Transcutaneous Columellar Strut for Correcting Caudal Nasal Septal Deviation

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Abstract Correction of caudal septal deviation is a challenging issue because of its significant role in tip support mechanisms. Some interventions especially aggressive resection of caudal septum to correct deviation, may compromise external nasal valve, tip ptosis and persistence of nasal obstruction. Many surgical techniques have been suggested to correct this type of nasal septal deviation. This study presents a technique to correct caudal septal deviation without weakening of tip support mechanisms. To evaluate the efficacy of insertion of a transcutaneous columellar strut during correction of caudal septal deviation. The study was performed in patients complaining from nasal obstruction with caudal septal deviation. After intranasal incision and elevation of mucoperichondrial flap, Caudal septum released from anterior nasal spine (ANS)

and a band of cartilage removed from inferior and caudal part of septum and septum again fixed to ANS. Through a vertical transcutaneous incision, a cartilaginous strut is placed in columella, between medial crurae. Preoperative and postoperative NOSE score determined and photographs were taken. In 14 patients we performed this technique, the postoperative NOSE score showed significant improvement, ($p = 0.001$). Nasal breathing improved in all patients without any complication or tip ptosis or worsening of nasal appearance. This septoplasty technique along with placement of transcolumellar strut, is an easy, efficient and complication free method for simultaneously correction of caudal deviation of nasal septum, reinforcing external nasal valve and prevents tip ptosis.

Keywords Septoplasty · Rhinoplasty · Nasal septum · Caudal septal deviation

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Introduction

Nasal septal deviation is an important cause of nasal obstruction [1]. Septal deviation in different parts of the nose may have various functional or aesthetic effects. Caudal septal deviation narrows the airway and impairs major mechanisms supporting the tip, leading to tip ptosis and airway collapse [2]. In cases where resection of nasal cartilage is required for correction of septal deformity, leaving a 1 cm L-shaped strut in the dorsal and caudal regions is necessary [2]. Thus, correction of caudal septal deviation is the most challenging step in rhinoplasty [3] since the conventional septoplasty methods for correction of caudal septal deviation can weaken the caudal septal strut, aggravate tip ptosis and cause obstruction of the external nasal valve. Aside from the internal nasal valve,

some researchers considered another mechanism as the external nasal valve [4]. The external nasal valve is the cross-sectional area caudal to the internal nasal valve under the alar lobule, which is bounded supero-laterally by the caudal edge of upper lateral cartilages (ULC), laterally by the nasal alar and ligamentous attachment of the lateral crus, medially by the caudal septum and columella and inferiorly by the nasal sill [5]. However, some controversies exist regarding the definition of the external nasal valve. Caudal septal deviation is among the causes of narrowing of the external nasal valve [6]. Even mild caudal septal deviation can cause significant obstruction [7, 8]. Several techniques have been recommended for correction of caudal septal deviation due to its complexity. In general, these techniques are divided into two groups of cartilage reshaping techniques and septal reconstruction techniques [2]. The cartilage reshaping techniques include septal repositioning techniques such as the swinging technique [9] and its modifications, wedging, scoring and morselization techniques, suturing [10], the tongue-in-groove technique [11], the spreader graft and the batten graft [12]. The septal reconstruction techniques such as extracorporeal resection are used in patients with severe deviation [2]. Our suggested technique is a modified cartilage reshaping technique that includes a combination of repositioning and resection of some parts of the septal cartilage and subsequent reinforcement of the tip to prevent collapse of the tip and the external nasal valve.

Materials and Methods

This study was conducted on patients who had caudal septal deviation and were candidates for septoplasty and presented to the ear, nose and throat clinic of our hospital from August 1, 2015 to August 1, 2016. Only patients who did not respond to 4 weeks of intranasal corticosteroid therapy were included. Patients under 18 years of age, those with symptoms and signs of sinusitis or polyposis in rhinoscopy or endoscopy, patients with crooked nose and those who were candidates for surgical procedures simultaneous with septoplasty were excluded. The proposal of the study was approved in the committee of medical ethics of our university under protocol 1394.65. All patients signed informed consent forms prior to participation in the study.

Full face and profile photographs of the nose were taken before surgery and 6 months after the surgical procedure. In the profile view before and after the procedure, the nasolabial angle was measured as the angle between the line drawn through the labrale superius and subnasale and the line tangent to the subnasale and the most anterior point of columella [13]. Comparison of preoperative and

postoperative photographs was done by second and third authors separately.

The NOSE questionnaire was also filled out for each patient before and 6 months after surgery. The NOSE questionnaire developed by Stewart et al., which is a valid and reliable tool for assessment of the outcome of treatment of nasal obstruction, was used in this study. The patients scored five items in the questionnaire including nasal congestion, nasal blockage, trouble breathing through nose, trouble sleeping and unable to get enough air through nose during exercise from 0 to 4. The sum of scores was calculated and multiplied by 5. The final score varied from 0 (no problem with nasal breathing) to 100 (worst possible problems with nasal breathing) [14].

All surgical procedures were performed under general anesthesia and by senior author. After local anesthetic injection, a hemitransfixion incision was made and a mucoperichondrial flap was elevated bilaterally. The caudal septum was released from anterior nasal spine (ANS). If required, a narrow band of the inferior part of septum was removed. In all cases, (ANS) was preserved but in presence of deviation, it was carefully medialized. The anterior part of the septal cartilage was completely released, repositioned at the midline and sutured to the periosteum of ANS with 5–0 nylon sutures. To ensure no dislocation of caudal septum into the nostrils, a band of cartilage with 2–3 mm width was removed from the caudal septum anterior to the ANS and anterior septal angle. To prevent ptosis of the tip, which would cause deformation, narrowing of the external valve and breathing problems, the transcolumellar strut approach was used. A strut with an approximate length of 10–15 mm and 3 mm width was made of the septal cartilage. An incision was made vertically at the mid-columellar region with 3–4 mm length (Fig. 1). A dissection was made between the two medial crurae from ANS superiorly up to dome area of tip to create a space for the strut. First, one end and then the other end of the strut were inserted into the pouch (Fig. 2). The length of the strut could be adjusted as needed. To prevent strut displacement, using mild traction under soft triangle of both sides by blunt hook, mattress type sutures fix the strut to the medial crura bilaterally using 5–0 vicryl. The surgical incision site on the columella skin was closed using 6–0 nylon sutures. The mucosal incision was closed with 4–0 vicryl. The nasal packing was removed after 48 h. After 6 months, the NOSE questionnaire was filled out again for the patients and photographs were taken again.

Data were analyzed using SPSS version 13. Paired *t* test was applied for data analysis and level of significance was set at 0.05.

Fig. 1 A Vertical incision is made on columella. Then a vertical pocket is dissected between two medial crurae

Fig. 2 Cartilaginous strut is placed in pocket between two medial crurae

Results

A total of 14 patients entered study; out of which, 13 (93%) were males and one (7%) was female. The mean age of patients was 29.6 years (range 19–50 years). The NOSE score preoperatively was between 50 and 90 with a median of 67.5. After the operation, this score ranged from 0 to 30 with a median of 10. Difference in the median of NOSE score before and after the operation was statistically significant (Wilcoxon signed rank test, $P = 0.001$) (Table 1).

Nasal breathing improved in all patients after the operation compared to their preoperative state. The mean nasolabial angle in patients was $94.45^\circ \pm 11.183^\circ$ before and $101.70^\circ \pm 12.500^\circ$ after the operation. Reduction in nasolabial angle and tip ptosis did not occur in any patient. This difference was statistically significant ($P = 0.001$). All patients were satisfied with the appearance of their nose after surgery and no complication occurred in any patient.

Discussion

Correction of the shape of cartilage is difficult because it is hard to overcome the intrinsic memory of the cartilage [15]. Aggressive attempts to straighten the cartilage in the caudal region by its excision or making several incisions in the caudal region can have unpredictable effects and result in weakening of the tip and nasal deformity [16]. Surgical procedures in patients with caudal septal deviation follow two goals: reduction or correction of deviation to correct the airway and preserving the structures supporting the tip [17].

Severe caudal septal deviation causes stenosis of the external nasal valve and aesthetic problems [6–18]. In the

Table 1 Changes of NOSE score

Preoperative NOSE score and postoperative changes were shown. All patients show lower scores after surgery

conventional method of Freer for septoplasty, preservation of the L-shaped strut is necessary to prevent deformation of nasal appearance. Correction of caudal septal deviation has not been discussed in the Freer's technique or common methods of septoplasty [19]. Common methods of septoplasty can be used in cases of antero-caudal septal deviation but removal or weakening of the caudal strut without its reconstruction can compromise the tip support [17]. On the other hand, in these patients, vertical excess of anterior septal cartilage is present which cannot be corrected without its separation from the ANS, excision of cartilage and repositioning of septum at the midline and fixation to ANS [20]. We designed the current study taking into account the above-mentioned facts.

In this study, the mean size of nasolabial angle was 94° before the operation, which increased to 101° after the operation. This increase may be due to several reasons. Elimination of the septal effect due to dislocation and deviation of caudal septum changes the tripod of nasal tip without direct manipulation of its components [21]. In most cases, correction of septum and separating it from ANS adds several millimeters to the septum length, which reinforces the supportive mechanisms of the nasal tip according to the cantilever spring model and improves, tip projection [22]. Moreover, conservative caudal septal resection in this technique can increase the nasolabial angle. Eventually, transcutaneous strut can also play a role in reinforcement of the tip and prevention of ptosis; however, there is controversy about the role of columella strut [23]. Considering all the above, despite resection of part of caudal septum, not only tip ptosis did not occur postoperatively, but also the nasolabial angle significantly increased. The transcolumellar incision technique has been previously used as well. Bloom described using this technique to support the tip in cases of septoplasty and rhinoplasty [24]. Moreover, in patients requiring secondary rhinoplasty with thick soft tissue or scarified skin, the transcolumellar approach has been used for tip grafting or columella strut [25]. We used this technique to reinforce the tip supporting mechanisms after septoplasty and caudal septal resection in patients with caudal septal deviation because these patients primarily lack adequate tip support due to caudal septal deviation or may develop tip ptosis secondary to surgery.

Our technique is actually a modified form of the repositioning techniques, which briefly include separation of caudal and inferior part of septum from the maxillary crest and ANS, correction of vertical excess by excision of a cartilaginous band or wedge, excision of part of caudal septum to correct dislocation and reinforcement and replacement of the tip supporting mechanisms. Our goal in this method was to achieve maximum improvement of the nasal airway with the least change in appearance or nasal

collapse. It does not have the shortcomings of methods that weaken the nasal tip. The spreader graft has also been recommended for correction of caudal septal deviation [2] but it does not completely correct the stenosis of the nasal valve due to severe antero-caudal deviation [17]. Our suggested technique is suitable for cases with mild or moderate caudal septal deviation but is not recommended for cases with severe deviations such as crooked nose. In such cases, open techniques and extracorporeal septoplasty along with rhinoplasty are preferred.

Our technique has several advantages. The scar of the columella incision is insignificant and at the 6-month follow up, the surgical site is hardly detectable. This technique does not significantly prolong the duration of operation and at the same time, corrects the nasal septal deviation and stenosis of the external valve without causing ptosis or loss of projection of the tip. A large cartilage is not necessarily required to produce the strut. Thus, this technique can be used in cases with shortage of septal cartilage, such as patients who have been operated on before. Moreover, in this method, a straight access is created to insert the graft; thus, the need for tissue dissection is minimal and therefore, it is useful for revision surgery. Simultaneously with improvement of nasal breathing, this technique causes relative improvement of the form of nasal tip in patients. It is simple and easily applicable. No minor or major complication such as infection, displacement or extrusion of graft, worsening of nasal breathing or appearance or permanent scarring was noted in any patient. This study had a prospective design. Also, we used NOSE score for assessment of the outcome, which is an efficient instrument for assessment of nasal breathing associated quality of life and is more valuable than the other methods. The minimum duration of follow up in our study was 6 months but most patients did not have any complaint at the 1-year follow up either.

Conclusion

Our suggested septoplasty technique along with the use of a transcolumellar strut is an easy, efficient and complication-free method for correction of caudal septal deviation, which improves nasal breathing and appearance of the nose tip. It also prevents tip ptosis since it reinforces the external valve and the tip supporting mechanisms.

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Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflict of interest.

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