Rhinoplasty with Cartilage and Alloplastic Materials, Nasal SMAS Management in Asian Rhinoplasty, Contracture Classification, and Secondary Rhinoplasty with Contracture

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Abstract

Rhinoplasty for Asians is quite different from that of Westerners. Most Asians desire a raised nasal bridge with a projected nasal tip, similar to that of Westerners. Nevertheless, most Asian nasal bones, and upper and lower lateral cartilages are inadequately developed. This largely necessitates the use of a nasal alloplastic material such as a silicone implant, most frequently utilized in nasal cosmetic surgery for Asians. Shaping of the silicone implant is rather easy and its removal is also simple, in the case of a complication or undesired result. The disadvantage of a nasal silicone implant, like that of silicone implants of the breast, is the fibrous capsular formation, which may lead to capsular contracture. The frequently employed types of nasal silicone implant include (1) the boat type in which the silicone implant descends down to the nasal tip, (2) the L-shape in which the silicone implant further extends to the anterior nasal spine (ANS) after passing the tip, and (3) the three-quarter type for which the silicone implant extends down to the upper lateral cartilage. In conjunction with the silicone implant, the cartilages of the ear and the nasal septum are commonly used to create or lengthen tip projection. Asians generally have cartilage with inadequate anatomical development. Instead, they often have an anatomically thick fibrous fatty layer including underdeveloped superficial musculoaponeurotic system (SMAS). Patients with a thick fibrous tissue layer have a bulbous tip. This nasal tip is the area where severe capsular contracture occurs after insertion of a silicone implant. It is imperative that the surgeon properly understands the nasal anatomical characteristics of Asians, and selects an appropriate implant together with a suitable donor cartilage to attain a safe and aesthetically pleasing nose. The same principle should apply to reoperation cases; the fibrofatty layer of SMAS along with the capsular contracture must be removed or released to gain a sufficient soft tissue volume. This provides further stability to the cartilage framework.

Keywords

- silicone implant
- nasal SMAS
- fibrofatty layer
- contracture

Cartilage Harvesting

Cartilage is the safest and most important material in contemporary Asian rhinoplasty. Ear cartilage, septal cartilage,

and rib cartilage are all used for rhinoplasty. For Asians, augmentation rhinoplasty of the nasal dorsum is generally performed. Cartilage is used for rhinoplasty of the nasal tip, while an alloplastic material, such as a silicone implant or

Fig. 1 (A) Incision for harvest and area of harvest. The cymba concha is usually harvested for tip plasty; if the cymba concha is small or deformed, the cavum concha is harvested. (B) For cymba concha, a long shield graft and pieces of onlay grafts are designed. The remnant ear cartilage should be crushed and used in the supratip break area, and for continuity between the silicone implant and the tip onlay graft.

Gore-Tex material, is employed for rhinoplasty of the nasal dorsum.¹⁻⁴

Understanding the characteristics of autologous materials is quite important. Ear cartilage has high elasticity and sufficient thickness, and retains a natural curve. Thus, it is appropriate for areas requiring curvature. However, ear cartilage may be cut in half, and their opposite sides can be sutured for use in areas that require a straight line.⁵ Nasal septal cartilage is the donor choice for Westerners.⁶ However, owing to an underdeveloped Asian nasal septum in both quality and quantity, septal cartilage harvest including the vomer would not be sufficient in size for septal extension grafts and other uses.^{1,4} Furthermore, the thickness of the nasal septum would be inadequate. All these aspects do not justify it as a first choice of donor cartilage. Rib cartilage has the advantage of providing a large volume, but it may leave a scar in the chest, and warping of the rib cartilage is a matter

for concern.^{1,6,7} Also, it requires additional operative time. Thus, the rib cartilage should be used only for reconstructive cases, such as short nose deformity secondary to contracture or a cleft lip and nose deformity.¹

With respect to the harvesting method of the ear cartilage, there are anterior and posterior approaches. Any approach can be used depending on the surgeon's preference; we favor the anterior approach. A strategic use of different donor cartilage parts is also important (► Fig. 1).

Open Rhinoplasty versus Closed Rhinoplasty

Asians have relatively small nostrils, and their cartilages are underdeveloped.¹ Thus, it is difficult to carry out a closed rhinoplasty for Asians with all the possible maneuvers for support and tip definition. However, owing to the lack of columellar support disruption, the closed rhinoplasty

Fig. 2 The nasal superficial musculoaponeurotic system (SMAS) is very thick and covers the lower lateral cartilage area widely. In an open rhinoplasty, the nasal SMAS is harvested easily. It is used on the tip, the supratip, and any depressed area of the nose.

Fig. 3 The suture technique is not enough for tip projection and caudal lengthening, but is essential because it changes the shape of the cartilage frame, and cartilage graft placement on this changed platform is better than just a simple onlay graft without a concurrent suture technique.

approach has the advantage of enabling the surgeon to verify the final contour of the nasal tip and the dorsum during surgery, with more preservation of blood and lymphatic circulation.⁸

Our preference is for an open rhinoplasty because the procedure facilitates better control of the nasal SMAS. Most Asian noses have underdeveloped cartilage, and the fibrofatty soft tissues are largely distributed to the tip and the supratip areas.¹ Thus, the bulbous tip and parrot-beak deformity are quite often observed among this population. A highly developed Pitanguy ligament often inhibits tip projection.⁹ The nasal SMAS with highly developed fibrous tissues may also cause postoperative contracture. Hence, we harvest the Pitanguy ligament and the nasal SMAS during the skeletonization of the nasal cartilage and bone. The harvested nasal SMAS is then inserted on top of the cartilage graft when deciding the final height of the nasal tip. Thus, the height of the nasal tip is determined, and potential cartilage graft visibility under the skin is prevented (►Fig. 2).

Alloplastic Material Selection

The most frequently used alloplastic materials are silicone and Gore-Tex implants.⁸ Whichever implant is used for rhinoplasty, the floor plane of the nasal dorsum, to which an implant would be anchored, must be smoothed out. Alternatively, the floor of the implant should be carved out so that the implant could maximally adhere to the floor plane without any rocking. An implant must be positioned to the subperiosteal plane in the nasal bone area to minimize implant movement after surgery. The importance of making a pocket for the implant is that it is essential to preserve the mucosal barrier so that the created pocket does not perforate and expose the implant open to the nasal cavity. In the event of mucosal damage occasionally in the process of releasing the soft tissues or lower lateral cartilage (LLC) or in the process of dissecting cartilaginous and bony hump, the mucosa should be carefully sutured to definitively restore a mucosal barrier. We favor the silicone implant because it is easy to carve, insert, or withdraw. Also, contracture is more

Fig. 4 (Left) A long shield graft makes a triangular prism with the medial crura, with more stability than the batten-type strut graft between the medial crura. (Right) Ear cartilage has a natural curve. A long shield graft is placed as in this diagram, making the nose longer together with the lateral crural steal technique.

Fig. 5 Most Asians have a thick fibrofatty layer including nasal superficial musculoaponeurotic system; this creates a bulbous nasal tip, a less defined tip, as well as a parrot beak deformity. Secondary contracture also occurs primarily in this area; this layer should be removed or released in a secondary surgery.

likely the issue of infection control rather than that of silicone or Gore-Tex material triggering an exaggerated foreign body response. This is not unlike the formation of biofilm on breast implants.

Suture Technique Requirement—Lateral Crural Steal

A suture technique is required for tip surgery, though a visible graft, such as a shield graft or an onlay graft (as per Tebbets¹⁰), should be performed. The significance of the suture technique to increase tip projection and to shape the nasal tip may be underestimated because the degree of tip structural change or projection after use of the suture technique is not obvious in Asians. However, the key purpose of the suture technique is to shape the cartilage frame on which a visible graft could be placed. We prefer the lateral crural steal technique, in which the lateral crus is repositioned to the dome to increase the middle crural length (→Fig. 3).¹¹

Long Shield Graft and Onlay Graft

A columella strut graft is necessary to create and maintain tip projection. In cases of a septal or rib cartilage, a straight graft

Fig. 6 A 23-year-old woman with a low nasal dorsum and a less projected nasal tip. (A) Preoperative front view. (B) Postoperative front view. (C) Three-quarter view, preoperative. (D) Three-quarter view postoperative. (E) Diagram of techniques, open rhinoplasty, long shield graft, onlay graft, lateral crural steal, three-quarter-type silicone implant, and a nasal superficial musculoaponeurotic system graft.

can be used. The graft is repositioned between the medial crura, with the graft sutured to the medial crus. Then, the graft is fixed either as the floating type or to the ANS, to produce tip projection. Because ear cartilage has curvature, the graft with an opposite curve is sutured in an X-shape, and is repositioned between the medial crura.⁷ We do not reposition the graft between the medial crura. Instead, a long shield graft is placed in front of the medial crus.

In cases of a long shield graft, the caudal projection of the tip is simultaneously increased, and a stable structure can be created without having it tilt to either the right or left side (► Fig. 4).^{1,7}

Nasal Superficial Musculoaponeurotic System

The nasal envelope is comprised of skin, a superficial fatty layer fat, a fibromuscular layer, a deep fatty layer, and the perichondrium. The nasal SMAS is the structure in which the fibromuscular layer and the deep fatty layer are connected to the facial SMAS.¹² The nasal SMAS is also connected to the

dermocartilagenous ligament system as reported by Pitanguy et al.^{9,12} Patients with a well-developed lower lateral cartilage (LLC) have a thin nasal SMAS layer with elasticity. However, patients with an underdeveloped LLC have a thick nasal SMAS often with no elasticity. Most Asians have thick nasal SMAS without elasticity as opposed to that of Westerners.¹ Thus, a beautiful nose without a parrot-beak deformity can be made with careful manipulation of this layer (► Fig. 5). We dissect the Pitanguy ligament from the medial crus in the area of the transcolumellar incision site. En bloc excision of the nasal SMAS above the LLC is performed. The excised nasal SMAS is grafted to control the volume and the line by grafting it to the asymmetric left and right side or the columella and tip (► Fig. 6).

Contracture Classification and Secondary Rhinoplasty Algorithm

A silicone implant is one of the most common options for an Asian augmentation rhinoplasty. The major disadvantage is the secondary capsular contracture.¹³ This is quite similar

Fig. 7 (A) Grade 1: Natural appearance, as if no implant had been inserted. (B) Grade 2: Unnatural lateral margin. (C) Grade 3: Identified implant deviation. (D) Grade 4: Short nose deformation.

to the secondary contracture after an augmentation mammoplasty, though there is rather insufficient information about the classification for the secondary contracture after rhinoplasty with a silicone implant and its treatment algorithms according to its grade or severity (►Fig. 7A–D). To this end, perhaps a natural appearance, as if no implant has been inserted, may be classified as grade 1. Patients with an unnatural lateral margin of an implant can be classified as grade 2. A case showing a clearly identified

implant deviation may be classified as grade 3; and a case of short nose deformity classified as grade 4 (►Figs. 7D and 8). It is important to clinically classify the deformations of secondary contracture after surgery and establish treatment algorithms for more scientific communication between rhinoplasty surgeons. In ►Fig. 9 we provide a guideline for the clinical classification and treatment algorithm of secondary capsular contracture after rhinoplasty.¹⁴

pre-op-Grade 4 contracture

post-op

explanted Gore-Tex implant

Fig. 8 Secondary rhinoplasty in a 36-year-old woman, with two previous nasal surgeries done elsewhere with development of nasal contracture, with a short nose deformity and implant malposition-grade 4 contracture. The first surgery was with a silicone implant. The second surgery was with Gore-Tex. The third surgery was done through an open rhinoplasty, with explantation of Gore-Tex, ear cartilage, nasal superficial musculoaponeurotic system, and silicone implant three-quarter-type.

Fig. 9 Algorithm for the treatment of secondary contracture. LLC; lower lateral cartilage; SMAS, superficial musculoaponeurotic system.

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