



In the last century all kinds of biological and nonbiological materials were used for augmentation of the nasal dorsum and to correct tip deformities. Nonbiological implants have a high risk of local infection and extrusion of the implant, compared to biological grafts. Although the common use of new biocompatible synthetic materials (teflon, mersilene, goretex, etc) give very good results in other parts of the body, this is not so for the nose due to its vulnerability for trauma inducing an antigenic reaction in the tissue surrounding the implant. Allogeneic (homologous) and xenogeneic (heterologous) materials still have some extended resorption of the graft. Up until now, autogenous (autogeneic, autologous) material has always been regarded as the graft material of choice in nasal surgery, despite the additional harvesting procedure. In most cases there is a preference for autogenous cartilage over bone, because of the lack of flexibility of bone and its tendency to be resorbed.

Autogenous graft materials

As autogenous graft material for the nose, one can use single or composite grafts:

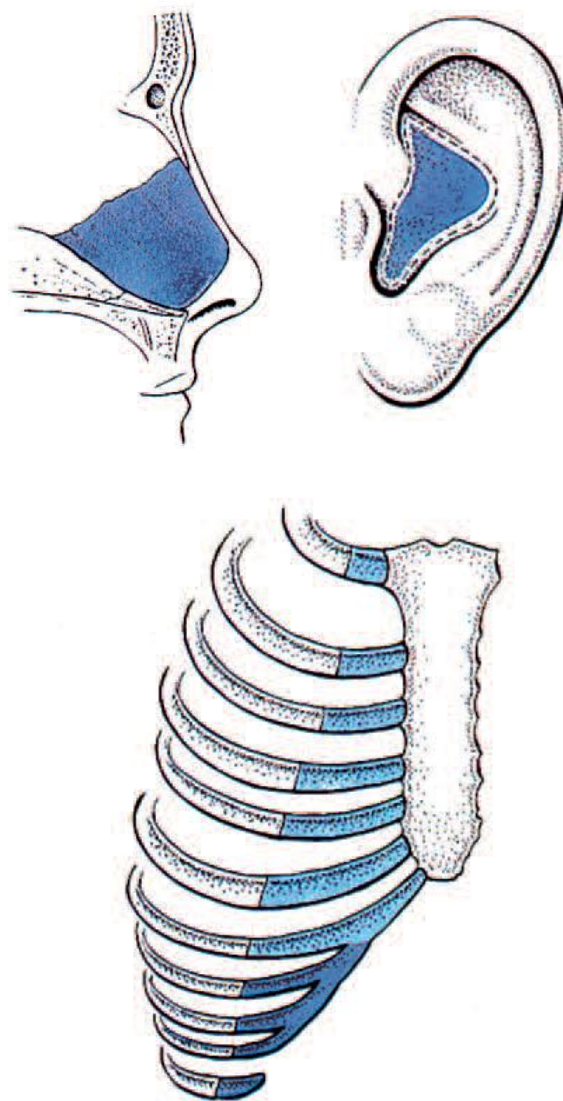
<i>Single grafts</i>	<i>Composite grafts</i>
Cartilage	Double layer graft (skin, cartilage)
Bone	Triple layer graft (skin, cartilage, skin)
Skin	

Donor sites

Most donor sites for autogenous grafts are easily accessible during nasal surgery. There are, however, two exceptions: costal cartilage and iliac crest bone.

The most frequently used donor sites are:

- For cartilage (*Figure 1a,b,c*)
 - Nasal septum
 - Auricle
 - Costal cartilage
- For bone (*Figure 2*)
 - Iliac crest
 - Cranium
- Full skin & composite grafts (*Figure 3*)
 - Auricle



Figures 1a,b,c: Donor sites for autogenous cartilage grafts – dark blue areas

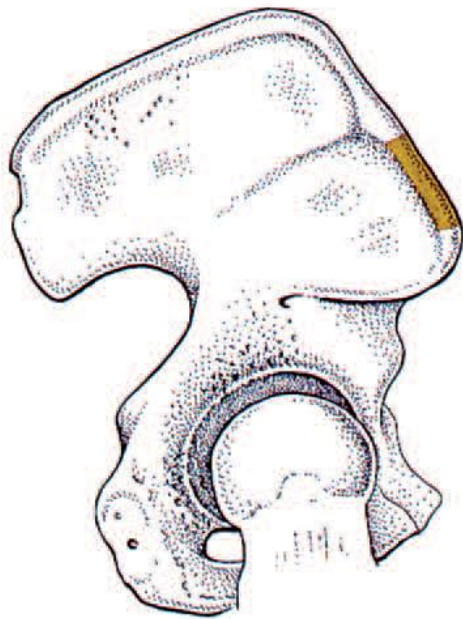


Figure 2: Iliac crest with brown area as donor site for bone

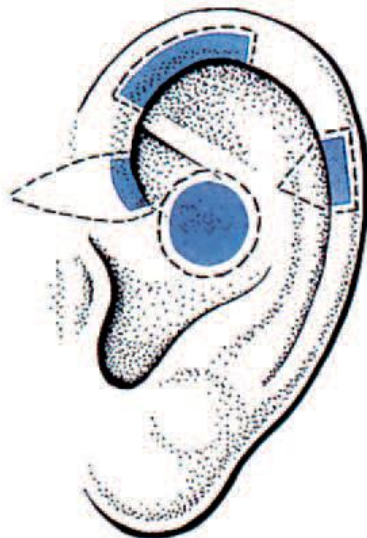


Figure 3: Different areas of the auricle for harvesting composite grafts

Recipient sites

The recipient site for bone is usually confined to the dorsum. Single full thickness skin grafts have a tendency to retract and are therefore only suitable for small skin defects over the cartilaginous and bony nasal skeleton. Double and triple layer composite grafts are indicated for defects with tissue loss of the tip, ala or columella.

Autogenous cartilage is generally used in most recipient sites. The main recipient sites for grafts in nasal surgery are the:

- radix
- septum
- nasal dorsum
- nasal side wall
- nasal tip
- ala
- columella
- nasolabial groove

Indications

Radix

Changing the horizontal and vertical positions of the deepest depression of the root of the nose using a small cartilaginous graft, will result in lengthening of the nose and diminishing an apparent over-projection of the nasal tip (*Figures 4a,b*).

Septum

The choice of graft for augmentation of the nasal dorsum depends on the aetiology and extent of the correction needed. Postoperative sagging of the cartilaginous dorsum after septal surgery is best treated with rebuilding or repositioning of the cartilaginous septum (*Figures 5a,b*). For rebuilding the septum, autogenous cartilage from the posterior portion of the septum (if still available), conchal cartilage or costal cartilage (less accessible) is suitable. In case of a septal abscess with excessive loss of septal cartilage, immediate rebuilding with autogenous costal cartilage or allogeneic 'bank' cartilage is indicated to prevent saddling and, with a growing child, additional mid-facial growth disturbances.

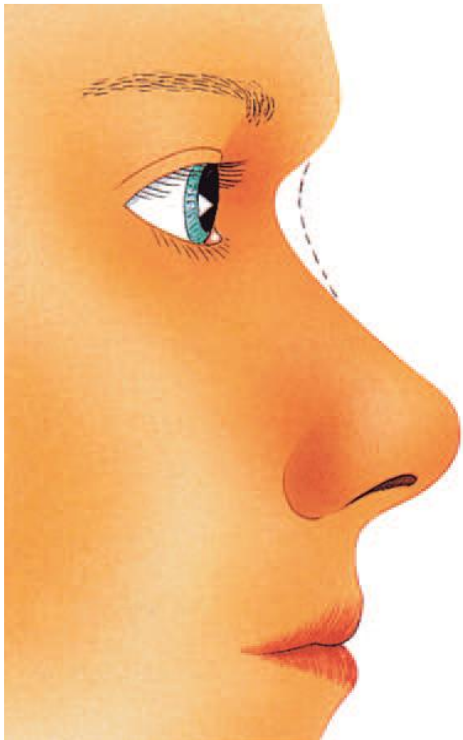


Figure 4a: A too deep nasofrontal groove resulting in an apparent overprojection of the nose



Figure 5a: Sagging of the cartilaginous dorsum, diminished tip support and retraction of the columella due to overresection of the caudal part of the septum



Figure 4b: Autogenous cartilage graft (blue striped area) to lengthen the nose and to correct the apparent overprojection

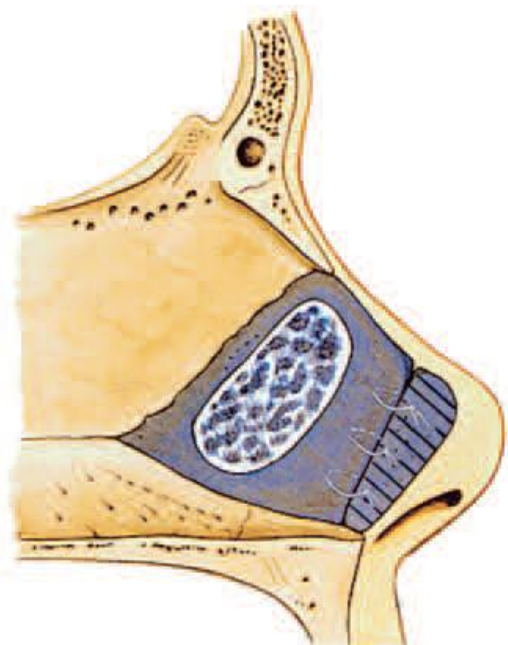


Figure 5b: Rebuilding the septum with autogenous septal cartilage (blue striped area). Reimplantation of crushed left-over cartilage in the donor site to prevent a septal perforation

Dorsum

In a saddle nose caused by a too low cartilaginous dorsum with normal tip support, a cartilaginous septal or conchal graft is appropriate (Figures 6a,b).

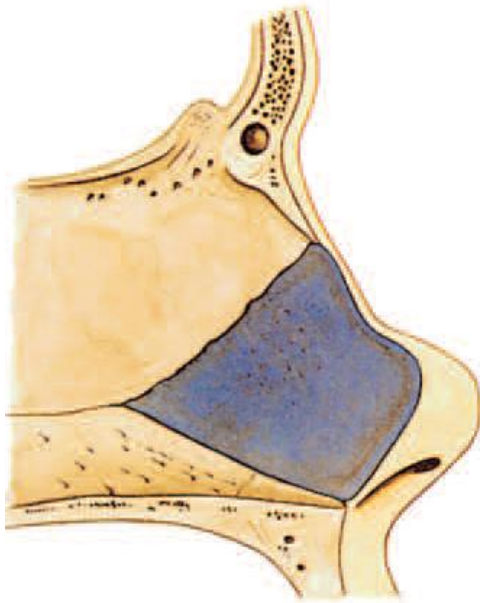


Figure 6a: Saddle nose caused by a too low cartilaginous dorsum with normal tip support



Figure 6b: Autogenous septal or conchal cartilage (blue striped area) to rebuild a sagging cartilaginous dorsum

A nose with severe saddling involving the whole osseocartilaginous vault could be a good candidate for a bone graft (Figures 7a,b).



Figure 7a: Severe saddling involving the whole osseocartilaginous vault

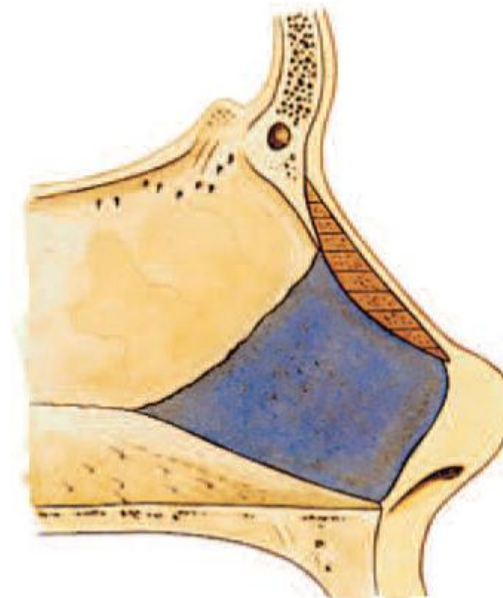


Figure 7b: Autogenous bone graft – brown striped area – to augment the nasal (bony and cartilaginous) dorsum

Due to the tendency of iliac crest bone to be resorbed, cranial bone or costal cartilage grafts are now more popular. When this se-

vere saddling is combined with loss of tip support, a (two piece) costal cartilage graft is very suitable (Figures 8a,b).

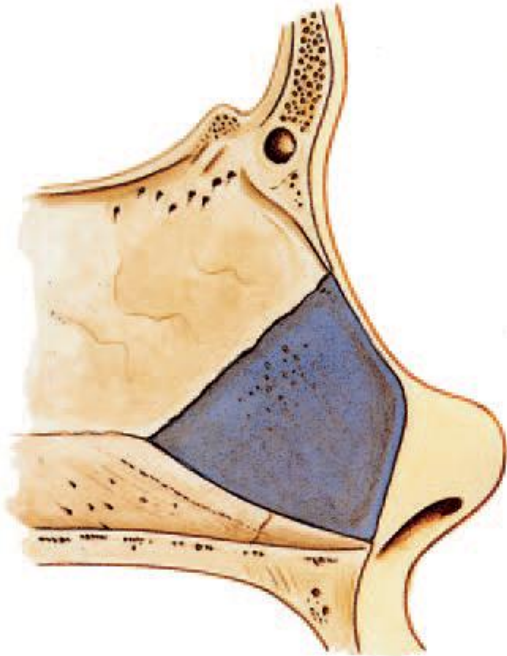


Figure 8a: A combination of severe saddling and diminished tip support

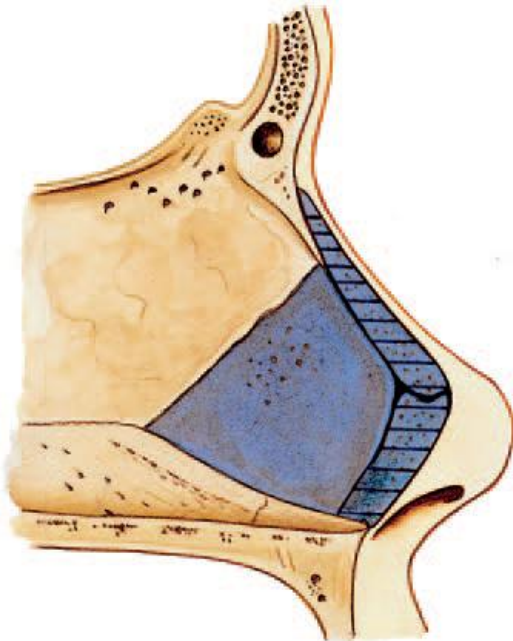


Figure 8b: A two-piece autogenous costal cartilage graft (blue striped areas) to reconstruct the normal projection of the nose

Nasal side wall

Mid-nose collapse due to excessive resection of the upper lateral cartilage or avulsion of the upper lateral cartilage from the nasal bone (K-area) can be treated with a septal cartilage graft (Figures 9a,b).

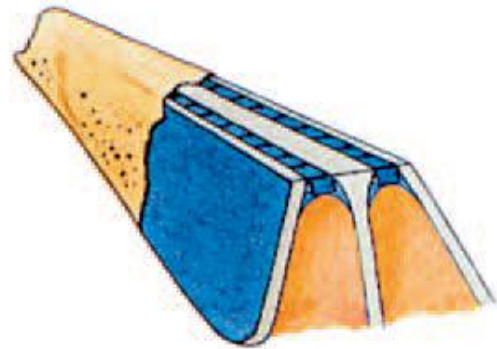


Figure 9a: Spreader grafts of autogenous septal cartilage (blue striped areas) to restore a too narrow nasal valve and an aesthetically too narrow mid-nose



Figure 9b: Autogenous septal onlay graft (blue striped area) to camouflage avulsion of the upper lateral from the nasal bone

Tip, ala and columella

For tip augmentation, cartilaginous grafts from the concha, septum, or a combination of these, can be used depending on the operative technique and extent of the correction. Conchal cartilage is very suitable as an onlay tip graft because of its natural bending properties (*Figure 10*).

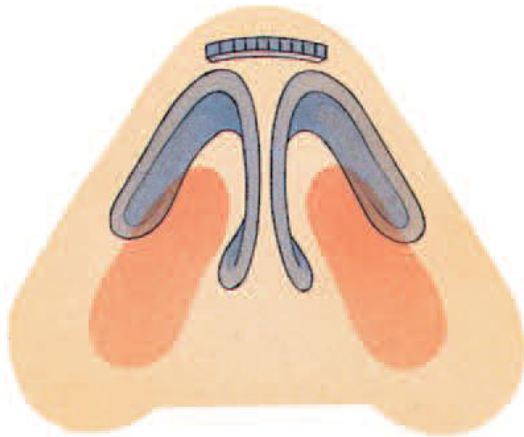


Figure 10: Onlay tip graft of autogenous cartilage of the concha, which is very suitable due to its natural bending

Septal cartilage is the material of choice for a columella strut for extra tip support, and for a shield-type tip graft for extra tip definition and projection (*Figures 11a,b*).

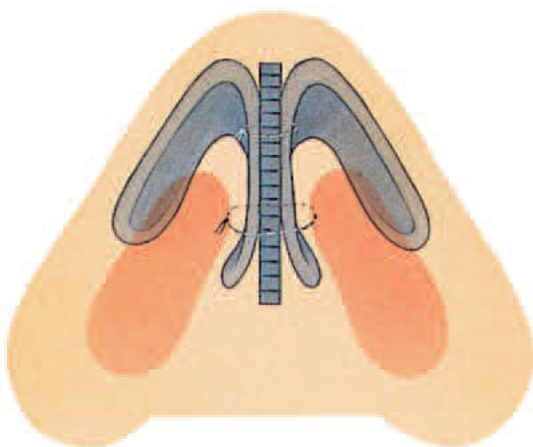


Figure 11a: Columella strut of autogenous septal cartilage for extra tip support fixed by mattress sutures to the medial crura

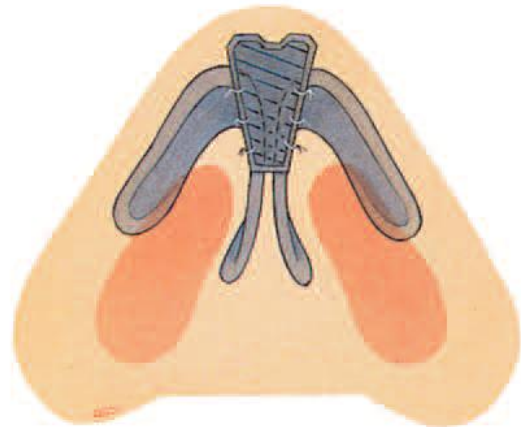


Figure 11b: Shield-type tip graft sculptured from autogenous septal cartilage to gain extra tip projection and definition

In certain cases of alar rim defects resulting in alar collapse, a conchal cartilage graft with its concave side towards the vestibulum can be very effective. When there are not very large alar, tip or columellar defects with cartilage and soft tissue loss, and in cases of vestibular stenosis, composite grafts are indicated.

Nasolabial angle

To correct an acute nasolabial angle due to some retraction of the columellar base, small pieces of available septal or conchal cartilage placed in a subcutaneous pocket are appropriate (*Figure 12*).

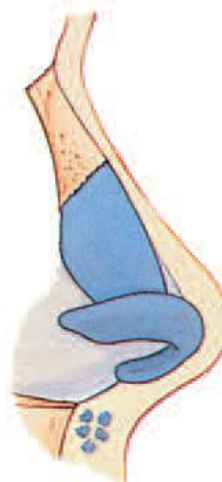


Figure 12: Small pieces of autogenous cartilage to correct an acute nasolabial angle

Harvesting technique

The harvesting technique described in this chapter is restricted to only the most frequently used autogenous grafts in nasal surgery.

Septal cartilage

Hydraulic dissection with local anaesthetic will facilitate this procedure (*Figure 13a*). When there is no indication for correction of a deviated septum, the hemitransfixion incision should be replaced by a Killian incision (blade No. 15), so as not to disturb the septocolumellar junction (*Figure 13b*). The initial incision through the mucoperichondrium can be made on either side of the septum. With a sharp, pointed, curved pair of scissors, dissection is started in the subperichondrial plane and continued with a Cottle or Joseph elevator to free the mucoperichondrium over the area of septal cartilage to be resected (*Figure 13b*). After incising the cartilage, a subperichondrial tunnel is made over the corresponding area on the opposite side of the cartilage (*Figure 13c*). Care should be taken not to damage the mucoperichondrium to prevent perforation of the septum.



Figure 13a: Hydraulic dissection with local anaesthetic



Figure 13b: Freeing the mucoperichondrium from the septal cartilage via a Killian incision



Fig. 13c. Vertical transcartilaginous incision followed by freeing of the mucoperichondrium on the opposite side

After additional horizontal and vertical chondrotomies with a beaver knife, the planned amount of septal cartilage can be harvested. In choosing the cartilage harvesting area, care should be taken not to disturb the continuity of that part of the quadrangular cartilage anteriorly to the imaginary line between the most caudal point of the nasal bones (rhinion) and the anterior nasal spine, to prevent sagging of the cartilaginous nasal dorsum (*Figures 14a,b*). A blunt forceps should be used to remove the graft material to avoid damaging the cartilage.

After the sculpturing procedure, the leftover cartilage should be used as a crushed implant in the area of the previously resected cartilage to prevent the mucoperichondrium from sticking together. This procedure diminishes the chance of a septal perforation and stimulates the growth of new septal cartilage.

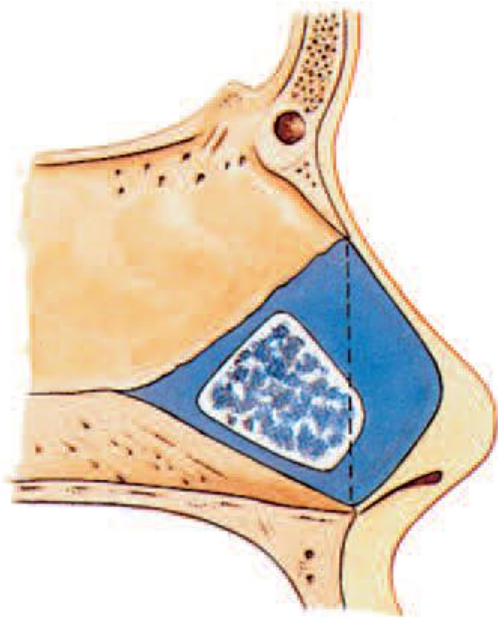


Figure 14a: Donor site of septal cartilage, posterior to the dotted line to guarantee septal support of the nasal dorsum with reimplantation of crushed cartilage



Figure 14b: Harvested septal cartilage for sculpturing columella strut and shield tip graft

Ear cartilage

For small cartilage onlay grafts for the nasal tip, a retro-auricular skin incision is made over the concha (*Figure 15*).



Figure 15: Retro-auricular skin incision

Generally, pieces measuring 5–10 mm are suitable. The cartilage grafts can be harvested from the *cymba conchae* (cranial to the *radix helices*) or *cavum conchae* (caudal to the *radix helices*), depending on the appropriate degree of bending which is needed. After freeing the soft tissue by blunt dissection over the area to be resected, two transcartilaginous incisions (No. 15 blade) are made through the cartilage and ‘post-auricular’ perichondrium (*Figure 16*), followed by subperichondrial dissection on the preauricular side with a sharp pointed, curved pair of scissors, and finally by resection of the cartilage graft (*Figure 17*). If necessary this can be followed by harvesting of a second piece of conchal cartilage (*Figures 18a,b*). The skin can easily be closed with a 5/0 atraumatic nylon ‘running’ suture (*Figure 18c*).



Figure 16: Two parallel incisions through cartilage and 'post-auricular' perichondrium

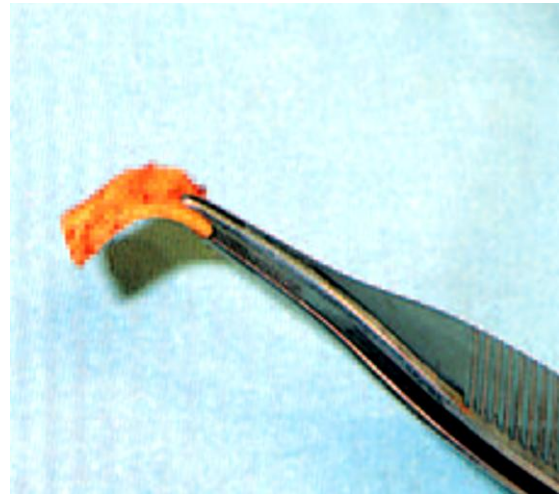


Figure 18b: Natural bending of the conchal cartilage graft



Figure 17: Resection of the first onlay tip graft



Figure 18c: Skin closure with 5/0 atraumatic nylon 'running' suture

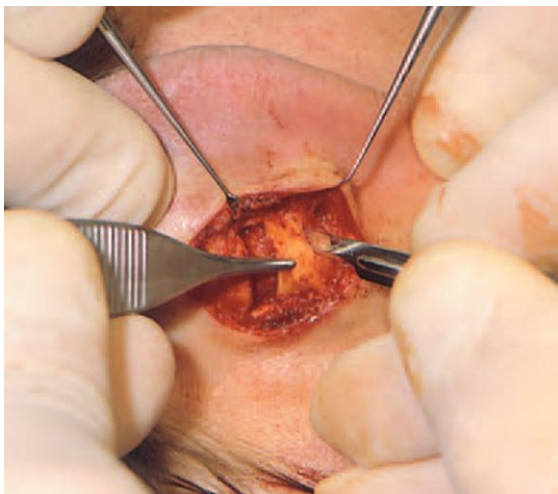


Figure 18a: Harvesting a second graft

To harvest a large piece of conchal cartilage, the preauricular approach is technically easier than the postauricular approach but is less elegant as it leaves a preauricular scar. After infiltration of local anaesthetic solution (2% lidocaine with 1:100,000 epinephrine) at the anterior side of the concha into the subperichondrial surgical plane to facilitate the dissection, the posterior side is infiltrated, but now in the supraperichondrial plane (*Figures 19a,b*). To outline the post-auricular semicircular skin and cartilage incision, three needles are used, stabbed through the auricle from the anterior side just medial to the antihelix, following the la-

teral border of the cavum and cymba conchae (Figure 20). After incising the skin along the line indicated by the needles (Figure 21), the postauricular perichondrium and conchal cartilage are incised, leaving the perichondrium intact on the anterior side (Figure 22). With a sharp pointed, curved pair of scissors, subperichondrial tunnelling is then carried out over the cavum and cymba conchae (Figure 23).



Figure 20: Three through-and-through needles to mark the postauricular skin and cartilage incisions

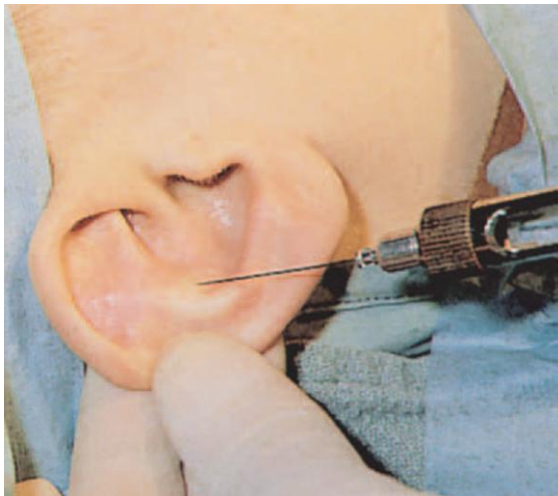


Figure 19a: Application of local anaesthetic: anterior side in subperichondrial plane



Figure 21: Skin incision along the landmark of the needles



Figure 19b: Application of local anaesthetic: posterior side in supraperichondrial plane



Figure 22: Transcartilaginous incision leaving the preauricular perichondrium intact

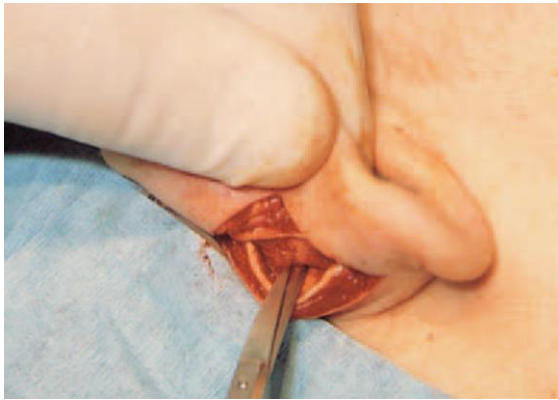


Figure 23: Subperichondrial tunnelling over the cavum and cymba conchae

The next step is to free the cartilage at the posterior side by blunt dissection in a supra-perichondrial plane (Figure 24). The cartilage is now incised just lateral of the ear canal, leaving the *radix helicis* intact for structural support and finally resected (Figures 25a,b). After meticulous haemostasis, the skin incision is closed with a 5/0 atraumatic running suture. Carefully applied conchal packing, secured with through-and-through mattress sutures (Figures 26), and a light compression ear bandage will prevent the formation of a haematoma.

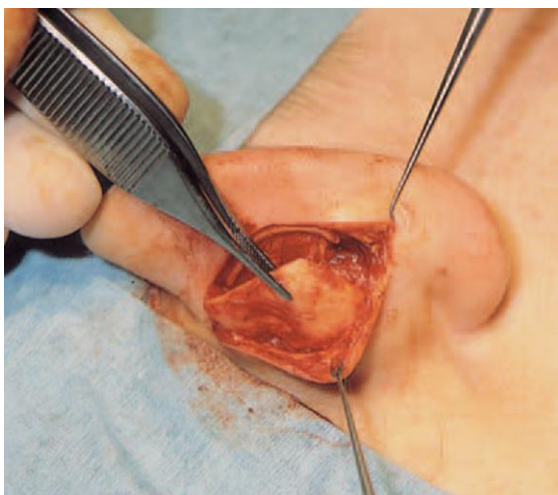
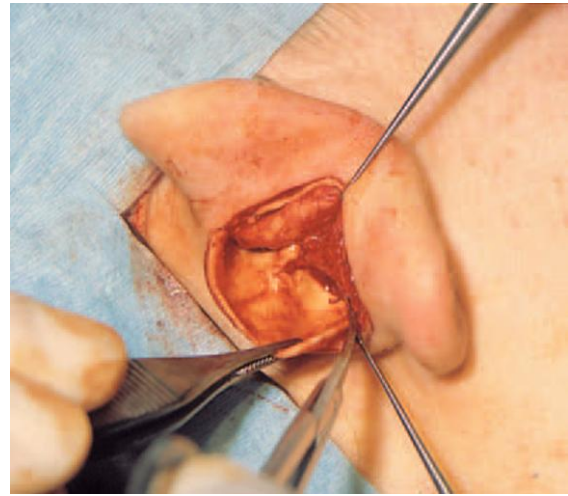


Figure 24: Supra-perichondrial dissection at the posterior side



Figures 25 a,b,c: Resection of the cartilage graft leaving the radix helicis intact



Figure 26: Conchal packing fixed with through-and-through mattress sutures

In Figures 27-31 show pre- and postoperative views of patients who underwent rhinoplasty with autogenous cartilage grafting.

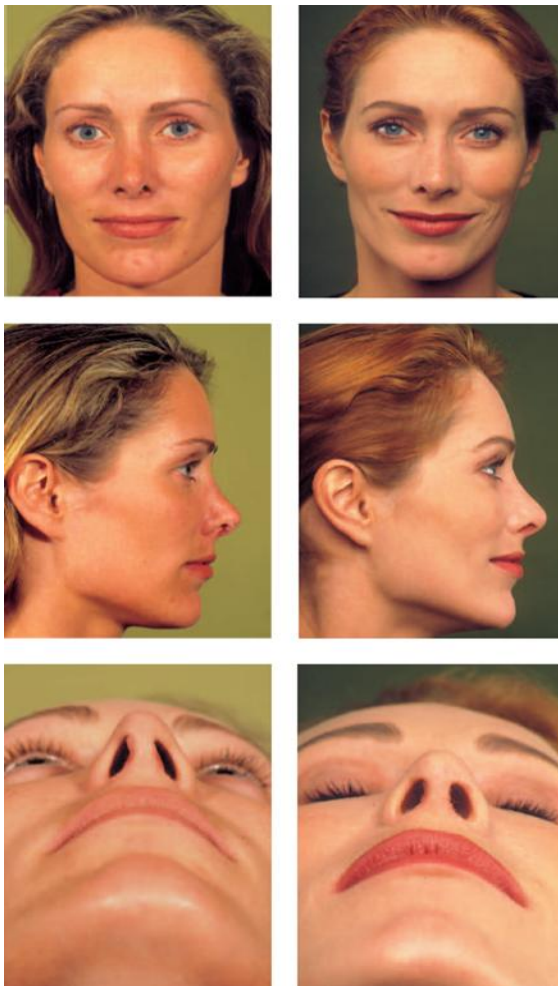


Figure 27: Pre- (L) & postoperative (R) views of patient who underwent a revision rhinoplasty with use of autogenous septal

cartilage to lengthen the caudal septum with a batten and to augment the nasal dorsum with a septal cartilage onlay graft

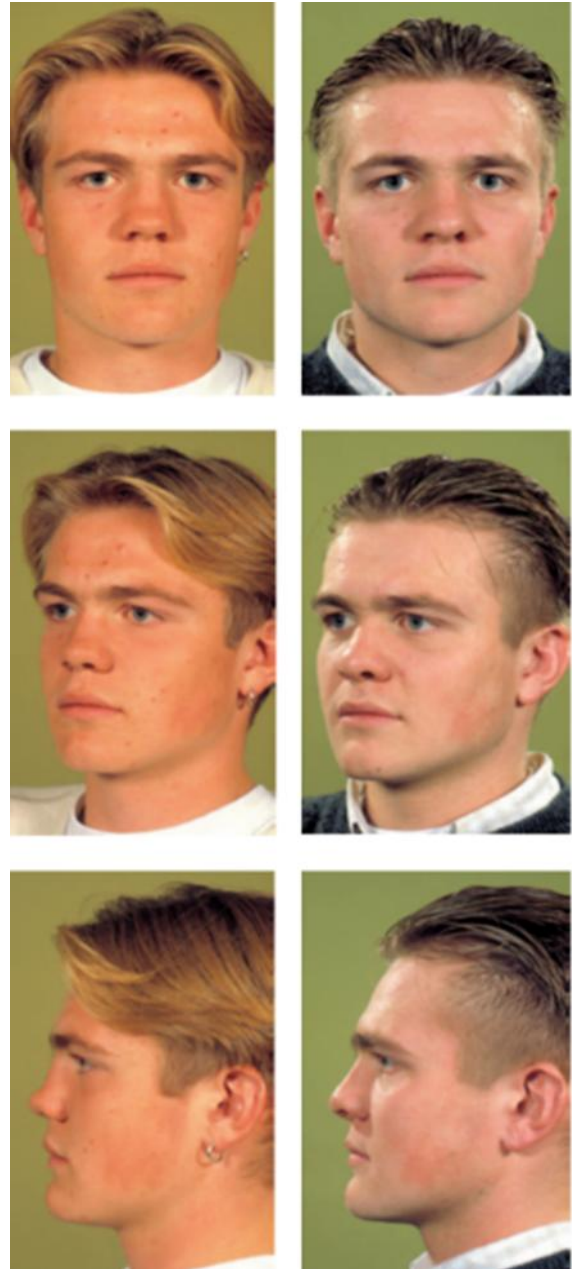


Figure 28: Pre- (L) and postoperative (R) views of patient who underwent rhinoplasty following severe trauma. The fractured septum was rebuilt through an external approach which, in combination with a dorsal conchal cartilage onlay graft, resulted in a normal profile



Figure 29: Pre- (L) and postoperative (R) views of a patient with functional problems due to a too narrow nasal valve (right worse than left), who underwent external rhinoplasty. After moderate reduction of the dorsal height, spreader grafts were harvested from the cartilaginous septum and placed between septum and upper laterals through an external approach. Due to widening of the nasal valve area forced inspiration did not result in alar collapse anymore.

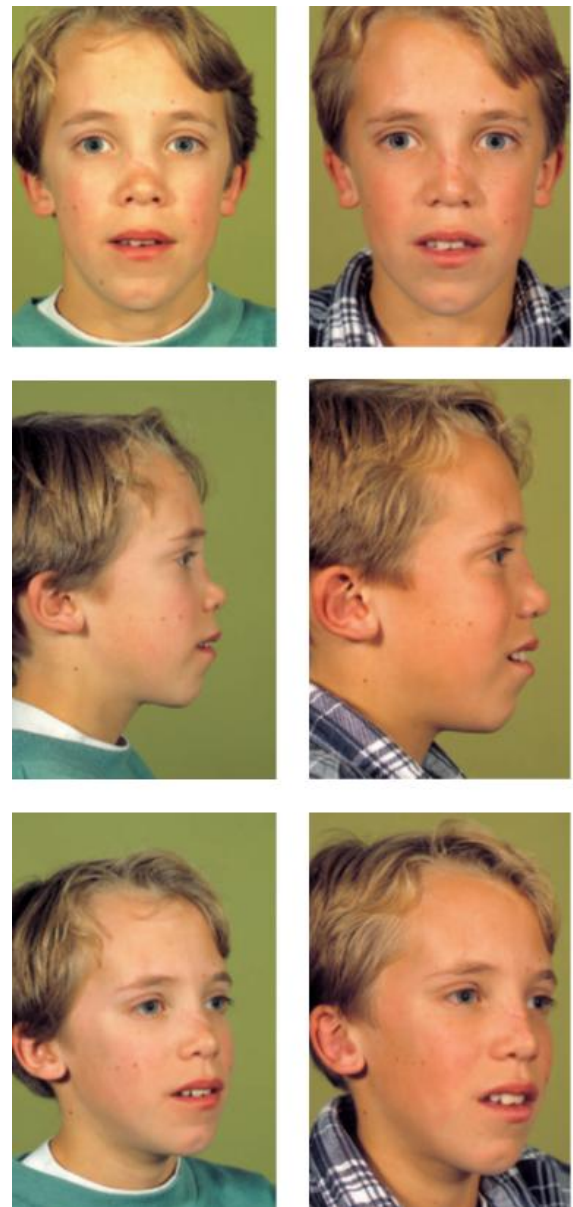


Figure 30: Pre- (Left) and postoperative (Right) views of an 11-year-old boy with a saddle deformity following severe nasal trauma. He underwent an endonasal septo-rhinoplasty to straighten the deformed septum, to narrow the bony pyramid with micro-osteotomies and to augment the nasal dorsum with a conchal cartilage onlay graft.



Figures 31: Pre- (L) and postoperative (R) views of patient after repeated nasal trauma with loss of most of his cartilaginous framework. An external rhinoplasty was performed. Instead of a broken columella incision, a V-incision was made at the base of the columella to perform a V-Y procedure to lengthen the columella. To rebuild the nose, autogenous rib cartilage was used

Figures 32a-k show the harvesting of rib cartilage and the reconstruction of the nasal framework. The cartilage was harvested from the eighth rib which was sculpted into two pieces, a columella strut and a dorsal onlay graft. To prevent warping, the superficial part of the rib cartilage was removed. Through an external approach, the airway and the dorsal profiles were restored by a two-piece reconstruction in combination with a tip onlay graft to restore tip definition.



Figure 32a: Incision over 8th rib cartilage



Figure 32b: 8th rib cartilage exposed



Figure 32c: Incising rib cartilage



Figure 32d: Harvesting rib cartilage



Figure 32h: Columella strut in situ



Figure 32e: Rib cartilage



Figure 32i: Dorsal onlay graft



Figure 32f: External approach



Figure 32j: Tip onlay graft



Figure 32g: Columella strut



Figure 32k: Skin closure

The material in this chapter originates from the textbook “**Rhinoplasty: A practical guide to functional and aesthetic surgery of the nose**” G.J. Nolst Trenité (ed) ISBN 978-90-6299-206-5 <https://www.rhinoplasty.nl/store/>

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