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**Introduction**

The information to be presented represents a variety of specialized, but less common techniques that the experienced rhinoplasty surgeon should be aware of. The five following topics will be presented: 1) the alar base, 2) the twisted nose, 3) saddle-nose deformity, 4) the non-Caucasian nose, and 5) the aged nose.

**Alar Base**

The ideal location and proportions of the nasal base must be viewed from the frontal, lateral, and basal views in order to assess the overall nasal-facial symmetry. In the frontal view a vertical line dropped from each inner canthus alongside the nose should define the lateral limits of the alae for an ideal normal appearance. Wider or more flaring alae suggest consideration for alar reduction techniques. From the lateral view, the site and position of insertion of the alae into the face influence nasal proportions and aesthetics dramatically. A more cephalic location of the alar-facial junction may create a high, arched appearance to the alae, exposing an excessive amount of columella, and in its extreme producing a snarling appearance. The opposite appearance is created because of a disproportionately large and bulbous alar lobule, resulting in alar hooding and inadequate exposure of the aesthetically appropriate amount of columellar anatomy. The ideal alar-columellar relationship has the ala inserting into the face at about the level of the caudal border of the columella with approximately 2-3 mm of columellar show. On basal view of the nose the general shape is that of an isosceles triangle with the lobule being neither too broad nor too narrow. The columellar-lobule relationship ideally approximates a 2:1 ratio. The beginning of the flare of the medial crural footplates divides the alar base into halves. There are significant ethnic differences in alar configuration which will be discussed in a later section.

Alar modification, while not often necessary in the Caucasian rhinoplasty, are rather consistently required in certain ethnic types such as black, and Oriental. However,
anytime narrowing of the nasal skeleton and tip create imbalance in the nasal base, concomitant reduction refinement of the alar base should be performed. In general, alar modifications are indicated when alar flaring, bulbosity, or excessive width of the nasal base exists or when retropositioning of excessive tip projection results in a displeasing postoperative alar flare. Excessively wide nostril floor dimensions may also dictate the need for alar sill or nostril floor modifications.

The sites of incisions and the amount, degree, and geometry of alar reductions depends on a host of anatomic variations predetermined before and during surgery. Conservatism is mandatory to avoid overreduction and asymmetry, conditions almost impossible to correct satisfactorily. The following anatomic factors are evaluated to determine the planned approach and site of incisions: 1) the internal (medial) length, shape, thickness, and flare of the alar margin, 2) the external (lateral) length, shape, thickness, and flare of the alar margin, 3) the width and shape of the nostril floor and sill, 4) the shape of the nostril aperture, 5) the shape (anatomy) of the columella and related medial crural footplates, 6) the length of the lateral sidewalls of the nose, determined by the site of insertion of the alae into the face. Once the above factors are evaluated and modifications planned a graduated surgical scheme is employed to achieve the desired aesthetic result. Surgical excisions vary from internal nostril floor reduction only where the sill and external border are not violated to complete wedge excisions of the alar base area, once again dependent on the areas and extent in need of correction. General guidelines once again are to perform the excision in a graduated fashion performing only what is necessary. Incisions should be made 1-2 mm above the alar-facial crease, avoiding to some degree the thick sebaceous glands located in the junction. Of equal importance to the planning for alar sculpturing is the precise plastic surgery repair of the resultant scar. The epithelial edges must be approximated meticulously. Additionally, skin sutures placed across the junction often lead to contracted suture marks, typical of any incision or overly tight sutures that traverse an epithelial concavity. To avoid unsightly scars the cut edges need to lie in exact approximation with the use of buried interrupted sutures. If skin sutures are deemed necessary 5-0 mild chromic catgut loosely tied to accommodate slight tissue swelling is preferred. Mild chromic catgut suture stitches stretch enough to accommodate tissue swelling without cutting the epithelial edges and weaken sufficiently in 2-4 days to aid in healing, but avoid unsightly suture marks.

**Management of the Crooked Nose**

The crooked nose deformity remains one of the most difficult problems encountered by the facial plastic surgeon. Contributions to the deviation often exist from the nasal septum, bony and cartilaginous dorsum, and even nasal tip. Manipulations to the deviated structures must be made in such a manner as to not compromise the structural support for the nose. The major support mechanisms or the lower third of the nose include 1) the structural integrity of the lower lateral cartilages, 2) the fibrous attachment between the cephalic margin of the lateral crura and the caudal margin of the upper lateral cartilage, 3) the soft-tissue attachment between the cephalic margin of the medial
crura and the caudal margin of the nasal septum, and 4) the interdomal ligament attaching the domes to the anterior septal angle.

The first step in correcting the crooked nose is to make a careful anatomic diagnosis through a good physical evaluation and careful study of facial aesthetics. The nose should be examined in light of overall facial asymmetry. At times the entire lower two-thirds of the face deviates to one side which can be visualized by holding a vertical rule from the midpoint of the nasion to the midportion of the upper lip and teeth. This deviation must be recognized because not only will it prevent complete straightening of the nose, but may lead to a less aesthetically desirable outcome if attempted. The entire nose should be palpated including the bony dorsum to determine length of nasal bones and point of deviation as well as the nasal septum and nasal spine. Additionally, the tip recoil should be estimated by depressing the nasal tip in order to assess the existing tip support.

The nose may be addressed by a variety of surgical techniques depending upon surgeon preference and nasal deformity, however several areas of common pitfall exist including important deviations in the caudal and dorsal septum as well as irregularities of the upper lateral cartilages. Prior to shifting the bony vault back to the midline, the dorsal profile must be assessed for hump removal. Care must be taken in removing the hump however because of the vertically oriented position of one of the nasal bones. When removing the bony dorsum often less bone removal is required from the vertically oriented nasal bone to produce symmetry once osteotomies are complete. Often times the nasal bones are markedly asymmetrical in their appearance with one being concave and the other convex. In these instances intermediate osteotomies may need to be carried out to straighten the bones. In these cases extra care must be taken not to elevate the periosteum off the nasal bones to prevent their collapse into the nasal vault.

In most crooked noses, the lower two thirds of the nose is at least partially involved in the deformity. In these cases the upper lateral cartilages should be freed from the anterior dorsal border of the nasal septum to allow these structures to reorient themselves in the midline. If reorientation of the lower two thirds of the nose is not performed, after osteotomies the nose may shift back toward the preoperative orientation and heal in a crooked position because of the memory of the deviated cartilaginous structures. Following division of the upper lateral cartilages care must be taken to prevent the upper-lateral cartilage from collapsing inferior-medially and obstructing the nasal valve. This can be prevented by leaving the mucosa attached to the underside of the upper lateral cartilage and by taking care to re-secure the cartilage to the septum upon completion. These maneuvers are best accomplished through an open approach to the nose and septum. This technique is also beneficial because it affords adequate visualization of the dorsal aspect of the septum which is often deviated and may contribute to persistent post-operative deviation.

If only a minor deviation exists the nose may shift to the midline following osteotomies with little difficulty. In some cases, a significant residual deviation of the anterior (dorsal) border of the nasal septum will be present. These deformities may be isolated or
involve the entire cartilaginous septum. In many cases, there is some form of a C-shaped deformity creating a dorsal concavity on one side of the nose and a convexity on the opposite side. If the caudal septum is in the midline camouflaging techniques can be used to correct mild to moderate C-shaped deformities of the dorsal septum. The convex side of the septum may be shaved and the concave side have a unilateral spreader graft placed. The graft should be slightly larger than the defect to allow for changes in the ipsilateral upper lateral cartilage. The upper lateral cartilages can then be resutured to the spreader graft and septum and the skin soft tissue envelope replaced. Any further deviations or irregularities may be corrected with on-lay grafts. This technique is very useful for camouflaging the C-shaped deformity of the dorsal septum, but it does not correct for the underlying deviation. If the patient suffers nasal airway obstruction secondary to the septal deviation more aggressive maneuvers may be necessary. With larger C-shaped deformities thin ethmoid bone can be harvested from the septum and cut unto rectangular grafts measuring 5-12 mm in length and 3-5 mm in width. The septal cartilage may be lightly cross-hatched on the concave side to release the memory and the ethmoid bone grafts sutured on either side using a large Keith needle to drill holes, therefore stenting the septum into a straight orientation. A rim of about 1 mm of dorsal cartilage should be sutured above the graft to hide any irregularities. If further camouflaging is necessary on-lay grafts may be placed. Once all of the grafts are in place the anterocaudal-most corner of the upper lateral cartilage must be sutured to the region near the anterior septal angle to prevent collapse.

The caudal margin of the septal cartilage is very important because it provide support for the lower third of the nose via attachments to the domes and medial crura. Caudal deviations must be corrected for support purposes as well as for correction of airway obstruction. Relatively minor caudal septal deviations can be corrected by using cartilage manipulation and suturing techniques. Severe caudal septal deviations may require replacement of the deformed segment of the nasal septum with a straight piece of cartilage. If the anterior septal angle is in good position and only the posterior septal angle has been shifted off the nasal spine, a small triangular piece of septum may be trimmed, the concave side lightly crosshatched and then sutured to the periosteum on the opposite side of the nasal spine. With placement of this suture care must be taken not to pull down on the posterior septal angle which could result in a decrease in nasal tip projection. When the caudal septum, anterior septal angle, or a significant portion of the L-shaped strut is severely deviated or fractured, replacement of the deformed segment of nasal septum can be performed, and if necessary the entire strut may be refashioned. The replacement L-shaped strut must be resutured to a stable cartilage remnant at the osseocartilaginous junction (rhinion) and nasal spine. Positioning of the medial crural footplates onto the new caudal strut can affect tip rotation and nasal length. To add additional tip support a sutured-in-place columellar strut may also be placed.

Patients are kept on antibiotics for 7 days and external casts are removed on post-operative day 5-7. Transcolumellar sutures are removed at 5 days and the nose continued in anti-tension taping for at least 2 weeks. At 5 days, the nasal bones are not completely healed and a slight shift in the bony nasal vault may be corrected by applying repeated
pressure to the mal-positioned bone. The possibility of such exercises is discussed before surgery so patients are not confused about the necessity of such management.

**Saddle Nose Deformity**

Saddle nose deformity consists of a significant loss of profile in the bony and cartilaginous dorsum. While some result from ethnic congenital inheritance, most are the product of overzealous profile reduction, trauma, or infection associated with a septal hematoma. The use of more conservative septoplasty techniques with the abandonment of classic submucous resection techniques with inadequate dorsal and caudal struts have decreased the incidence of this deformity. The repair consists of dorsal augmentation and can be performed through a variety of techniques and utilizing a variety of materials depending on severity of the deformity, available donor sites, and surgeon and patient preference. Septal cartilage is preferred if available in sufficient quantity, however this is often not the case due to the origin of the deformity. If septal cartilage is not available the cavum and cymba conchal cartilages provide an excellent donor material. If septal or conchal cartilage is not available in sufficient quantity a myriad of other materials are available including autogenous cartilage or bone (rib, mastoid cortex, split calvarial, iliac crest); synthetic or alloplastic materials including but not limited to silastic, Gortex and Mersilene mesh; heterografts such as bovine cartilage or bone; or homograft materials including radiated cartilage, demineralized bone, and allograft. All of these materials have individual problems including resorption or lifetime risk of extrusion. Regardless of the material used the surgeon must always consider that since the epithelium over the rhinion lacks substantial subcutaneous tissue, grafts over the bony profile must be smooth and carefully sculpted. Care is taken to bevel the lateral edges of the implanted grafts to eliminate visible step-deformities at the lateral edges of the nose.

Planning for reconstructive approaches and techniques is best understood if the exact deformity or deformities are appreciated. By determining as exactly as possible which individual components are missing, deformed, or structurally deficient, the appropriate reconstructive graft or grafts can be individually crafted and implanted. The nasal bony pyramid is composed of two paired nasal bones articulating with the maxillary ascending processes. Portions of these bony components, along with the attached paired upper lateral cartilages, are commonly missing or deficient in the saddle nose deformity. A constant finding is significant depression of the supratip cartilaginous dorsum, owing to septal cartilaginous collapse, dislocation, or resorption. Because of this loss of support (with a diminished tip recoil mechanism); retraction of the columella often accompanies the anatomic deficiencies already mentioned. By analyzing which of the nasal components is missing or in need of augmentation, carried out by both inspection and palpation, a reconstructive plan is more easily determined preoperatively.

It is useful to classify saddle nose deformity into three general categories: minimal, moderate, and major. The minimal saddle nose deformity demonstrates moderate tip-supratip differential. Commonly, the bony nasal hump is consequently mildly accentuated. Little if any columellar retraction is apparent, and the nose is over wide. Minimal supratip augmentation with cartilage or fascia is required, or occasionally with
contouring of the bony hump without supratip graft placement. Moderate saddle nose deformities demonstrate significant loss of quadrangular cartilage dorsal height due to septal collapse. Tissue losses from necrosis or trauma commonly result in significant columellar retraction with an increasingly acute nasolabial angle. In addition, if the saddling is the result of blunt trauma, the bony pyramid is often typically excessively broad and flattened, necessitating augmentation or osteotomy narrowing or both. Saddle noses of major proportions demonstrate all of the stigmata of the moderate saddle nose, only to a greater degree. They are more commonly associated with childhood or massive trauma and are associated with major nasal twist and severe septal deformity.

The operative technique of graft placement begins by marking with a sterile making pen both the lateral and cephalic-caudal dimensions of the patient's supratip depression; anesthetic infiltration is then performed. Exacting pocket preparation is mandatory. the mobile tip cartilages are deflected from the midline and a stab incision is sited at the anterior septal angle directly axially aligned to the profile. The recipient host pocket is entered and its predetermined dimensions finalized with a small serrated scissors. Spreading the blades beneath the skin, without tearing or cutting, effectively defines the pocket periphery, which in all dimensions should exist only 1-2 mm larger than the planned grafts. The graft is then inserted into the prepared pocket through the small stab incision. Palpation over the dorsum with peroxide-moistened finger will detect any minor irregularities. Seldom are fixation sutures necessary.

**Surgery of the Non-Caucasian Nose**

Rhinoplasty of the non-Caucasian nose is perhaps the most difficult challenge to the rhinoplasty surgeon. Surgical management of the non-Caucasian nose requires strengthening weak cartilaginous structures, preservation of major support mechanisms, and careful manipulation of the skin-soft tissue envelope (S-STE).

Several differences exist between the Caucasian and non-Caucasian nose with black noses differing most severely and Oriental noses intermediate between the two. Typically, the non-Caucasian nose is flat, broad, and short with an infantile dorsum lacking projection from the nasal tip to the nasofrontal angle. The nasal tip tends to be rounded and poorly defined, with less projection than the Caucasian. An acute nasolabial angle is one of the most consistent findings in the non-Caucasian nose and is partly caused by an underdeveloped anterior nasal spine. The columella is short, thick, and hidden, and tends to diverge superiorly and inferiorly. The alae are thick, flaring, wide-based, and overhang the columella acting to hide it on lateral view. The skin of the ala is thick, fatty and inelastic with numerous sebaceous glands. the nostrils are round or horizontally ovoid. The nose appears short because the nasal tip tends to be rounded and the starting point of the nose (deepest point of the nasofrontal angle) is frequently poorly defined. The starting point of the nose should be well-defined and located at or just below the level of the superior palpebral fold. In many cases, the dorsum is low with a long sweeping slope up to the glabella without any definition of a distinct nasal starting point. The anterior septal angle is usually more obtuse and is set more cephalically. Additionally, the quadrangular cartilage is smaller, thinner, and shorter than in the
Caucasian. The pyriform aperture is wide and the ratio of bone-to-cartilage of the nasal vault is smaller than in Caucasians. The nasal bones are oriented at a more obtuse angle along the dorsum just as the angle at the domes are also set at a more obtuse angle. Not all noses exhibit all of these characteristics, but the more that are present the more challenging surgical correction can become.

Several factors of the non-Caucasian nose limit the degree of aesthetic improvement that can be obtained. First and foremost is the thick, inelastic nature of the S-STE. Despite radical changes in the underlying structure if the S-STE will not redrape appropriately the desired changes in contour can not be achieved. Additionally, after the tip is augmented the thick, short columella may preclude closure of the columellar incision. Weak or thin lateral crura provide little support, and thin and small septal cartilage may not provide enough support requiring conchal cartilage grafts. The surgeon and patient must be realistic about what goals may be obtained. Finally, the ethnicity of the non-Caucasian nose must be preserved to prevent a severe aesthetic deformity.

The non-Caucasian nose is one of the indication for open rhinoplasty techniques. The technique includes a sutured in place columellar strut graft, which due to the thickness of the septal cartilage may need to be doubled. This will provide support for the nose and the tip graft. Most non-Caucasian noses do not require great degrees of tip rotation and so therefore cephalic trim or resection of a triangular portion of the lower lateral cartilages is not indicated. Additionally, to do so could result in significant weakening of the already under supported tip and so is usually not indicated. The small amounts of rotation needed can be obtained with a sutured in place tip graft, often times due to the desired projection increase needed need to be multi-layered. To correct the obtuse domal angle the lower lateral cartilages may be transected at the domes, no cartilage is resected to avoid over rotation, the cartilages are then resutured meticulously to form a more acute angle. Most non-Caucasian noses require dorsal grafting to strengthen the dorsum and provide projection. Dorsal augmentation also provides the illusion of narrowing the upper 2/3 of the nose. If dorsal augmentation and tip grafting would prevent closure of the columellar incision, medial and lateral osteotomies must be performed to narrow the upper third of the nose. Multi-layered tip grafts may be necessary in order to provide the desired projection and definition of the nasal tip. Several additionally techniques may be necessary in order to achieve the full affect of the graft including trimming the medial crura and being sure to suture the basal layer of the graft to the medial crura to prevent retrodisplacement of the graft. These are necessary due to the thick nature of the overlying skin and the relative weakness of the underlying cartilage. The fibrofatty tissue of the nasal tip may be excised to increase definition, however care must be taken not to violate the dermis. Small cartilage plumping grafts can be placed through the lower columellar incision into the premaxillary region to help blunt the nasolabial angle. The columellar incision is then closed with interrupted dermal and skin sutures. Alar flare can be decreased by performing selective alar base excisions. Over-resection of the ala will result in loss of the curvature of the ala as it meets the face creating an unnatural appearance. Post-operatively these patients should be seen every 3-4 weeks for the first 6 months to monitor healing. Kenalog 10 mg/dL may need to be injected in the supratip region sub-dermally to decrease edema and prevent scar tissue formation.
**Aging and Rhinoplasty Surgery**

Both younger and older patients desiring rhinoplasty require special consideration. It is generally agreed that young patients desiring purely cosmetic rhinoplasty should be delayed until facial growth has completed. This age is arbitrary and must be individualized, but is generally thought of as about 15 for females and 17 for males. Some animal models have shown that major septal resections may interfere with subsequent midfacial growth, however, there is no good experimental evidence that conservative repositioning of the alar cartilage (as in the cleft-lip nose) or conservative septoplasty to create an airway result in altered facial growth.

The older rhinoplasty patient also requires special consideration. As with any rhinoplasty patient the motivation and aesthetic goals of the patient must considered. Many patients have had long-standing dissatisfaction with their nose and have simply decided they now have the time and money to proceed. While these patients are good surgical candidates they need to be counseled because they have developed a self-image over many years and need to be prepared for a change in that image. Patients desiring mainly correction of brought on by aging are also good psychological candidates for surgery. An older patient who has had a longstanding contour irregularity who has only recently become dissatisfied with it should be evaluated carefully. If in addition, the patient is undergoing some type of undesired life change, the surgeon should be careful in recommending significant changes. Finally, many older patients have other medical problems that must be evaluated before recommending a cosmetic procedure.

With age, there are changes in the position of the nasal tip, the quality of the nasal cartilage and bone, and the thickness and elasticity of the skin as well as associated changes in the surrounding facial structures. The tip support mechanisms weaken with age, resulting in the well-documented descent of the nasal tip over the years. Cadaveric studies of the aging nose show alar cartilages which became flattened and fragmented with loss of attachment between upper lateral and lower lateral cartilages and fragmentation of the attachments in the scroll area. The nasal bones themselves are thinner and more brittle. The skin of the nasal dorsum becomes thinner and less elastic. This older skin, however, heals in a less aggressive manner and therefore results in finer scars.

In addition to changes in the nose itself age related changes of the surrounding face must also be considered. As always techniques employed must take overall facial symmetry into consideration. Tip support mechanisms must be maintained, and use of columellar struts is very useful. Care should be taken during septoplasty that the mucosa is thinner and drier and at risk for septal perforation. Conservative techniques should be employed. Wide undermining of the skin may be necessary in order to allow for proper redraping due to the relative inelasticity of the skin. A major difference between rhinoplasty in the older verses younger population is the use of external (particularly dorsal) incisions. Because of the skin characteristics already discusses these external incisions heal well and allow for desirable redraping of skin. These external incisions are rarely useful by
themselves, but are good adjunct to a more complete rhinoplasty procedure. When
osteotomies are performed fine 2-3 mm osteotomes are recommended to prevent
communion of nasal bones. This can be performed a endonasal incision or via an
external stab incision. The usual dressings are applied, however retaping of the nose for
extended periods should be considered to aide in soft tissue attachment formation.

Summary

Rhinoplasty presents one of the most challenging surgical procedures performed. The
alar base, crooked and twisted noses, saddle deformities, non-Caucasian noses, and aging
nose present special situations that require appropriately applied special techniques to
obtain desired surgical outcomes. With applications of these techniques both surgeon
and patient will experience satisfaction with the surgical outcome.

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