

## RHINOPLASTY: SURGERY OF THE OSSEOCARTILAGINOUS VAULT

GJ Nolst Trenité

Looking at the sequence of operative steps, most rhinoplastic surgeons prefer to perform surgery of the osseocartilaginous vault after tip surgery. One of the main reasons for this is that, by applying an external nasal dressing immediately after osteotomy, oedema and ecchymosis can be prevented or at least diminished. Another reason is that, to obtain an aesthetic balance, in certain cases it is easier to adapt the form of the osseocartilaginous vault to the form of the tip, rather than vice versa.

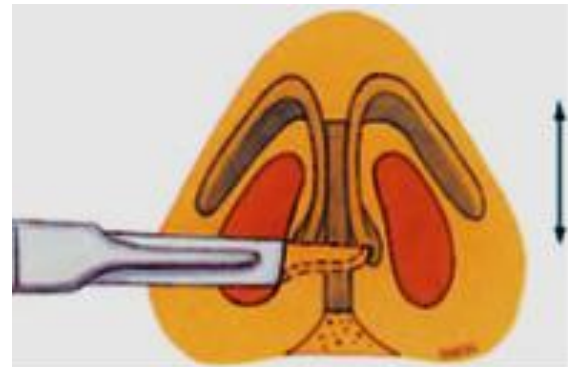
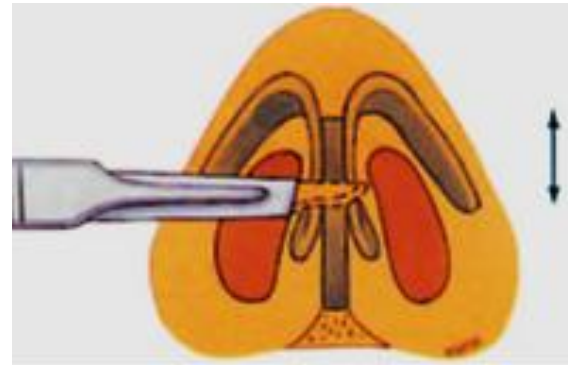
In this chapter, surgery of the osseocartilaginous vault is divided into five sections:

- Hump resection
- Osteotomies
- Management of special bony pyramid problems
- Radix nasi surgery
- Cartilaginous vault surgery

### Hump resection

The nasal hump consists of a cartilaginous and a bony part. In most cases, the bony part of the hump is much smaller than the cartilaginous part. With the endonasal approach, intercartilaginous incisions are connected by a transfixion incision to obtain ample access to the hump. It is important to dissect carefully between the upper and lower lateral cartilages to prevent postoperative irregularities of the lateral nasal wall. The intercartilaginous incision from lateral-to-medial, just caudal of the nasal valve must be carried around the anterior septal angle. The two intercartilaginous incisions will then be connected by a partial transfixion incision, unless there is a specific indication for a complete transfixion incision. With a complete transfixion incision an important support of the tip in its connection between the medial crura and the anterior edge of the na-

sal septum will be disturbed (*Figures 1a,b*).



*Figures 1a,b: Partial transfixion incision; b: complete transfixion incision*

The next step is to free the cartilaginous part of the hump from the overlying soft tissues. With careful and sharp dissection (No. 15 blade) in the supraperichondrial surgical plane, damage to the musculus transversus nasi, together with unnecessary scarring and bleeding, will be prevented (*Figure 2*).

After freeing the cartilaginous vault from the overlying soft tissues, the periosteum is incised at the caudal end of the nasal bone and elevated with a Joseph elevator (*Figures 3 a,b*). There is no need to elevate the periosteum very far laterally. The procedure should be limited to the area of the hump to be resected. Periosteum attached to the suture intranasalis can simply be cut from the bony vault with a long pair of scissors (*Figure 4*). With an 'Aufricht' retractor in place,

the cartilaginous vault can now be incised by a through-and-through incision (No. 15 blade) from cephalic to caudal at the 'planned' resection line (*Figure 5*).



*Figure 2: Sharp dissection in the surgical plane (close to the perichondrium) to free the cartilaginous dorsum from the overlying soft tissue*



*Figures 3 a,b: Elevation of the periosteum of the nasal bone (only of the hump area) with a Joseph elevator*



*Figure 4: Dissection of the periosteum attached to the sutura intranasalis*



*Figure 5: Incising the cartilaginous vault under direct vision at the 'planned' resection line*

Using this cartilaginous cutting face as a guideline, the hump osteotome is introduced to loosen the bony part at the hump, followed by the 'en bloc' removal of the osseocartilaginous hump (*Figures 6a,b,c*).

A (medium-fine) tungsten-carbide or diamond rasp is now used to smooth the bony surface (*Figure 7*) and, if necessary, some extra shaving of the cartilaginous dorsum is carried out to obtain the desired supratip relation.

In cases of a small hump, it is easier to start shaving off small pieces of the cartilaginous hump to the desired level and then to use a down-cutting rasp to lower the bony dorsum.

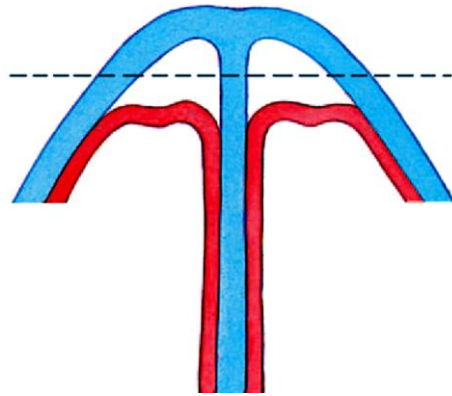


*Figures 6 a,b,c: Resection of the osseocartilaginous hump with a 14 mm hump osteotome*



*Figure 7: Smoothing of bony surface after hump resection with a medium-fine (tungsten-carbide) rasp*

When a small bony hump is removed with a rasp, it is certainly less important to elevate the periosteum, the more so as this kind of bony hump resection guarantees a smooth contour of the bony pyramid. When removing the cartilaginous part of a very large hump, stripping off the mucoperichondrium at first on the posterior side of the cartilaginous vault (extramucosal technique), will prevent postoperative irregularities of the dorsum due to damage to the mucoperichondrium (*Figure 8*).



*Figure 8: Stripping of mucoperichondrium initially on the posterior side of the cartilaginous vault in cases of large humps*

There are various additional important points to consider in hump resection:

- Pay attention to the difference in thickness of the overlying soft tissue, which is at its thinnest at the rhinion (caudal point of *ossa nasalia*) (*Figure 9*)
- Check whether the nasal dorsum shows any small irregularities after hump resection which should be meticulously smoothed over
- Check whether enough cartilage has been resected from the anterior edge of the upper lateral cartilage
- Remove all loose bone particles, especially after rasping
- Correct over-resection by replacing the excised hump after trimming to the appropriate size (Skoog's method), or use an autogenous septal cartilage graft



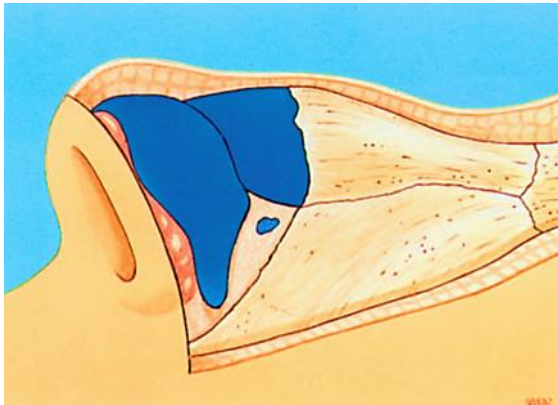


Figure 9: Illustration of difference in thickness of soft tissue overlying osseocartilaginous vault

A frequently occurring postoperative complication is the 'polly beak', which can be divided into:

- Soft tissue 'polly beak' (Figure 10a). This arises when dissection in the surgical plane is not made carefully enough, resulting in scarring of the overlying soft tissues
- Cartilaginous 'polly beak' (Figure 10b). This is caused by too little resection of the cartilaginous part, or by a relatively excessive resection of the bony part of the hump

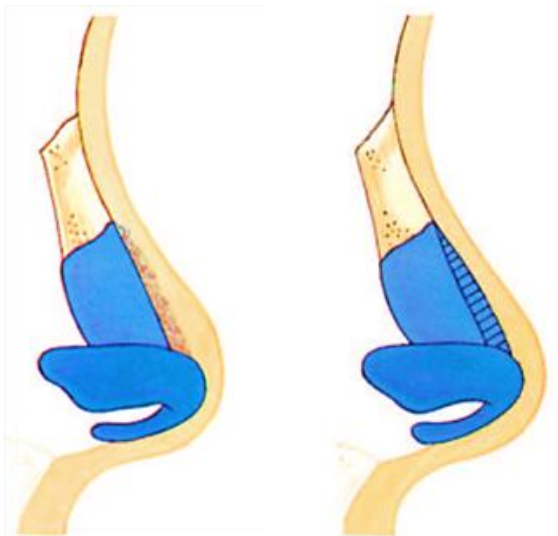


Figure 10a: Soft tissue 'polly beak'; b: Cartilaginous 'polly beak'

- Relative 'polly beak'. This is a result of drooping of the tip, due to tip surgery in which the tip support was insufficiently guaranteed (Figure 10c)

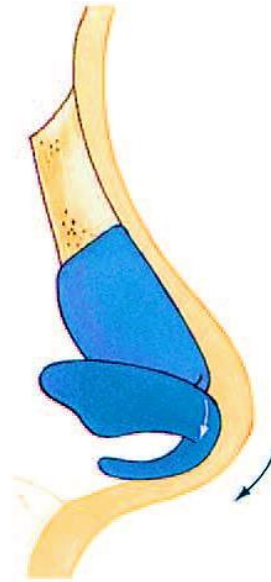


Figure 10c: Relative 'polly beak'

### Osteotomies

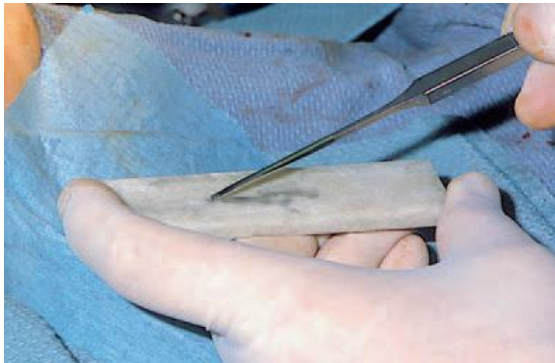
Osteotomies are required to mobilize the bony pyramid for in-fracture, out-fracture or realignment. With traditional techniques and instruments, mobilisation of the bony pyramids causes significant oedema and ecchymosis.

Technical refinements of the last decade have resulted in considerable reduction in ecchymosis and oedema, resulting in quicker and better healing. The most important factors are:

- Precise placement of local vasoconstrictive and anaesthetic solution
- Use of micro-osteotomes
- Preservation of periosteal attachments
- Medial-oblique osteotomy and elimination of transverse osteotomy

Well-placed local anaesthesia at least 15 minutes prior to surgery on the bony pyramid is very helpful to reduce bleeding. With

the micro-osteotome, if necessary, sharpened during surgery (*Figure 11*), it is not necessary to elevate the periosteum. This gives less surgical trauma and leaves the periosteum intact to a large extent so that it can act as an internal splint.



*Figure 11a: Sharpening of micro-osteotome 'durante operationem'*

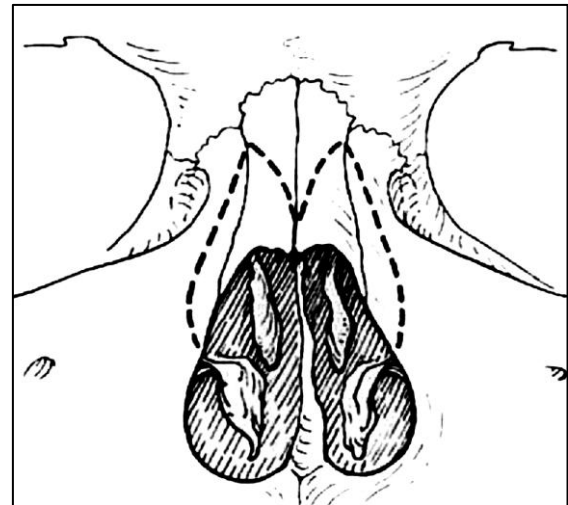
When a medial-oblique osteotomy is combined with a slightly curved lateral osteotomy, there is no need for the traditional transverse osteotomy (*Figure 12*).



*Figure 12: Medial-oblique osteotomy*

The crossover point of both osteotomies should not be (and aesthetically there is no need) more cephalic than the intercanthal line, thereby avoiding the thick bone of the *radix nasi* (*Figure 13*). It is important to leave the (external) periosteal and (internal) mucoperiosteal lining intact as far as is possible.

Lateral osteotomies can be performed percutaneously as well as intranasally.



*Figures 13: Osteotomy pathway (dotted line) of medial-oblique and lateral osteotomies*

The micro-osteotome is inserted through the soft tissue of the lateral wall of the piriform aperture, starting at the ascending process of the maxilla at the superior margin of the inferior turbinate. For a low lateral osteotomy, it should then proceed laterally, preserving a bony ridge at the base of the lateral wall of the piriform aperture (*Figures 14-17*). In this way, any possible narrowing of the airway by in-fracture of the *os nasale* can be prevented (*Figure 17*).

It should then proceed, slowly curving from lateral to medial, as far as the intercanthal line where the medial-oblique osteotomy is done. Readjustment of the osteotome after sliding off the bone, prevents unnecessary lesions of the periosteum. A 2-mm osteotome is often sufficient. When the bone is thicker than normal, a 3-mm osteotome is indicated.

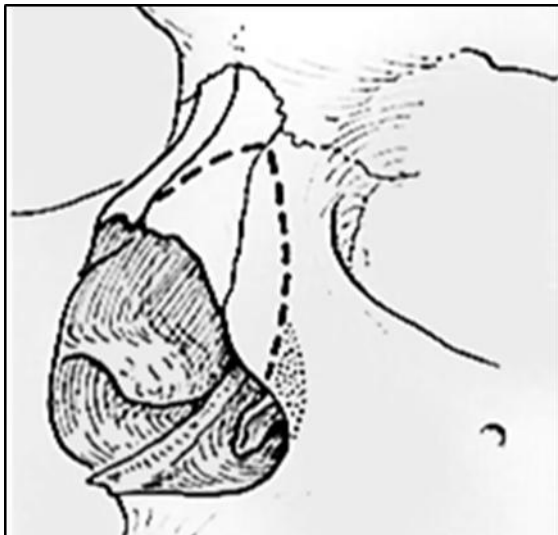
In **percutaneous lateral osteotomy**, a skin incision of 23 mm is made halfway along the planned osteotomy line, after which small point-osteotomies are made cephalically and caudally along the osteotomy line (*Figures 18a,b*). Although the percutaneous technique is rather more traumatic than the intranasal one, it gives excellent control.



*Figure 14: Low lateral osteotomy*



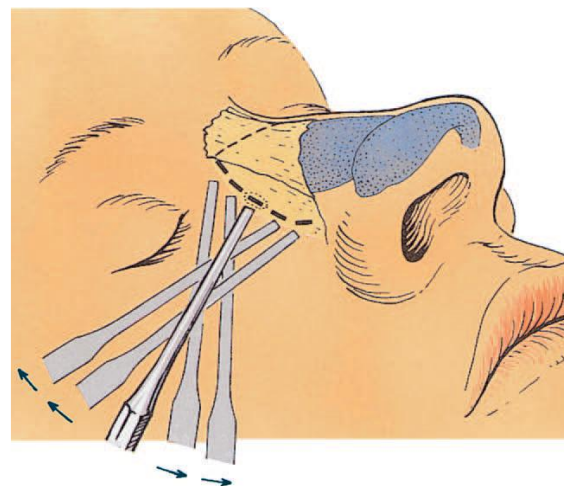
*Figure 15: Dorsum of the nose after hump resection and micro-osteotomies*



*Figure 16: Bony ridge at base of lateral wall of piriform aperture (dotted area) to be preserved in performing a low lateral osteotomy followed by in-fracture of nasal bone*



*Figure 17: Readjusted bony vault after in-fracture of the nasal bones*



*Fig. 18a: Percutaneous lateral osteotomy making small point osteotomies along the planned osteotomy line*



*Figure 18b: Percutaneous lateral osteotomy through a skin incision halfway along the planned osteotomy line*

To prevent a haematoma, it is wise to apply pressure paranasally for 3-5 minutes on



both sides at the level of the skin incisions after the procedure.

Additional intermediate osteotomies are indicated with an asymmetric bony pyramid.

If the traditional transverse osteotomy is indicated, this can either be done percutaneously via a small incision at the level of nasion or an incision in the eyebrow with a micro-osteotome, or intranasally via the lateral osteotomy line, with a special transversely curved osteotome.

Complications which can occur with osteotomies of the bony pyramid include the following:

- Insufficiently osteotomy, after which the bony jumps back into its original position
- ‘Rocker phenomenon’ occurs when osteotomies are carried out too cephalad. When the concave bony part, now curved medially, is repositioned on the caudal or cephalic side, the other part will project (Figure 19)

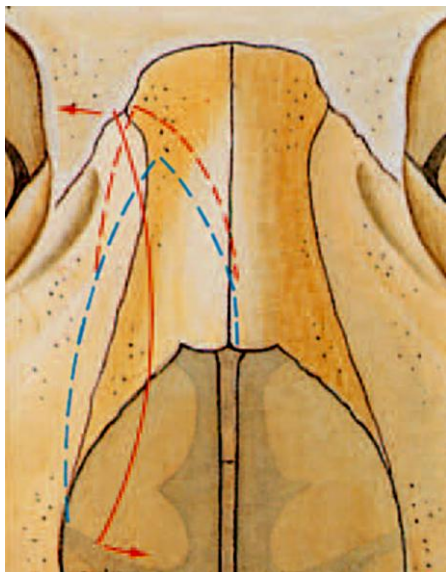


Figure 19: “Rocker phenomenon” due to osteotomies made too far cephalad (red dotted lines)

- Lateral osteotomies made too medially, causing a “staircase phenomenon” (Figure 20)
- Callosus (which often disappear spontaneously)



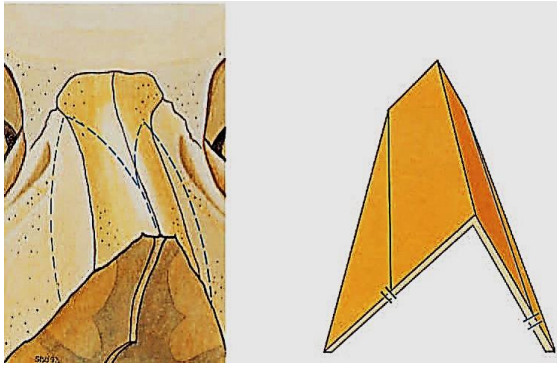
Figure 20: Staircase phenomenon due to a too medially placed osteotomy (red dotted line)

### Management of special bony pyramid problems

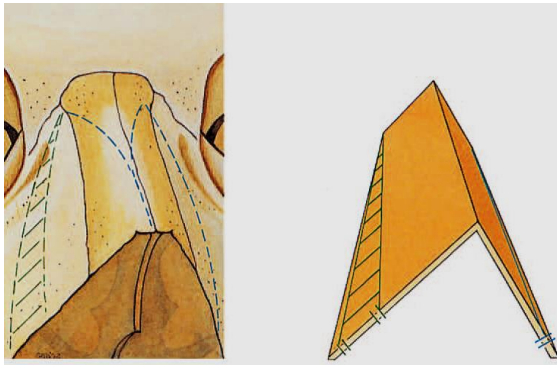
#### *Asymmetric bony pyramid due to lateral deviation*

With a big deviation of the nose, there may be a large difference between the size of the left and right *os nasale*, in which case exact repositioning in the midline after standard osteotomies is not possible.

If asymmetries are not too great, a lateral osteotomy, placed more medially on the long side, is often sufficient (Figure 21). In a very asymmetric bony pyramid, a wedge resection is indicated, whereby a bony wedge is removed on the lateral side of the longest sidewall (Figure 22). When removing a bony wedge, the periosteum will have to be stripped off both sides of the wedge for it to be removed. To obtain adequate repositioning, the septum also must be mobilized and corrected; otherwise, the chance of the deviation reappearing postoperatively is significant.



*Figures 21: More medially placed lateral osteotomy (green dotted line) to correct moderate asymmetry of bony pyramid*



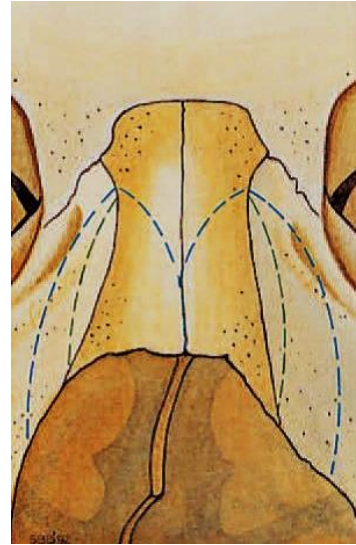
*Figure 22: Resection of bony wedge (green striped area) in case of severe asymmetry of bony pyramid*

### ***Abnormally curved nasal bones***

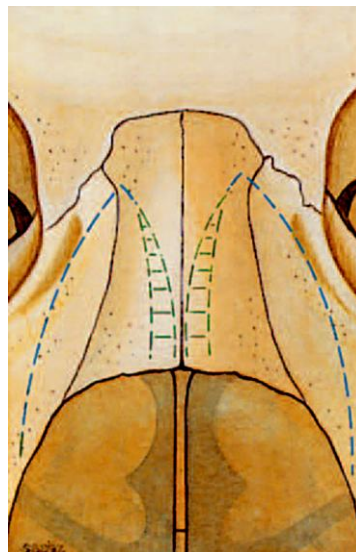
In cases of a concavity or convexity of a sidewall, it is necessary to perform one or more intermediate osteotomies to remodel the bony pyramid (*Figure 23*).

### ***Broad trapezoid bony pyramid***

With this type of bony pyramid, in-fracture is not possible by medial-oblique and lateral osteotomies alone. Therefore, a medial wedge resection is mandatory on both medial parts of the nasal bones (*Figure 24*).



*Figure 23: Supplementary intermediate osteotomies (green dotted lines) to remodel concave and convex bony sidewalls*



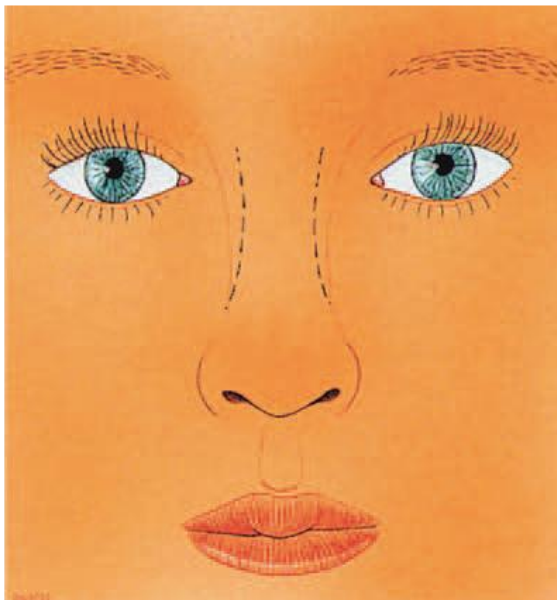
*Figure 24: Resection of medial wedges (green striped areas) to correct a broad trapezoid bony pyramid*

### **Radix nasi surgery**

The role of the *radix nasi* is often underestimated in the aesthetic balance of the facial complex. On a frontal view, the width of the *radix nasi* should be in good alignment with the natural curve from eyebrow to lateral nasal bone. A too wide *radix nasi* is very uncommon and can be corrected by in-fracture, after osteotomies have been pla-



ced more cephalad, above the intercanthal line (*Figure 25*). After rhinoplasty when osteotomies have been placed too cephalad and after too much in-fracture of the bony pyramid, the *radix nasi* often becomes too narrow. This can be corrected by out-fracture after re-osteotomies. On lateral profile, the *radix nasi* also plays a role in the aesthetic balance of the face and is characterized by the nasofrontal and nasofacial angles. A change in the horizontal or vertical positions of the deepest depression of the root of the nose (nasion) has a direct effect on the apparent projection and length of the nose. A change in the position of the *radix nasi*, which is a relatively small surgical procedure, will have a great impact on the appearance of the nose. A dorsal onlay graft gives the nose a longer appearance and the (unchanged) nasal tip a shorter one. Deepening of the nasofacial groove using a chisel or glabella rasp has the opposite effect.



*Figure 25: Proposed correction (dotted lines) of too wide a radix nasi*

## **Cartilaginous vault surgery**

### ***Resection of caudal border of upper laterals***

This is indicated as an additional procedure after a considerable shortening of the nose, causing the caudal parts of the upper laterals to protrude into the vestibulum.

Care should be taken not to overshorten the upper lateral cartilages, as this may cause unnatural narrowing of the middle third of the nose. Besides an unaesthetic appearance, over-resection of the upper lateral cartilages may result in functional problems due to inspiratory collapse of the weakened lateral nasal wall. When shortening the nose, it is a good rule not to resect more from the caudal end of the upper lateral than from the septum (*Figure 26*).



*Figure 26: The resected cartilaginous part of caudal border of the upper laterals and caudal septum in a nose shortening procedure should be approximately of equal length*

Other indications for caudal resection of the upper laterals are internal valve problems caused by pathological returning of the caudal end of the upper lateral, which interfere with normal internal valve functioning.

#### ***Narrowing the cartilaginous vault***

In some cases, the cartilaginous vault is trapezoid in shape due to flat anterior parts of the upper laterals. Resection of a small parasseptal strip of cartilage on both sides will narrow the cartilaginous vault. The technique used for adequate exposure of the cartilaginous dorsum in combination with extramucosal dissection is the same as the one used for resection of a large hump.

#### ***Widening the cartilaginous vault***

Spreader grafts to widen the cartilaginous vault are indicated for aesthetic reasons when there is a very narrow mid-nose or because of functional problems caused by too sharp an angle (smaller than 10 degrees) of the internal valve. Small strips of autogenic septal cartilage are the first choice as graft material. Using the intranasal approach, they should be placed in an extramucosal pocket between the septum and the lateral cartilages. However, the external approach gives far better control.

### **Clinical examples of osseocartilaginous vault surgery**

In *Figures 27-31*, pre- and postoperative views of patients are shown who underwent osseocartilaginous vault surgery.



*Figure 27: A patient who underwent a hump resection followed by medial oblique, (endonasal) lateral micro-osteotomies and in-fracture with moderate oedema and ecchymosis two days postoperatively (top); and already resolving ecchymosis six days postoperatively (bottom) just before removal of the Denver splint*



*Figure 28: Pre- (L) and longterm (R) post-operative views after hump resection followed by predialoblique (endonasal) lateral view-osteotomies and in-fracture of the nasal bones*



*Figure 29: Pre- and postoperative views of a patient who underwent revision rhinoplasty to correct a cartilaginous polly beak*





Figure 30: Pre- and postoperative views of a patient with a tension nose due to over-development of the cartilaginous septum who underwent a rhinoplasty by the endonasal approach to reduce the osseocartilaginous vault and to correct a slight downward rotation of the tip with resection of a caudal strip of septal cartilage



Figure 31: Pre- and postoperative views of a ten-year-old girl who underwent endonasal septorhinoplasty due to posttraumatic septal deviation with nasal airway impairment and a gradually increasing deviation of the nasal dorsum. Realignment of the dorsum was performed with medial oblique and (endonasal) lateral osteotomies. When performing rhinoplasties in children, the surgeon should be aware that operating on a growing nose can interfere with midfacial growth. He/she has to weigh up the possible advantages (psychological and growth directional) against possible disadvantages (growth inhibition). From the experimental work of the Verwoerd group, we know that,

*in contrast to surgery of the cartilaginous vault, mobilisation of the nasal bones does not lead to specific morphological anomalies in further growth*

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)  
<https://www.rhinoplasty.nl/store/>

### How to cite this chapter

Trenité GJN. (2017). Rhinoplasty: Surgery of the osseocartilaginous vault. In *The Open Access Atlas of Otolaryngology, Head & Neck Operative Surgery*. Retrieved from <https://vula.uct.ac.za/access/content/group/ba5fb1bd-be95-48e5-81be-586fbaeba29d/Rhinoplasty%20surgery%20of%20the%20osseocartilaginous%20vault.pdf>

### Author

Gilbert Nolst Trenité MD, PhD  
Professor of Otorhinolaryngology  
Former President of European Academy of Plastic Surgery  
Amsterdam, Netherlands  
[nolsttrenite@gmail.com](mailto:nolsttrenite@gmail.com)

### Editor

Johan Fagan MBChB, FCS (ORL), MMed  
Emeritus Professor and Past Chair  
Division of Otolaryngology  
University of Cape Town  
Cape Town, South Africa  
[johannes.fagan@uct.ac.za](mailto:johannes.fagan@uct.ac.za)

## THE OPEN ACCESS ATLAS OF OTOLARYNGOLOGY, HEAD & NECK OPERATIVE SURGERY

[www.entdev.uct.ac.za](http://www.entdev.uct.ac.za)



The Open Access Atlas of Otolaryngology, Head & Neck Operative Surgery by [Johan Fagan \(Editor\) johannes.fagan@uct.ac.za](mailto:johannes.fagan@uct.ac.za) is licensed under a [Creative Commons Attribution - Non-Commercial 3.0 Unported License](https://creativecommons.org/licenses/by-nc/3.0/)

