (Fig. 2.20) or with cartilage (Fig. 2.21) are common and useful closures in this site. Grafts can cover any size or shape of defect without distorting the contour of the ala. This is particularly important when dealing with defects at or near the alar rim.

ADVANTAGES

- Reasonable contour can be maintained
- Able to repair small or large defects

DISADVANTAGES

- Two wounds (donor site and defect)
- Risk of contraction with rim elevation
- Colour and texture variation

TECHNIQUE

1 Evaluate the defect. If the defect is deep or is showing exposed cartilage, a muscle hinge flap can be used to cover the cartilage. This will improve graft 'take' and cosmesis.[8]
   a Extend the cutaneous incision line superiorly to expose the muscle.
   b Incise the muscle on the superior, lateral and medial edges leaving the inferior margin intact (the source of blood supply).
   c Flip the flap over and down so the superior edge now becomes the inferior edge.
   d Suture the flap into place with absorbable sutures. The donor location is closed primarily.

2 Make a template of the defect with either foil (from the suture wrapper) or a non-stick dressing.

3 Choose a donor site by evaluating skin match from either pre- or postauricular, conchal bowl, glabella or nasolabial areas.
   - Preauricular skin is often similar but may, in some people, have more photoaging changes than the nose and may not be a good match. Many elderly patients have ample skin laxity in this area to provide donor skin.
   - Postauricular skin often has a good match for the nose, has tissue laxity and the scar hides well.
   - The conchal bowl has a sebaceous nature which is an ideal match for nasal defects. However, donor sites in this area are often left to heal by second intention, which takes time and may cause some discomfort.
   - Nasolabial fold or glabellar skin can also be a very good match. However, the scar will be on the face, although it usually disappears well into a fold or rhytid.

4 With a marking pen outline the template on the skin in the chosen area then draw an ellipse around the template. After the area has been anaesthetised, the authors prefer to perforate the graft multiple times with a 19 gauge needle while still in situ to improve graft take. Excise the ellipse of skin. Place it in sterile saline while the donor site is sutured.

5 Defat the graft and cut around the template marking.

6 Suture the graft into place with 5-0 superficial sutures. Tie-over sutures can be placed around the graft edge or are placed outside the graft on the normal alar skin.

7 Some surgeons like to use pexing sutures within the graft to tie the graft to the recipient bed, thereby avoiding a tie-over dressing.

Courtesy of Clin A/Prof Duncan Stanford

Figure 2.20 Full-thickness skin graft on the nasal ala from ipsilateral nasolabial donor showing good tissue match and preservation of the alar groove. **A** Mohs defect. **B** Postop. **C** At 3 months.

continued

FULL-THICKNESS SKIN GRAFT *continued*

Courtesy of Clin A/Prof Duncan Stanford

Figure 2.21 Chondrocutaneous graft on the nasal ala from ipsilateral helical crus with island pedicle flap repair to donor site. Note: for this deep defect, the cartilage prevents graft contraction and notching; however, it also repairs full-thickness alar rim defects. **A** Mohs defect abutting alar rim. Postop for **B** graft and **C** donor site. Follow up at 8 weeks for **D** graft and **E** donor site.

NASAL ALA REPAIRS FOR FULL-THICKNESS DEFECTS

NASOLABIAL TURNOVER ISLAND PEDICLE (SPEAR) FLAP[8]

SEE VIDEO 1 | SPEAR FLAP **AND VIDEO 2** | SPEAR FLAP WITH FULL-THICKNESS SKIN GRAFT

ADVANTAGES

- Allows for full-thickness reconstruction of the ala and is especially useful when there has been loss of the alar base and some of the perialar skin
- Large defects can be repaired depending on the age of the patient and amount of tissue laxity
- Single-stage procedure

DISADVANTAGES

- Difficult to design and perform
- May result in a bulky ala requiring a surgical revision at a later date
- Will lead to some change of the nasal alar contour

TECHNIQUE (See Fig. 2.22)

1 Outline the flap with the medial edge commencing at the lateral border of the defect and running down the nasolabial fold. The lateral edge of the flap will be drawn so that the width of the flap will be equal to the horizontal measurement of the widest portion of the defect. The length of the flap will need to be at least twice the vertical measurement of the defect (mucosal defect plus alar defect). Note: the superior end of the flap will be at a horizontal level equal to the superior edge of the mucosal defect. The lower end of the flap will be the full length of the flap as described previously (mucosal defect length plus cutaneous defect length) tapered at a 30-degree angle down to the nasolabial fold. Make a template based on the contralateral ala and place *upside down* on the cheek lateral to the nasolabial fold.

2 Incise the flap through the dermis and 2 to 3 mm into the underlying fat. The tenotomy scissors can be placed in the flap incision lines and opened perpendicular to tease the wound edge and fat open, increasing the mobility of the flap. A significant amount of teasing and trimming is required to produce a narrow and deep muscle and fatty pedicle. This pedicle inserts into the proximal one-quarter to one-fifth of the flap which will turn over to form the nasal lining (roll over medially into the defect). The distal three-quarters of the flap will be released from its underlying fat so it can turn over superiorly on itself and reconstruct the cutaneous nasal defect.

3 The proximal end of the flap skin (12 o'clock) is trimmed to the size of the mucosal defect. Remember the proximal end will turn over 180 degrees and fit into the mucosal defect so the proximal flap skin forms the nasal lining of the defect.

4 Suture the mucosal aspect first with an interrupted absorbable suture starting at the lateral edge. Some surgeons prefer to use the fast-absorbing gut or synthetic (e.g. Monosyn Quick®, Vicryl Rapide®) suture.

5 Carefully trim the flap and pedicle to allow the flap to fold up onto itself and fill the entire cutaneous component of the defect.

6 Place a key superficial suture at the point where the flap will fold on itself to recreate the alar rim at the medial end of the defect closest to the soft triangle.

7 Insert a deep suture to pull the donor site closed along the nasolabial fold. This suture also helps to stretch open the nostril.

8 Place a surface suture where the lateral flap is turned over on itself, recreating the lateral alar rim and forming a new alar base. This point is sutured to the advancing cheek. The area of the flap which was previously the 6 o'clock tip is now sitting on the remaining cutaneous alar defect and is partially covering the nasal sidewall.

continued

NASOLABIAL TURNOVER ISLAND PEDICLE (SPEAR) FLAP *continued*

9 Trim this part of the flap to fit the surface defect and suture into place.

10 Suture the entire wound with superficial sutures.

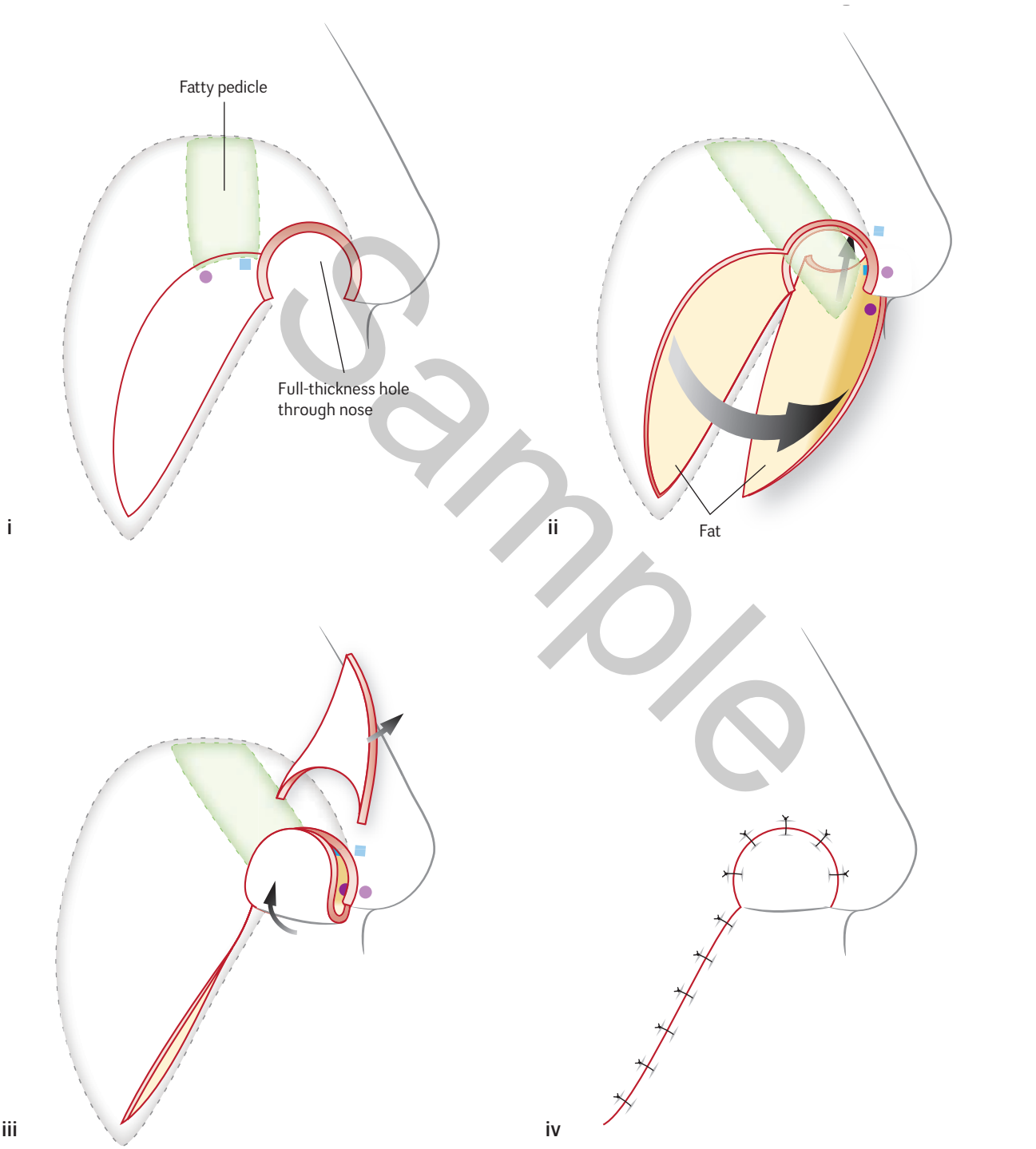


Figure 2.22 Spear flap design

Courtesy of A/Prof Leslie Storey

Figure 2.23 Spear flap for a full-thickness defect of the nasal ala. **A** Mohs defect. **B** Postop. **C** At 6 weeks.

continued

TUNNELLED (KEARNEY) VARIANT OF THE SPEAR FLAP[9]

In cases where the alar base is intact but a full-thickness defect of the remaining ala requires repair, this flap can be tunnelled from its origins lateral to the ala and nasofacial sulcus to the alar defect beneath the nasal sidewall and upper ala.

Courtesy of Dr Chris Kearney

Figure 2.24 A tunnelled Spear flap (Kearney variant) may be used when the alar base is still present. **A** Full-thickness Mohs defect. **B** Flap tunnelled under alar base. **C** Postop. **D** At 3 months.

The flap is pulled through the 'tunnel' and the pedicle remains intact beneath the skin on the nasal sidewall. This tunnelled pedicle flap is very time consuming and technically quite difficult to manoeuvre into place. The pedicle is very thin and care must be taken when pulling the flap into place through the tunnel, so that the blood supply is not compromised by the tension or compression. There is bulkiness in the area of the pedicle under the nasal sidewall which will partly settle with time but may need surgical revision or some intralesional steroids.

COMPOSITE GRAFT[7]

SEE VIDEO | COMPOSITE GRAFT

ADVANTAGES

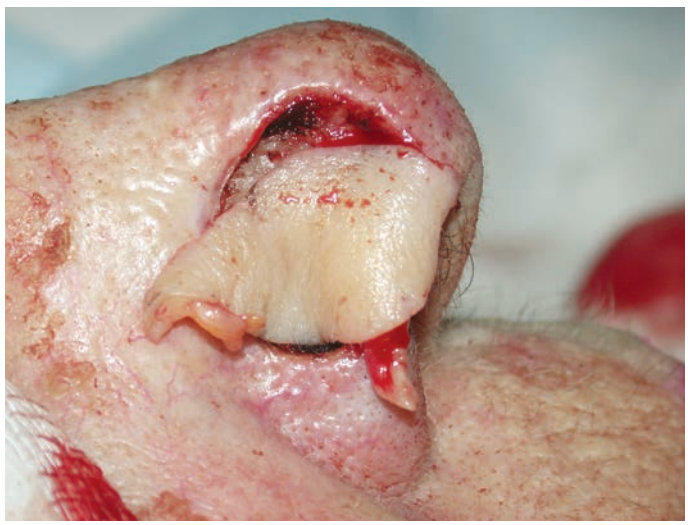
- Allows for reconstruction of full-thickness defects on the alar rim
- Avoids the need for complex, two-stage flap repairs
- Recreates the alar contour
- Maintains patency of the nostril

DISADVANTAGES

- Size limitation (not suitable for rim defects larger than about 1 cm in diameter)
- Higher risk of partial or complete graft necrosis compared to a standard full-thickness skin graft on a well-vascularised bed
- Patient discomfort due to nasal packing (until sutures removed)

TECHNIQUE

1. Make a template and mark out the template at the donor site.
   - The donor site is typically from the helical crus on the ipsilateral ear.
   - If a wider area of cartilage is needed, the conchal bowl may be used.
2. Anaesthetise the donor site. Incise the graft and cartilage.
3. The cutaneous component of the donor site needs to match the defect size on both the internal and external sides of the defect. The cartilaginous component, however, needs to be 2 to 3 mm longer than the skin component on each end. These cartilaginous pegs will slot into small incisions made in each side of the defect to hold the composite graft in place.
4. Close the donor site either primarily along the helical crus or with an appropriate flap repair. If a primary closure is performed along the helical crus it should be very long to minimise the risk of chondrodermatitis at the tips of the ellipse.
5. At the medial and lateral edges of the alar defect, create small pockets into which the cartilage will sit. A stab incision with the scalpel tip is effective.
6. Suture the mucosal surface in place first, then suture the cartilage into the small pockets using absorbable sutures.
7. Suture the skin surface with 5-0 non-absorbable sutures.
8. Pack the nostril with petrolatum- or antibacterial-impregnated gauze. This will give pressure to the graft and stability for the outside pressure dressing. The pressure dressing and nasal packing should remain intact for up to 7 days until the sutures are removed.



Courtesy of Clin A/Prof Duncan Stanford

Figure 2.25 Cartilage batten used to provide structure to the alar rim (in this case as part of a composite graft). One end of the batten has been inserted into the edge of the defect at the soft triangle. The other will then be inserted into a pocket on the alar side of the defect. The skin can then be trimmed and sutured into position.

COMBINED PROCEDURE—MUCOSA, CARTILAGE AND SKIN

Where a single procedure is not possible, a combined procedure addressing specific closure options for each of the three layers on the ala—the mucosal layer, the cartilaginous support structure and the skin—is necessary.

MUCOSAL LAYER

The mucosal lining of the nose is a thin, highly vascular layer. It is relatively immobile due to its tight adherence to the cartilage and bones which lie directly beneath it. Only small mucosal defects (less than 5 mm) can be closed with a side-to-side closure. Other mucosal repair options include advancement flap, cutaneous turnover flap, full-thickness skin graft, split-thickness skin graft, composite grafts or a septal mucosal graft. Septal mucosal grafts are difficult to perform under local anaesthetic and without special instrumentation, and are not included in our list of options.

- Side-to-side mucosal repairs are adequate for small defects less than 5 mm.
- For mucosal defects on the rim of the ala, a bipedicle mucosal advancement flap from immediately above the defect can be brought down (bucket-handle style) and the donor area higher up in the nostril left to heal by second intention.
- Second intention healing is also reasonable for small defects or for the donor area higher up in the nostril at the site of origin of the mucosal bipedicle advancement flap.
- Composite grafts from the ear can be used to line mucosal defects and provide cartilaginous structural support with one procedure. This is best when the mucosal defect and cartilage requirement is reasonably small but the cutaneous defect is quite large (see Figs 2.21 and 2.29).
- Split-thickness skin grafts are sometimes used for mucosal loss on the ala and lateral side of the nasal vestibule when thinner skin is required for the mucosal repair.
- Full-thickness skin grafts are best for mucosal defects on the nasal sill and posterior nasal vestibule, extending up from the upper lip (see Fig. 2.26).
- For some mucosal defects, especially those where the alar rim is still intact and the mucosal defect is above the rim, a myocutaneous hinged flap can be used. This flap involves harvesting skin from immediately above the cutaneous defect on the nasal sidewall (similar to a triangular-shaped island pedicle flap). The entire flap is undermined leaving a thin muscular pedicle along the inferior border of the triangle. The flap is then mobilised enough to be flipped down through 180 degrees so the skin is now facing into the nostril and pulled down to cover the mucosal defect. The flap is then trimmed and sutured into position with absorbable sutures.

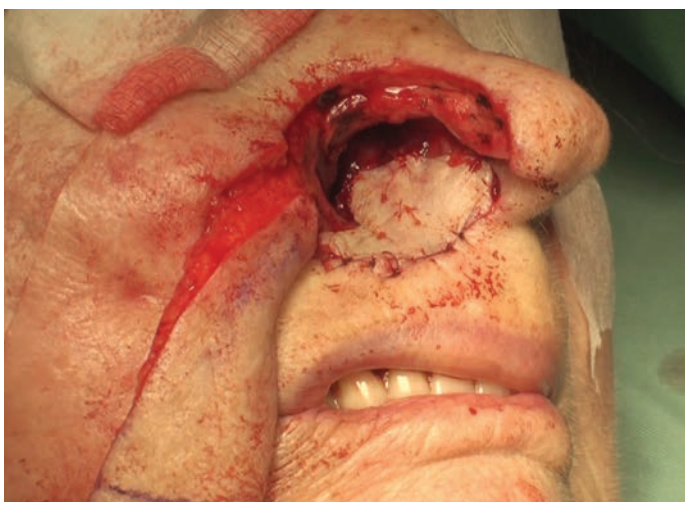


Figure 2.26 A full-thickness skin graft is used to line the defect on the medial and posterior nasal vestibule while a Spear flap will be used to repair the nasal ala. (See video Spear flap with full-thickness skin graft, p. 50)

Courtesy of A/Prof Robert Paver

CARTILAGE LAYER

Cartilage can be harvested from the ipsilateral helical crus or the conchal bowl.

- The helical crus is suitable if a strip of cartilage is required for the alar rim. The donor area can be closed with a long, curving side-to-side closure or a flap, such as an island pedicle flap, or advancement from the preauricular area (see Figs 2.21 and 2.27).
- If more cartilage is required for the sidewall or tip reconstruction then the ipsilateral conchal bowl is an ideal donor site (see Fig. 2.28). A large amount of cartilage can be harvested without producing any noticeable contour change to the ear. The cartilage is exposed by making a large U-shaped incision around the conchal bowl, leaving the skin attached along its medial border. The skin is then turned back on itself and the cartilage can be harvested as required leaving the perichondrium intact on the cartilage. The cartilage is placed in normal saline and the skin is placed back into position over the cartilage defect and sutured into position (see Fig. 2.28C). A pack should be placed into the conchal bowl to gently press the flap down onto the underlying bed. The cartilage with intact perichondrium is then trimmed into appropriate shapes.
- Templates made out of foil or cardboard suture packaging can sometimes be useful to replicate the exact shape and size of cartilage required. This may involve a thin batten for alar rim support or a larger plate for nasal sidewall support.
- The cartilage is tacked into place with absorbable monofilament sutures. In the case of the alar batten, the two ends of the batten should be inserted into small pockets created at either end of the defect (see Fig. 2.26). Therefore, the batten needs to be long enough to allow for insertion into these pockets. The length can be determined by replicating the contralateral nostril size as seen from below.

Courtesy of A/Prof Robert Paver

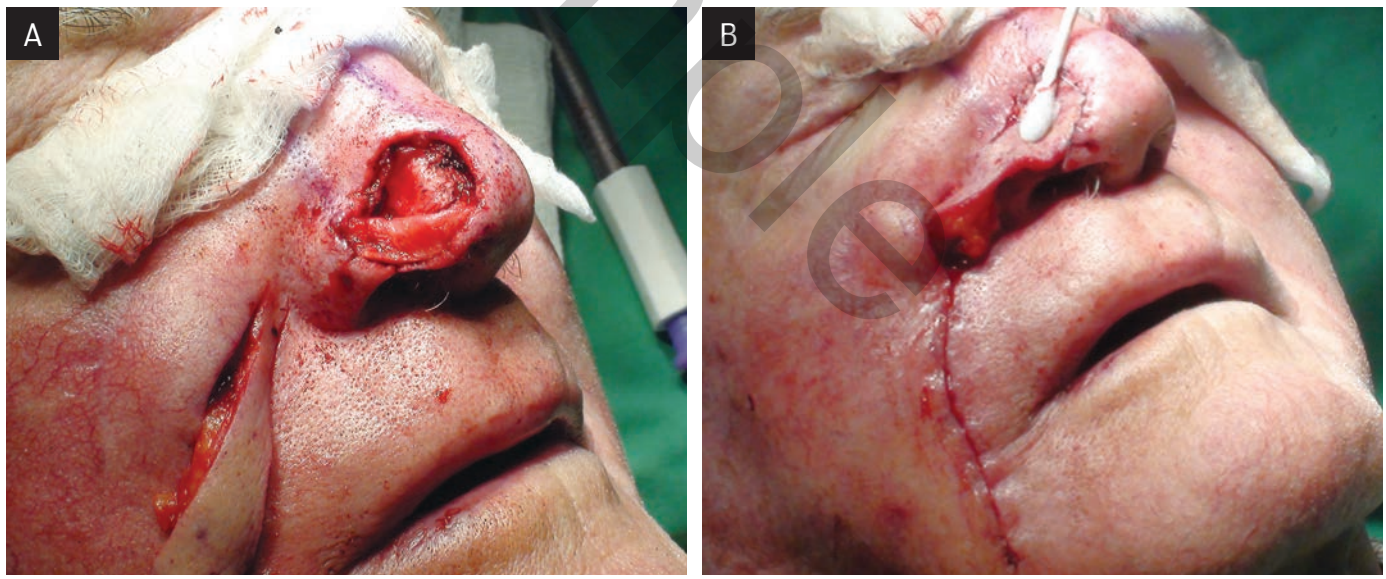
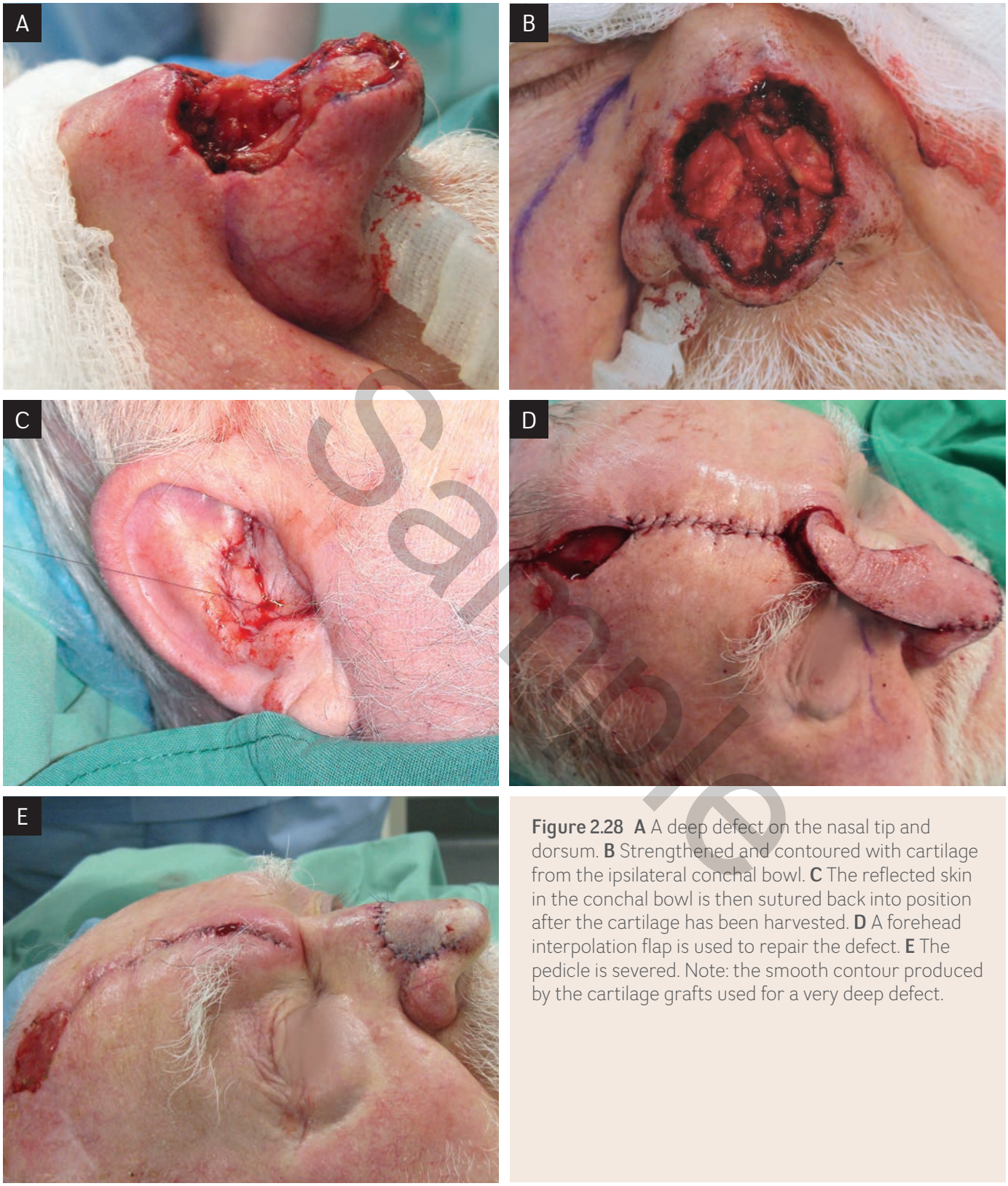


Figure 2.27 A strip of cartilage from the ipsilateral helical crus is used to strengthen the helical rim prior to an interpolation flap from the nasolabial fold. **A** Intraop. **B**. Postop.

continued

COMBINED PROCEDURE—MUCOSA, CARTILAGE AND SKIN *continued*



Courtesy of A/Prof Robert Paver

Figure 2.28 **A** A deep defect on the nasal tip and dorsum. **B** Strengthened and contoured with cartilage from the ipsilateral conchal bowl. **C** The reflected skin in the conchal bowl is then sutured back into position after the cartilage has been harvested. **D** A forehead interpolation flap is used to repair the defect. **E** The pedicle is severed. Note: the smooth contour produced by the cartilage grafts used for a very deep defect.

SKIN

The cutaneous defect will now need to be repaired by a flap to provide the blood supply to the underlying cartilage and mucosal lining. The main flaps used for this purpose are two-stage interpolation flaps from the forehead (see Fig. 2.28) or the cheek (see Fig. 2.29). Other random pattern flaps used for nasal repairs can be used to repair smaller defects.

Courtesy of A/Prof Robert Paver

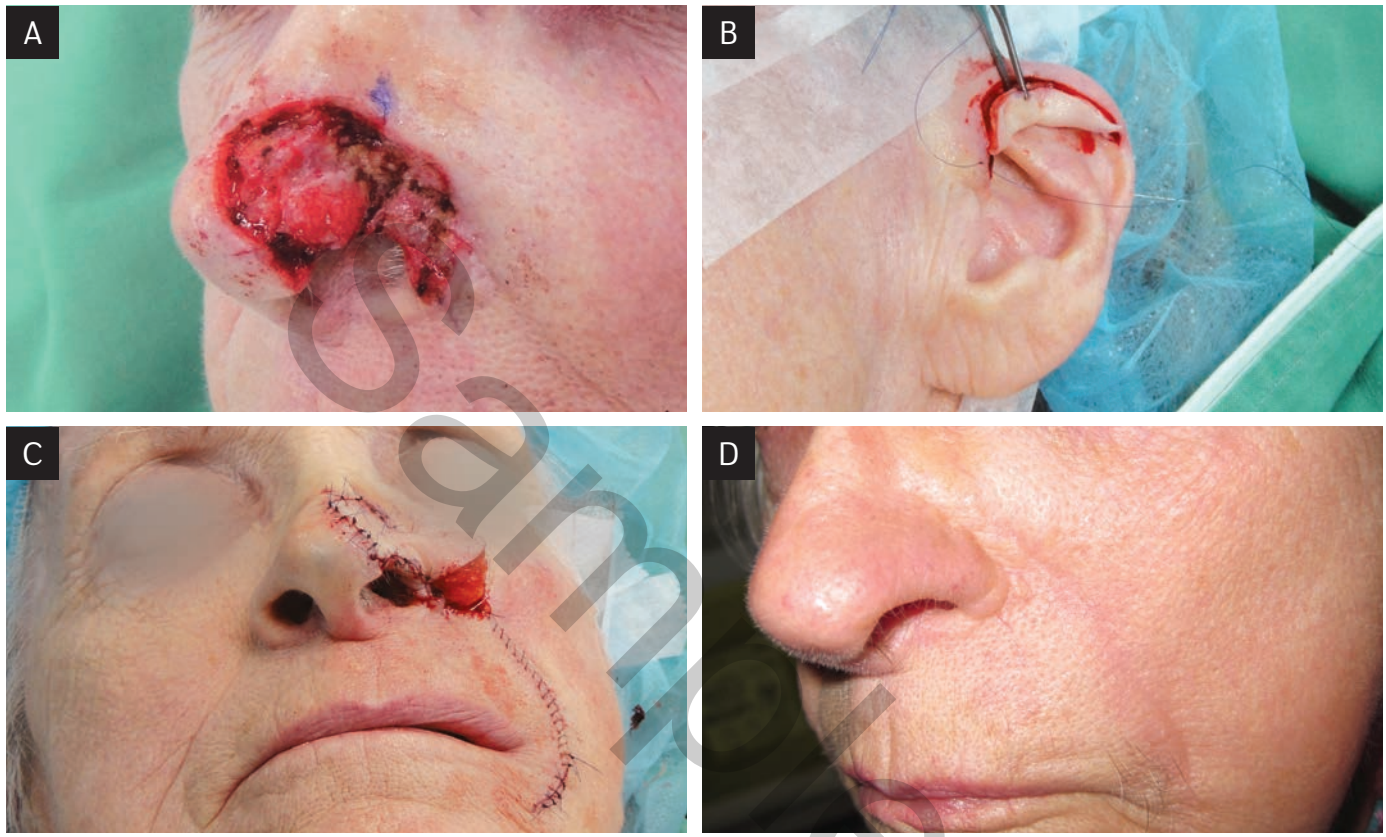


Figure 2.29 **A** A large cutaneous defect with a full-thickness loss of the alar rim. **B** The full-thickness alar rim defect is repaired with an inverted chondrocutaneous composite graft from the ipsilateral helical crus with the cartilaginous strut inserted into pockets in the soft triangle and alar base to bridge open the nostril. **C** Nasolabial interpolation flap is used to cover and nourish the composite graft and cover the cutaneous defect. **D** The contour of the ala after 3 months is well maintained.

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See also Chapter 1, p. 30.

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