Nasal Valve Stabilization in Extracorporeal Septoplasty

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Abstract

Introduction

Thena nasal septal deviation is a common disorder in otorhinolaryngology and one of the major causes of nasal obstruction. In some cases, septal deviation is non-symptomatic, but in a high number of patients it causes functional disturbance. The degree of septal deviation affects the severity of symptoms so as severe nasal obstruction strongly affects patients’ quality of life [1]. Ever since Killian and Freer introduced the concept of the submucous resection, the technique has been gradually developed by many operators sustainably and scientifically. In the last century, there have been significant advances regarding surgical septal procedures [2,3].

In patients with a mild or moderate deviation of the septum, traditional techniques of septoplasty are effective to improve nasal breathing. On the other hand, in severe anterior deformities, usually associated with stenosis of the nasal valve, these methods have unsatisfying results and sometimes can cause functional problems due to over resection or over weakening of the cartilage [4].

In case of severe anterior deformities of the septum, with compromise of the valve area, the removal of the whole septum, followed by extracorporeal reconstruction and reinsertion is recommended [5]. In cases of severe septal deviation, Gubisch advised total quadrangular cartilage extraction, external reconstruction of the septal framework, and reinsertion in the mucopericranial drial pocket. Fixation of the reconstructed septum to the anterior nasal spine and to the upper lateral cartilages avoided saddling and relapse of the deviation.

The main drawback of extracorporeal septoplasty is the destabilization of the junction of the quadrilateral cartilage and nasal bones with the subsequent alteration of the dorsal contour. In this study, we aim to define a personal modified suture technique. The philosophy of which, is to support the quadrangular cartilage inserted and stabilize the valve area in order to minimize the risk of alteration of the dorsal contour and prevent the restenosis in the valve area.

Patients and Methods

Between January 2011 and December 2013, we retrospectively reviewed the medical records of all patients treated by an extracorporeal septoplasty in Imola Hospital, Italy. The Institutional Review Board of the Hospital approved this retrospective study.

We included patients that were followed up in our centre and had a middle to sever anterior (Cottle’s areas I and II principally) structural nasal patency impairment, with nasal valve affection, based on the rhinomanometric results and anterior rhinoscopy.

The information regarding perioperative data including patient demographics, preoperative data, side of the nasal patency impairment, diagnostic studies, operative details, postoperative outcomes and complications was obtained. The side of the nasal obstruction was determined by anterior rhinoscopy. The nasal patency was assessed using Anterior Active Rhinomanometry (AAR) with Rhinopocket® rhinomanometer and acoustic rhinometry (AR) [6-7]. We performed both examinations, before and after surgery during the follow-up period, based on the Consensus report on acoustic rhinometry and rhinomanometry [8].

According to our clinic normative, we considered a range of 0.25-0.50 Pa/cm²/s as normal rhinomanometric result. The resistance is determined at a pressure of 150 Pa. Data was acquired at a flow/pressure display. The AR software provides minimal cross-sectional areas in two separate points: the first minimal cross-sectional area (MCA 1) from 10 mm to 32 mm of the nostril, and the second minimal cross-sectional area (MCA 2) which is located from 32 mm to 64 mm of the nostril. A median MCA1 value of 0.73 cm² (range 0.57-1.45 cm²) was considered a normal result. Preoperatively, AAR and AR were performed in basal condition, after decongestion and after dilatation.

The surgery outcome was evaluated by comparing pre and postoperative baseline investigation results taking into consideration the average results of the follow up done 3, 6 and 12 months after the surgical intervention. All examinations were done by the same operator after a 15-minute period of acclimatization.

Surgical Technique

All the procedures are performed by an endonasal approach with general anesthesia and orotracheal intubation. The surgical
sides are infiltrated using 1% lidocaine with epinephrine 1:100,000 before the operation.

The septum is approached through a caudal septal incision on the right side, with Cottle hemitransfixion incision, 1-2 mm from the caudal margin, cutting the periosteum completely. The caudal margin of the septal cartilage should be completely exposed using suction dissector with careful movements. Once the caudal margin is exposed, the surgeon starts to create the anterior tunnels along the subperichondral avascular plane.

Then, the creation of the magic plane is made with the Knapp scissors introduced through the hemitransfixion incision immediately under the membranous septum and into the crural connective tissue, with small spreading movements. That is how a small anterior pocket to the anterior nasal spine is created. The pre-spinal connective fibers are then incised along the axis running from the cartilaginous septum to the spine, thus exposing the nasal spine, the anterior-inferior septal angle, and the medial portion of the inferior margin of the pyriform aperture.

Subperiosteal inferior tunnels are then created along the floor of the nasal cavities. After joining these tunnels the septal space is exposed, allowing a general view of the whole septum and its bony framework. With the aid of a nasal speculum, the entire anterior septum can be visualized from vault to floor. The entire quadrangular cartilage was surgically removed leaving only a small 3 mm strip of cartilage close to the keystone area (Figure 1).

Once the septal bony structures have been removed, nasal packing is inserted. We use Lyofoam® in 2 × 3 × 10 cm strips. These have been placed in the nasal cavities and pushed posteriorly toward the nasopharynx and into the nasal cavity up to the attic. Packing keeps the crushed bone and/or cartilage fragments repositioned during posterior reconstruction.

Reconstruction prevents from dystrophic sequelae which may in turn lead to a flaccid septum and even to a possible septal perforation or prolapse of the turbinates.

The most regular, defect-free area of the quadrangular cartilage (which has been previously removed) is trimmed and shaped into a rectangle; in some cases this may include part of the perpendicular plate. The graft is tethered to the muco-pericondral flap with polyglactin 910 suture 3/0 (Vycril®) (Figure 2).

Cartilage graft fixation is accomplished by a 3-point suture using 3-0 Vicryl suture:

1. Inferior: mucosa-to-mucosa suture prevents the neoseptum from slipping out of the midline to the nasal floor, it goes under the quadrangular cartilage (Figure 3).

2. Midline suture: as the main point of fixation it gives support to the middle nasal vault so as to avoid nasal dorsal collapse.

3. L-inverted suture: approximates the nasal mucosa in the valve area in order to prevent from dead space (risk of haematoma) and to further stabilize the replanted septum (Figure 4).

The hemitransfixion incision is closed, suturing the septum and columella with mattress sutures. Closure of the hemitransfixion incision is performed using 3-0 Vicryl suture with a 6 cm straight needle.
Synthetic packing is left in the nasal fossae for two days to ensure the flap adheres, prevent septal hematoma and displacement of the inserted fragments.

**Statistical Analysis**

In the descriptive analysis, quantitative variables with normal distribution were expressed with means and standard deviation and the ones with abnormal distribution with medians and range; whereas qualitative categorical variables were summarized as frequency and percentage. Preoperative nasal resistance obtained by AAR and nasal cross sectional areas obtained by AR were compared with postoperative results using the non-parametric Wilcoxon Sign Rank test. Differences were considered significant at a p value of <0.05. Statistical Analysis was performed with commercially available software (IBM SPSS Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp.).

**Results**

A total of 133 adult patients treated with extracorporeal septoplasty were enrolled in this study. Patient characteristics are summarized in table 1. Surgeries were done by five different surgeons of the ENT department with a median operating time of 42 minutes (range, 20-58min).

No intraoperative complications were reported. Early complications included septal hematoma in one patient (0.75%) which requires drainage in the outpatient clinic. Three patients (2.25%) had to be reoperated on due to impaired nasal patency. Neither saddling of the dorsum nor irregular contour of it was observed in the postoperative period. Follow-up ranged from 3 to 18 months (mean, 12 months). All patients stayed, hospitalized for 48 hours. The nasal photographs of patients in the base view, before and at least six months after surgery were evaluated (Figure 5,6).

An average of the postoperative results obtained at month 3, 6 and 12 was made (Table 2). A statistically significant improvement was evident after surgery based on the rhinomanometric and acoustic rhinometric outcomes.

**Discussion**

Severe deviations of the nasal septum, especially when the anterior and/or superior parts of the quadrangular cartilage are involved, represent one of the most difficult challenges for nasal surgeons. Removal of the deviated segments, as prescribed in...

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<td>Male, n(%)</td>
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<td>Previously treated, n (%)</td>
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<td>Side affected, n(%)</td>
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<td>Right nostril</td>
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<td>46 (34.6)</td>
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<tr>
<td>Bilateral</td>
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<td>Kind of rhinomanometric impairment n(%)</td>
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<td>AR cm² median (range)</td>
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<tr>
<td>MCA 1</td>
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**Table 1:** Patient characteristics

**Table 2:** Comparative preoperative and postoperative baseline investigation results

AAR indicates Active Anterior Rhinomanometry; AR- Acoustic Rhinometry; MCA 1- the first Minimal Cross-sectional Area; MCA 2- the Second Minimal Cross-sectional Area

**Figure 5:** Preoperative Images

**Figure 6:** Postoperative - six months later
Cottle’s classic technique, will often lead to total or near-total cartilage resection resulting in postoperative saddling of the middle vault, internal valve collapse, and/or posterior relapse of the septal deviation due to lack of support. Simple replacement of the cartilage segments between the two mucoperichondral layers, as suggested by other authors, is a highly imprecise maneuver that fails to reinforce the anterior and superior part of the septum and may create postoperative reduplication of the cartilage with nasal obstruction.

Nowadays there is not a standard treatment for all types of nasal deformities. Techniques such as suture, swinging door, septal batten, ethmoid bone sandwich graft, tongue-in-groove, and extracorporeal septoplasty have been used in managing caudal septal deviation [5,9-12]. The broad range of approaches illustrates the difficulty in treating caudal septal deviation and this is the reason why we consider, there is no doubt regarding the need to obtain pre and postoperative rhinometric measures if objective results in septal surgery are to be achieved.

Various techniques have been proposed for the correction of caudal septal dislocations and deviations. General logic of these techniques is repositioning and suturing the structures to fix the caudal septal deformity. The mobilization of the caudal septum to the midline and anchoring the newly shortened caudal segment with a figure of eight suture to the nasal spine in a “swinging door” fashion is defined by Alduman [13]. Galloway [14], reported advancing the caudal septal cartilage into columella. The placement of the caudal septum into the groove between the medial crura to hold it in place as “Tongue in Groove” technique is defined by Kridel [10].

In the present study, we showed that the anterior deviation was corrected successfully and objective improvement was achieved with our new “3 point suture valve technique”. In our experience, this technique has several advantages over other corrective techniques for caudal septal deviation. It preserves a major part of the cartilage; the conservative remodeling of the quadrangular cartilage allows the use of septal cartilage grafts in secondary or revision rhinoplasty and is useful for the simultaneous correction of caudal deviation of the external nose and nasal obstruction. This technique completely avoids the cartilage remodeling from bending and is a secure technique for the valve area. Therefore, an immediate intraoperative check-up of the straightening of the caudal septum is possible, and there is low risk of deviation recurrence, which is a major issue because the cartilage has a strong tendency to return to its original shape.

The drawbacks of this procedure are the swelling of the mucosa, restenosis of the nasal valve area, septal hematoma and saddle nose development. They can be avoid by a correct suture technique to straighten the mucosa, especially in the valve area and give support to the nasal cartilage replaced in order to avoid saddle nose development.

The operative time that we measure in the study is also a strong point. Hardy et al. [15], in a cohort of 1753 patients who underwent a broad range of complex plastic surgical procedures concluded that surgery duration is an independent predictor of complications, with a significantly increased risk after three hours. Septoplasty is usually associated with other surgical procedures such as functional endoscopic sinus surgery (FESS) and rhinoplasty. That’s why we considered that it is important to measure surgery time, to organize the surgical schedule and the operative time when the intervention is associated with other procedures.

The present study has one limitation. It hasn’t a control group to compare the surgical method. Despite this limitation, we were able to see that the “3 point suture valve technique” is an effective and simple technique, which can be used to correct an anterior severe septal deviation.

**Conclusions**

Our study presents a drawback that was the use of nasal packing for 48 hours and admission of the patient for one or two nights at hospital. The nasal packing could probably be replaced by a septum mattress suture to stabilize the replaced cartilages, prevent the septal hematoma and help to heal the valve area.

The extracorporeal septal reconstruction is the advocated procedure for the correction of the anterior markedly deviated nasal septum via an endonasal approach. This technique has demonstrated to be safe and effective to restore nasal patency and the results remain stable. We describe a new type of simple suturing technique to correct caudal septal cartilage deviation, which is quick, easy to perform, free of major complications and produces excellent cosmetic and functional results.

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**References**


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