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Chapter 1

Anatomy

Individual nasal anatomy varies so much that "standard" drawings differ substantially. For the purposes of this manual certain points are emphasized.

Anatomic considerations pertaining to the septum are as follows:
Lower lateral cartilages will be referred to as alar cartilages for ease of teaching. Classic textbooks refer only to the lateral and medial crura of the alar cartilage; however, the transition between the medial and lateral crura has also been called the middle (or intermediate) crus. This part of the alar cartilage gives rise to the break point at the columellar lobular junction and the tip defining point just below the supratip region.

The dome is the junction between the medial and lateral crura (or the middle and lateral crura). It is the most angulated part of the alar cartilage.
Surgical implications

The following anatomic relationships are important in rhinoplasty. At the rhinion (junction of the bony and cartilaginous dorsum) the upper lateral cartilages join the septum to form one single piece of cartilage. The attachment between them is fibrous near the septal angle (angle between the caudal and dorsal septum). In a patient with a crooked nose, dividing this attachment during rhinoplasty allows straightening of the nose.

The angle between the septum and the lower border of the upper lateral cartilage is called the nasal valve. Even minimal constriction in this area causes substantial restriction of air flow. Hump removal with osteotomies can narrow the valve, especially in people with short nasal bones.
Therefore, many surgeons avoid using osteotomies; instead, they place a small piece of cartilage between the septum and the upper lateral cartilage. This "spreader graft" moves the upper lateral cartilage away from the septum.

The upper lateral cartilages also have a fibrous attachment to the underside of the nasal bones that maintains the smooth transition from the medial portion of the eyebrow to the tip of the nose. Traumatic disarticulation of this attachment disrupts the smooth transition between the upper and middle thirds of the nose.
The junction between the upper lateral cartilage and alar cartilages is often a continuous roll of cartilage (the scroll). In some people trimming the scroll reduces bulbousness of the tip.
Good photographs are well worth the small time and money investment. They are essential for a surgeon to evaluate his results and perfect his technique. They can also facilitate communication with the patient, and they provide medicolegal documentation.

The easiest way to take consistent photographs is with a 35 mm camera using a portrait lens (90-105 mm). The portrait lens renders true facial proportions, whereas a 50 or 60 mm lens distorts the middle third of the face, especially the nose. To keep head size constant, all pictures should be taken at a distance of 1 m. An f-stop range of 8-11 gives a good depth of field. A background of light blue photographic paper provides good definition of the nasal profile in both color and black and white pictures. Consistent flash position for pre- and postoperative views will yield truly comparable photographs.

When taking a profile view, the flash should be positioned such that the shadow falls behind the nose and is not visible on the background.

Standardization of patient position is critical.

In a frontal view the base of the nose is at the level of the bottom of the earlobe. The vertical center is at the level of the infraorbital rim.
In the profile view, the top of the tragus is aligned with the infraorbital rim, putting the patient in the Frankfort horizontal plane. The view finder should be on that plane at the lateral canthus. Alignment of the eyebrows indicates that a true lateral position has been obtained.

In the view from the base of the nose (at a distance of 60 cm, instead of 1 m), the tip is between the medial canthi, and the dorsum is just visible. This view shows the shape of the tip and the dorsal alignment. In most cases three photographic views (frontal, lateral, and basal) will provide all necessary information.
Preoperative analysis is the cornerstone of rhinoplasty. Almost all anatomic deformities can be treated with several different surgical techniques. Choosing the best technique involves many factors, but the most important one is a clear understanding of the specific anatomic deformities involved.

A systematic analysis includes evaluation of the profile, frontal, and basal views.

The nasofrontal angle should be at about the level of supratarsal (upper eyelid) crease. Studies have shown that the size of this angle varies greatly among people judged to be attractive.

A straight dorsal profile is acceptable in either males or females, although a slight hump may lend masculinity, and a slight scoop femininity. The patient’s wishes are discussed during preoperative consultation.

Generally, the tip leads the dorsum by 1-2 mm. A “double break” characterizes a refined tip. The first break is in the supratip area where the dorsum ends and the tip begins. This is usually 1-3 mm above the most distal part of the tip (tip defining point). A second break is found at the junction of the infratip lobule and columella.
The concepts of tip projection and tip rotation illustrated above are most useful in describing relative positions of the nasal tip. Their specific measurements are not clinically useful. A correlate of tip rotation, however, is the nasolabial angle.

The nasolabial angle should be 90 – 105 degrees in males and 95 to 110 degrees in females. If this angle is too wide the tip appears overrotated. Often a wide nasolabial angle is due to a caudal septal excess, which can also give the appearance of a short upper lip.
The alar rim should arch 2-3 mm above the columella.

In men, chin projection generally approximates a vertical line from the vermilion-cutaneous junction of the lower lip when the head is positioned in the Frankfurt horizontal plane. In women, the chin may be slightly behind this line.
Evaluation of the frontal view starts with the smooth lines running from the eyebrows down through the radix along the lateral edge of the dorsum, diverging slightly at the tip. Disarticulation of the upper lateral cartilages or a fracture of the nasal bones can disrupt this line.

In a deviated nose the nasal bones and the upper lateral cartilages point in the same direction. In a twisted nose the nasal bones deviate in one direction while the upper lateral cartilages return toward the midline.
If the volume of the lateral crura is too large the tip is said to be **bulbous**. Surgical reduction is indicated.

The alar cartilages (lower lateral cartilages) form prominences in the skin that are called “highlights.” Highlights define the nose. Thick skinned people have less definition (less well-defined highlights) than thin skinned people.
Analysis

The alar-columellar margin forms a gentle "seagull in flight" outline along the base.

On base view, the tip should be triangular. Bulbous tips are trapezoidal.

The alar base width should be within 1 - 2 mm of the intercanthal distance.
Dislocation of the caudal septum off the premaxillary spine is the usual cause of asymmetric nostrils. Repositioning of the caudal septum at surgery usually restores symmetry.

Finally, a well-proportioned large nose looks better than an ill-proportioned small one. In the drawings below, the nasal base is exactly the same size.

The illustrations show that an overprojecting lower third of the nose may actually be an optical illusion caused by relative underprojection of the upper third. The presence of this phenomenon, called low radix disproportion, indicates a need for surgical augmentation of the radix.
To summarize the analysis:

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Chapter 4

Anesthesia

Septorhinoplasty can be performed with the patient under local or general anesthesia, depending on the preference of the patient and surgeon.

If a local anesthesia regimen is used, a mixture of oxymetazoline and 4% lidocaine is often sprayed into the patient’s nose before arrival in the operating room to provide vasoconstriction and some anesthesia.

For the operation, use of a “beach-chair” position (waist and knees flexed and the neck slightly extended) mitigates lumbar fatigue. A nasal cannula is placed in the patient’s mouth to supply oxygen. Injecting the local anesthetic (1% lidocaine with 1:100,000 epinephrine) into the nose prior to prepping and draping allows time for vasoconstriction. Anesthesia and hemostasis are maintained for as long as necessary by reinjection every 60 minutes.

The entire face and one ear are prepared and draped to allow evaluation of facial balance and ready access to auricular cartilage. A small, clear adhesive dressing (such as Tegaderm) secures an Oral Rae® endotracheal tube in the midline without distorting the mouth. The anesthetization sequence is begun by placing pledgets soaked in oxymetazoline and lidocaine in the nose, especially up underneath the nasal bones.
Anesthesia

The infraorbital nerve is then blocked with 0.5 ml of local anesthetic injected through a vestibular puncture.

This facilitates subsequent needle passage between the infraorbital foramen and medial canthus.

Anesthetic is injected into the side wall of the nose through an intercartilaginous puncture; to prevent distortion, only a minimal amount is used. Slight ballooning (2 mm) of the dorsum during injection through a septal angle puncture imitates the permanent postoperative soft tissue thickening to be expected and thereby facilitates accurate hump removal.

An injection across the base of the nose helps numb the tip prior to placing four separate injections around the lower margin of the alar cartilages.
Judicious injection while directing the needle over the alar cartilages maximizes vasoconstriction while minimizing tip distortion.

The final step in external anesthetization is blanching the mucosa on the underside of the nasal bones.

For septal anesthesia 1 ml of anesthetic is placed 1 cm in front of the sphenoid rostrum to block the posterior and superior branches of the sphenopalatine artery and nerve. A 25-gauge spinal needle (bent at the hub) is used to permit optimal visualization. Systematic injections from back to front complete the septal anesthetization and prevent blood from obscuring the surgeon's view. Injections are also made into the inferior turbinates.
Severe spurs that prevent posterior injection may necessitate trans-oral pterygopalatine nerve blocking through the greater palatine foramina. The foramen is identified by locating the dimple just medial to the third molar. The needle should not be inserted more than 2.5 cm into the foramen because of the possibility of affecting the optic nerve. Considerable resistance on injection confirms proper placement in the pterygopalatine canal. Minimal resistance suggests misdirection of the needle behind the foramen into the soft tissues of the nasopharynx.

The most commonly under-anesthetized areas are the posterior septum, high on the perpendicular plate, and underneath the nasal bones. A high septal deflection may require injection of the middle turbinates. Patients should be warned that they may experience a sensation of dysphagia caused by anesthesia of the pharynx; some become so numb that they cannot feel the air passing through the nose and throat. The injection should be done before the surgical preparation and draping to allow 15 to 20 minutes for the onset of vasoconstriction. Reinjection on the outside and underside of the nasal bones 15 minutes prior to osteotomies eliminates bleeding and pain. To prevent startling, patients should be told beforehand that the osteotomies will be loud, but will not hurt.
Endonasal Rhinoplasty Technique

Personal preference determines the order of a septorhinoplasty. Many surgeons have had success with the following technique.

A hemitransfixion incision is made through the mucosa on one side of the caudal septum to provide access for the septoplasty.

In patients in whom the caudal septum is dislocated off the premaxillary spine, however, a full transfixion incision through the mucosa on both sides just in front of the caudal septum is made to allow better access for repositioning and securing the septum to the nasal spine.

The mucoperichondrium and mucoperiosteum are lifted off the entire concave side of the nasal septum to provide optimal visualization.
A 6 mm dorsal cartilaginous strut and a 1 cm caudal strut are preserved to support the external nose when septal cartilage is used in the rhinoplasty (e.g., for creation of a columellar strut or tip graft or for dorsal augmentation).

The cartilage to be resected is outlined with a Cottle or Freer knife to prevent incising the contralateral mucoperichondrium.
A Cottle elevator is then used to dissect the contralateral mucoperichondrium. Flap elevation is continued onto the perpendicular plate of the ethmoid and down along the vomer to the nasal floor.

The perpendicular plate of the ethmoid superiorly and the vomer inferiorly are cut with scissors.
Basic Technique

A Freer elevator is placed between these cuts and used to fracture the perpendicular plate and vomer.

The harvested septal cartilage-bone complex is then removed with forceps, with care taken to preserve the thick cartilage at the bone-cartilage junction for tip grafting. In cases in which no grafts are needed, only the obstructing cartilage and bone are excised, thereby preserving autogenous material for future grafting procedures. After the septoplasty, a low fenestra is created in one flap to help prevent hematoma formation.
The hemitransfixion incision is closed and Silastic® splints or a quilting stitch are used to hold the flaps together in the midline. Some surgeons also perform osteotomy, cauterization, or partial (including submucosal) resection of the inferior turbinates to ensure an adequate airway.

The rhinoplasty starts with degloving of the nose.

**Bilateral intercartilaginous incisions** (between the alar and upper lateral cartilages) are made 1 mm above the caudal margin of the upper lateral cartilage and extended medially above the nasal valve and around the septal angle. These incisions will meet any full transfixion or hemitransfixion incisions that have been made.
Elevation of soft tissues over the cartilaginous dorsum and upper lateral cartilages proceeds with scissors or knife in the supraperichondrial plane.

Once the soft tissue has been elevated over the cartilaginous dorsum, a McKenty elevator is inserted under the periosteum starting just above the caudal margin of the nasal bones. The periosteum is lifted with the elevator to allow introduction of the instruments necessary for dorsal reduction. The small midline raphé of the periosteum is divided at the rhinion with scissors to allow insertion of a Converse or Aufricht retractor. When the retractor is in place, the entire nasal dorsum will be exposed.
The surgeon may then either remove the hump (see chapter 6) or begin work on the tip. Many surgeons think that tip projection is harder to control than hump removal and therefore work on the tip first so that they can subsequently judge how much of the hump should be removed in relation to the final tip projection. On the other hand, surgeons who set tip projection by using a strut and a shield often prefer to remove the hump and perform the necessary osteotomies before beginning the delicate tip work.
Basic Technique

If an endonasal tip delivery approach is used, bilateral incisions are made at the lower margin of the alar cartilages (alar marginal incisions).

The soft tissue is elevated off the cartilages with scissors in the supraperichondrial plane.

This plane is connected with the intercartilaginous incision allowing the alar cartilages to be delivered and modified as necessary. Any shaping stitches (see chapter 9) are placed after trimming the appropriate parts of the alar cartilages.
Osteotomies are then performed. The outside and especially the underside of the nasal bones and the ascending process of the maxilla are injected with local anesthetic 15 minutes prior to the osteotomies to prevent pain and bleeding.

**Medial osteotomies** are made parallel to the midline (when the nose is crooked) or may fade laterally (if the nose is straight). The osteotome may be introduced transmucosally with no untoward effects.

After completion of the medial osteotomies, **lateral osteotomies** are performed.

The vestibular skin is punctured with Iris scissors to allow the osteotome to be inserted without bleeding. Some surgeons elevate the periosteum on the sidewall of the nose prior to performing the osteotomy.
Basic Technique

Beginning surgeons prefer guarded osteotomes because they are easier to localize along the sidewall of the nose. With experience, a 2- or 3-mm osteotome can be used effectively for lateral osteotomies.

An osteotome of the same size can also be employed for percutaneous lateral osteotomies. After multiple perforations have been created in the bone, digital pressure is applied to fracture it. The stab incision on the outside of the nose disappears.

A lateral osteotomy may be either low or high. Most surgeons create low osteotomies because the sites of high osteotomies may be palpable and sometimes visible postoperatively.
In general, osteotomies are used for three reasons: to close an open roof created by removing a hump; to straighten a crooked nose; and to flatten convex nasal bones (intermediate osteotomies).

A lateral osteotomy acts like a hinge, allowing the upper surfaces of the nasal bones and upper lateral cartilages to come together in the midline. The only area actually narrowed by osteotomies is the dorsum of the nose. Eventual bone remodeling at the piriform aperture will nullify any immediate narrowing of the base of the nose.
Basic Technique

Beginning surgeons understandably approach osteotomies with some trepidation. The following points about these procedures may be helpful.

1. The initial placement of the osteotome for a lateral osteotomy can vary by 1-3 mm with almost no affect on the final appearance.

2. Many surgeons are overly concerned about starting the lateral osteotomies sufficiently low on the piriform rim since a high osteotomy site may be palpable and perhaps visible postoperatively. I prefer to start a little higher on the rim, where the bone is slightly thinner, and then drop quickly to a low position along the side wall of the nose. A curved osteotome lends mechanical advantage to approaching the top of the medial osteotomy. If the medial osteotomy fades away from the midline, a straight osteotome can be used for the lateral osteotomy.

3. Once the osteotome is seated, forceful tapping facilitates the procedure. A sound-attenuated mallet is used when patients are under local anesthesia.

At the end of the case all the incisions are closed with absorbable sutures. Precise reapproximation of the mucosa near the septal angle prevents scarring in the valve area. Some surgeons leave the intercartilaginous incisions open to allow drainage.

The nose is taped and a cast is applied. Administration of steroids may decrease swelling. Antibiotic therapy may prevent infection, a special concern in patients in whom splints or prosthetic implants have been inserted. The nasal cast and splints are generally removed on the seventh postoperative day.
An external rhinoplasty begins with bilateral incisions starting just anterior to the medial crura and extending from the dome to the midcolumnellar region.
An inverted "V" incision across the columella connects the incisions on the side.

Small sharp scissors are then advanced across the columella between the skin and anterior edge of the medial crura. Once in position, the scissors are opened to spread the transcolumellar incision and reveal any remaining soft tissue attachments that must be divided.
A small double hook is used to retract the columellar flap while the scissors are inserted over the lateral crura.

One blade of the scissors is placed in the pocket over the lateral crus and the other in the vestibule along the lower rim of the alar cartilage. The marginal incision is then completed.
Basic Technique

The domes are retracted inferiorly with a narrow 7 mm double hook. The columellar flap is retracted with a 2 mm double hook. Dissection is extended to the septal angle and along the nasal dorsum up to the caudal end of the nasal bones.

A McKenty elevator is used to lift the periosteum off the nasal bones.

The septoplasty can be performed through the external approach, which provides a panoramic view of the upper septum that is especially helpful in patients with a high septal deflection or in revision cases in which some remaining cartilage is harvested. Dividing the attachment of the upper lateral cartilages to the septum assists in elevation of the mucoperichondrial flap and exposure of the septum.
Basic Technique

If a columellar strut is to be placed, small scissors are used to create a pocket between the medial crura. The soft tissue in front of the nasal spine is preserved to prevent lateral strut displacement.

Some surgeons secure the strut with 4-0 gut suture on a straight needle that they pass through the columella-strut complex; usually two or three stitches suffice. Others use buried nylon or polydioxanone sutures.
If a shield graft is to be placed, the sides are beveled to prevent visible sharp edges. The shield graft is secured with polydioxanone (PDS®) or nylon sutures.

To promote optimal positioning of the graft, the sutures nearest the domes should be placed before those closest to the transcolumnellar incision are inserted.
Replacement of the skin over the strut and shield complex may produce a slight upward rotation of the tip and consequent flaring of the lateral crura. This can be prevented by dividing the dome and excising a small segment of lateral crus. The medial and lateral crura are then reapproximated with sutures.

The transcolumnellar incision is closed with a deeply placed 6-0 polydioxanone suture and fine skin sutures. Absorbable sutures are used to close the incisions along the alar margin. The nose is taped and splinted.
Chapter 6

The Hump

Rhinoplasty has been called the “just one thing” operation. At the end of the one-year postoperative visit the patient will smile and say “doctor, I love my nose, but there’s just one thing…” They then may point to a very small residual hump (called swelling up to now) and ask, “Will this go away?” During the rhinoplasty, the profile of this patient had looked perfect to the surgeon. A study of preoperative and postoperative xeroradiographs, however, reveals permanent postoperative soft tissue thickening occurs at the rhinion. As mentioned earlier, injecting anesthetic directly over the dorsum during the operation will produce a mimicking of this postoperative thickening (1 to 2 mm) and allows more accurate judgments to be made about the amount of bone and cartilage that should be removed. In addition, the soft tissues at the radix swell quickly after they are elevated. At surgery, this swelling, which increases with the length of the case, must be pushed out by applying pressure to the radix area immediately before the profile is assessed. Finally, because the dorsal hump seems larger in a patient with a low radix disproportion or a tip with inadequate projection, it should be remembered that modifying these features will decrease the amount of hump to be removed.

There are many ways to remove a hump. Some surgeons rasp the bone and then use a scalpel to shave down the cartilage. Other surgeons cut the cartilage first and then remove the bone with an osteotome. A few prefer to use power rasps and drills.

For beginning surgeons, it is safest to use a rasp on the bony convexity and then shave the remaining cartilaginous dorsum with a scalpel. A rasp engages a progressively larger surface area of bone as hump removal proceeds, thereby slowing down the process as the ideal profile is approached. It is impossible to gouge the dorsum unintentionally. Engaging the cartilage with a blade can subsequently be somewhat difficult because of the surrounding bone, but most surgeons learn to do it.
Some surgeons stab through the cartilaginous convexity at the bone-cartilage junction with a scalpel, draw the instrument down toward the septal angle, and then remove the bony hump with an osteotome. This method can result in overreduction if the osteotome is not directed superficially, since the instrument will be deflected downward by the flat cortex of the underside of the nasal bones. However, many experienced surgeons prefer this technique because it is faster.

In a more conservative approach, the desired level on the side of the cartilaginous convexity is first marked with a blade. The blade is then advanced to the bone-cartilage junction by means of progressive sweeps across the dorsum. An osteotome or a rasp is used to remove the remaining bony convexity.

Almost all surgeons smooth the bony dorsum with a rasp and employ some form of incremental cartilage shaving to make final adjustments to the dorsal profile.
Because optical illusions are important in the postoperative appearance of the profile, use of a radix graft may reduce the amount of hump that must be removed or eliminate the need for hump removal entirely.

Increasing the tip projection (with a shield, strut, or both) may have the same effect.
A "deviated" nose is one in which the nasal bones and upper lateral cartilages point away from the midline.

In a "twisted" nose, the nasal bones point in one direction, but the upper lateral cartilages return to the midline. A systematic approach simplifies correction of either abnormality.

First, if the septum is crooked, a septoplasty is performed. Second, the upper lateral cartilages are disarticulated from their attachment to the septum.

Disarticulation can be performed transmucosally or submucosally. If the transmucosal approach is used, care must be taken to preserve a small rim of mucosa at the nasal valve. Medial and lateral ostectomies are then performed.
After the septoplasty, release of the upper lateral cartilages, and osteotomies, the nose will usually be straight. However, the extension of the perpendicular plate of the ethmoid up underneath the nasal bones, (the "central complex") may remain crooked. If so, it should be digitally fractured.

Beginning surgeons should not let the dramatic nature of this maneuver produce a reluctance to do it. In fact, fracturing rarely has any complications.
If the nose is still crooked after the central complex fracture, camouflaging crushed cartilage grafts should be placed along the side walls of the nose.

To summarize for a crooked nose:

1. Septoplasty.
2. Disarticulation of the upper lateral cartilages.
3. Osteotomies.
5. Camouflaging crushed cartilage grafts.

Patients should never be guaranteed an absolutely straight nose, and most understand that such an assurance is not possible. With use of good technique, however, improvement—though not perfection—occurs in nearly all cases.
Chapter 8

Saddle Nose

Most saddle nose repairs include augmentation of the nasal dorsum with autogenous septal cartilage. If the septum has previously been harvested, cartilage from the auricular concha can be used. Autogenous septum and concha are well tolerated and will not become infected or be reabsorbed. Other autogenous materials that can be used include split calvarial bone, although it tends to be stiff and have somewhat sharp edges (which, however, can be smoothed with a burr), and rib, which sometimes resorbs or warps.

If autogenous material is not available (eg, in a patient who has had multiple revisions), the dorsum may be augmented with an alloplast. Many prosthetic materials have been used in plastic surgery procedures, with varying degrees of success. Polyamide mesh is reabsorbed by the body. Solid silicone has the ability to get infected and extrude even years after being placed. Polypropylene mesh has been useful in some cases. Porous polyethylene allows soft tissue ingrowth, but is somewhat stiff.

The most promising alloplastic material appears to be expanded polytetrafluoroethylene (ePTFE), which is nonabsorbable, biocompatible, soft, conformable, and allows soft tissue ingrowth. Several authors have reported initial success with ePTFE, which may become the alloplastic material of choice if long-term data on the material are as good as the early results.

Many surgeons continue to believe, however, that the use of any form of nonautogenous graft material in the nasal dorsum represents an invitation to the eventual development of problems caused by mobility, infection, and extrusion of the implant.
Good projection, rotation, geometric form and definition create a pleasing tip.

**Projection**

In general, the tip is adequately projected when it leads the dorsum by 1-2 mm, although, in some persons, it appears adequate if it is aligned with the dorsum.

**Increasing Tip Projection**

A systematic approach to a tip with inadequate projection eliminates confusion.

If only 1-2 mm of additional projection is needed, a supradomal graft or a shield graft can be placed in a pocket in the tip.
If still more projection is required, a strut of autogenous septal cartilage can be sutured between the medial crura.

For maximal projection both a strut and a shield graft are sutured into place. Use of an external approach facilitates this procedure, which is called an "open-structured rhinoplasty".
Some surgeons place an intercrural strut, divide the domes, and then sew the medial crura to the strut.

This "dome-division" technique can maximize projection, but sometimes the cut edges of cartilage are visible through the skin postoperatively (bossae formation). The method may therefore be most useful in thick-skinned patients, who are not as likely as thin-skinned patients to have bossae formation and alar notching.

In summary, a systematic approach to increasing tip projection involves:

1. A shield or supradomal graft.
2. A columellar strut.
3. A strut and a shield or supradomal graft.
4. A strut and dome division.
The Tip

Decreasing Tip Projection

In decreasing tip projection, achieving acceptable results can be difficult, since definition may be lost when the skin contracts around the new, smaller framework. It is important to remember that an overprojected lower third of the nose is often an optical illusion caused by a low radix disproportion. In such cases, use of a radix graft can eliminate the need to decrease tip projection.

A well-proportioned large nose is preferred over an ill-proportioned small one.
Consideration of the tripod model of tip support will help in planning procedures to deproject or rotate the tip.

According to this model, each lateral crus represents one leg of a tripod, with the conjoined medial crura and caudal septum forming the third leg. Shortening or lengthening any of the legs produces a corresponding movement of the tip. Pushing gently on an overprojected tip will reveal the origin of most of its support. If the tip is supported primarily by the crura, it will feel springy. If its support is derived chiefly from the septum, the septal angle will be palpable.

The most subtle tip-deprojection maneuver is the creation of a complete transfixion incision that allows the tip to slide back along the caudal margin of the septum. If the septum is providing substantial support for the tip, the septal angle will be lowered. If the tip is overprojected because of the length and strength of the medial and lateral crura, the crura will be modified.

A segment of the lateral crura or a segment of the medial crura can be excised or overlapped with subsequent fixation by sutures. This technique maintains the natural shape of the tip at the domes.
The Tip

Excision of the domes themselves can also be done, but the procedure will change their shape.

In patients in whom the tip is substantially deprojected (especially thick-skinned patients), the skin sleeve may be too large to drape well over the smaller framework resulting from the deprojection procedure. A shield graft (sutured or placed in a pocket) can help fill the skin envelope, adding definition without adding projection.

In summary, to decrease tip projection:

1. Full transfixion incision.
2. Lower septal angle.
3. Shorten crura (add shield graft for definition).

Rotation

Increasing Tip Rotation

The most subtle way to increase apparent tip rotation is to remove the hump. The first direct maneuver for augmenting tip rotation is excision of a triangular piece of the caudal septum, with the base of the triangle at the top.

Another frequently employed direct maneuver is shortening the lateral crura. Use of this procedure is based on the tripod theory of tip support.
In cases in which there is concern that shortening the lateral crura might decrease projection, many surgeons use a shield graft, which often creates the illusion of dramatically increased tip rotation. Augmentation of the premaxilla with autogenous cartilage or ePTFE will enhance that illusion.

In summary, to increase tip rotation:

1. Remove hump if present.
2. Shorten caudal septum.
3. Shorten lateral crura.
4. Shield graft.
5. Premaxillary augmentation.
Decreasing Tip Rotation

Tip rotation may seem excessive in patients with hypertrophy of the caudal septum near the nasal spine that results in a large nasolabial angle and an apparently short upper lip.

Trimming the caudal septum near the nasal spine decreases the nasolabial angle, creates an apparent derotation of the tip, and may relieve tension on the upper lip. Tip rotation may also be visually decreased by dorsal augmentation.

In summary, to decrease tip rotation:

1. Trim caudal septum near spine.
2. Augment the dorsum.
Shape

When viewed from the base of the nose, the tip should appear triangular. If the alar cartilages are bulbous or the domes are wide, the tip looks trapezoidal.

In patients with V-shaped domes, placement of a suture between the medial crura will narrow the interdomal distance and create a more triangular tip.
Often, however, the domes form more of an arch than a V. In such cases, both the medial and lateral crura can be included in a horizontal or vertical mattress suture ("double-dome" or "interdomal" stitch). This may be supplemented by scoring the cartilage at the domes to weaken its inherent spring.

Some surgeons modify the tip by placing sutures in each dome separately to create the proper individual dome shape. A separate stitch allows precise control of the interdomal distance.

For maximal narrowing, the domes themselves can be divided and the medial crura sewn together (the dome-division technique). Most surgeons preserve the continuity of the vestibular skin when dividing the domes. As mentioned previously, sharp edges of the cartilage may show through the skin creating bossae. In thick-skinned patients, however, this is less likely.
The Tip

Tip bulbousness can be decreased by excising the cephalic portion of the lateral crura. To prevent alar notching and collapse from this procedure, a strip of cartilage at least 6 mm wide should be left intact.

In summary, to narrow the tip:

1. A stitch between the medial crura.
2. A stitch between the domes.
3. A stitch between dome shaping stitches.
4. Dome division with coaptation of the medial crura.
The Tip

Definition

Tip definition depends on the visible ridges (highlights) created by cartilage under the skin. Because these ridges are less noticeable in thick-skinned than in thin-skinned persons, resection of cartilage underneath thick skin would compromise definition. Conversely, augmentation with cartilage grafts (supradomal or shield) in thick-skinned patients creates highlights, making the skin appear thinner and the tip of the nose more well defined. Any excessive subcutaneous fat in the supratip area should be removed during this procedure.

Placing a tip graft adds volume to the total amount of tip cartilage and can actually increase bulbousness by causing flaring of the lateral crura. Excising a small segment of the alar cartilage just lateral to the dome with reapproximation of the remaining lateral crus will allow an increase in definition and projection without an increase in bulbosity.
The alar base should be no more than 1-2 mm wider than the intercanthal distance when the nose is viewed from its base.

When narrowing the alar base, by performing alar base resections, a small flap of tissue is always preserved medially at the base of the columella to change the size rather than the shape of the nostril.

Asymmetric nostrils are usually the result of dislocation of the caudal septum off the premaxillary spine. Repositioning the caudal septum restores symmetry.
Chapter 10

Nasal Fractures

Patients with nasal fractures usually present to the emergency room with substantial swelling. Management includes the usual procedures employed in any trauma case (e.g., maintenance of an airway) and evaluation of any associated fractures. Patients with an isolated nasal fracture can be treated with ice for 24 hours, as well as decongestants, analgesics, and antibiotics. When the swelling has gone down (five to seven days), they should return for evaluation. Photographs obtained in the emergency room will provide documentation pertaining to the nature of the injury. Nasal radiographs do not change management.

The traditional treatment for nasal fracture is closed reduction, the results of which will satisfy 65% to 85% of patients. Experienced surgeons, however, treat this injury more aggressively. A prefracture photograph is obtained, if possible, for preoperative assessment. After discussion with the surgeon, the patient usually grants permission for an open reduction and septal reconstruction.

When the septum is fractured and a closed reduction is attempted the nose will often drift back off midline even before the cast is applied. In these cases a septal reconstruction is performed. Minimal cartilage is resected, but disarticulation of the septal bony-cartilaginous junction is necessary. Any bony or cartilaginous spur is removed. The nasal bones are reduced again and if they stay in place without packing or splinting then the incisions are closed and a splint is applied.

Occasionally, the nose continues to deviate after the septoplasty. In such cases, medial and lateral osteotomies are performed, which usually straightened the nose in patients in whom the upper lateral cartilages were straight before the initial fracture. If the nose continues to deviate after the osteotomies, the upper lateral cartilages are divided from their attachment to the septum. Osteotomies and disarticulation of the upper lateral cartilages can be done without degloving the nose. Subsequently, the surgeon follows the same procedures used to repair a crooked nose including digital central complex fracture and camouflage crushed cartilage grafts (Chapter 7).
Some patients with a nasal fracture want a previously existing hump removed during the surgery for the fracture. Although some surgeons think that rasping fractured nasal bones might avulse them from their superior attachments, a small hump can usually be removed, if it is done with care. If the fracture is severely comminuted, however, hump removal may not be advisable until after healing has occurred (three to six months). Moreover, tip work is rarely done in patients with an acute fracture because of the presence of swelling.

Open reduction works best when performed within two weeks of the fracture. After three weeks, the development of fibrous tissue between fragments makes repositioning more difficult, even with osteotomies. Therefore, if three or more weeks have passed since the injury, the patient is usually scheduled for a septrhinoplasty to be performed three to six months after the fracture was sustained.

In summary, a systematic approach to treatment of the fractured nose involves:

1. Closed reduction.
2. Septoplasty.
3. Osteotomies.
4. Division of upper lateral cartilages from the septum.
5. Central complex fracture.
6. Camouflaging crushed cartilage grafts.
Conclusion

Many technical principles of rhinoplasty have been presented in this book. It only remains to share a few philosophical principles about the procedure.

The first goal of any rhinoplasty is to establish and maintain the airway. This can be done in several ways. First, the septum is straightened and, if necessary, the turbinates are reduced. During straightening of the septum, adequate dorsal and caudal cartilages are preserved to provide support for the external nasal skeleton. When concern about valve collapse exists (especially in cases of short nasal bones), spreader grafts are often placed. Adequate alar cartilage is preserved to prevent alar collapse.

Following these principles of airway preservation also serves another purpose: providing as much skeletal support as possible to minimize long term changes in the nose resulting from soft tissue contraction.

Once the airway and skeletal support are adequate, attention may be turned to the first cosmetic goal of rhinoplasty, the creation of a balanced-appearing nose. Interestingly, the most attractive feature of any face is the eyes. Thus the nose must not draw attention to itself, but allow attention to be drawn to the eyes. (Have you ever heard anyone other than a professional colleague say, “what a beautiful nose!”?)

Once balance has been achieved, refinement and beauty become the goals. These must never be achieved at the cost of compromise of the airway or skeletal support, and \textit{a priori} cannot be achieved at the price of balance.

Occasionally, a surgeon will have to make a choice between creating a perfect profile and making the nose look better from the front. This can happen when choosing, for example, whether to use the last piece of cartilage on the side of the nose for straightening or in the tip for added projection. In general, the nose should be made to look good from the front before creation of the perfect profile. This is simply because patients are viewed from the front far more often than in profile. Perhaps even more important, patients view themselves from the front in a mirror every day and very rarely see their profile.

Many beginning surgeons become confused because of the emphasis in the literature on techniques and approaches. Always remember that the underlying question for any rhinoplasty is, “what needs to be done to this nose to make it work well and look right?” Once the operative maneuvers
have been decided on, the question becomes, "which approach is technically the easiest for me to use to perform these maneuvers?" For example, if I need to secure a strut and shield graft with sutures, I prefer an external approach. However, some surgeons use an endonasal approach, with equally good results. Likewise, if a shield graft can provide adequate projection and definition by being placed in a pocket, then an external approach becomes superfluous. The common arguments concerning transcolumnellar scars and operative times are irrelevant.

Finally, rhinoplasty is a challenging and fun operation, but the stakes are very high because of the visibility of the results. Any surgeon who undertakes rhinoplasty should give his or her patients the benefits of continued dedication to self-education. Graphical records showing operative maneuvers on standardized nasal drawings are the easiest way to keep track of what was done at surgery. These records, coupled with good clinical photographs, form the basis for understanding the failure or success of one's own techniques. Persistence in self-education will yield fruitful results.
Suggested Reading


