Nasal tip surgery: nasal lengthening and augmentation in Asian rhinoplasty

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Nasal tip surgery is the most important surgical procedure in rhinoplasty. Various surgical techniques have been introduced, however, in Asian rhinoplasty, nasal lengthening and augmentation are important in these days. The authors aimed to compile and review various tip techniques based on the 25 years of experience of the senior author. The authors reviewed and shared our thoughts on various nasal tip techniques with a focus on both a nasal lengthening and tip augmentation. There has been advancement in our understanding of the nasal anatomy and its relation to form. To share our knowledge led to new and improved techniques for manipulating the nasal tip. Rhinoplasty is a dynamic and continually advancing field, and the quest for the most efficient and effective technique continues.

Keywords: rhinoplasty; nasal tip; asian rhinoplasty; nasal lengthening; graft materials; nasal augmentation

Introduction

Surgery of the nasal tip is widely considered as the most crucial and difficult surgical procedure in rhinoplasty. Traditionally, techniques of nasal tip surgery were limited to manipulations of tip position via projection, deprojection, and degrees of rotation. However, as finer appreciation of nasal aesthetics developed, intricate aspects such as alar-columellar relationships were taken into consideration in the assessment and management of the tip.

The alar-columellar relationship is considered on the basis of the lateral view. On this view, the alar and columellar positions are analyzed in relation to a line drawn through the long axis of the nostril. The desired position of the alar and the columella is to be equidistant (about 2 mm) above and below this longitudinal axis line, respectively. If the columella is longer than 2 mm, it is considered a hanging columella; if the alar rim rises more than 2 mm above this line, it is described as a retracted alar.

These tip deformities require specific techniques to address and correct. For example, an arrow-tipped nose (hanging columellar, long and sharp tip) could be corrected by the resection of the caudal and membranous septum and shortening of the lateral crura of the lower lateral cartilages. Correction of columellar retraction can be achieved by adding a caudal septal extension graft. Alar retraction can be corrected by using a composite graft and/or alar rotation flap.

In Asian rhinoplasty, most surgical corrections consist of nasal lengthening and augmentation. However, despite the myriad innovative techniques employed according to patient factors and surgeon preferences, a comprehensive review of these procedures has not been carried out. We aimed to compile and review various tip techniques for both short and low noses based on the 25 years of experience of the senior author.
Graft materials

Unlike Caucasian rhinoplasty, it is widely recognized that suture techniques alone are insufficient to achieve the desired tip results in Asian rhinoplasty. Asian rhinoplasty surgeons typically require more graft materials to augment the nasal tip—specifically for nasal lengthening, enhancing projection, and creating definition.

Autologous cartilage from the nasal septum and concha are popular and usually the first choice of harvest for grafting in the nasal tip [1]. Harvesting the septum does not require additional incisions and has minimal donor site morbidity. In addition, it is occasionally an essential step to correct any concurrent septal deviation. Concha harvest does not require any additional surgical draping and can be performed conveniently and quickly. The authors consider the naturally rounded contour of the concha cartilage as ideal for a natural looking cap graft. However, the available amount of both septum and concha is often insufficient. This is due to the fact that the Asian nasal septum and ear cartilages are frequently small and thin to begin with. This may be further compounded by ossification of the quadrangular cartilage. In addition, previous septoplasty or septrhinoplasty will naturally render further harvest almost impossible. In situations such as these, one way to maximize the utility of small pieces of septal/concha cartilages is to suture them together to create a longer and more sturdy strut.

The usage of autologous rib cartilage has enjoyed increasing popularity in recent years. This is due to the fact that autologous rib is an abundant source of strong and resilient cartilage [2]. We advocate the use of costal cartilage, especially for surgical correction of contracted noses, which typically require abundant amounts of strong cartilage to restore the structural framework of the nose and resist contracting forces of the skin and soft tissue envelope. However, it is also important to acknowledge the disadvantages of rib harvest and use of rib cartilages. These include complications of pneumothorax, postoperative warping, and prolonged inpatient stays. While patients are increasingly becoming better informed and more accepting of a rib harvest, some still find the invasiveness and scarring of a rib harvest unacceptable. These patients will have to consider the following other options.

Irradiated homologous costal cartilage (IHCC) provides an alternative rib cartilage from a cadaveric source [3]. IHCC is easily carved, readily available, and provides adequate structural support without the problem of donor site morbidity. Hence, IHCC enjoys good popularity among many rhinoplasty surgeons as an alternative to autologous rib harvest. However, some studies have indicated that IHCC suffers from problems of warping, infection, and infective and non-infective resorption [1]. Issues of its resorption and infection rates have been controversial, with some studies claiming low absorption rates and positive aesthetic results [2-4]. In our experience however, a high rate of both infective and non-infective resorption was observed during the use of IHCC in a revision rhinoplasty. As a result, its use in our practice is now limited to fashioning cartilages into extended septal grafts (ESG) for purposes of septal extension.

Alloplastic materials commonly used in facial reconstruction have also been applied to rhinoplasty [4]. Kim et al.[5] described using a bio-absorbable mesh sutured with the septal cartilage to reinforce the septal cartilage, providing sufficient strength to maintain the nasal dorsum. Medpor, a porous high-density polyethylene, is becoming increasingly popular as an allograft material [5]. It is known to be non-antigenic, non-allergenic, and can be carved to various shapes [6]. However, some studies suggest that using Medpor for nasal augmentation is not recommended because of its variable and unpredictable resorption rate [7,8]. In our experience, Medpor is difficult to remove during revision rhinoplasties. Therefore, we feel that, while Medpor may be considered for structural work, it is not ideal for nasal augmentation purposes [9].

Surgical techniques

The Asian nose typically presents with a low dorsum and tip and weak lower lateral cartilages. The L-shaped silicone implants used to be popular due to their ability to address the deficiencies of the Asian nose simultaneously [10]. However, due to frequent complications, such as extrusion of the implants, new techniques are being developed to achieve these aesthetic goals safely without the use of L-shaped implants.

The weak lower lateral cartilages do not lend themselves well to suture techniques, which are often ineffective in achieving the desired projection in Asian noses [11]. Instead, tip grafting methods are much more effective. For effective tip grafting, it is important first to construct a stable and strong tip as a base for the tip grafts [12].

The tongue-in-groove (TIG) technique is a powerful maneuver that can be used to adjust the alar-columellar relationship by reducing excessive columellar show and increasing tip projection and rotation. In addition to its usage to correct excessive columellar show and the droopy tip, the TIG technique can be used to provide additional lateral stability to a septal extension/
Kim described the Flag technique, which makes use of the harvested septal cartilage to achieve the desired projection (Fig. 1). In this technique, an elongated columellar strut graft is sutured at 95° to the upper lip (columellar-labial angle) between the two medial crura with 5-0 polydioxanone. The most superior part of this strut rises above the domes of the lower lateral cartilages and marks the new tip position. This is stabilized on both sides with a flag-shaped graft that is sutured to the caudal septum. After completing this “flag” framework, a shield-shaped graft is fashioned out of the remaining septal cartilage and sutured onto the new tip. This recreates the defining points of the new tip [22].

Celik et al. [23] described the figure-of-eight suspension suture to increase nasal tip rotation. A 4-0 Prolene suture starting from the medial and intermediate crura of the ipsilateral alar cartilage is passed through the dorsal septum to the contralateral upper lateral cartilage. The needle then passes back to the ipsilateral upper lateral cartilage and to the medial and intermediate crura of the contralateral alar cartilage, before finally being knotted in a figure-of-eight fashion [23].

Robotti et al. [24] introduced the usage of the “Septal T,” which is the cartilaginous portion of the hump removed during a hump reduction procedure. It consists of the cartilaginous junction between the dorsal septum and both upper lateral cartilages at the keystone area distal to the end of the nasal bone. This cartilage complex can be used as a spacer or for contouring the nasal tip in primary rhinoplasty. Their article described the use of this piece of cartilage as volume filler for cleft noses to correct the bifidity of the medial crus, thus helping to stabilize the tip [24].

In our opinion, the most important factors to consider in tip surgery are the degree of tip projection, tip lengthening, and tip narrowing. These parameters have the greatest impact on the aesthetic outcome of tip surgery. For tip projection, we favor the use of extended spreader grafts with columellar strut, or in select cases, X-grafts. Onlay cap grafts are also another workhorse graft for increasing the projection.

Moreover, we prefer to lengthen the tip by transfixing the lower lateral cartilages to the extended spreader graft at the desired position. ESG is a crucial surgical procedure for tip augmentation when tip support is insufficient. Without a strong tip, tip deviation may occur postoperatively. Usually, we anchor the ESG to the caudal septum with an overlap of at least 5 mm for stability. After anchoring the ESG, it is important to ensure the new construct remains stable and straight by applying some digital pressure on the tip. If the construct is not sturdy enough, buckling, deviation, and/or drooping of the nasal tip will develop postoperatively. Subsequently, the ESG is sutured to a columellar strut that further stabilizes the tip complex. We find that a unilateral ESG usually suffices and works well (Fig. 2). However, bilateral ESG is preferred when more postoperative stability, reliability, and symmetry are required. In contrast, bilateral ESG may cause widening of the nasal vault, stiffness in the transition area between the nasal tip and anterior nasal septal angle, and possible internal nasal valve obstruction [25]. Most significantly, the possibility of pressure or ischemic necrosis of the caudal septum from the pressure of bilateral ESGs is a major concern. We have often observed weakening and thinning of the caudal septum in Asian patients with wide bilateral ESGs (Fig. 3). The septal ischemic necrosis causes loss of rigidity from damage to the structural integrity, resulting in loss of tip support. Unfortunately, such revisions are often difficult undertakings [26].

In cases where there is shortage of graft material, the X-grafting method, which we often use, may be employed. The design of X-graft allows the surgeon to create a scaffold with excellent stability using only minimal amounts of cartilage [27]. After fixing the ESG, a modified caudal septal extension graft is sutured onto the contralateral caudal inferior septum projecting superoanteriorly to meet the ESG in the midline where they are sutured together (Fig. 4).

When using costal cartilage, the cartilage is usually cut into strips of more than 2 mm in thickness to reduce the likelihood of warping. Using these relatively thick grafts, we frequently employ the LOCK technique for fixing the ESG with the columellar strut graft [13-21].
strut. This allows for a more secure and stable fixation of the two cartilages to improve nasal tip projection and lengthening (Fig. 5, 6). In addition, LOCK technique allows the control of the thickness of ESG and collumellar strut interface. One strip is sutured to one side of the septum as a unilateral ESG. Another piece is placed in position as the columellar strut. The contact surface between the ESG and collumellar strut is marked and half the graft thickness is carved out of the ESG and collumellar strut, respectively. These cut surfaces allow a snug fit of both grafts. The two grafts are then sutured in place [28].

Fig. 2. (A) Schematic diagram of a unilateral extended spreader graft (ESG) and collumellar strut. (B-D) Intraoperative views.

Fig. 3. (A) Schematic diagram of a wide bilateral extended spreader graft (ESG). (B) Intraoperative views after 6 months’ postoperative period. (C, D) Intraoperative views; clinically obvious compression necrosis after removal of ESGs is observed.
Cap grafting is performed as one of the final steps in tip plasty. We favor using conchal cartilage as cap grafts. The naturally rounded contour of the conchal cartilage is ideal for creating a natural looking tip. When using costal cartilages, it is necessary to carve the edges to create a natural looking rounded contour. Lastly, shield grafts may be used for additional lengthening.

Fig. 4. Schematic illustration and intraoperative photograph of X-graft procedure.

Fig. 5. Schematic illustration of the LOCK technique.

Fig. 6. Intraoperative views of a LOCK technique intervention.
when necessary or when correcting problems of retracted columella.

Since aesthetic concerns are an important, if not main, consideration for most rhinoplasties, creating extra scars on the nasal skin may seem a counterintuitive proposition. However, we often find it necessary to perform supratip skin excision (also known as vertical midline nasal dorsal skin excision) to correct the supra tip pollybeak, which is often observed at the end of the surgery in patients with bulbous tip and thick skin. Supratip excision should be considered in these cases to enhance tip definition, decrease dorsal height, and eliminate supratip fullness [29].

Similarly, the alar rotational flap technique is an effective single-stage technique for correcting severely retracted alar rim in contracted noses and excessive nostril show (Fig. 7). The incision is made in the supra alar crease extending caudally to the tip. The flap is then undermined in the subcutaneous plane in order not to injure the alar cartilage. The fulcrum of the rotation is centered along the alar-facial sulcus. Alar batten grafts are used to provide additional support for the skin flap. When closing the wound, care must be taken to ensure minimal tension on the suture line and to ensure that the natural shape of the nostril is preserved [30]. In our opinion, these seemingly aggressive techniques are in fact crucial maneuvers when correcting the deformities seen in contracted and/or droopy noses or excessive and thick skin.

For tip narrowing, we favor transdomal suturing and cephalic resection. During transdomal suturing, we prefer to use absorbable suture materials such as polydioxanone. While we recognize the popularity of using non-absorbable sutures among some surgeons, we feel it is not ideal due to the high tensions often created during suturing. In addition, non-absorbable sutures run the risk of triggering an inflammatory response postoperatively. Therefore, we routinely use only absorbable suture materials for suturing cartilages and grafts.

**Conclusion**

In this review article, we reviewed and shared our thoughts on various nasal tip techniques with a focus on nasal lengthening and augmentation in Asian rhinoplasty.
ing and tip augmentation. This is based on our 25 years of experience performing rhinoplasty. Over the years, there has indeed been considerable advancement in our understanding of the nasal anatomy and its relation to form. The application of this knowledge led to new and improved techniques for manipulating the nasal tip. Even as we summarized our journey thus far, rhinoplasty is a dynamic and continually advancing field, and the quest for the most efficient and effective technique continues.

Conflicts of interest

The authors have nothing to disclose.

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