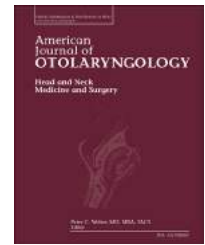


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## An alternative technique to define and visualize columellar and nasal tip vectors. Improvement of mestizo nose<sup>☆</sup>

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### ABSTRACT

**Background:** With some frequency, in mestizo rhinoplasty, we focus much of our attention on the nasal tip. This work also highlights the importance of obtaining a proper balance of the columella, achieving a pleasing visual effect of the vector lines that make up the nasal profile (columella and nasal tip vectors).

**Methods:** We performed a complete medical history in all patients and developed a surgical plan after nasal anatomy analysis. Pre- and postoperative photographs were obtained for medium and long term control.

**Results:** We treated 112 patients with this surgical technique, 77 with an open approach and 35 with a closed approach. The results were documented in the short and long term with a range of 6 months to 5 years.

**Conclusions:** We feel that the use of an angulated extended columellar graft is highly polyfunctional, providing length, definition and support to nasal tip grafts. Because of the graft design, it is possible to predetermine the new columella length/tip, thus visualizing the columella and nasal tip vectors of the nasal profile. The angulated extension prevents cephalic-lateral-caudal displacements of the tip graft, and to some degree it is possible to increase or decrease nasal length depending on the angularity of the extension.

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### 1. Background

The anatomical characteristics of the Mestizo patient's nose usually include an apparently large nose, a convex dorsum with a deep radix, and a wide nasal base. The length of the nasal columella and tip is decreased because the alar cartilages are short and also weak and thin, providing insufficient structural support, poor definition and nasal tip projection. Skin thickness also contributes to the poor overall

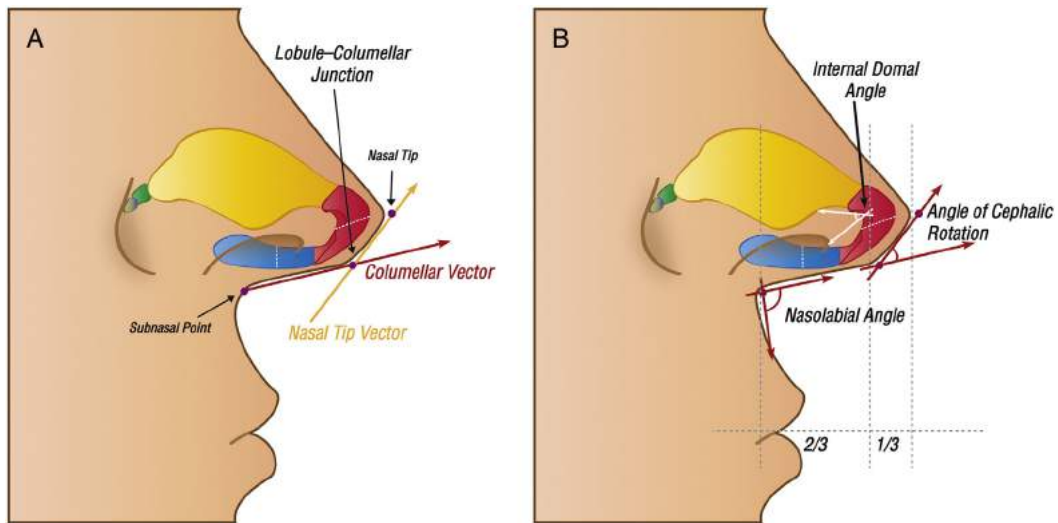
definition of the nose, especially of the tip [1]. Patients often have alveolar protrusion that projects the lips forward. This effect makes the reduced nasolabial angle more apparent.

The normal anatomy of the nose in a profile view describes two vectors: the columellar vector and the nasal tip vector, each with an origin, length, direction and an end (Fig. 1). The vector describing the columella starts in the sub-nasal point and ends at the columella-lobe junction (cephalic rotation point). The vector of the nasal tip begins precisely at the point

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**Fig. 1 – Anatomy of the prototype nose. (A) Columellar and nasal tip vectors. (B) Nasolabial angle, angle of cephalic rotation, and internal domal angle. Longitudinal relationship of vectors.**

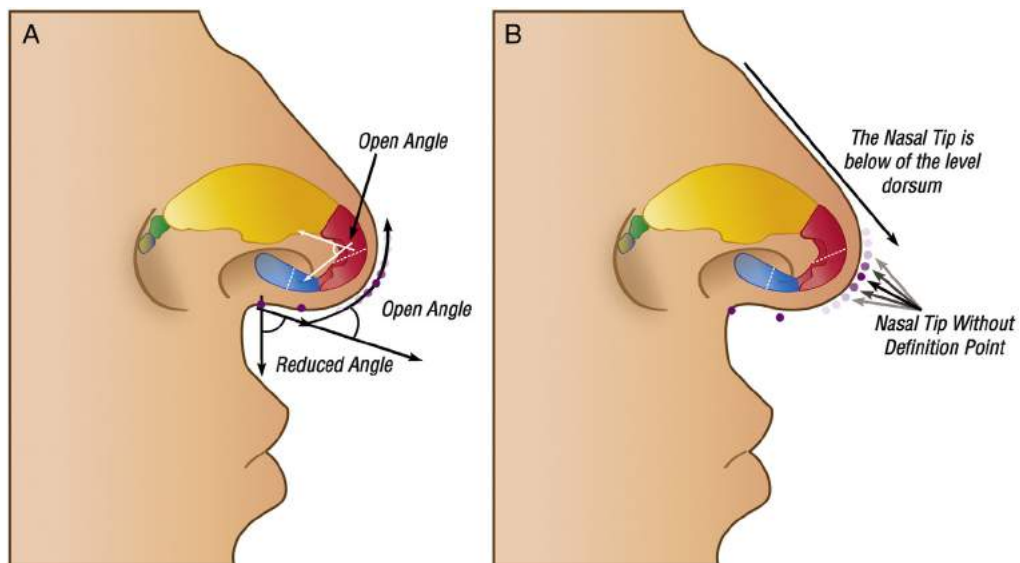
of cephalic rotation and ends at the dome, which is the maximum point of projection of the nose. Both vectors from their beginning move in an anterior and cephalic direction, the intersection of these vectors at the columella-lobe junction forms an average angle of rotation of  $50^\circ$  (Fig. 1A) [2,3]. The longitudinal relationship of these vectors is approximately  $2/3$  and  $1/3$ , respectively (Fig. 1B).

The mestizo nose usually has a short columella, which is more or less retracted and hidden because of its alar borders (Fig. 2). The shortness and lack of deflection of the internal domal angle of the segments of the middle crura (lobule and dome segment) give the tip a convex aspect (Fig. 2A). This obtuse angle prevents the formation of a point of maximum projection of the nose tip. The vectors representing the

columella and tip are short and their crosslink generates an obtuse angle of cephalic rotation (greater than  $50^\circ$ ) (Fig. 2A). These variables establish a poorly defined short convex nasal tip, which is often below the level of the dorsum (Fig. 2B).

Surgical modeling of the nasal tip in a Caucasian rhinoplasty involves, according to its anatomical features, strategic modeling of the lower lateral cartilages with sutures. The use of a columellar support depends on these variables, and less frequently on a tip graft. However, contrary to these standards, in mestizo patients, the use of a columellar support and a cartilage graft for the nasal tip is practically the rule.

The columellar graft provides support, projection and length; in turn the tip graft provides tip projection and definition [4,5]; however, with a certain frequency, due to



**Fig. 2 – Mestizo nasal anatomy. (A) The middle crura is short originating a short columellar vector with a caudal direction. The nasolabial angle is reduced and the angle of cephalic rotation and internal domal angle are open. The nasal tip vector is convex. (B) The nasal tip is without definition and is below the level of the nasal dorsum.**

the weak support of the cartilaginous tripod, particularly the central pillar, and also the thickness and weight of the soft tissues on these grafts, and possibly also due to the fixation technique and the retraction effect of the scar, these grafts may undergo basal, cephalic, and/or lateral displacement with the loss of a good result (Fig. 3).

In this work, we have focused our attention not only on obtaining a good result, strictly of the nasal tip, but also on achieving an appropriate balance of the columella, with this being reflected externally with the visualization of the lines (vectors) originating from the columella and the nasal tip. Based on this, we propose the use of an angulated extended columellar graft (AECG) as a single unit that allows us to establish a clear definition of these vectors with the breaking point that defines them (cephalic rotation point) (Fig. 4). Thus with the AECG, whose design predetermines these vector lines, it is possible to reach a high standard of beauty, which is difficult to attain, for the mestizo nose.

## 2. Material and Methods

The technique was used in 112 rhinoplasty patients with a mestizo nose (89 women and 23 men) ranging from 16 to 55 years of age. A complete medical evaluation was performed with preoperative and postoperative photographs to aid in the evaluation of intermediate and long-term results. The majority of the patients underwent surgery with local anesthesia and sedation. There were 85 primary cases and 27 secondary cases, with 77 cases being done with an open approach and 35 with a closed approach. We obtained the informed consent from all patients, who were also informed fully regarding the aim of the study. The clinical study was approved by the appropriate institutional review boards from the "Dr. José E. González" University Hospital.

The day before surgery, oral cephalexin (500 mg tid) and oral amica (as a preventive anti-inflammatory drug) were

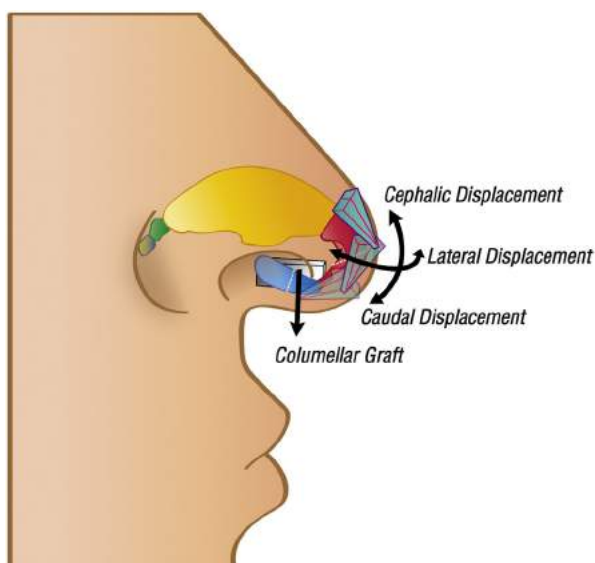


Fig. 3 – Possible displacements of nasal tip grafts.

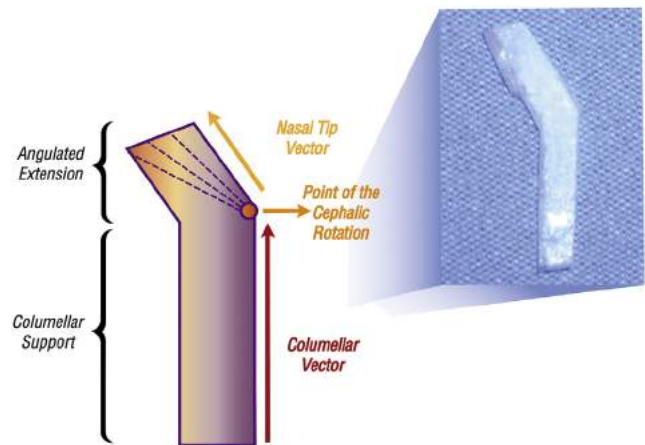


Fig. 4 – The angulated extended columellar graft consists of two parts: a "columellar support" that establishes the columellar vector, and an "angulated extension" that forms the nasal tip vector. The angulation of the angulated extension varies in each case.

prescribed. Postoperatively, cephalexin was continued for four days and amica was continued for 10 days.

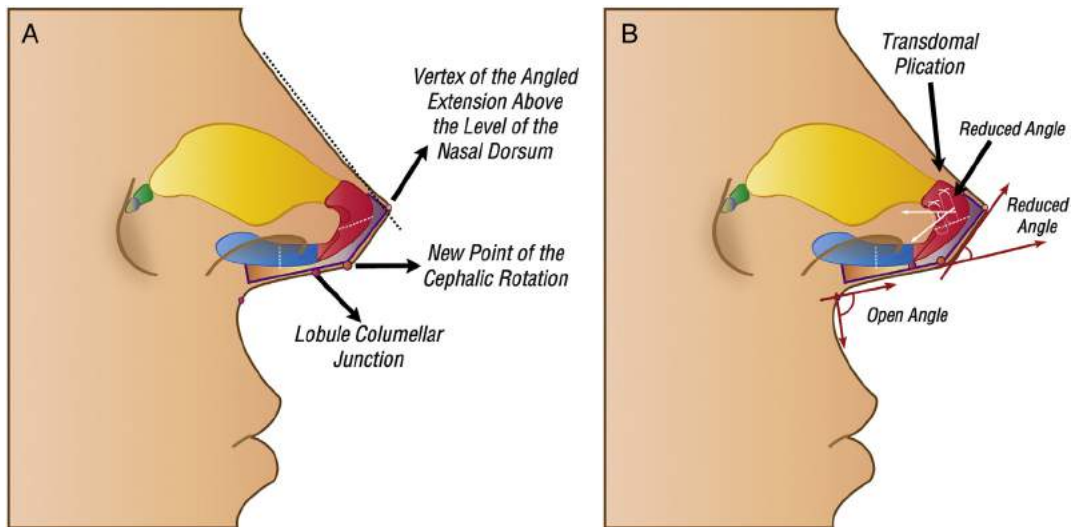
Local anesthesia consisted of 1% lidocaine with epinephrine (ratio of 1:100,000). Cotton applicators soaked with this solution were introduced to create a vasoconstrictive effect on the mucoperichondrium of the septum and turbinates. The infraorbital nerves and the areas to be dissected were infiltrated. The mucoperichondrium of the nasal septum was infiltrated, directing the bevel of the needle towards the wall of the septum in order to perform hydrodissection, thereby facilitating elevation of the mucoperichondrial flap.

In most patients, we performed an external approach through a stepwise transcolumellar incision connected to a marginal incision through the lower edge of the alar cartilage [6–8]. Then we symmetrically exposed the cartilaginous framework and dissection continued upward to the bony dorsum. When it was necessary to remove a large hump, subperichondrial tunnels were created along the anterior edge of the septum up to the level of the nasal bones, allowing for extramucous resection [9].

We preferred to harvest the septal cartilage and then work on the dorsum, continuing with necessary modifications of the tip. This provided us with a fixed point of reference from which to establish a dynamic balance between the dorsum and the tip. The grafts were obtained from the septum for the columella, tip, and dorsum and carved to the size and shape determined by preoperative planning [10]. If there is insufficient septal cartilage for the graft, ear cartilage provided a good alternative. Rib cartilage can also be used when a greater amount of cartilage is needed or when other donor areas have been used previously.

### 2.1. Design of the angulated extended columellar graft

Graft design conforms to the nasal profile with its two vectors and in contrast with the usual columellar support. The AECG is formed by two parts: a long portion for columellar support



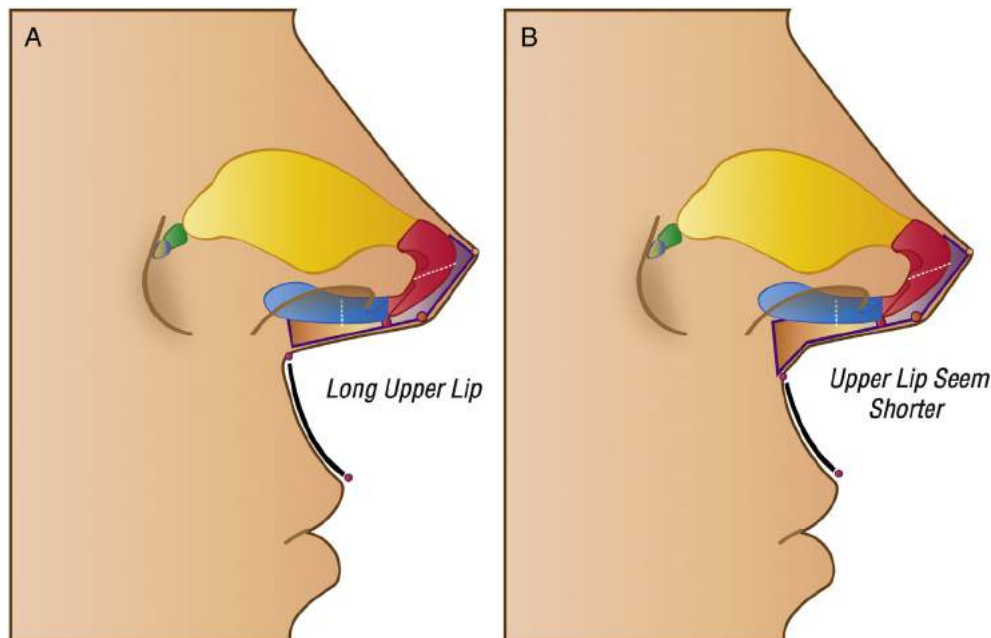
**Fig. 5 – Relationship between the extended angulated columellar graft and its correct position. (A) Greater columellar length with a new cephalic rotation point. (B) The nasolabial angle is open and cephalic rotation and the internal domal angle have been reduced to a more natural aspect. Anterior projection of the extended angulated columellar graft occurs according to each case.**

(the columellar vector) and a short angled portion termed the angulated extension (the nasal tip vector) (Fig. 4).

## 2.2. Columellar support (Columellar vector)

The mestizo patient usually has a short columella; therefore, we define a new length of the columella in the design of the graft. Initially, we identify the lobule–columella junction of the crura to estimate the length that the columellar support must have (Fig. 5A). We dissect an intercollumellar pocket through which

the AECG is introduced and tested in different positions to establish a suitable height for the columella. The columella is usually hidden by the alar borders therefore the graft must be placed anteriorly, according to the required projection. We must simultaneously predetermine the nasolabial angle (commonly reduced), so that the graft will have a slight cephalic rotation to increase the nasolabial angle (Fig. 5B). It is important to remember that the depressor septi nasi muscle and the ligament of Pitanguy intrinsically participate in nasal dynamics, so manipulation must be controlled (action-effect) [11–15]. The



**Fig. 6 – (A) Individual with a long upper lip. (B) The use of a triangular extension in the base of the extended angulated columellar graft produces a visual effect that causes the upper lip to seem shorter.**



adequate length and projection of the columellar graft support ensure satisfactory visualization of the columellar vector. Finally, the graft is secured at the previously determined site with two or three 5-0 horizontal mattress sutures [16].

### 2.3. Triangular extension of the Columellar support

Some patients have a long upper lip, so we add a triangular extension to the base of the columella support of the graft. This technique helps the nasolabial junction seem lower and the upper lip seem shorter (Fig. 6).

### 2.4. Angulated extension (Nasal tip vector)

As previously mentioned, the nasal tip is short and convex without definition and with an obtuse angle of cephalic rotation. The angulated extension functions as a bed on which the tip graft directly lies. This prevents cephalic-caudal displacement. We also place rectangular mini-grafts on both sides of the extension to prevent lateral displacement thus increasing the contact surface (rectangular mini-grafts for lateral stability) (Fig. 7). These two maneuvers provide greater stability to the nasal tip graft. We establish the angularity of the extension; however, in almost all cases a reduction of the angle of cephalic rotation is necessary. At the same time we determine the length of this portion of the graft. We usually place the vertex of the angled extension above the level of the nasal dorsum (Fig. 5A). This will be our reference point to estimate projection of the tip graft (Fig. 7). The height and projection of the columellar portion, the angularity of the point of cephalic rotation, and the length of the angled extension are determined before the procedure and confirmed during surgery.

### 2.5. Nasal tip graft

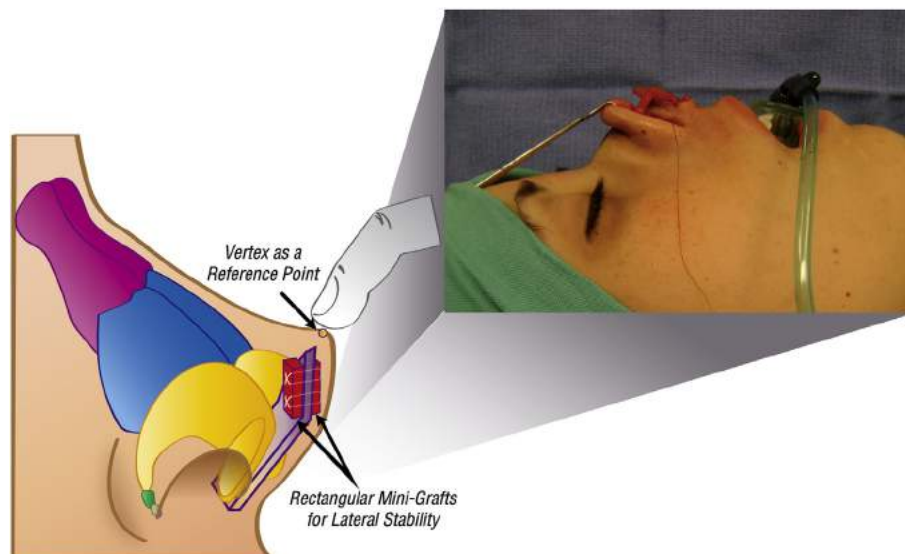
We use Sheen grafts [17] and in most cases, sculpture their moderately sharp angles and moderately acute edges so that

bright spots are visible as much as possible on a thick skin. The nasal tip graft will evidently clearly lie on the increased contact surface of the angled extension (Fig. 8). The graft is positioned 2 to 3 mm above the dorsum to prevent the lack of nasal tip projection caused by scar retraction. The lower vertex of the graft is carved and is at the level of the new point of cephalic rotation of the AECG. The angularity, stability, and adequate length of the graft ensure satisfactory visualization of the nasal tip vector. Finally, the graft is secured with two or three 5-0 vascular Prolene horizontal mattress sutures.

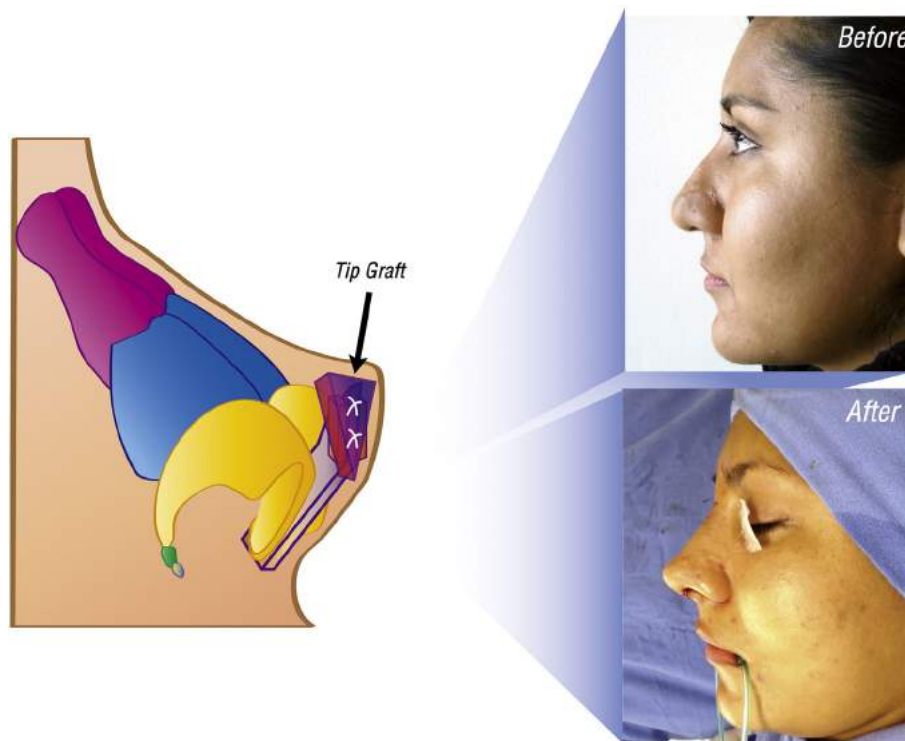
## 3. Results

Patients were evaluated using a Visual Analogue Scale (VAS), categorizing the results with five variables: very satisfied, satisfied, somewhat satisfied, dissatisfied, and very dissatisfied. Forty-eight patients (64%) were very satisfied, 15 (20%) satisfied, 8 (10.66%) somewhat satisfied, 4 (5.33%) dissatisfied, and no patient was very dissatisfied. Patients were also evaluated by three plastic surgeons that were not involved in the procedure and were blinded to the operator performing the procedure categorizing the results with a Likert scale as excellent, very good, good, and poor. The results were considered by the surgeon reviewers as very good in 72%, good in 22%, and poor in 6%.

Sixty-seven patients presented a more or less hidden columella and this condition improved with surgery in 65. The nasolabial angle was increased to a standard parameter (95°–110°) in most cases. Based on these results it was possible to entirely visualize in most patients the vectors of the columella and the nasal tip, and the break point that precisely defines these two vectors. In addition, a better longitudinal balance between these vectors was achieved, which was perceived by the surgeon evaluators. With a suitable nasolabial angle and a defined nasal tip it was possible to establish a better balance between nasal and facial length. The transcolumellar scar over time became almost imperceptible.



**Fig. 7 – Placement of rectangular mini-grafts provides lateral stability. The vertex of the extension is used as a reference to determine the height of the tip graft.**



**Fig. 8 – Strategic positioning of the nasal tip graft. The tip graft is sculptured and placed over the angulated extension.**

Nasal retouching was performed in seven patients: one because of tip overprojection, one because of underprojection, one because of lateral displacement, three because of a residual hump, and one because of a hidden columella. There were no other complications. These seven patients were from the somewhat satisfied [3] and dissatisfied [4] categories after initial surgery. After retouch surgery these patients were satisfied and very satisfied with the results, respectively.

These less favorable outcomes were possibly related to patient characteristics, such as the presence of thick skin and inflammation that caused difficulty in adequately eliminating a bony hump during initial surgery and which improved with retouching. We feel that underprojection was caused by scar retraction in a patient who wanted the tip at the level of the dorsum although we usually position the tip graft 2 to 3 mm above the dorsum to prevent a lack of nasal tip projection. The patient with lateral displacement received direct trauma to the nose when lifting a child 5 or 6 days after surgery. Tip overprojection and the hidden columella were possibly due to a miscalculation of tip graft position and of the columellar support of the angulated extended columellar graft.

Results were documented in the short and long term with a range of 6 months to 5 years, where visualization of the vectors persisted together with nasal tip graft stability (Figs. 9 and 10).

#### 4. Discussion

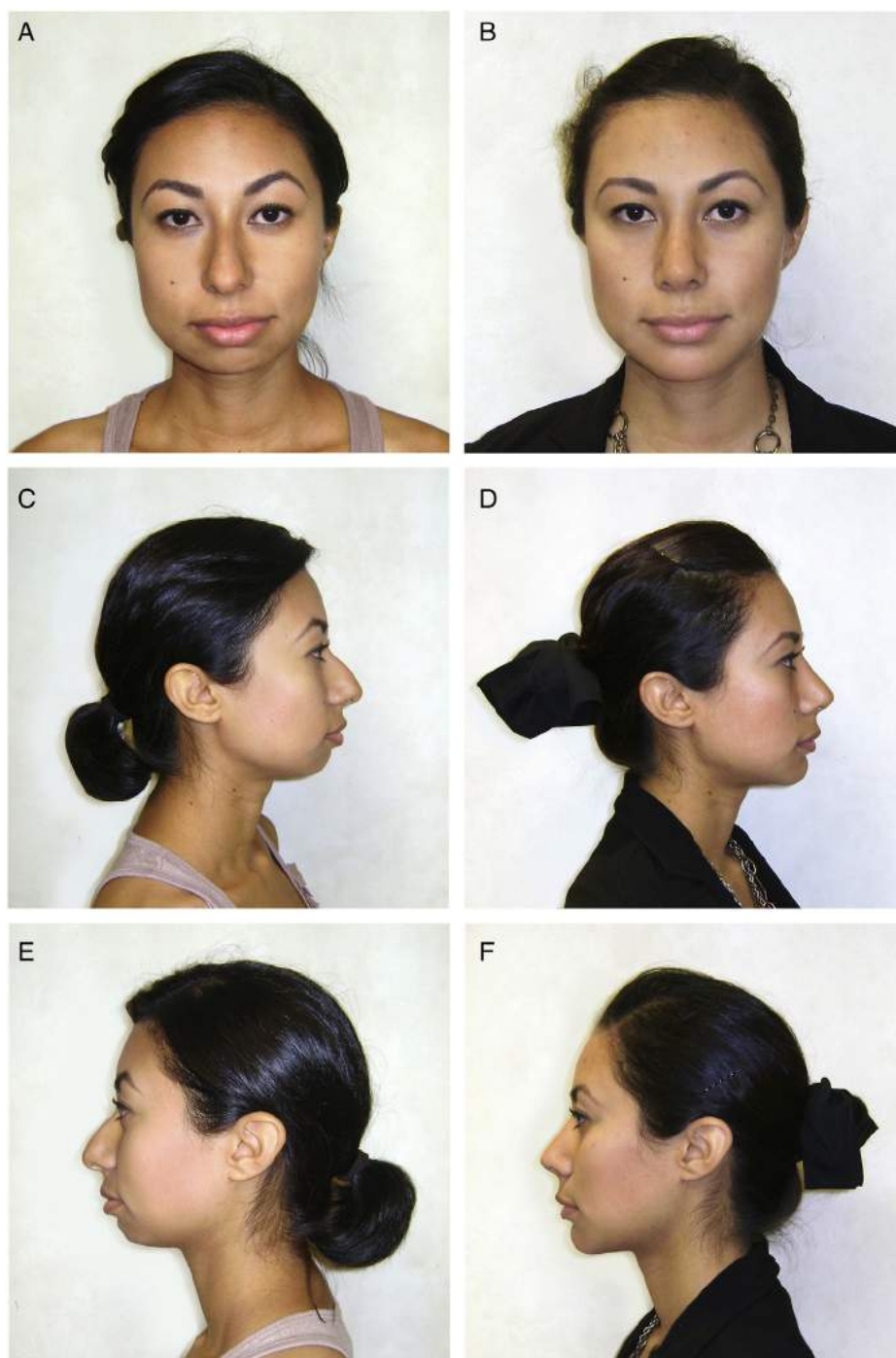
From our perspective, one of the great challenges in nasal surgery in the mestizo patient is to achieve adequate

projection and definition of the nasal profile to allow visualization of these important vectors. The common denominator of the different treatment methods described in rhinoplasty in patients with mestizo features has been the use of a cartilage graft to strengthen the central tripod and another to provide projection and definition to the nasal tip, all these considering their fixation techniques [1,18,19].

We believe that displacement and malposition of nasal tip grafts, and to a lesser degree, of columellar supports, are the main variables that contribute to poor nasal profile definition and consequently to a non-strict view of the vector lines. This is partly due to the weight of the soft tissue, the effect of scar retraction, and maybe also to the graft fixation technique, and of course, to the relative weakness of the cartilaginous tripod. The columellar support of the AECG provides adequate reinforcement particularly to the central pillar of the tripod.

The angulated extension of the AECG literally constitutes a brake that prevents cephalic-caudal displacement of the tip graft. The addition of rectangular mini-grafts for lateral stability is a factor that avoids displacement. According to each particular case, cephalic rotation of the extension is predetermined taking into account that the tip graft will be positioned on the angulated extension.

From our perspective, we consider the treatment of the mestizo nose equal to rhinoplasty in patients with sequelae of cleft lip and palate; in both cases, strong reinforcement of the central cartilaginous tripod is necessary to support the weight of the soft tissues and the effect of scar retraction [20,21]. The strategic design of the AECG allows the pressure exerted by the soft tissue to not be transmitted in a straight line, rather it is gradually diluted in a downward manner due to the inverted golf club shape of the graft and also because it is



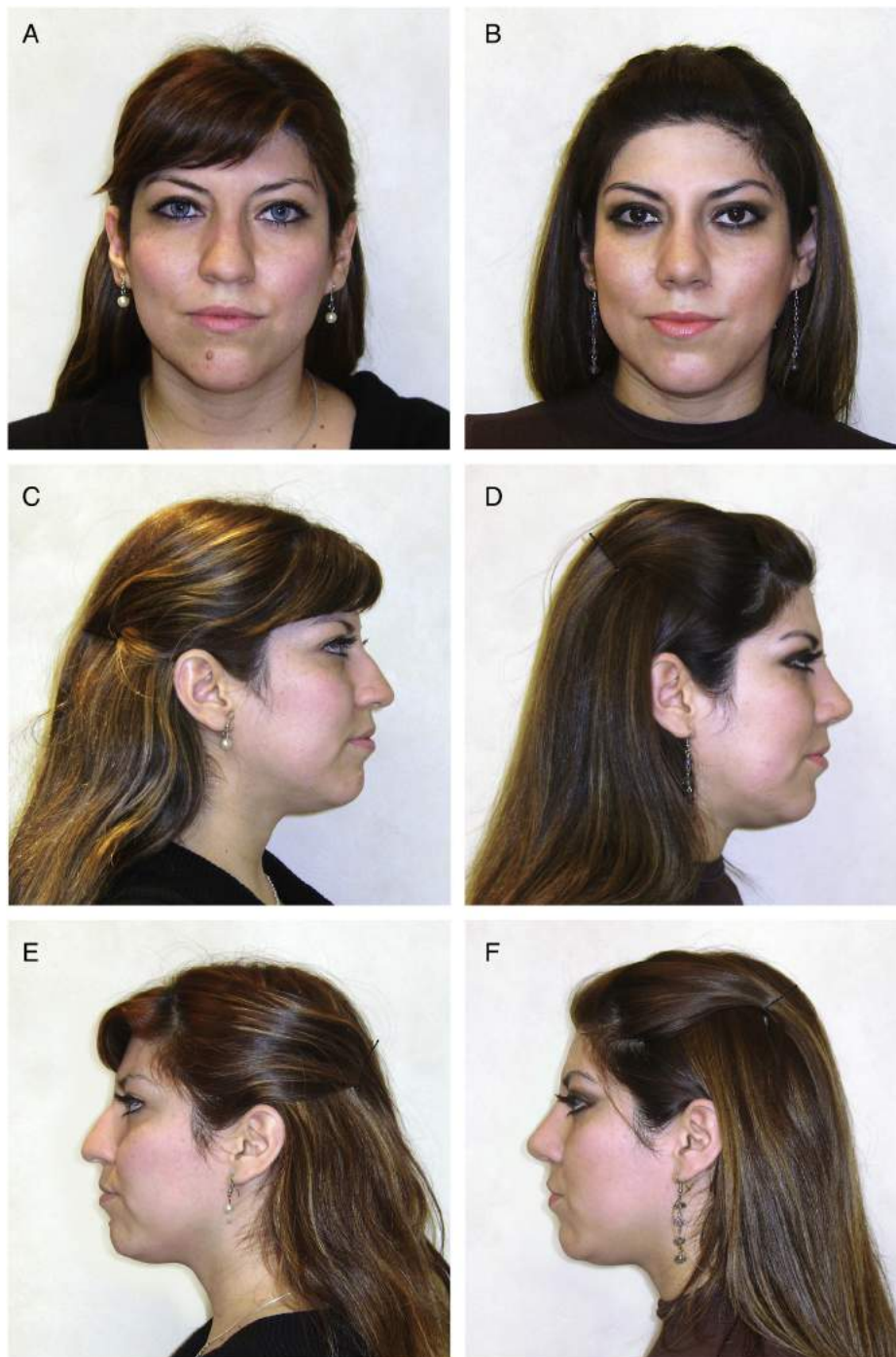
**Fig. 9 – (A, C, E) Preoperative view of a 22-year-old woman with a typical mestizo nose; the columellar vector is short and the nasolabial angle borderline. The nasal tip has a convex vector and there is a small bony hump. (B, D, F) Postoperative view 12 months after the procedure. The columellar support of the extended angulated columellar graft projects, elongates, and defines the columellar vector. The nasolabial angle was opened. The tip graft projects and defines the nasal tip vector. Discrete resection of the hump and a cartilage graft was placed on the radix. A chin implant was also placed.**

transmitted to the side arms of the tripod. Due to the anatomy of the external crura, only in some cases, we performed small resections of the cephalic borders; what we usually do is transdomal plication [22] and horizontal mattress sutures [23] to change the convex aspect of the external crura to a relatively concave shape (Fig. 5A). This maneuver reduces lateral bulging of the nasal tip.

## 5. Conclusions

In this paper we have given great importance to a good result of the nasal tip, but also to achieving adequate definition and collumellar projection to obtain the visual effect of the two lines that conform to the nasal profile: the columellar and





**Fig. 10 – (A, C, E) Preoperative views of a 30-year-old woman. (B, D, F) Postoperative views 18 months after the procedure. The use of the extended angulated columellar graft provided stability and visual definition of the nasal profile vectors. Discrete lipo-injection of the chin and excision of a nevus were also performed.**

nasal tip vectors. In addition, due to the position and conformation of the AECG, we have better control of the nasolabial and cephalic rotation angles. We feel that the use of the AECG is polyfunctional, since it predetermines or establishes the nasal profile, composed of a new columellar and tip length.

The tridimensional stability provided by the angulated extension prevents displacement and malposition of the tip

graft and to a certain extent an increase or decrease in nasal length depending on the angularity of the extension.

The AECG can be a good alternative in secondary rhinoplasty and nasal reconstruction in patients with sequelae of cleft lip and palate. In these cases a costal graft is desirable. Likewise, it can also be a good choice in the treatment of patients with Afro-American features, which are characterized by a weak cartilaginous structure and thick soft tissue.



A mestizo rhinoplasty patient represents a challenge for the surgeon today. We believe that by incorporating this technique it is possible to achieve a higher level of beauty in order to obtain greater aesthetic refinement in this type of nose.

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## REFERENCES

- [1] Ortiz Monasterio F, Olmedo A. Rhinoplasty on the mestizo nose. *Clin Plast Surg* 1977;4:89.
- [2] Guyuron B. Dynamics in rhinoplasty. *Plast Reconstr Surg* 2000;105:2257-9.
- [3] Daniel RK. Rhinoplasty: creating an aesthetic tip. A preliminary report. *Plast Reconstr Surg* 1987;80:775-82.
- [4] Ortiz Monasterio F, Michelena J. The use of augmentation rhinoplasty techniques for the correction of the non-Caucasian nose. *Clin Plast Surg* 1988;15:57-72.
- [5] Sheen JH. Tip graft: a 20-year retrospective. *Plast Reconstr Surg* 1993;91:48-63.
- [6] Gruber RP. Open rhinoplasty. *Clin Plast Surg* 1988;15:95-114.
- [7] Gunter JP, Rohrich RJ. The external approach for secondary rhinoplasty. *Plast Reconstr Surg* 1987;80:161-74.
- [8] Tebbetts JB. Open rhinoplasty: more than an incisional approach. In: Daniel RK, editor. *Aesthetic plastic surgery: rhinoplasty*. Boston: Little, Brown; 1993. p. 525-53.
- [9] Jost G, Meresse B, Torossian F. Study of the junction between the lateral cartilages of the nose (in French). *Ann Chir Plast* 1973;18:175-82.
- [10] Gunter JP, Landecker A, Cochran CS. Frequently used grafts in rhinoplasty: nomenclature and analysis. *Plast Reconstr Surg* 2006;118:14-29.
- [11] Cachay Velásquez H. Rhinoplasty and facial expression. *Ann Plast Surg* 1992;28(5):427.
- [12] de Benito J, Fernández Sanza I. Rhinoplasty and the aesthetic of the smile. *Aesth Plast Surg* 1995;19:79.
- [13] Figallo E. The nasal tip: a new dynamic structure. *Plast Reconstr Surg* 1995;95:1178.
- [14] de Souza Pinto EB. Relationship between tip nasal muscle and the short upper lip. *Aesth Plast Surg* 2003;27(5):381.
- [15] Pitanguy I. Surgical importance of a dermocarilaginous ligament in bulbous noses. *Plast Reconstr Surg* 1965 Aug;36:247-53.
- [16] Ortiz-Monasterio F, Olmedo A, Oscoy LO. The use of cartilage grafts in primary aesthetic rhinoplasty. *Plast Reconstr Surg* 1981;67:597-605.
- [17] Sheen JH. Achieving more nasal tip projection by the use of a small autogenous vomer or septal cartilage graft. A preliminary report. *Plast Reconstr Surg* 1975;56:35-40.
- [18] Cobo R. Hispanic/mestizo rhinoplasty. *Facial Plast Surg Clin North Am* 2010;18:173-88.
- [19] Cobo R. Nuances with the mestizo tip. *Facial Plast Surg* 2012;28:202-12.
- [20] Ortiz Mnasterio F, Ruas EJ. Cleft lip rhinoplasty: the role of bone and cartilage grafts. *Clin Plast Surg* 1989;16:177-86.
- [21] Byrd HS, El-Musa KS, Yazdani A. Definitive repair of the unilateral cleft lip nasal deformity. *Plast Reconstr Surg* 2007;120:1348-56.
- [22] Dosanjh AS, Hsu C, Gruber RP. The hemitransdomal suture for narrowing the nasal tip. *Ann Plast Surg* 2010;64:708-12.
- [23] Gruber RP, Nahai F, Bogdan MA, et al. Changing the convexity and concavity of nasal cartilages and cartilage grafts with horizontal mattress sutures: part II. Clinical results. *Plast Reconstr Surg* 2005;115:595-606 [discussion 607-8].