

## Post-Rhinoplastic Nasal Obstruction

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The success of cosmetic rhinoplasty is initially judged by aesthetics; however, the final result is deemed successful only if the internal nose functions as well as the external nose appears. A pinched supratip area, for example, that disrupts the natural contours of the nose is usually caused by an overresection of the upper lateral cartilages in the nasal valve area and ultimately results in significant nasal valve obstruction. There are multiple examples of these intimate relationships of which the nasal surgeon must be aware.

Subdividing a nasal operation into purely functional and aesthetic categories is, at best, artificial and, at worst, dangerous to the patient's health. Every aesthetic change imparts a functional alteration. The Bauhaus school fully realized this significance in relation to architecture design over 50 years ago and taught the now famous tenet, "Form follows function." Surgeons must also appreciate the nose as a living form of architecture and adhere to these same principles. It is only by doing so that we will create both beautifully functioning and aesthetically pleasing noses.

The focus of this article is the prevention of nasal obstruction during cosmetic rhinoplasty and not the subsequent reconstruction of iatrogenic obstruction. Employing the techniques and strategies derived from cadaver dissection and the experience of thousands of rhinoplasties over more than 10 years, I believe that iatrogenic nasal obstruction can be minimized.

This article outlines not only specific techniques, but a philosophy of planning and execution that each individual surgeon can adapt to his or her particular style of rhinoplasty. The ultimate purpose is to assure that the rhinoplasty patient never states, "Doctor, I love my beautiful nose but I'm miserable because I can't breathe."

## DIAGNOSIS AND PLANNING

The prevention of post-rhinoplastic obstruction begins with a careful assessment of the pertinent cosmetic pathology, which is then specifically addressed by a thoughtful, concise, and well-planned operative procedure. The worst mistake is to fit a patient into a predetermined routine procedure and not tailor the operation to the particular patient. This may seem pedantic, but some surgeons try to fit the patient into a model form of rhinoplasty, barely varying their technique from one operation to the next. An example of this erroneous planning would be to routinely perform a full transfixion incision or to disarticulate the upper lateral cartilages from the septum in a patient in whom no alteration of the dorsum is being considered.

The avoidance of nasal obstruction begins in the preoperative planning steps of the operation. The key word at this stage is conservation. If one minimizes the surgical insult to the nose and carefully preserves the anatomic structures while still gracefully and elegantly sculpturing a new form, then the ubiquitous problem of nasal obstruction can be limited. Do only those steps of the rhinoplasty that are necessary to either expose or manipulate the tissues that need reconstructing. Do not perform gratuitous steps simply because a textbook has described it as a part of the "basic rhinoplasty operation."

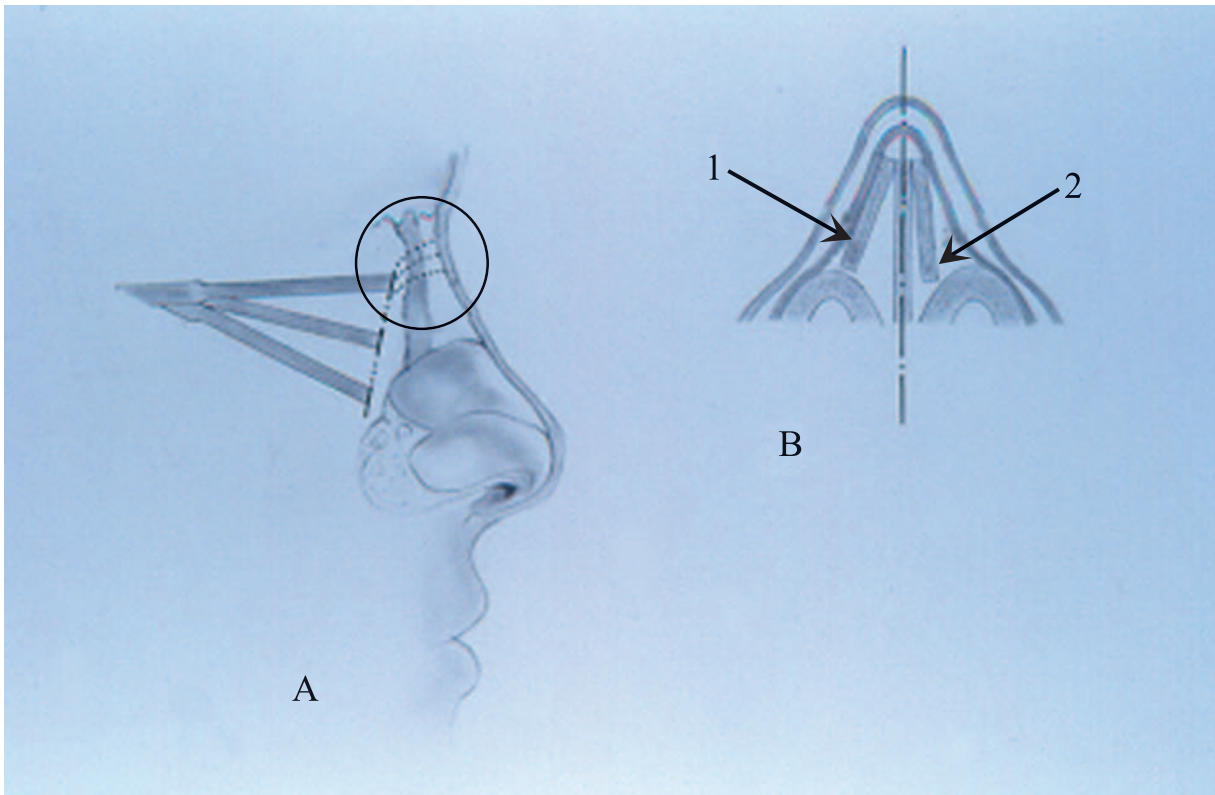
The most important aspect of preoperative planning is to determine which areas need altering and which parts can be left alone. This requires mentally molding the undesirable parts of the nose into those that are attractive. This part of the planning process is key and also quite difficult to master. It necessitates employing an operative approach that is quite advanced and totally flexible. Practically, this translates into an operation that is eclectic yet direct enough to circumvent unnecessary steps that cause trauma to the fragile intranasal tissues.

When planning an operation, I like to conceptualize the nose as a delicate wind tunnel, which, except for the nasal valve, delivers to the lungs a stream of smooth, softly flowing air. Obviously this aerodynamic state is altered by scarring, extraneous untrimmed bits of tissue, or any other structural deformity that will impede the flow of air. If one keeps this in mind while operating on the nose, the results will be rewarding.

## BONY NASAL VAULT

The manipulation of the bony nasal vault during rhinoplasty is essentially limited to removing the upper bony dorsum and narrowing the nasal bones medially. Both of these maneuvers are ideally performed underneath the protection and support of the periosteum.<sup>7</sup>

The periosteum actually serves to hold and support the nasal bones after osteotomy and secondarily adds smoothness to the nasal dorsum; thus, it is extremely important that the elevation of the periosteum be exacting and limited. The ideal periosteal elevation should begin approximately 2 mm above the caudal edge of the nasal bones, leaving enough attachment to the upper lateral cartilages so that they will not become detached from the nasal bones and cause obstruction or a dorsal deformity. The lateral extent of the elevation should be equal to one half the distance of the width of the remaining nasal bones after hump removal. This allows the periosteum to bridge the distance between the nasal bones and the maxilla after osteotomy, obviating the obstructive problem of a fully mobile nasal bone depressed into the pyriform aperture (Fig. 1).



**Figure 1.** **A.** Postage stamp osteotomies secure the continuity of the periosteum from the face of the maxilla onto the nasal bones. An added advantage of this type of osteotomy is minimal trauma and the assurance of a greenstick fracture superiorly, which adds to the support of the nasal bones. Minimal narrowing in the glabellar region is usually desirable, but if true glabellar narrowing is deemed necessary, then the last postage stamp chisel cut is adjusted more superiorly, as circled. **B.** Arrow 1 points to the nasal bone supported by an intact periosteum. It is mobile enough to accomplish narrowing but will not be displaced interiorly arrow 2 demonstrates a hypermobile nasal bone with displacement.

## DORSUM ADJUSTMENT

The upper one third of the nose is composed of paired nasal bones that articulate with the medial edges of the maxillary bones and the frontal bone. Although these bones coalesce with one another at the nasal maxillary and nasal-frontal suture lines, in a practical sense it is best to consider this area as a single bony structure. Because the suture lines do not add any significance to the surgical anatomy, they can be essentially ignored, allowing a more direct and exacting alteration of this most crucial area.

Anatomically, the bony vault is the sturdiest part of the nose. It is also the most sensitive to change. The key at this very sensitive step is to minimize the assault on the bony vault and to manipulate these tissues delicately and cleanly.

The correction of the vault begins with dorsal removal, during the planning stage, the amount of bony removal is first estimated and matched to the corresponding segment of cartilaginous dorsum. To minimize trauma to these tissues, a sharp chisel that follows the exact height and pathway of the cartilaginous dorsum is preferred. The removal begins with the excision of the cartilaginous dorsum with a right-angled serrated scissors and then continues with an osteotome into the nasal bones. This simplifies the procedure of bony dorsal removal, creates a smooth,

continuous cut from cartilage to bone, and prevents scarring in the delicate cartilaginous bony junctional area. The upper dorsum is then removed en bloc, after first trimming the upper lateral cartilages to the same dorsal height. This last step assures the integrity of the upper lateral cartilages, especially at their most caudal region, which constitutes the nasal valve. Final trimming of these cartilages is reserved for a later step in the rhinoplasty.

### **LATERAL OSTEOTOMIES**

The operative plan at this point should concern the length, height, and width of the nasal bones. Focus on the glabellar area and decide whether narrowing is desirable. Most noses do not need narrowing in this area, so the osteotomies do not have to continue completely to the superior edge of the bones. Also inspect the height of the bones and determine if rasping alone can accomplish the desired result. If so, then the internal nose can be spared an operative insult.

Because osteotomies are potentially the most damaging part of the rhinoplasty, careful handling of tissue is paramount. Periosteal elevation should be minimized; therefore, saws should not be used.

My personal preference is to perform the lower portion of the osteotomies with a 3- or 4-mm osteotome in such a way as to preserve the delicate periosteal attachments of these bones. This concept is quite important and is depicted in Figure 1. The osteotome usually begins its "postage stamp" type perforation just above the inferior edge of the bone and continues up until the exact point at which narrowing of the nose is to be completed. Usually the osteotome ends somewhat short of the glabellar region, with multiple transverse greenstick fracture possibilities determined by the height of the last perforation (see circled area in Fig. 1A). It takes no more than three or four perforations to set up the final step, which is the creation of a transverse greenstick fracture by direct digital pressure that exactly matches the height of the last perforation. By performing the osteotomies in this way, the nose is effectively narrowed, but the important attachments of the periosteum to the base of the nasal bones are maintained, preventing complete nasal bone mobility and displacement into the pyriform aperture.

The effect of undesirable glabellar narrowing is depicted in Figure 2. This usually occurs when full non-postage-stamp osteotomies are employed, which not only results in considerable cosmetic deformity but upper nasal obstruction as well.

Careful insertion of the osteotome into the nose is important in preventing cicatricial scarring of the anterior vestibule. The speculum is placed first into the lateral nasal vestibule and pulled as laterally as possible, acting as a guard. The osteotome is placed through a small stab incision as laterally as possible and the rotated to complete the bony perforations. These maneuvers prevent the internal nasal vestibular incisions from joining and limit cicatricial scar formation.

### **MEDIAL OSTEOTOMIES**

Medial osteotomies are performed only as required. The postage-stamp osteotomy, by its very nature, does not reach as far superiorly as routine osteotomies, so that fracturing into the

substance of the frontal bones is unnecessary. Figure 3 depicts one instance in which a V-type medial osteotomy is necessary to remove bone and sometimes debris in this area to assure medialization of the nasal bones. Figure 3A shows the technique of chiseling out this bone so that the nasal bones can be shifted, Figure 3B shows the depth that this bone can sometimes exhibit and that presents a rather significant obstruction that must be dealt with effectively, This phenomenon is sometimes naturally occurring, but it is usually the result of long-term preexisting trauma.

### **NASAL VALVE**

The nasal valve is that part of the upper lateral cartilage that descends into the superior nasal vault at the juncture with the dorsal septum. The top cartilage lends considerable, but often overlooked, support to the valve by connecting soft tissue and mucosa to the upper lateral cartilage in a suspensory arrangement. This efficient and simplistic structure belies the valve's importance. It is the freely moving and delicate nature of this tissue that allows for the variable increase in nasal resistance so crucial to efficient pulmonary function. The valve is the centerpoint of two strategic incisions during routine rhinoplasty the intercartilaginous incision and the disarticulation of the upper lateral cartilage from the septum, The slightest bit of damage or scarring in this area can cause devastating stenosis; thus, it is not surprising that many surgeons advocate complete avoidance of the nasal valve area during rhinoplasty. When possible, I support this thesis. If the rhinoplasty is limited to minimal change in proportion and size, then I advocate the use of Intracartilaginous incisions to access the dorsum and refrain from disarticulating the upper lateral cartilage from the septum. These techniques will allow successful completion of the rhinoplasty and still leave the nasal valve unscarred.

I do, however, feel that when considerable alteration of nasal size and angulation has ensued, it is absurd to expect the nasal valve to automatically re adjust itself to the new situation. In effect, the nasal valve now becomes too large for its surroundings and will eventually buckle and sag into the vestibule, causing significant obstruction. Figure 4 outlines the concept of upper lateral cartilage trimming, which must be considered any time the planned rhinoplasty dictates significant change in size, angulation, or proportion.

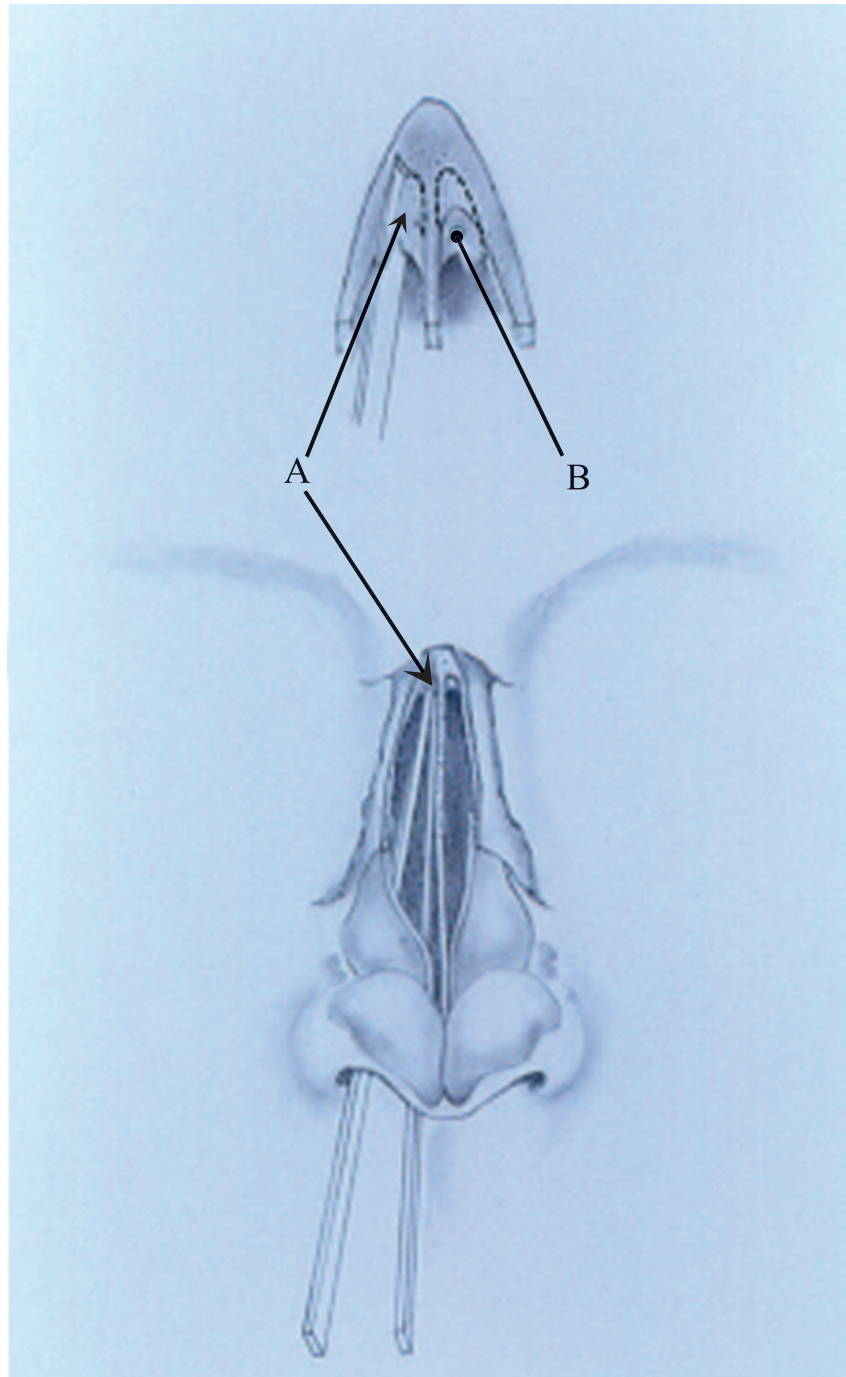
When trimming the upper lateral cartilages, adjust the superior aspect to the exact height of the new dorsum. While trimming, the retractor is artificially heightening the cartilage because of its attachment to the soft tissue. During trimming of the caudal aspect, the nasal valve must have adequate mucosa to redrape onto the tip cartilages, so that it can function adequately by moving further into the nasal vestibule as the airway resistance increase. The surgeon should not hinder this important dynamic activity by trimming away too much mucosa from the caudal area of the upper lateral cartilage.

### **LOWER LATERAL CARTILAGES**

The lower lateral cartilages (tip cartilages) are the most functionally elegant and aesthetically pleasing structures in the entire nose; therefore, it is imperative that the surgical management



**Figure 2.** A, Preoperative frontal view. B, Postoperative view reveals effect of performing complete osteotomies with excessive glabellar narrowing. Patient has an unnatural postsurgical appearance. C, Preoperative frontal view. D, Postoperative view showing results obtained with postage-stamp osteotomies. The upper dorsum is narrowed yet cosmetically pleasing and more natural than that in B. There are no stigmata of surgical intervention.



**Figure 3.** The removal of bone and debris in area **A**, is best accomplished by a V-type medial osteotomy. Arrow **B**, shows the thickness this bone can exhibit in causing an obstructive problem.

of these structures adhere to strict principles of aesthetics and conservatism. Overmanipulation will lead to the dual disasters of deformity and nasal obstruction.

Figure 5 outlines the extent that the tip cartilages can be altered during rhinoplasty and still stay within the confines of functional safety. The right side of the nose A shows the normal tip cartilage. The left side of the nose B,C, and D shows the extent and distribution of tip alteration during rhinoplasty. The key point here is to never disrupt the continuity of the most caudal aspect of these cartilages, as indicated by arrow D.

Within this context, many alterations can be safely performed on the tip. A significant portion of the cephalic borders can be trimmed.<sup>6</sup> The domes can be rotated by excision laterally and morselization medially.<sup>4</sup> Tip grafts can be placed above the intact cartilages to increase projection and add definition.<sup>5</sup> In general, as long as the principles of tip support are respected, any alteration of the tip cartilages is acceptable in a particular circumstance.<sup>3</sup> The potential serious aesthetic and functional consequences following a classic Goldman tip rhinoplasty attest to the validity of these concepts.

If true rotation of the dome is performed with significant lateral nasal vestibular skin overlying the resected cartilage should be trimmed appropriately to prevent obstruction in this area.

An often-ignored component of the tip cartilages are the feet of the medial crura. These present obstructive difficulties when they protrude into the vestibule, so they should be trimmed as described in Figure 6. The delicate submucosal dissection of the feet secures an adequate opening into the nostrils. Figure 7 reveals an obstructive problem that was improved by this method. Careful examination of this area is necessary to differentiate this type of obstruction from either a caudal septal deflection or a prominent and skewed nasal spine, which are both corrected quite differently.

## SEPTUM

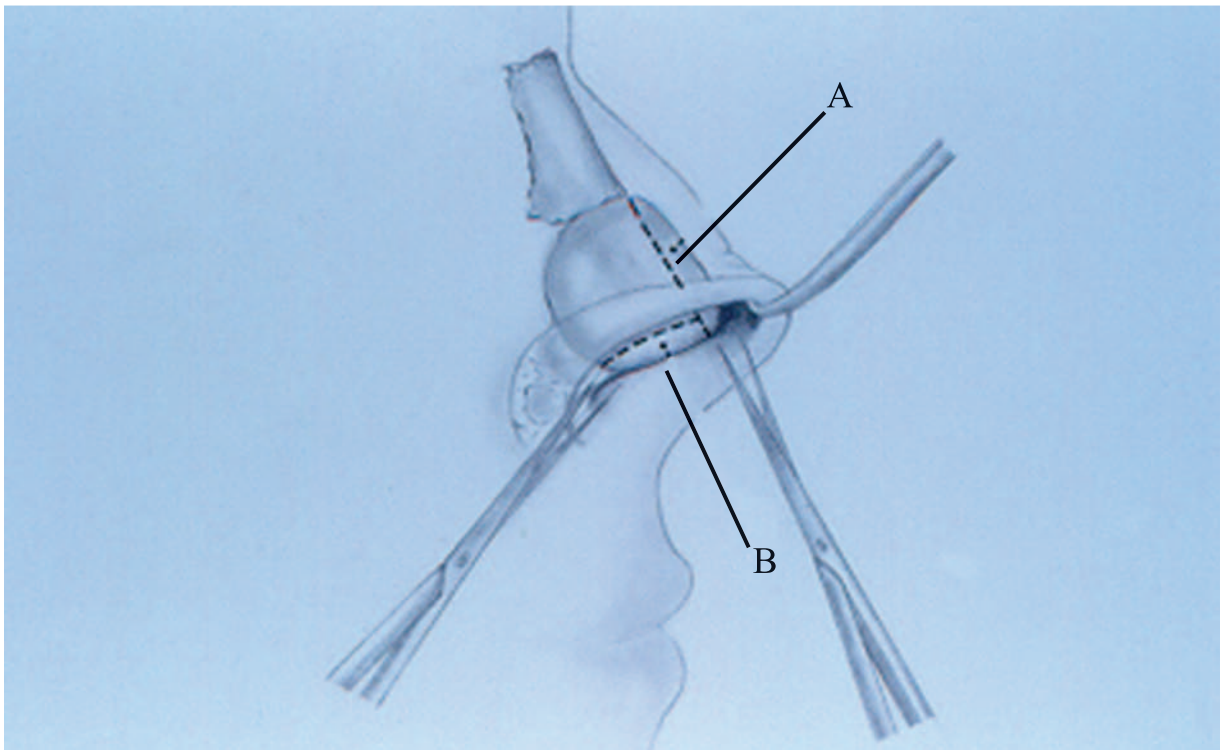
The spectrum of septal deformities that cause nasal obstruction are legion<sup>1</sup> and are reviewed in the article "The Nasal Septum and Concha Bullosa." It is important to realize that severe septal deformities may not be correctable in one-stage procedure with cosmetic rhinoplasty. If the septum can no longer be depended on for internal support after it has been fixed then the second-stage cosmetic rhinoplasty should be postponed for 6 months.

When feasible, a one-stage procedure is preferred because many of the components of septal surgery impact on the final result of rhinoplasty; for example, it is impossible to straighten the dorsum of a nose when a deviated septum is left intact.

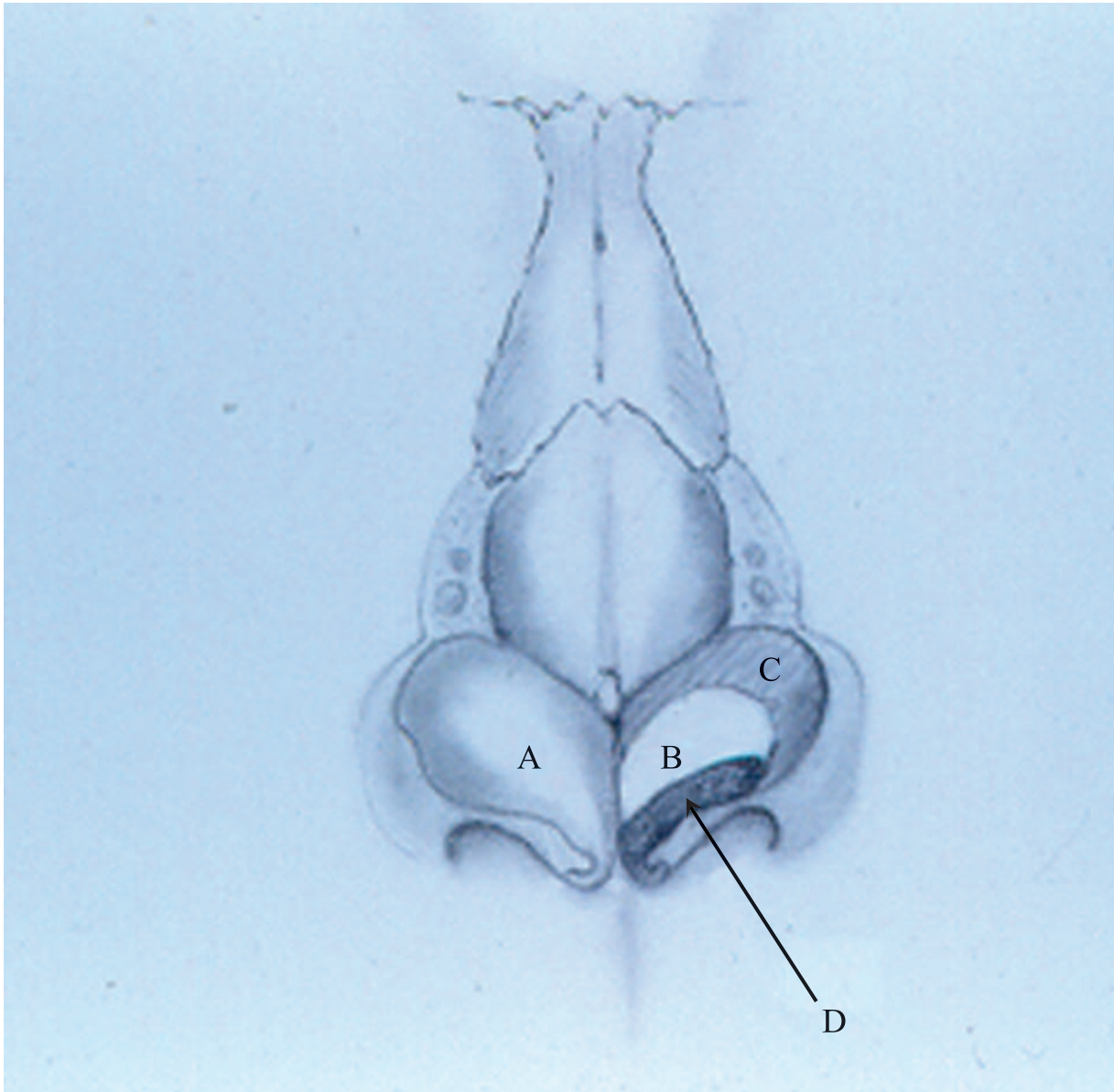
It should also be noted that asymptomatic septal deflections can be obstructive after a reduction rhinoplasty. A careful inspection of the entire septum is therefore mandatory before performing rhinoplasty, so that all the septal deformities can be corrected.

A particularly sensitive area of the septum that causes obstruction because of its location is the upper bony septum composed of the perpendicular plate of the ethmoid. This area has a dual concern during rhinoplasty because, if deviated, it obstructs a significant amount of air any may not allow inward movement of the nasal bones after osteotomy,

Another part of the septum that is usually ignored, but must be repaired during rhinoplasty,



**Figure 4.** Arrow **A.** shows trimming of medial aspect of upper lateral cartilage. Arrow **B.** shows trimming of caudal aspect. Both cuts must be extremely accurate to avoid obstruction problems. From a cosmetic standpoint, cut **B.** will aid in readjusting the nasolabial angle, whereas cut **A.** is necessary to assure a smooth, thin supratip region and to prevent the formation of a “polly beak” deformity.

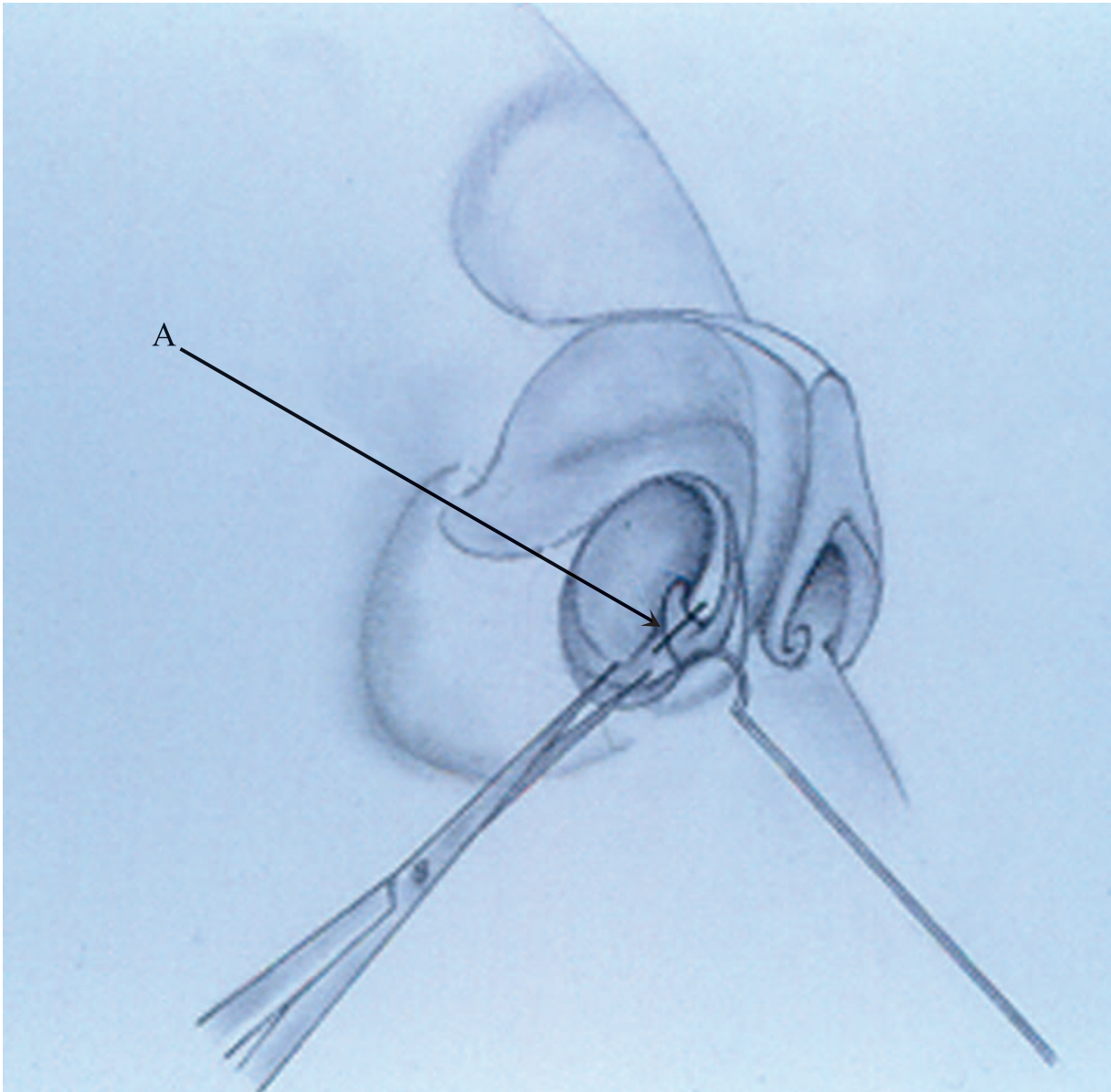


**Figure 5.** The normal tip cartilage **A**. Resected area following nasal tip refinement **C** leaves the amount of cartilage corresponding to **B**. This area approximates the size and extent of tip cartilage seen in refined tips. The key support area of the nasal tip **D**. Violation of this area will lead to tip collapse.

is the inferior area along the floor of the nose. Although these isolated deflections do not usually cause obstructive problems, their proximity to the turbinates must be considered. After rhinoplasty, especially if alar base resections are performed, the sides of the nose including the turbinates move medially and can impact against an inferior septal deflection. Correction of this part of the septum is therefore essential under these circumstances.

## TURBINATES

Hypertrophic turbinates can be a significant cause of nasal obstruction after rhinoplasty and must always be considered in the planning stages. The reasons for turbinate hypertrophy are numerous, but every means possible must be made to determine the etiology. Sometimes



**Figure 6.** Arrow **A.** shows trimming of the tip cartilage foot when it is either too large or deflected into the nasal vestibule. The obstructing cartilage is removed after submucoperichondrial dissection.

outfracture of the turbinates during rhinoplasty is sufficient to ameliorate the problem. Significant hypertrophy, however, usually requires partial resection as a second-stage procedure.

### **INTERNAL HOUSEKEEPING AND TRIMMING**

Poor housekeeping and a disregard for appropriate trimming of internal nasal tissues accounts for a significant degree of iatrogenic obstruction. After rasping and hump removal, a large suction-tip catheter should be passed over the nasal dorsum to vacuum any debris left after these maneuvers. Even tiny spicules of bone can become a nidus for osteoneogenesis and scarring, causing unsightly deformities and obstruction. All cartilage trimmed from the cartilages, septum, and bone should be accounted for upon removal of the instrument, so that extraneous tissue does



**Figure 7.** **A.** Preoperative view of nasal obstruction caused by deflection of medial crus into left nasal vestibule. Arrow shows deflected septum. **B.** Postoperative view after correction. Arrow shows clear airway.

not lodge within the nose and cause obstructive problems later.

During most rhinoplasties, there is a reduction of volume that necessitates trimming of internal skin and mucosa. All mucosal surfaces surrounding the septum, including dorsally and anteriorly along the columella, should be back cut so that at least 1mm of cartilage extends beyond the mucosal surface.

Packing should be avoided in rhinoplasty because it serves no purpose and can cause infection, edema, pain, and bleeding. It also tends to disrupt the delicate intranasal tissues upon removal. Instead of packing, I reapproximate the internal incisions, paying careful attention to the flap raised during tip plasty through an intracartilaginous incision.

### SUMMARY

Successful rhinoplasty achieves both aesthetic and functional goals. This article outlines the pitfalls that cause postoperative obstruction that can occur during the process of cosmetic rhinoplasty. It is my sincere hope that iatrogenic nasal obstruction can be reduced by awareness of these problems and careful attention and planning. The aspects of rhinoplasty that maintain a balance between aesthetics and functional integrity are specifically described. These techniques can be incorporated into the rhinoplastic repertoire of any surgeon and will improve the results dramatically.

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