

Tip-Oriented Closed Rhinoplasty Built on Septocolumellar Suture and a New Caudal Septal Graft Technique

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Background: A beautiful and appealing nose receives the greatest contribution from the nasal tip subunit, which should be regarded as the primary center of attention during a rhinoplasty procedure. In achieving the desired shape and position of the nasal tip during closed rhinoplasty, the septocolumellar suture functions as the major determinant together with the caudal portion of the septal cartilage, which has a significant influence on the versatility of the septocolumellar suture. The purpose of this study was to present the analysis of the indications, the technical steps, and the advantages of caudal septal graft and septocolumellar suture utilization in closed rhinoplasty.

Methods: The septocolumellar suture with or without the caudal septal graft combination procedure has been performed in 2286 patients via a closed rhinoplasty approach. Intraoperatively, the septal cartilage at hand was thoroughly evaluated and one of the 5 types of caudal septal grafts was used when necessary. After the establishment of a strong and straight septal cartilage with sufficient height and length, 4 different septocolumellar sutures in a specific order were used to modify the relationship between the lower lateral cartilages and the nasal septum.

Results: Of the 2286 cases, 1837 (80.3%) were primary and 449 (19.7%) secondary rhinoplasties, which have been followed up for 9 to 48 months. The caudal septal graft was combined to the septocolumellar suture in 621 (27.1%) patients. Of the caudal septal grafts, 69.7% were used for primary rhinoplasty cases, and 30.3% for secondary rhinoplasties. At the 18th month postoperatively, tip projection was found to be satisfactory for 98% of the patients.

Conclusions: The septocolumellar suture combined with caudal septal graft in closed rhinoplasty substantially facilitates the achievement of a cosmetically and functionally pleasing end result, bringing the solution for a wide array of problems such as short nose, supratip deformity, nasolabial angle change, or columellar bowing. Nevertheless, the technique has a steep learning curve; therefore, a meticulous preoperative evaluation should be exerted, a precise surgical planning should be prosecuted, and an excessive reduction of the nasal tip or exaggerated columellar retraction should be avoided.

Key Words: closed rhinoplasty, septocolumellar suture, nasal tip, septal graft

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In the last decade, the primary aim of the rhinoplasty procedure evolved from just an aesthetically beautiful nose toward a natural as well as cosmetically appealing one. Twenty years ago, merely the history of a nose surgery by itself was perceived as a distinguished sign reflecting the high social status of the individual; but in time, the widespread recognition and popularization of the aesthetic surgery has brought about the search for a better nose in shape and function with minimal surgical scars, forcing the plastic surgeons to act with an absolute perfectionism in that matter.

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The correlation between nasal dorsum and nasal tip had been regarded in the past as one of the primary determinants for a successful rhinoplasty procedure. Thus, exaggerated dorsal hump resections had been frequently performed to achieve an aesthetically pleasing straight dorsum. However, the surgical trends have undergone certain modifications in time; thus, nowadays, reorientation surgery is much more frequently applied and, under a conservative approach, considerably less amount of tissue is resected in a standard rhinoplasty operation. Consequently, the application of the suture techniques in rhinoplasty outweighs the excisional procedures in practice.^{1,2}

Since 2000, we have been routinely using the septocolumellar suture technique in our primary and secondary rhinoplasty cases.³ After the implementation of the septocolumellar suture into our practice, the establishment of nasal tip projection and the fine adjustment of the columella-labial angle have become the priority targets which eventually dictate our decision for nasal hump resection and the amount of bony and cartilaginous hump to be resected.

Among our 2286 rhinoplasty patients in the last 14 years, we have inevitably observed that, for some of the individuals undergoing rhinoplasty procedure, the height, length, or stability of the nasal septum turned out to be insufficient for the effective application of the septocolumellar suture; thus, the correction of the existing deformity had to precede the decision for nasal hump resection. Considering the fact that the backbone of our rhinoplasty procedure consisted of the position of the nasal tip and the application of the septocolumellar suture, we have concluded that the fine adjustment of the septocolumellar suture has to be performed on the “ideal” nasal septum, which might exhibit a great discrepancy from the actual septum in hand.

On the other hand, the achievement of a proper correlation between the lower lateral cartilages and the septal cartilage also assists in preservation of the columella-labial angle and the nasal tip projection. In that regard, the caudal end of the septal cartilage plays a decisive role. As a whole, it can be concluded that the following properties of the nasal septum are deemed to be prerequisites for a successful application of the septocolumellar suture:

- 1) The flatness of the nasal septum: The central alignment of the nasal tip depends on the caudal end of the septal cartilage, which is required to be in a straight shape without a significant deviation from the midline.
- 2) The height of the nasal septum: The vertical (cephalocaudal) length of the nasal septum plays a decisive role in the designation of the nasal tip position.
- 3) The length of the nasal septum: A sufficient anteroposterior length of the nasal septum on the sagittal plane is a prerequisite for establishing the desired nasal tip projection.
- 4) The thickness of the nasal septum: Being the anchor site for septocolumellar suture, the septal cartilage has to be strong enough to withstand the force of gravity and its unfavorable effect on the sutures. Therefore, the thickness of the septal cartilage is a major determinant of stability and longevity of the nasal tip result in the postoperative period.

The correction of one or more of the properties listed previously necessitates the utilization of a caudal septal cartilage graft. This article presents the analysis of the indications, the technical steps, and the advantages of caudal septal graft and septocolumellar suture utilization in primary and secondary closed rhinoplasty procedures.

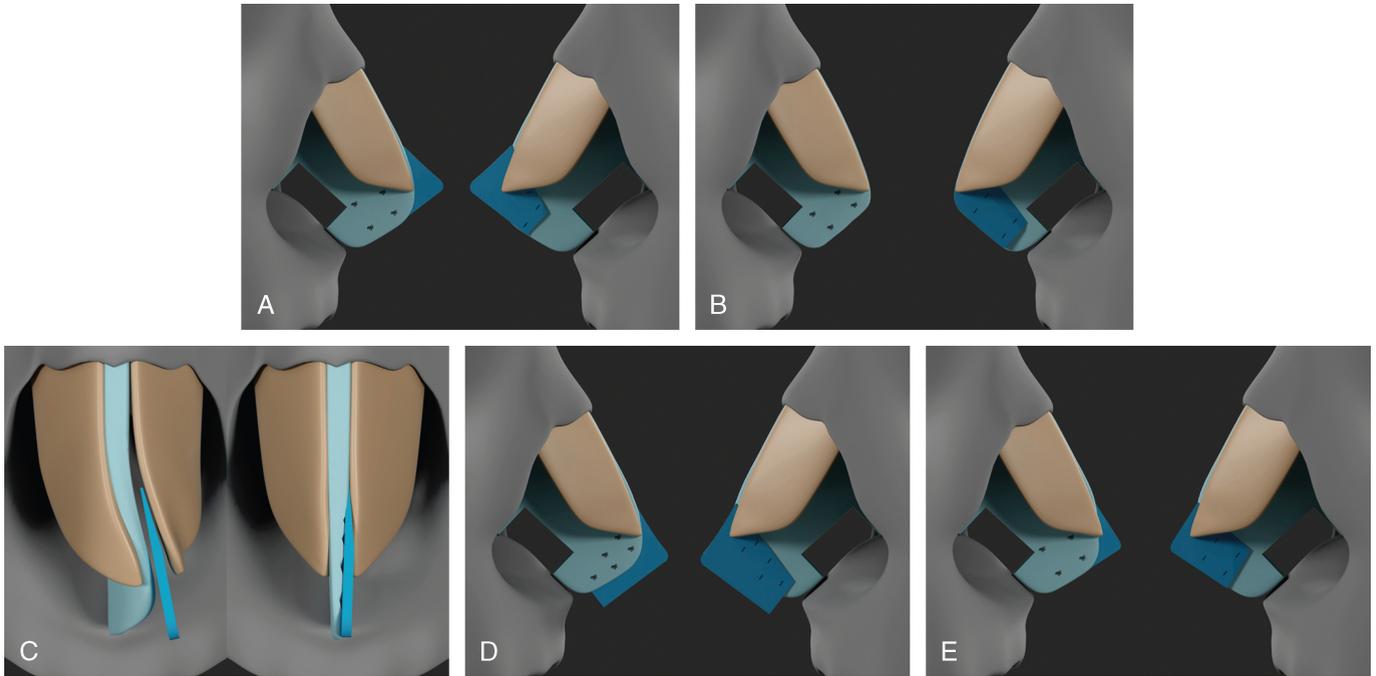


FIGURE 1. Types of caudal septal graft designed according to the septal deformity. A, Type 1 caudal septal graft, used to increase the septal height for better projection. B, Type 2 caudal septal graft, designed to support a thin and fragile septal cartilage. C, Type 3 caudal septal graft, used to straighten a deviated septum. D, Type 4 caudal septal graft, designed to lengthen a caudally deficient septal cartilage. E, Type 5 caudal septal graft, used to correct anterior 1/3 triangular deficiency of the caudal septum. In each case, the caudal septal graft is sutured to the septal cartilage with a minimum of 4 knots and the knots are deliberately left on thicker cartilage's side.

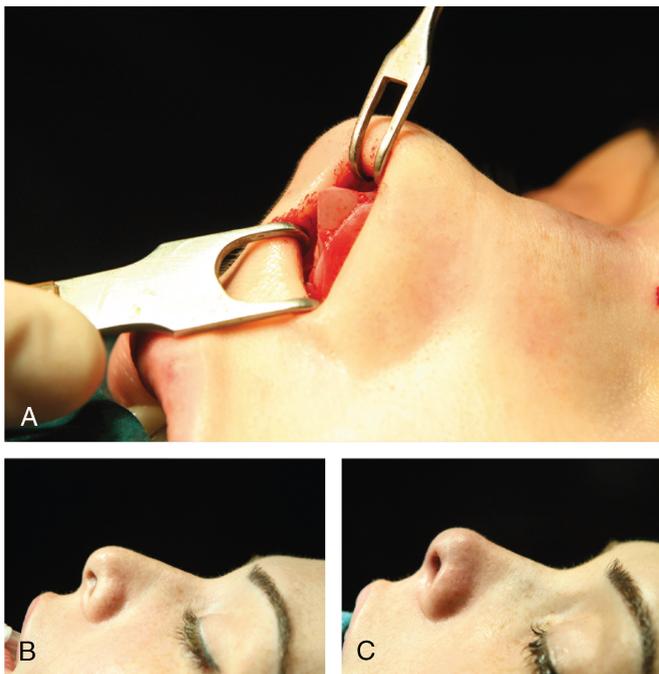


FIGURE 2. The intraoperative view of a type 1 caudal septal graft (A) and the comparison of the preoperative (B) and the immediately postoperative results (C).

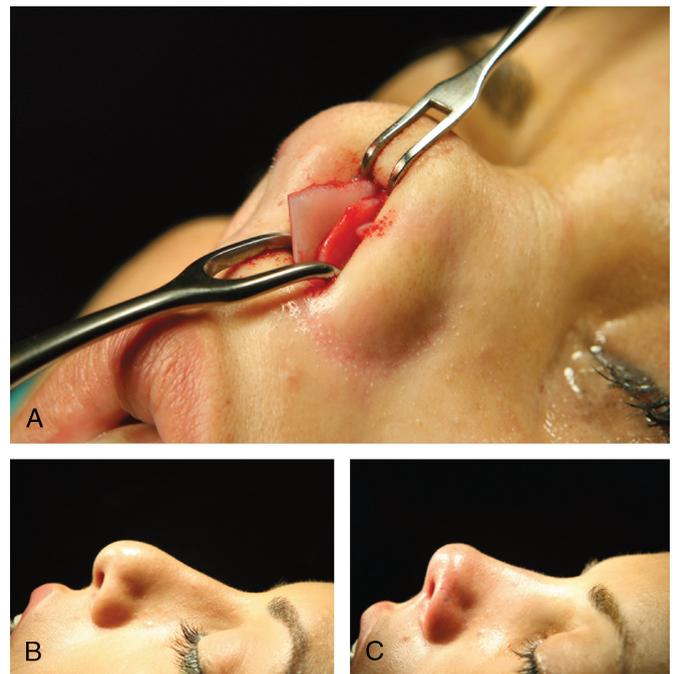


FIGURE 3. The intraoperative view of a type 4 caudal septal graft (A) and the comparison of the preoperative (B) and the immediately postoperative results (C).

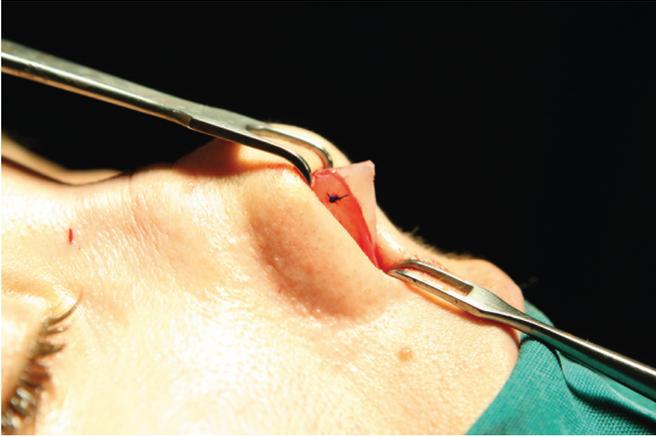


FIGURE 4. The intraoperative view of a type 5 caudal septal graft sutured to the septal cartilage.

PATIENTS AND METHODS

A thorough intranasal examination was performed in all patients preoperatively. To assess the adequacy of septal support, a wide range of diagnostic methods, including speculum examination, palpation, transillumination, and endoscopic visualization were used.

The classic sequence of endonasal extramucous technique was followed as bilateral intercartilaginous and transfixion incisions, skeletonization, and extramucous dissection of the septum. After its exposure, the septal cartilage at hand was thoroughly evaluated: if it is found to be deviated, fragile, or of insufficient length and height, a cartilage graft of desired dimensions was harvested leaving a minimum of 15-mm wide L-shaped strut. Precautions were taken to preserve the integrity of the harvested cartilage to ensure the grafting strength. The harvested cartilage graft was carved with a stair-step pattern so that it fits the caudal end of the septal cartilage on the sagittal plane (see Video, Supplemental Digital Content 1, which demonstrates the harvest and application of the caudal septal graft, <http://links.lww.com/SAP/A124>). After the fixation of the caudal septal graft to the septum with interrupted sutures, further interventions to the nasal tip were accomplished and the septocolumellar sutures were applied as the last tip refinement step, passing through both medial crura, septum as well as the caudal septal graft in a tongue-in-groove fashion.

The various designs of the caudal septal graft for each of the miscellaneous septal deformities are shown in Figures 1A–E. Similar to a puzzle piece in appearance, the caudal septal graft was sculptured



FIGURE 5. Preoperative and 1-year postoperative front, oblique, and lateral view of a 30-year-old patient. Type 1 caudal septal graft and septocolumellar suture have been used with osteotomy.

for each type of septal deformity, optimally placed and sutured to the nasal septum (Figs. 2–4).

The Application of the Septocolumellar Suture: Where and Why?

After the establishment of a strong and straight septal cartilage with sufficient height and length, 4 different septocolumellar sutures in a specific order are used to modify the relationship between the lower lateral cartilages and the nasal septum, each with a distinctive rationale and a specific localization on the cartilages to apply (see Video, Supplemental Digital Content 2, which demonstrates the application of the septocolumellar sutures on various angles, <http://links.lww.com/SAP/A125>). Depending on the thickness of the septal cartilage, a 5/0 or 4/0 nonabsorbable polypropylene suture (Prolene; Ethicon, Somerville, NJ) with a round needle is used.

The first septocolumellar suture can be also designated as the pivot suture, which is placed as a loop suture between the medial crura and the caudal part of the nasal septum. The vertical direction of this suture is critical as it can be used to increase or decrease the tip projection by penetrating the caudal septum at a level above or below the medial crural penetration point, respectively. However, a significant enhancement in tip projection might give rise to a divergence of the lower lateral cartilages on the interdomal area, which should be controlled with the utilization of the following sutures to be highlighted next. On the

horizontal plane, the correction of the columellar show or retraction is also accomplished with this pivot suture; a columellar recession is carried out by penetrating the septal cartilage further away from the caudal border of the septum. Protrusion of the columella is achieved with a septal penetration closer to the caudal border or via suturing the bases of the 2 crura to each other below the caudal part of the septum.

The second septocolumellar suture is a rotation suture that is passed through the lobular segment of the medial crura (middle crura) and the dorsal septum near the septal angle. The suture should be tightened gradually until the desired tip rotation is achieved. On the horizontal plane, the angle of rotation is increased by penetrating the septal cartilage further away from the caudal border of the septum and decreased vice versa (see Video, Supplemental Digital Content 3, which demonstrates the rotation effect obtained by the second septocolumellar suture, <http://links.lww.com/SAP/A126>). If a rotation movement is considered to be unnecessary, then this suture is solely placed for its stabilization effect, preventing any unwanted forward or backward rotation of the tip. As it is placed after the first septocolumellar suture, its placement does not significantly affect the nasal tip projection.

The third suture is used to support the second suture (middle crura suture) and to adjust the angle of the columellar region below the middle crura. With the help of this suture, the footplates can be propelled externally (protrusion) or pulled internally (retraction) to widen or narrow the columella-labial angle, respectively (see Videos, Supplemental Digital Contents 4–5, which demonstrate the effect of the



FIGURE 6. Preoperative and 6-month postoperative front, oblique, and lateral view of a 31-year-old patient. Type 5 caudal septal graft and septocolumellar suture have been used without osteotomy.

third septocolumellar suture on footplates, <http://links.lww.com/SAP/A127>, <http://links.lww.com/SAP/A128>).

The fourth (interdomal) suture is used whenever a domal divergence is present as a result of the nasal septum interposed between the lower lateral cartilages. The placement of the first septocolumellar suture can also pull the lower lateral cartilages upward, contributing to the interdomal separation. Although it is a well-known and frequently used suture, it should be kept in mind that this fourth suture can potentially result in tapering of the nasal tip and approximately 1-mm increase in tip projection.

RESULTS

Since 2000, the septocolumellar suture with or without the caudal septal graft combination procedure has been performed in 2286 patients who have been followed up for 9 to 48 months (mean, 22 months). Of these 2286 cases, 1837 (80.3%) were primary and 449 (19.7%) secondary rhinoplasties, all of which were performed with the endonasal extramucosal approach. The ages of the patients ranged from 25 to 67 years (average, 34.7 years). The utilization of a caudal septal graft was combined to the septocolumellar suture in 621 (27.1%) patients. Of the caudal septal grafts, 69.7% were used for primary rhinoplasty cases and 30.3% for secondary rhinoplasties (Table 1). It should be also noted that the number of patients who had received a caudal septal graft for the sole purpose of straightening a deviated septum remained quite low ($n = 33$; 5.3% of the grafted patient group);

nevertheless, many of the cases among the rest of the grafted patient group had also benefited from the straightening effect of the cartilage graft to a certain extent.

At the 18th month postoperative follow-up assessment, tip projection was found to be satisfactory for 98% of the patients (Figs. 5–8). Figs. 5–8). Nasal tip projection was less than desired for 25 patients, and more than desired in 22 cases. Among the patients, 16 cases of nostril asymmetry were noted; 12 of them were without a deviation in nasal tip. The remaining 4 cases were reoperated for revision.

DISCUSSION

The shape and projection of the nasal tip constitute the fundamental basis of our rhinoplasty concept. Our own observation on patients with a history of previous rhinoplasty in various other centers revealed that most of the complications and other unfavorable results postoperatively stem from the nasal tip subunit or more specifically from the distorted relationship between the caudal septum and the medial crura. A beautiful and appealing nose receives the greatest contribution from the nasal tip subunit, which should be regarded as the primary center of attention during the rhinoplasty procedure and which will subsequently dictate the necessity to manipulate other subunits of the nose including the nasal dorsum. In achieving the desired shape and position of the nasal tip, the septocolumellar suture functions as the major determinant and is used as an indispensable tool in our practice. The septocolumellar suture, as its name implies, relies on the lower



FIGURE 7. Preoperative and 15-month postoperative front, oblique, and lateral view of a 34-year-old patient. Type 1 caudal septal graft and septocolumellar suture have been used without osteotomy.



FIGURE 8. Preoperative and 1-year postoperative oblique and lateral view of a 28-year-old patient. Type 1 caudal septal graft and septocolumellar suture have been used without osteotomy. The patient had previously undergone an open rhinoplasty procedure 1 year ago.

lateral cartilages and the caudal part of the nasal septum; therefore, the inherent characteristics of the nasal septum such as its height, length, shape, and thickness (stability) gain particular importance.⁴⁻¹² Particularly, the caudal portion of the septal cartilage has a significant influence on the versatility of the septocolumellar suture and the final arrangement of the nasal tip. In the original article on septocolumellar suture in closed rhinoplasty, the septocolumellar suture had been suggested as a figure-of-8 suture if the septum is too short and a risk for columellar retraction is present.³ Nevertheless, in the long run, we have observed that the figure-of-8 suture has been unable to provide adequate fixation; without a direct contact with cartilage, the stability of the nasal tip could not be established with the suture alone and the septocolumellar suture tends to tear off in the early postoperative period. This fact had eventually led us to designate the caudal septum as the keystone area in our rationale for a successful rhinoplasty procedure and we have decided to use the term “caudal septal cartilage graft” as a common phrase that covers the various types of cartilage grafts we have designed to correct the existing septal deformities.

To construct a permanent nasal tip and to prevent postoperative progressive descent of the nasal tip, various types of septal extension grafts have been designed and used, including extended spreader grafts, batten grafts, and direct extension grafts.¹³⁻¹⁷ However, an algorithm for proper septal extension graft selection does not exist, which led to our classification of the caudal septal graft types according to the various septal cartilage deformities.

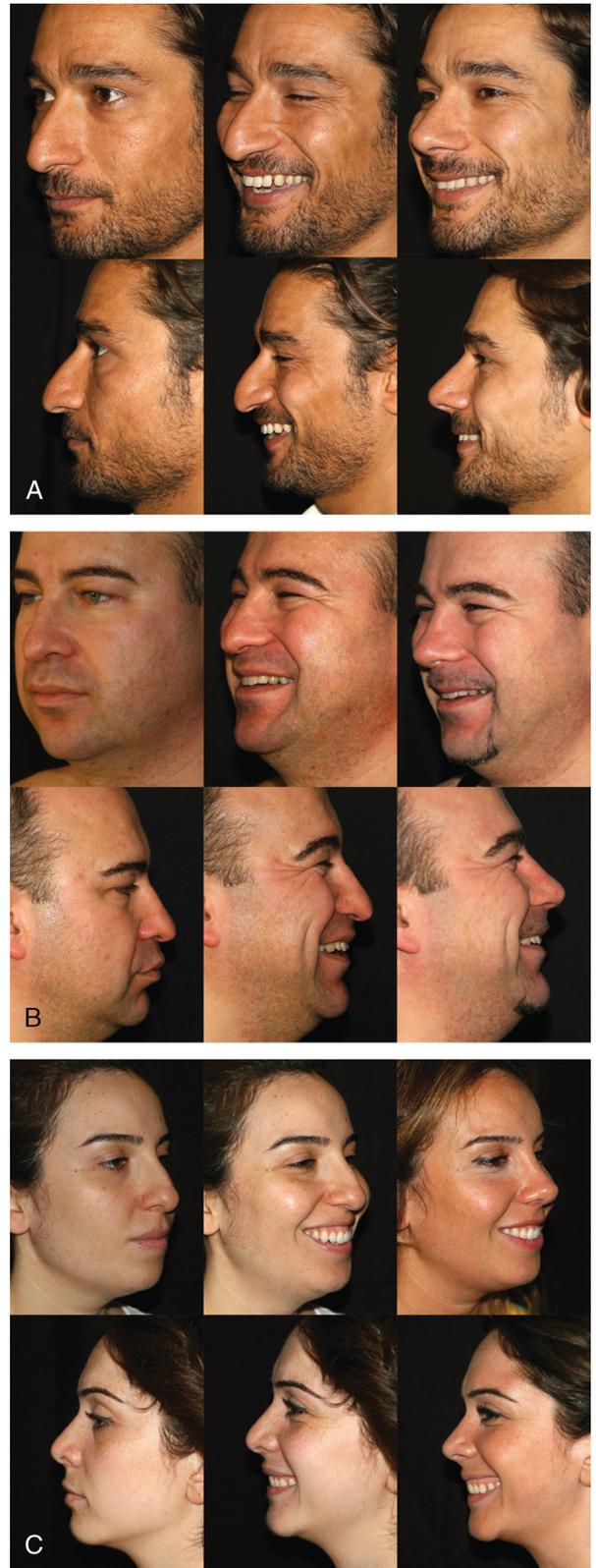


FIGURE 9. A–C, The effect of smiling on the nasal tip position preoperatively and after the utilization of septocolumellar suture in patients previously presented in Figures 5–8.

Batten-type septal extension grafts as originally described by Byrd et al⁴ and later modified by various other authors^{13,17} may result in columellar retraction. These grafts are also prone to trauma-related disfigurements including bending and cleavage of the cartilage, whereas caudal septal grafts secured to the native septum and reinforced with septocolumellar suture provide a state-of-the-art resistance against external forces applied to the nasal tip. Postoperatively, 12 of our patients have reported direct trauma to the nasal tip after the sixth month and none of them has experienced any unwanted deformation of the main postoperative result.

Autogenous cartilage is generally considered the gold standard graft material for nasal surgery, and septal and conchal cartilages have traditionally been recognized as the primary donor areas in rhinoplasty.^{4,17-24} The size of the septal cartilage to be harvested should be large enough to be used as a caudal septal graft. Conventional harvesting techniques have limited the size of the L-shaped strut to 15,²⁵ 7 to 8,²⁶ or 5 to 10 mm¹³ to maintain the function of the strut as a nasal support structure, thereby decreasing the risk of postoperative complications. To maximize the size of the caudal septal graft, a minimum of 15-mm L-shaped strut was preserved in our study. After the septum, the second choice for graft harvest is typically the concha of the ear. When the amount of septal or conchal cartilage is insufficient, the use of rib cartilage is advocated; however, it is often overlooked in reconstructive septorhinoplasty because of the potential for donor-site morbidity and the risk of cartilage warping. In the current patient series, we mostly were able to obtain good aesthetic results using a septal cartilage graft alone. However, in 6 of the patients undergoing secondary rhinoplasty, the septal cartilage had been previously harvested or was inadequate; thus, the remainder did not allow the harvest of a caudal septal graft. Therefore, cartilage grafts harvested from auricular cartilage in 4 patients and from lower lateral cartilage in 2 cases were used for septal support.

Having established adequate septal support, whether by means of the utilization of a caudal septal graft or by the native septal cartilage at hand, the next step toward the acquisition of an aesthetically pleasing nasal tip rests in a variety of tip sutures. Septocolumellar suture is one of them which can be described as a loop suture between the medial crura and the caudal part of the septum. According to the position and penetration level of this suture in relevant cartilages and cartilage grafts, several effects can be achieved: The projection of the nasal tip can be decreased or increased, tip can be rotated and columellar show as well as hanging columella can be corrected. In advanced cases of over-projection, footplate resection is also performed to assist the septocolumellar sutures decrease the tip projection.

Open rhinoplasty provides direct visualization of most of the bony and cartilaginous structure of the nose; therefore, it has a relatively straight learning curve and has become the most popular approach performed by most surgeons worldwide. However, since natural contact between skin and cartilage is detached in an open approach, fluid collection in the subcutaneous space and its replacement with fibrous tissue can distract from the result achieved in the surgery. Moreover, in the open approach, the fibrous attachments of the nasal cartilages are completely separated. Thus, their stability is impaired, necessitating a great deal of sutures and cartilage grafts to support lower lateral cartilages, which in turn result in an unnatural appearance and additional scar tissue with more stiffness. On the other hand, the closed technique has also certain drawbacks. During the closed rhinoplasty, the fibrous connections between lower lateral cartilages, septum, and upper lateral cartilages are separated through transfixion incision, and a sudden loss of projection is observed intraoperatively. The tip complex slides downward during the healing period in many cases because there is no structure to hold it in its place but the dorsal edge of the septal cartilage. This leads not only to the loss of projection of the tip but also the supratip deformity. During this drop, columellar bowing may appear. Even if

these do not happen, it is not uncommon to see that edema and fluid collection between the columella and caudal edge of the septum (despite taping) are replaced with fibrous tissue, which causes increased columellar show. And from the functional point of view, a narrowing of the nasal valve angle might ensue as another adverse consequence of the nasal drop, deteriorating the nasal breathing. The septocolumellar suture is capable of preventing these major drawbacks of closed rhinoplasty and decreases the need for open rhinoplasty in most cases, therefore limiting the dissection and making the adjacent structures less subject to disruption or distortion by postoperative wound contraction forces.

Some of the primary rhinoplasty patients and an even larger proportion of the secondary cases necessitated only a minor intervention to the nasal bones; some did not require osteotomy or rasping at all. In these cases, the application of the tip rhinoplasty with the septocolumellar suture was conveniently performed under local anesthesia mostly within 20 minutes. In these patients, a caudal septal graft is also harvested if necessary, extending the overall duration of surgery approximately to 35 to 40 minutes.

Special attention must be given to the nasal tip in the first 2 postoperative months until the cartilages are welded together. To maintain the desired position of the nasal cartilages, tip massage is not allowed; also contact sports and heavy physical exercise were not permitted during this period. Nevertheless, 3 of the patients were reoperated after facial trauma in the early postoperative period.

The presence of unintentional fine movements of the nasal tip during talking and the unsightly downward displacement of the tip with a full-blown smile are rather frequently observed deformities, which can greatly benefit from the application of the septocolumellar sutures (Figs. 9A–C); in some cases, these arguments may represent the primary reason to seek medical advice. The septocolumellar sutures provide resistance against the force originating from the upper lip movements, pulling the nasal tip downward; thus, the inferior displacement of the columella and nasal tip with smiling and talking is significantly improved. However, in our study, the upper lip movements were also temporarily restricted for the first 2 to 3 weeks postoperatively; thereafter, the hypokinesia of the upper lip gradually returned to its normal preoperative state in 5 to 6 weeks. The only other disturbing finding, observed in almost one third of the patients (n = 682), was the temporary stiffness of the nasal tip which usually lasted for approximately 1 year and gradually subsided thereafter.

Overall, the septocolumellar suture combined with caudal septal graft in closed rhinoplasty substantially facilitates the achievement of a cosmetically and functionally pleasing end result postoperatively. This method brings the solution for a wide array of problems such as short nose, supratip deformity, nasolabial angle change, or columellar bowing that occur after the loss of position of the desired columella-tip complex in the late postoperative period. Nevertheless, the technique has a steep learning curve; therefore, a meticulous preoperative evaluation should be exerted, a precise planning of the surgical intervention should be prosecuted, and an excessive reduction of the nasal tip or exaggerated columellar retraction should be avoided.

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