

A Practical Approach for Learning Rhinoplasty Surgery

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ABSTRACT

Rhinoplasty surgery is a procedure well suited for otolaryngology residents to incorporate in their training and subsequent practices of medicine. We detail a practical approach for learning rhinoplasty which may commence during residency. The resident learns to conduct a proper consultation, preoperative evaluation, surgical procedure, and follow-up care for the prospective rhinoplasty patient. The history of rhinoplasty, and modern rhinoplasty techniques is discussed, and suggestions are made for residents to successfully incorporate learning rhinoplasty surgery during their otolaryngology training.

Keywords: Otolaryngology, Residency, Rhinoplasty.

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INTRODUCTION

Patients desiring rhinoplasty surgery may benefit by the skills of an otolaryngologist, since many prospective rhinoplasty patients require concomitant otolaryngologic procedures. Rhinoplasty surgery may be performed in synergy with major septal repair, internal and external nasal valvular repair, turbinate reduction, and endoscopic sinus surgery when both cosmetic and functional concerns coexist. The prospective patient benefits when both functional and cosmetic nasal concerns may be addressed at a single operation, and the surgeon benefits from the ability to harvest septal cartilage for grafting and reconstruction. The premise of this manuscript is that rhinoplasty surgery is a facial plastic surgical procedure well suited for otolaryngology residents to integrate in their training. The majority of innovations in modern rhinoplasty surgical techniques have come from surgeons with otolaryngologic training, and we wish to provide a practical approach for otolaryngology residents to learn rhinoplasty surgery.

HISTORY OF MODERN RHINOPLASTY TECHNIQUES

Modern rhinoplasty techniques were largely conceived in the latter half of the 20th century, but rhinoplasty surgery has been described for several thousand years. One of the first written accounts of rhinoplasty was recorded around the time that the Egyptian Pyramids were being built, around 2500 BC. Translated from hieroglyphics, the Edwin Smith Papyrus gave detailed instructions for performing closed nasal reduction for nasal fracture.¹ Additionally, the Indian physician Sushruta developed staged pedicled flaps for reconstruction of the nose, and many of these principles are in use today.²

Over the past 60 years, advances in nasal anatomy, technology, and anesthesia lead to the understanding and capabilities that are used in modern rhinoplasty techniques.

Jacques Joseph, born Jakob Lewin Joseph, was a German plastic surgeon credited with developing modern rhinoplasty techniques in the early 20th century. In 1904, he was the first to publish an endonasal technique for removing a dorsal hump. He became head of the department of plastic surgery at a prominent Prussian hospital in 1916 where he was credited with teaching surgeons worldwide his techniques of rhinoplasty.³

There are several notable surgeons who were also developing rhinoplasty techniques around the same time as Joseph. A surgeon named Johann Friedrich Dieffenbach (1792–1847) published a paper describing nasal reduction using external incisions. Robert F Weir (1838–1927) was a professor of surgery in New York City who in 1885 performed a nasal reduction (named rhinomiosis totalis). In 1887 the Rochester, New York surgeon John Orlando Roe (1848–1915) published several papers describing endonasal rhinoplasty technique and dorsal hump removal.³

Joseph had a steady flow of rhinoplasty patients after gaining notoriety across Europe. Additionally, World War I left many soldiers with complex nasal injuries in need of repair. In the 1930's Dr Samuel Forman traveled to Europe to observe and learn from Joseph. Forman gained valuable experience while learning Joseph's approach to the rhinoplasty patient. Forman brought this experience with him to New York City. Forman went on to teach a rhinoplasty course in New York City. Among his students were Dr Maurice Cottle and Dr Irving Goldman.

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These two surgeons were instrumental in disseminating rhinoplasty techniques throughout the United States.

Maurice Cottle (1898–1981) was born in England and immigrated to the United States from France in 1913. He settled in Chicago. He learned from Dr Forman and also contributed to the field with his advancements in rhinometry. He taught hundreds of doctors in Chicago, and went on to found the American Rhinological Society in 1954.³

Irving Goldman (1898–1975), a native New Yorker, practiced medicine in New York City and was a prominent rhinoplasty surgeon. He cared for celebrities, such as Dean Martin and Frank Sinatra. He was also an avid boxer. Goldman was one of the first people who performed rhinoplasty in New York City and was instrumental in the formation of the American Academy of Facial Plastic and Reconstructive Surgery. Prior to becoming the academy's first president he was the chairman of the Ear Nose and Throat section of the American Medical Association.

As time went on, Forman, Cottle and Goldman each taught their own courses and had a loyal following of plastic surgeons. Each would teach their specific techniques. The three would eventually go on to form their own societies while offering instructional courses. In 1964, the American Academy of Facial Plastic and Reconstructive Surgery (AAFPRS) was formed as the union of the Forman Society, and the Goldman Society.

TWO SIGNIFICANT VARIATIONS^{8-11,14} IN TECHNIQUE: THE SURGICAL APPROACH, AND THE TREATMENT OF THE LOWER LATERAL TIP CARTILAGES

The preference and training of the rhinoplasty surgeon may determine whether an endonasal approach, or an external approach may be used to identify and alter the underlying nasal skeleton. Many surgeons may use either approach, depending on the clinical situation. An endonasal approach typically combines transfixion incisions, intercartilaginous incisions, and marginal incisions to expose and deliver the alar cartilages for visualization and repair. An external approach involves a mid-columellar skin incision, with separation of the columellar skin from the medial crura, and continuation of the incision along both caudal margins of the lateral crura. With either approach, the skin and superficial muscular aponeurotic system (SMAS) overlying the nasal tip and dorsum are separated from the cartilaginous and bony skeleton of the nose providing wide exposure in this avascular plane. The second distinction in modern rhinoplasty techniques involves the treatment of the nasal tip cartilages. Goldman, Anderson and Simmons popularized division of the lower lateral cartilages anteriorly, symmetrically, at a location near the angle where the

medial crura meet the lateral crura. Anderson elegantly described the importance of dividing the lower lateral cartilages to have maximal control of tip configuration by treating the nasal tip as a tripod. Two of the tripod's limbs are bilateral lateral crura, and the third limb is the sutured medial crural complex, typically with a columellar shoring strut (Fig. 1).

Many surgeons prefer to leave the crural arches intact and utilize intradomal and interdomal sutures to repair bulbous, wide nasal tips.⁵

CONSIDERATIONS FOR THE RESIDENT

The resident may begin the educational process by studying rhinoplasty and functional nasal surgical techniques, while becoming proficient in performing septoplasty, submucous resection of septal cartilage, open reduction of naso-septal fractures, repair of obstructed nasal valves, endoscopic sinus surgery, management of nasofacial trauma, and control of epistaxis.

Otolaryngology residents may enhance their learning experience by spending time in the offices of their rhinoplastic attendings, since the care of rhinoplasty patients starts at their initial consultation and continues through the first year postoperative. Senior residents should observe rhinoplasty surgical techniques, and schedule posttraumatic nasoseptal reconstruction clinic cases with their attendings. The resident should learn to remove a dorsal hump, narrow a wide nose, shorten a long nose, straighten a crooked nose and repair a droopy, bulbous nasal tip. The resident studies the orderly sequence of rhinoplasty surgery-exposure, septoplasty with harvest, tip work, bony work, refinement, closure, taping and splinting. If allowable, intraoperative videos may be a resource for future review of the sequence, common surgical maneuvers, and proper hand positioning.

MOTIVATING FACTORS OF THE PATIENT REQUESTING RHINOPLASTY SURGERY

The majority of patients seeking rhinoplasty surgery are young adults who have have significant dissatisfaction

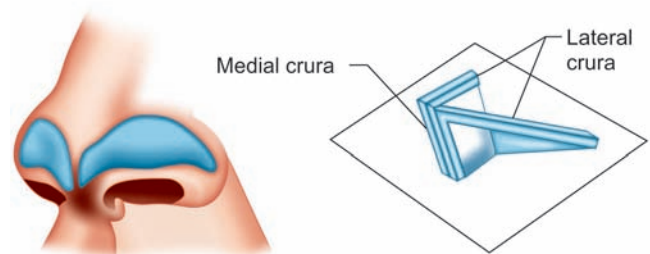


Fig. 1: The middle limb of the tripod is the combined medial crura, and the lateral crura are the other two limbs

with the appearance and function of their noses. Prospective patients are mostly females in their second to fourth decades, and they may describe dissatisfaction with their nasal appearances beginning in middle school or high school. Rhinoplasty may be offered to girls when they have reached their full growth potential, as early as 13 years. Many girls who develop large, distracting, and often masculine nasal appearances, may become bothered, and begin discussing rhinoplasty surgery with their parents. Boys mature both physically and psychologically later than girls, and rhinoplasty surgery is rarely offered before 17 years in boys. Patients in their second to fourth decade may request rhinoplasty surgery during a time of transition, such as before commencing high school, college, or a new work environment.

The effects of gravity on facial aging do not spare the nose, and some patients request rhinoplasty in their 5th to 7th decades. The tip of the nose tends to droop several millimeters with aging and a droopy tip may exacerbate the appearance of a dorsal hump. Rhinoplasty surgery to achieve tip rotation and hump removal may lead to a more youthful and desirable nasal appearance.

Others present for rhinoplasty when it is economically feasible, since fees associated with many cosmetic and functional rhinoplasty surgeries may be the responsibility of the patient.

THE INITIAL CONSULTATION IS THE BEST TIME TO DETERMINE CANDIDACY FOR RHINOPLASTY SURGERY

A prospective rhinoplasty patient should be carefully evaluated for candidacy. The results of rhinoplasty surgery will be the centerpiece of the patient's face. The esthetic endpoint of successful surgery is to allow a patient's nose to blend in, and become less distracting—not to transform the centerpiece into a masterpiece. The patient and surgeon must accept that the goal of rhinoplasty surgery is improvement, not perfection. The rhinoplasty consultation is the first, and best time to determine whether the patient has realistic expectations, and whether they may be achieved through surgery. During the consultation the surgeon determines, to the best ability, that if all goes as planned, the patient will be pleased with the outcome.

Surgeons may observe while taking a history, that rhinoplasty may be suitable from an esthetic standpoint, but careful listening, questioning, examining, and computer imaging may be necessary to ensure the patient has realistic goals and expectations:

- *Essential portions of the prospective rhinoplasty patient's history:* After greeting the patient sitting in a standard otolaryngology chair, hand washing, and asking

the source of referral, the patient-intake form is reviewed to ensure there are no contraindications for rhinoplasty surgery, or conditions that may predispose a poor outcome.

If the patient is prescribed any psychiatric medication, the patient's diagnosis is documented. A personal history of panic disorder may require psychiatric consultation preoperatively, since the stress of surgery may exacerbate an otherwise dormant condition.

If the patient uses cocaine regularly, even infrequently, rhinoplasty should be avoided. If there has been no cocaine use for 12 months or longer, the patient may be considered for surgery, but is advised that future cocaine use may lead to midline nasal destructive disorder.

If there is a prior dental extraction or major surgery, the surgeon inquires about prolonged bleeding or anesthetic allergy. The patient is also asked if there is a family history of a bleeding disorder, malignant hyperthermia or succinylcholine deficiency.

If there is a personal history of prior substance abuse or opioid addiction, the patient is informed at the consultation that narcotics and benzodiazepines may not be prescribed postoperatively. A pain management consultation may be considered.

The surgeon inquires about nasal obstruction, rhinitis, sinusitis, anosmia, epistaxis, and previous nasal surgery.

The next step is understanding the patient's concerns about nasal appearance and function. Descriptions are recorded verbatim in the medical record, along with the duration of dissatisfaction and dysfunction.

The surgeon may ask the prospective rhinoplasty patient how much they dislike their nose, from zero to ten. Ten may be defined as the worst possible dissatisfaction, and zero may be defined as no desire for surgery. Patients who quantify dissatisfaction at seven or higher are typically eagerly desiring surgery. Rhinoplasty surgery may not be appropriate if a patient has only mild to moderate dissatisfaction, or if the patient likes their current nasal appearance on occasion. Patients with a high degree of dissatisfaction for a long duration, with repairable pathology, are some of the best candidates for rhinoplasty surgery, since they may be inclined to accept improvement, and experience satisfaction.

- *Physical examination of the prospective rhinoplasty patient:* A head and neck examination is performed, and the patient's nose is examined last. The nasal examination is an important factor in determining candidacy for surgery.

While sitting or standing at the patient's side, the patient's face is gently positioned using both hands, so the patient looks straight ahead, with the facial plane perpendicular to the floor. The surgeon's index fingers palpate the sidewalls of the nose starting from the glabella, down to the tip while noting the thickness and mobility of the nasal skin, and the quality of the underlying cartilaginous and bony framework. Patients with light-colored, thin nasal skin, and firm adherent tip cartilages may be prone to encounter visible irregularities after rhinoplasty, and these considerations are discussed with the patient when encountered.

The surgeon may assess the patency of each nasal airway by gently occluding each naris with the pad of the thumb, without distorting the nasal appearance, and requesting the patient inhale normally through their nose several times. Direct or indirect head lighting may be used to illuminate the nasal airway and visualize internal nasal anatomy. The surgeon may lift the tip with one thumb, and view the position of the caudal septum, and the size and color of the inferior turbinates. The undersurface of the patient's lower lateral cartilages may be visualized while palpating with the thumb and index finger. The thumb lifts the alar margin, just lateral to the soft tissue triangle, and the index finger pushes the dome of the tip down to see the internal configuration of the tip, and assess the quality and size of the alar cartilages.

The surgeon then moves toward the back of the patient's examination chair, so the patient's profile is visualized. The size and shape of the nose, and its proportion with the upper lip, lower face and chin are noted. The nose is then palpated while viewing the nasal profile with the thumb and middle finger on the sidewalls, and the index finger on the dorsum. Gentle palpation begins at the nasal bones and sequentially moves down the bony-cartilaginous junction to the tip. The nasal tip is then palpated from side to side and from top to bottom with two fingers. The strength of the lower lateral cartilages and the thickness and adherence of tip skin are assessed. The length, position and lateral mobility of the caudal septum is palpated with the thumb and index finger, and the spatial relationship between the medial crura, the caudal septum and the alar rim is noted. If there is a dorsal hump and a droopy tip, the surgeon may use an index finger to camouflage the hump, and a thumb to lift the base of the nose to simulate a desired profile result—a mirror may be given to the patient to observe Figure 2.



Fig. 2: The patient may view a desired result by lifting the tip, and camouflaging a dorsal hump. This maneuver is helpful for marking the location of hump reduction preoperatively

Anterior rhinoscopy enables further visualization of the nasal airway, and also enables identification of intranasal anatomy and recognition of coexistent pathology. Patients with obstructed nasal airways, or who are noted to have pathology on anterior rhinoscopy undergo flexible fiber-optic nasal endoscopy, and nasopharyngoscopy to complete the nasal examination.

- *Computer imaging may help to establish realistic expectations:* If the surgeon feels comfortable offering cosmetic and functional rhinoplasty surgery, computer imaging may be offered to assist the patient in visualizing what to expect after surgery. Computer imaging is underdone to demonstrate a modest improvement; the surgeon observes if the patient would be satisfied with the simulated improvement. If the patient points out small irregularities, or if the patient appears to have unrealistic expectations, it may be best to defer surgery.
- *Concluding the consultation:* The surgeon must make a sound determination of the feasibility of rhinoplasty surgery with a comfortable doctor-patient relationship. If realistic goals are established, the patient may be shown examples how others looked and felt as they progressed through their healing processes postoperatively. Ample time should be reserved to answer all of the patient's questions, and the patient is reassured the lines of communication will remain open for any concerns that may arise after the consultation.

If the surgeon feels confident that the patient may benefit from cosmetic and functional rhinoplasty surgery, the conclusion of the consultation may be conducted by an office assistant. The assistant may give a questionnaire to the patient to ensure a bleeding

diathesis, medical problem, psychiatric disorder or substance abuse problem has not been overlooked, and to assist with surgical scheduling and fees.

Close family support of the prospective rhinoplasty patient is essential, and rhinoplasty should be avoided if a patient's close family member is strongly opposed to surgery. Patients may be informed that 10% may require revision rhinoplasty. The necessity for revision rhinoplasty surgery decreases as the surgeon gains experience.

In the senior author's practice, approximately 20% of patients may require nonsurgical revision rhinoplasty with liquid injectable silicone (LIS).⁶ The swollen soft tissue envelope overlying the nasal skeleton may cause irregularities to be hidden, and there is variability in healing over the course of the first postoperative year that may necessitate nonsurgical rhinoplastic revision.

Surgeons ought not to regret surgeries not performed, so if confidence is lacking that the patient will be pleased, or if the surgeon is uncomfortable in any way, the patient may be referred to a senior colleague for evaluation.

A PRACTICAL APPROACH TO THE PREOPERATIVE VISIT

The patient's comprehensive preoperative visit occurs within 2 weeks of scheduled surgery, and is best performed in the presence of a loved one or caretaker who will drive and accompany the patient for the first 24 hours after rhinoplasty surgery. The preoperative visit begins with a reiteration of the patient's medical history, medications and review of systems. The physical examination includes vital signs, auscultation of the lungs, heart, and abdomen, and the ankles are palpated.

Attention is brought to the nose which is re-examined and palpated, and the cosmetic and functional goals of surgery are re-discussed with the patient holding a hand mirror.

The patient is reassured that all questions will be answered before the preoperative visit ends. Printouts and consent forms are read aloud to the patient which typically addresses most concerns.

Prescriptions typically include three prophylactic doses of an anti-staphylococcal antibiotic, 10 tablets of a mild narcotic, 20 tablets of a low-dose, anxiolytic benzodiazepine, and three antiemetic strips. A printout with the names, dosages and purposes of these medications is provided for the patient and is read aloud. The medication printout also lists other products to be obtained from the pharmacy, such as throat lozenges, lip balm, hydrogen peroxide and cotton applicators.

The next printout contains preoperative and postoperative instructions. The preoperative instructions delineate the importance of Nil per os (NPO) after midnight, face washing without makeup or lotions the morning of surgery, wearing a zipper or button down top to the surgicenter, avoiding Non-steroidal anti-inflammatory drugs (NSAIDs) and blood thinners, and calling if any questions or personal illness occur before surgery. An upper respiratory infection that occurs between the preoperative visit and surgery may necessitate evaluation, since rhinoplasty should be performed when the patient is in good health.

The patient is reassured that postoperative pain is minimal since nasal packing is not routinely placed. Some patients are completely nasally obstructed the first postoperative week from inspissated blood and mucous and edema. The anxiolytic may be used liberally the first postoperative week for insomnia or anxiety. The postoperative printout advises head elevation above the chest, and the use of cold compresses, such as frozen peas in a sandwich bag. They may be applied to the patient's eyes and forehead, 20 minutes on, and 20 minutes off for the first 48 hours postoperative.

Two days after rhinoplasty, the patient may use hydrogen peroxide on a cotton applicator to loosen blood and mucous that often accumulates in the nasal vestibules. The peroxide-moistened applicator is placed into the nostril, to the end of the cotton tip, and is twirled like a baton between the thumb and index finger. This enables some patients to begin nasal breathing the first week postoperative, and decreases difficulty in tape removal at the first postoperative visit. The patient is instructed to remain on house-rest for the first postoperative week. Normal social activities may be resumed 7 to 10 days postoperative with artful concealer provided by an office assistant, and unrestricted physical activity is allowed 3 weeks postoperative.

Many patients may receive compliments from friends and acquaintances citing improved general appearances postoperatively, but in most patients, the change in nasal appearance is not specifically noticed by others. This is important to inform the patient since many are unnecessarily fearful of becoming unrecognizable or of 'looking like someone else.'

The consent for surgery is also read aloud, and informed consent is obtained. The patient initials next to the delineated complications associated with surgery, and signs the document at its conclusion.

Reproducible, digital, full face photo-documentation is obtained at the preoperative visit, caring to keep the patient's facial plane perpendicular to the floor, and ensuring the lighting and exposure is consistent. Eight

necessary photos include the frontal view in repose and smiling, bilateral oblique views in repose keeping the tip of the nose in line with the contralateral pupil, bilateral profile photos in repose and one smiling, and a base view of the nose while the patient looks at the ceiling. The quality of preoperative photos is assessed and photos are repeated until all are acceptable and consistent.

The preoperative visit is concluded while viewing the frontal and profile computer simulation provided at the consultation. Any further questions are addressed, and the first postoperative visit is scheduled 6 to 8 days after surgery to remove the dressing. The patient is given a direct emergency contact to the surgeon, such as a cell phone number, and the patient is encouraged to call, anytime, with questions or concerns.

ONE METHOD FOR ADDRESSING THE MOST COMMON CAUSES OF NASAL DISSATISFACTION

The following sequence is one time tested method of performing rhinoplasty surgery that was taught to the senior author by Dr Alvin I Glasgold, who is a disciple of Dr Jack Anderson⁴.

- *Preoperative reevaluation:* The patient is examined and marked in the preoperative holding area. Last minute concerns are addressed, the goals of surgery are re-discussed, and the patient is reassured. The markings include the location of the transcolumellar incision, which is just anterior to the flair of the medial crura. If nostril narrowing is planned, the scar placement is marked on the nasal sills in an inconspicuous location, symmetrically. Placement of nostril narrowing incisions is determined with the patient smiling, as this helps to delineate the isthmus

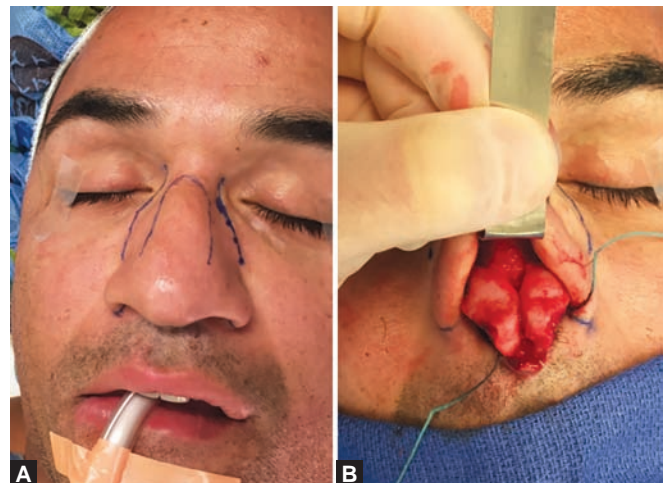
between the posterior alar margin and the nasal sill (Fig. 3). Redundant nostril skin may be excised as a small wedge in this area bilaterally, inconspicuously at the nasal base. The path of lateral osteotomies¹² is marked at the nasofacial junction from the frontal process of the maxilla superiorly to the glabella. The path of the lateral osteotomy should end anterior to the lacrimal fossa which may be palpated with an index finger. The profile is then viewed, and while placing the tip in the desired location, the dorsal hump is marked for resection (Fig. 4A).

- *Surgical prep:* General anesthetic with a cuffed orotracheal tube is preferred to protect the patient's airway from aspiration of postnasal blood. The tube is taped to the midline lower lip, rather than an oral commissure, to prevent distortion of the nasal base. The patient's eyelids are taped closed, and the head of the table is rotated 90° from the anesthesiologist to allow for instruments to be placed on a stand above the patient's head. Surgical instruments above the head enables the surgeon to look up, rather than behind, to access instruments that may be unfamiliar to a new assistant.

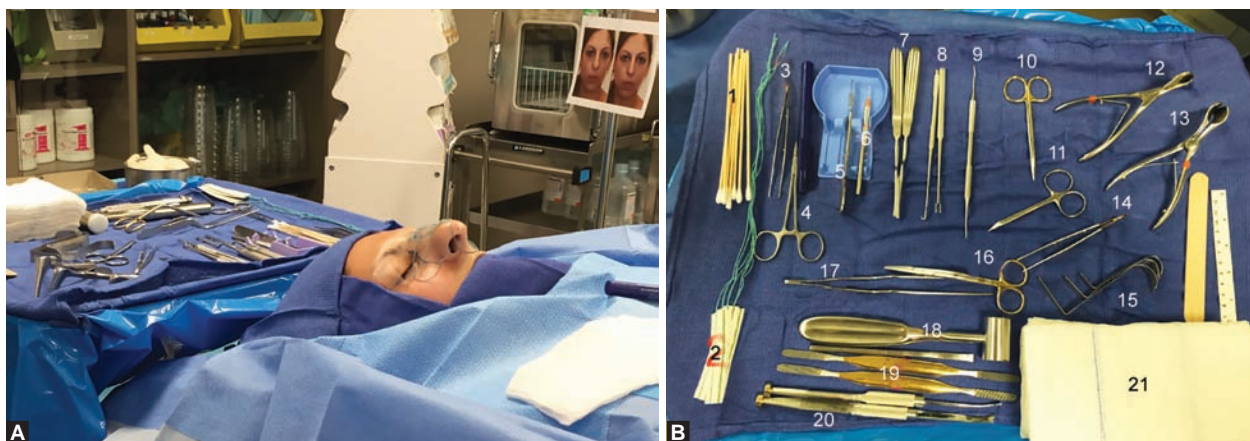
The instruments necessary for performing rhinoplasty should be those from a standard nasal surgical tray. Frequently used nasal instruments used for rhinoplasty include: A Converse tip scissor, 2 and 4 mm double pronged hooks, three sizes of Converse retractors, an Anderson-McCullough elevator, Brown-Adson forceps, a blunt, curved iris scissor, a right angle scissor, right and left Joseph saws, right and left 4 mm curved, guarded osteotomes, a 4 mm straight osteotome, nasal rasps, and a toothed forcep for the columellar skin closure (Figs 5A and B).



Fig. 3: The columellar incision is just above the flair of the medial crura. Nostril narrowing scar-placement is marked with the patient smiling, at the isthmus of the posterior ala and the nasal sill—an inconspicuous location



Figs 4A and B: (A) External markings at the level of dorsal lowering, and at the path of lateral osteotomies, (b) wide exposure of the nasal framework in the avascular plane beneath the nasal SMAS. A stringed pledget will replace the retractor, and the septoplasty will commence



Figs 5A and B: (1) Patient positioning with instruments easily accessible above the head, (1) Cotton applicators, (2) 1/4" x 3" stringed pledgets, (3) Smooth forceps, (4) Clamp (5,6) 6700 Beaver blade, #15 blade, (7) Joseph saws, (8) 2 and 4 mm hooks, (9) Anderson-McCullough elevator, (10) Curved, blunt iris scissor, (11) Converse scissor, (12 and 13) Nasal specula, (14) Brown-Adson forcep, (15) Converse retractors, (16) Right angle scissor, (17) Bayonet forcep, (18) Mallet, (19) Nasal rasps, (20) Guarded, curved 4 mm osteotomes, (21) Gauze

Four stringed pledgets are saturated with 4 mm of 4% cocaine, and two of these are placed along the length of each inferior turbinate. The nose is infiltrated with approximately 15 cc of 2% lidocaine with 1:100,000 epinephrine along the entire subcutaneous soft tissue envelope of the nose and into each side of the nasal septum. Distortion of the external nose is expected after infiltration, and a tumescent type of injection leads to easier identification of the sub superficial muscular aponeurotic system (SMAS) avascular plane, and facilitates submucous septal dissection, while protecting both the skin envelope and septal flaps from perforation.

After the septal infiltration, the soiled intranasal pledgets are replaced with the other two fresh pledgets, and the nose and face is prepped with chlorhexidine. Four towels are placed around the face, and a sterile split-sheet drape is used. The split ends are taped to each other at the top of the patient's head. The exposed field is from the hairline down to the chin, with the orotracheal tube in plain view. Care is taken not to tape the drape directly to the orotracheal tube. A reflective 5 minutes scrub allows the surgical assistant to complete the setup, and allow for adequate vasoconstriction.

- **Exposure:** The nondominant hand positions and stabilizes the nasal tip with the thumb and middle finger on each of the ala, and the index finger pushes on the infratip lobule. The columella is rotated away from the surgeon, and a 6700 Beaver blade makes the first incision, at the inferior border of the medial crus, from the lobule-columella junction posteriorly to the skin marking. The columella is then rotated toward the surgeon and the contralateral columella is similarly incised. The columella is then incised with an inverted V in the center to break up the straight

line that was marked in the holding area. Each of the four limbs of the transcolumella incision are equal in length.

The nondominant first three digits continue to stabilize the tip, and the index finger is repositioned posteriorly, on top of the columella to protect the skin. The Converse scissor is used in a spreading and snipping fashion to lift the columellar skin completely off the medial crura. The 2 mm hook is grasped proximally with the nondominant thumb and index finger and it is used to lift the columella flap anteriorly, and the fourth digit is used to evert the nostril margin on each side to perform marginal incisions bilaterally with the Converse scissor. The elevation of skin and SMAS from the cartilaginous and bony framework is performed with the Converse scissor with its tips down. Initially the 2 mm hook retracts the columellar flap anteriorly. The pad of the fourth digit of the nondominant hand is used to push the lower lateral cartilages posteriorly and inferiorly, while the Converse scissor is used to establish the deep avascular plane, between and the skeleton and the nasal SMAS. The third and fourth digits of the nondominant hand also determine the depth of dissection and help avoid inadvertent skin perforations. Both alar cartilages are widely exposed, usually to the sesamoid cartilages. The tips of the scissor point posteriorly, in the midline supratip, and expose the lower dorsum while snipping posteriorly.

Converse retractors are now used with the nondominant hand to lift the soft tissue envelope anteriorly and superiorly to complete the wide undermining and nasal degloving to the mid dorsum, under direct vision. A curved, blunt-tip iris scissor is placed under the flap at the avascular plane, and the nondominant first three digits are placed on the

external nasal skin with the flap down. The exposure is completed using a snipping and spreading technique. The surgeon's elevation is completed when the closed iris scissor may be moved from one nasal sidewall to the other without resistance. The soft tissue envelope is then retracted superiorly using a stringed pledget along the dorsum, pulling the flap superiorly. The pledget string is clamped to the towel at the patient's forehead providing wide exposure of the alar cartilages and the lower cartilaginous dorsum (Fig. 4B).

- *Septal harvest for a columellar shoring strut (C-strut), and possible tip graft, spreader graft(s) or batten graft(s):* The nondominant hand uses a Brown-Adson forcep to retract the closer medial crus away from the midline, and the assistant uses a 4 mm hook to retract the contralateral medial crus away from the septum. The dissection to expose the caudal septum is in the midline, and is performed with the Converse scissor (Fig. 6). The anterior septal angle is revealed and the ligaments from the medial crural foot plates to the posterior caudal septum may be left intact, or divided if septal shortening or if tip deprojection is desired. When the caudal septum is identified, the assistant may retract it away from the surgeon with a smooth forcep, and the subperichondrial septal plane may be developed sharply, typically using the pointed tips of the Converse scissor. The bluish hue of the septal cartilage is the proper plane for avascular septal flap elevation. The contralateral septal flap is developed by retracting the caudal septum toward the surgeon with the Brown-Adson forcep, while using the Converse scissor to define the contralateral subperichondrial plane. When the septal flap is developed for one or more centimeters sharply, a medium or large nasal speculum is placed between the mucoperichondrium

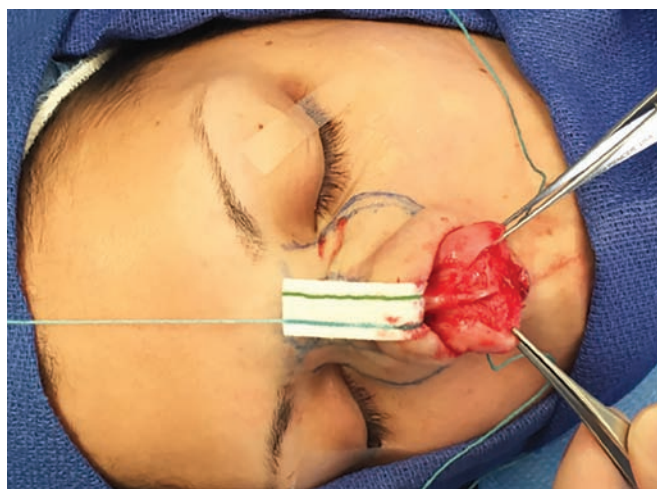


Fig. 6: The pledget exposes the alar cartilages which are lateralized to begin septoplasty, starting at the anterior septal angle

and the septum to aid in visualization and dissection. The speculum is held with the nondominant hand, palm up, resting on the patient's forehead. Gentle squeezing of the speculum opens the plane, and subperichondrial and subperiosteal septal elevation is completed with an Anderson-McCullough elevator, which has a smaller tip than a Freer elevator, and may be less likely to cause mucoperichondrial perforations. A transcartilaginous incision is made with a blade at least 1 cm superior to the caudal septal margin, and the nasal speculum is replaced to straddle the incised, posterior quadrilateral cartilage. The septal cartilage for harvest is best taken from the floor of the septum, at the maxillary crest, since this is the strongest and thickest part of the septal cartilage. A knife begins the incision at the floor of the septum, and the inferior septum is freed from the maxillary crest posteriorly to the vomer with a right angle scissor. The closed tips of the right angle scissor are used to separate the septal bony-cartilaginous junction, and this scissor is then used to remove a septal cartilage graft that measures approximately 3 cm long, and 1 to 2 cm wide, depending on the needs of the surgeon. Septoplasty is then completed, and a 4-0 chromic quilting suture is run from posterior to anterior to reapproximate the septal flaps, and close small perforations that may be encountered. A septal quilting suture that reapproximates the septal flaps in the midline, precludes the use of nasal packing by preventing the formation of a septal hematoma (Fig. 7).

- *The nasaltip is transformed into a tripod by dividing the lower lateral cartilages and suturing the medial crura to each other in the midline:* With the soft tissue flap still retracted with a pledget, a forcep is placed intranasally at the soft tissue triangle and is lifted anteriorly to delineate the angle where the medial crus meets the lateral crus, and a marking pen is used to delineate this position bilaterally. The Brown-Adson forcep is used to retract the vestibular lining into the nose, and the Converse scissor is used to separate the vestibular lining from undersurface of the tip cartilages (Fig. 8). In the majority of cases, the lower lateral cartilages are divided at their angles, and the medial crura are sutured to each other, approximately 4 mm posterior to the division point, with one 5-0 polydioxanone suture (PDS). The nasal tip is now a tripod where the medial crural complex is the central limb, and both lateral crura are the other two limbs. This maneuver typically results in a change in the spatial relationship between the medial and lateral crura such that the anterior portion of the lateral crura may overlap as the lower lateral cartilages medialize with angle division.

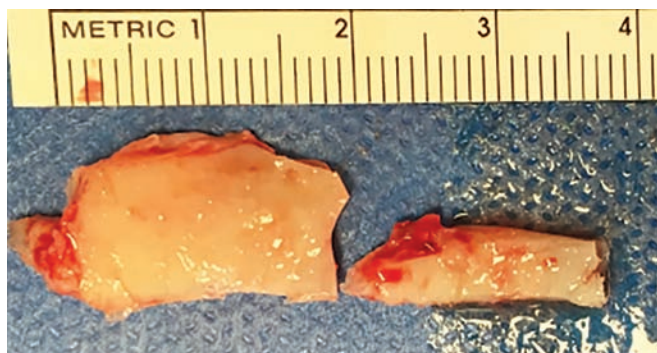


Fig. 7: Septal harvest for columellar strut and extended, shield-type, tip graft



Fig. 9: The nasal-tip tripod consists of the sutured medial crura in the midline, and bilateral lateral crura

The divisions may be placed lateral to the angles, if the medial crural limb needs to be elongated to address tip under projection and under rotation which was performed in this clinical example.

The lateral crura are then retracted anteroinferiorly and the Converse scissor is used to dissect the intranasal mucosal lining from the undersurface of the cephalic margin of the lateral crura, at the scroll regions bilaterally. The Converse scissors are used to separate the lateral crura from the upper lateral cartilages from anterior to posterior. This separation allows for superior rotation of the lateral crura and tip simply by freeing these two limbs of the tripod from their anatomical attachment to the upper lateral cartilages. The scroll region is usually resected with a cephalic trim.

Depending on the bulbosity of the nasal tip, and size of the lateral crura, several millimeters of the cephalic margin of the lateral crura may be resected symmetrically. The majority of lower lateral cartilages, greater than 7 mm, are left intact to avoid unwanted sequelae, such as external nasal valvular collapse, postoperative nasal obstruction, and pinching of the nasal tip (Fig. 9). The retracting pledget is now

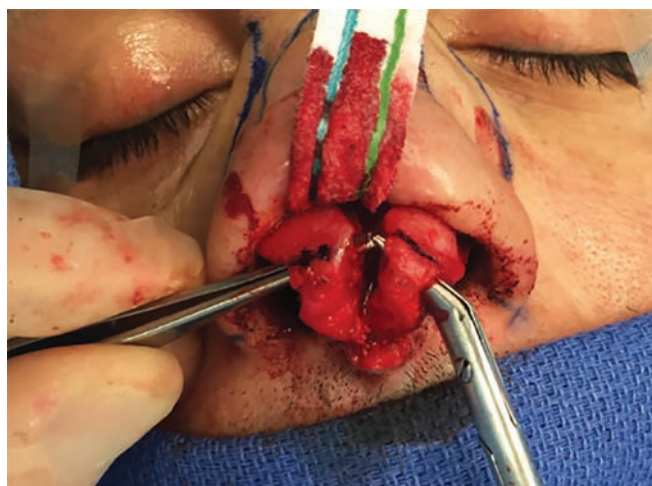


Fig. 8: Markings for lower lateral cartilage division, in this case just lateral to the angles, to aid in tip rotation and projection

removed, the flap is lowered, and a cold compress is used to squeeze edema and anesthetic from the flap. The nose and face is cleaned, and the position and configuration of the nasal tip is assessed from above and from profile. Deprojection may be achieved by lowering the central limb. Rotation may be achieved by excising the anterior projection of the lateral crura—the other two limbs of the tripod. The flap is lowered, and the tip reassessed after each incremental excision until a desired tip configuration is attained.

- *A columellar shoring strut (C-strut) supports tip position, and may aid in tip projection and rotation:* When the desired position and configuration of the nasal tip is achieved, a C-strut is carved from the septal harvest, approximately 25 mm long by 4 mm wide. The columellar skin and medial crural footplates are grasped with a Brown-Adson forcep, and a straight iris scissor is used to create a pocket between the medial crura posteriorly to the premaxilla. The C-strut is placed in this pocket and sutured to the medial crural central limb. It extends from the premaxilla to the previously placed 5-0 PDS securing the medial crura to each other. The C-strut is sutured to the medial crural complex in one or two locations with 5-0 PDS.

A long C-strut may aid in projection and rotation by lengthening the central limb of the tripod. A shorter C-strut, simply by its addition, will add cartilaginous support to the central tripod limb, and aid in preventing postoperative tip ptosis (Fig. 10). Before proceeding with dorsal reduction, the paths of lateral osteotomies are re-infiltrated with local anesthetic.

- *Dorsal reduction:* Small bony humps may be lowered with rasps. Large humps are conservatively lowered with right and left Joseph saws. The hump is engaged

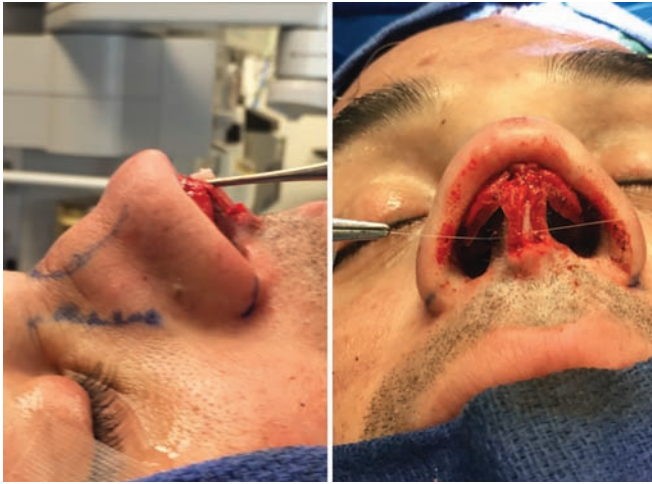
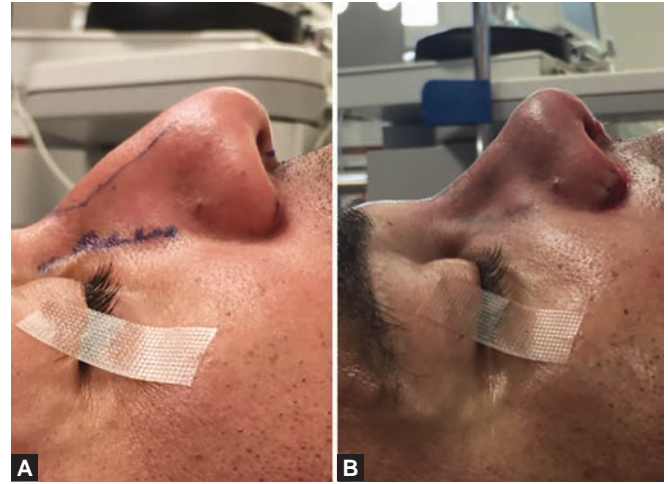


Fig. 10: Lateral and inferior views of placement and suture fixation of columellar strut to aid in support, projection and rotation of the nasal tip



Figs 11A and B: Intraoperative profile appearance after tip work, hump removal and lateral osteotomies

superiorly with each saw, and is placed under the flap, along the sidewall, at the level of preoperative skin marking. When the bony hump is released, a large Converse retractor is placed under the flap, and the cartilaginous portion of the hump is incised and removed en bloc with the attached bone using a 15-blade. The flap is replaced, and the nasal profile is reassessed. Further bony lowering is performed with nasal rasps, and cartilaginous dorsal lowering is performed with a blade or right angle scissor. The dorsal reduction is performed incrementally to avoid over-resection. When the height of the nasal dorsum is lowered, the width of the patient's nose increases on anterior view, and osteotomies are necessary to close the 'open-roof deformity' (Figs 11A and B).

- **Osteotomies:** A needle-point electrocautery device is used to make a 3 mm intranasal incision, just anterior to the inferior turbinates, down to the bone of the frontal process of the maxilla. Curved, guarded, 4 mm osteotomes are placed into the incisions onto the piriform aperture. The dominant hand holds the osteotome, and the other hand palpates the instrument as it courses along the nasofacial junction up to the glabella. The assistant uses a mallet and will strike the osteotome twice upon request. The bone and skin both become progressively thinner as the osteotomy proceeds superiorly to the glabella. Care is taken to end the osteotomy anterior to the lacrimal fossa, and care is also taken not to perforate the thin nasal skin near the medial canthus.

After completing the osteotomy, the osteotome is lifted anteriorly, and rotated medially to infracture the upper and middle thirds of the nasal dorsum. If there is incomplete infracture laterally, the lateral osteotomy is repeated. If there is inadequate infracture medially,

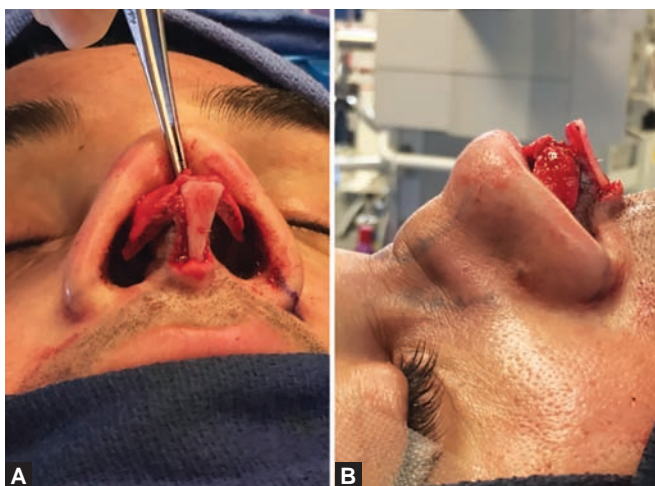
a straight 4 mm unguarded osteotome is placed on the medial nasal bone between the superior upper lateral cartilage and septum with a large Converse retractor protecting the soft tissue and allowing direct visualization of the osteotomy. The medial osteotomy is performed gently and moves laterally as the glabella is approached.

After hump removal, most patients require only bilateral lateral osteotomies to infracture the dorsum. Adequate bilateral infracture must be achieved before proceeding by repeating osteotomies as necessary, since leaving an 'open-roof' may necessitate revision surgery.

- **Final adjustments^{7,13,15} to the nasal appearance and airway are performed before closure:** After bilateral osteotomies are completed, it is common to observe the dorsum raise several millimeters on profile, and further lowering may be necessary. The cartilaginous dorsum must be several millimeters lower than the tip to avoid a 'poly-beak deformity.' The upper lateral cartilages should be at the level of the dorsal septum.

A 5-0 PDS septocolumellar suture, from the central tripod limb to the caudal septum, may be considered to improve or secure tip rotation. Since, this suture will reposition central limb of the tripod, the anterior projection of the lateral crura may require further shortening to achieve proper tip rotation. Interrupted 4-0 Chromic sutures may also be placed from the membranous septum to the caudal septal strut to enhance or maintain tip rotation.

If redundancy and bulging of the membranous septum is noted intranasally, interrupted 4-0 Chromic through and through sutures may be utilized for medialization of the mucosa and elimination of dead space.



Figs 12A and B: Inferior and lateral views of precolumellar-lobular extended shield graft. The anterior projection of the graft defines the tip in our patient with thick skin

Spreader grafts may be fashioned and interposed between the dorsal septum and upper lateral cartilages to repair obstructed internal nasal valves, and visible dorsal indentations. This may be observed and palpated with the flap down, and visualized directly with a Converse retractor. The length and thickness of a spreader graft is determined by direct visualization, and the graft is carved and sutured to the dorsal septum with a 5-0 PDS horizontal mattress suture. The upper lateral cartilages may then be sutured to the spreader graft and septum, if they need to be elevated to the height of the dorsal septum.

An extended shield graft may be fashioned and used in patients with thick skin to enhance tip definition and projection. These grafts may be sutured to the medial crural complex with a 5-0 PDS horizontal mattress suture. These are typically 7 mm wide at the anterior margin, and taper and extend posteriorly into a pocket inferior to the medial crura (Figs 12A and B).

A precolumella plumping graft may be carved and inserted into the same pocket, with suture fixation to the medial crural limb, to repair a retracted columella.

Alar batten grafts may be necessary during revision rhinoplasty to replace previously over resected lateral crura, or to straighten buckled lateral crura, and open collapsed external nasal valves (Fig. 13).

Inferior turbinate reduction may be performed with a Dennis bipolar probe at 20 watts. Three passes are made along each inferior turbinate after infiltration with local anesthetic.

- **Closure:** The closure begins when the surgeon is confident that the nasal airway is patent, and that esthetic goals have been achieved. The transcolumellar incision is closed with three 6-0 Prolene sutures at the corners and in the midline, and two paramedian



Fig. 13: Intraoperative appearance of a right alar batten graft used to correct pinching of the nasal tip and external nasal valve collapse after previous rhinoplasty. In this case, the lower lateral cartilages were not overresected, but were buckled. Their irregular concavities were improved by fastening the batten grafts to the lower lateral cartilages with 5-0 PDS to treat both the visible bossa, and the obstructed airway

6-0 fast absorbing cat gut sutures complete the skin closure. A 4 mm hook is used at the alar margin with the non-dominant hand to expose the marginal incisions which are closed with 5-0 Chromic. If nostril narrowing is indicated, wedges may be excised at the alar base leaving scars at the preoperative linear markings. These incisions are closed with 6-0 Prolene and 6-0 fast absorbing gut sutures.

- **Taping:** Quarter inch beige paper tape is important for stabilizing and immobilizing the reconstructed nasal skeleton. The first piece is placed at the supratip. It is applied using the thumb and index finger from the dorsum down to the maxilla, ensuring the skin flap is adherent to the framework. Smaller pieces are cut and placed along the dorsum up to the medial canthus.

A 6 mm piece of paper tape is cut, and each end is placed along the side of the tip. The U-shaped extension of the tape is pinched together until the infratip lobule is reached, securing the position of the nasal tip. The linear inferior extension of tape is trimmed, and another piece of tape is centrally placed on the lobule, and the ends of the tape are pushed from the lobule up to the maxilla to further secure nasal tip positioning for the first postoperative week. A light aluminum splint is placed on the upper two-thirds of the nose and is taped to the patient's maxilla from medial to lateral with two fingers (Fig. 14).

POSTOPERATIVE CARE^{6,16} CONTINUES FOR A YEAR OR LONGER AFTER RHINOPLASTY

There are five or more postoperative visits the first year of surgery—1 week, 1, 3, 6 months, and then 1 year post-



Fig. 14: 1/4" paper tape maintains the stability and position of the reconstructed nose. Nasal packing is not routine, and the postoperative course is typically not painful

operatively. Seventy to 80% of nasal swelling dissipates in most patients 1 month postoperative, and the remaining 20 to 30% of swelling tends to linger in the lower third of the nose for a year or longer. Photo-documentation is obtained at each visit, and color prints are given to the patient at the end of each visit.

One week after surgery, the patient's tape and splint are removed. The patient holds a tissue on the upper lip,

and an adhesive remover is applied with a medicine dropper while the tape is gently removed with a forcep. The tape is particularly adherent to the columellar sutures, and the tape is removed in a posterior direction at the nasal base, toward the upper lip, to avoid wound dehiscence. The five columellar sutures are removed, along with nostril narrowing sutures, and the airway is inspected and cleaned of dried blood and mucous. Intranasal chromic sutures are left intact. The patient and the surgeon should notice a swollen, but improved nasal appearance. Concealer is applied by an assistant, who also instructs the patient on proper application, so normal social activities may be resumed promptly. The patient is given a concealer kit to take home (Fig. 15).

One month postoperative, the patient's periorbital bruising will be gone, the patient's nasal tip will be firm and swollen and the upper and mid nasal dorsum should have little remaining swelling. Any persistent intranasal Chromic sutures may be removed during anterior rhinoscopy, and the airway is assessed. Patients who experience nasal obstruction may benefit from bilateral intraturbinate injections with 1 mm of triamcinolone acetonide (TA), 40 mg/cc, when necessary. Small cotton balls saturated with 1% lidocaine with 1:100,000 epinephrine are placed on the anterior inferior



Fig. 15: Photos of our gracious patient 6 weeks following rhinoplasty surgery for nasal narrowing, hump removal, and tip elevation. The lower lateral cartilages were divided and a columellar strut with an extended shield graft were placed to narrow and rotate his tip. After removing his dorsal hump, bilateral lateral osteotomies narrowed the upper 2/3 of his nose while restoring symmetry. His nasal base was narrowed with 3 mm skin excisions from the nasal sill bilaterally

turbinates bilaterally for less than 2 minutes. This renders the turbinate injections painless, and the topical epinephrine causes the inferior turbinates to shrink and become less vascular. If the patient breathes better when the topical anesthetic is removed, that is a good indication that the patient will have improved nasal breathing for 3 to 4 weeks post-TA injection. Nasal breathing will also continue to spontaneously improve as intranasal edema decreases over the next several months.

If there is excessive swelling in the supratip area 1 month postoperative, the surgeon may consider a dilute TA injection, 2.5 mg/cc, to reduce swelling in this area. Supratip edema may be retreated at monthly intervals or longer, as necessary. The concentration of TA may be increased as necessary for the treatment of supratip edema, not to exceed 10 mg/cc.

If a small indentation becomes visible on the front or profile view of the unswollen dorsum, microdroplet liquid injectable silicone (LIS) may be considered to fill the defect as early as 1 month postoperative. If the surgeon palpates a swollen dorsum, LIS treatments should be postponed until the dorsal swelling has resolved. Silikon-1000, Alcon Laboratories, Ft Worth, TX, 1000 centistoke LIS, may be administered with a 1 mm, Luer-Lok syringe and a half-inch, 27 gauge needle, with or without topical anesthetic. The patient must sign informed consent for the off-label application of LIS, a permanent filler. The depth of injection is between the skin and nasal framework, into the SMAS. Less than a tenth of a millimeter may be administered for the treatment of a small dorsal or nasal sidewall indentation. The serial puncture microdroplet technique of LIS administration involves depositing 0.025 mm, or less, per puncture to achieve a desired result. Liquid injectable silicone should be considered irremovable, so conservative treatments are mandatory to avoid overcorrection. Liquid injectable silicone treatments can be repeated at monthly intervals, or longer, as necessary. Microdroplet LIS treatments are safe, effective, and well received by most patients, for the nonsurgical treatment of minor postoperative indentations and irregularities that may follow rhinoplasty surgery. Rhinoplasty related irregularities may be seen in approximately 20% of patients with thin, light-colored skin. Thicker and darker nasal skin types are less likely to reveal irregularities as swelling dissipates over the 1-year healing period.

The 3, 6, and 12 months postoperative visits are scheduled to ensure patient satisfaction, analyze the progression of healing, and to assess the need for further interventions, both surgical and nonsurgical. As the surgeon begins the learning curve of performing rhinoplasty surgery, it is important to maintain a working

relationship with teachers, so postoperative issues may be successfully dealt with. Revision rhinoplasty surgery is exponentially more challenging than primary rhinoplasty since tissue planes become less distinct, and there is less septal grafting material to work with. Revision rhinoplasty may be offered 12 months postoperative, depending on the condition of the patient.

A SURGEON'S INTERNET PRESENCE AND REPUTATION WILL BE SOUGHT BY MOST PROSPECTIVE RHINOPLASTY PATIENTS

The rhinoplasty surgeon's internet presence has become important. Ninety percent or more prospective rhinoplasty patients will begin researching rhinoplasty on the internet. Patients cite positive patient reviews, favorable before and after photos, and credentials as the top three qualities they consider before scheduling their rhinoplasty consultations. A surgeon's website should be an informative source of knowledge for prospective rhinoplasty patients, and may contain credentials, patient reviews, and before and after photos. Less than 10% of patients will allow surgeons to post facial photos on the internet without modesty, and this number may increase to around 30% if digital photos are provided with the patient's eyes and lips concealed.

Before posting patients' photos on the internet, a separate and specific consent must be obtained from the patient to avoid privacy and civil rights violations. The consent for posting patients' photographs on the internet should specify the desired locations of the uploads, such as the surgeon's personal website, social media sites, and plastic surgery forums.

Even if satisfied patients are skittish about publicizing their photography, the majority will be happy to anonymously opine about their positive experience on one of many internet physician rating sites. It may be helpful to ask satisfied patients if they wouldn't mind sharing their experience on-line.

Unhappy patients are much more inclined to spontaneously compose epic narratives about their experiences, and copy and paste them to multiple physician rating sites. Other than a generic reply to a negative review, the surgeon's response to the negative review is limited by Health Insurance Portability and Accountability Act (HIPAA), and local privacy laws. Negative reviews tend to be read by more people since they are deemed by the public to be more interesting.

The surgeon should work to deputize happy patients, and encourage their composition of online reviews, since this is less likely to occur without encouragement. Internet posts should be considered permanent and irremovable, and may be read by the majority of patients

seeking rhinoplasty. Frequent participation in online forums designed to help patients seeking rhinoplasty, may serve to augment the surgeon's data base of knowledge available for public review.

CONCLUSION

Rhinoplasty surgery is a rewarding otolaryngologic procedure for the surgeon and patient. When rhinoplasty surgery is part of the services offered by the otolaryngologist, there is a proper approach for learning and achieving competency. This begins during residency with dedication to learning from skilled rhinoplasty attendings, and continues into private practice. Rhinoplasty surgery should be avoided if the surgeon is not confident in his or her ability to achieve a desired result, or if the prospective patient appears to have unrealistic expectations. Keeping a favorable internet presence, sounded by the voices of the surgeon's patients, is important for the growth and success of the rhinoplasty surgical practice.

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