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Reconstruction of the Internal Nasal Valve in External Functional-Cosmetic Rhinoplasty

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ABSTRACT

Rhinoplasty is considered to be one of the most common aesthetic surgeries done. Yet, attention was always paid to the tip and nasal hump removal from the aesthetic prospective while the functional results were overlooked.

Postoperative nasal obstruction is a common sequel following rhinoplasty. It's attributed to many factors among which is distortion of the normal anatomy especially in the boundaries forming the critical area of the internal nasal valve.

Many techniques were described for restoration of the anatomy of the internal nasal valve area following rhinoplasty. Among which is; primary closure of the upper lateral cartilages and the use of spreader grafts to widen the internal nasal valve angle.

In this study, a comparison and an evaluation of the postoperative results of both techniques is reviewed aiming to highlight the functionally overlooked prospective of rhinoplasty.

INTRODUCTION

Nasal obstruction can be due to a variety of factors, among which is anatomical disturbance of the internal nasal valve (INV).

The INV is an area bounded superiorly by the reflection between the upper lateral cartilage (ULC) and the nasal septum. Posteriorly, it's bounded by the head of the inferior turbinate, inferiorly by the floor of the nose, while laterally by the bony pyriform aperture and its adjacent fibro fatty tissue **[1]**.

Several operations have been developed to address this problem aiming at widening the nasal valve angle and preventing it from narrowing during inspiration **[2]**.

SG = Spreader Graft.
INV = Internal Nasal Valve.
ULC = Upper Lateral Cartilage.

The most widely used operation involves placing spreader grafts submucoperichondrally between the septum and the upper lateral cartilage **[3]**.

Surgical resection of the nasal hump permanently disrupts the attachments between the septum and the ULCs, leaving the septum isolated in the midline. Since there is no lateral skeletal connection for the ULCs, they are only supported by the nasal bones proximally.

If surgical reconstruction between the septal cartilage and the ULCs was neglected, the patient may develop problems such as; an S-shaped dorsum, internal valve stenosis, and might eventually lead to nasal obstruction through a flutter valve effect **[4]**.

Middle vault collapse is a consequence of nasal hump removal that leads to narrowing of the INV, decreasing the resistance against the negative pressure produced during inhalation. In turn, that would lead to impairment of the air flow through the nose.

Accordingly, preventive measures should be adopted during primary surgery for the sake of safe guarding against any disruption in the anatomy of the critical area of the INV.

Aim of Work:

The objective of this study is to evaluate and compare the results of primary re-attachment of the ULCs versus the use of spreader grafts as regards their effects on the INV insufficiency.

MATERIAL AND METHODS

In this study, twenty four patients were included. Twenty of which were females, while only four were males. Patients were divided into two groups, each comprised twelve patients.

For Group I, primary re-attachment of the separated ULCs to each other and to the nasal septum was done using PDS 5/0 sutures.

While for Group II, spreader grafts (SG) were fashioned and used from harvested septal cartilage. They were placed sub-perichondrially between the septum and the ULCs.

All patients were operated upon through an external nasal approach. All cases were followed up post-operatively for a mean of 5 months (6-12 months).

Meticulous evaluation for postoperative nasal obstruction was a cornerstone in this study. Evaluation was done for all patients at two levels. First, a thorough clinical evaluation by asking the patients for any symptoms of nasal obstruction while breathing. Alkaline washes were used for all patients for a few days after removal of nasal packs to ensure washing out of any blood clots or inspissated mucous that might be present. Secondly, instrumental evaluation was done for all patients using a nasal speculum and further more by means of an otoscope with a medium size ear speculum. The nasal speculum frequently caused distortion of the anatomy of the INV area and thus disabled proper assessment. On the other hand, the use of the otoscope with a medium sized ear speculum enabled better assessment of the INV as regards observation of any abnormalities or irregularities in its boundaries that might lead to stenosis, which in turn would cause nasal obstructive symptoms.

Techniques:

A- *Primary Closure:*

Primary closure of the ULCs comprises their direct suturing to each other and to the nasal septum by means of PDS 5/0 suture material.

B- *Spreader Grafts (SG):*

The external approach to rhinoplasty has expanded the indications and use of spreader grafts. They include; maintainance or reconstruction of the dorsal nasal roof, restoration of one or both internal valves, straightening and buttressing a high dorsally deviated septum, and recreation of the dorsal aesthetic lines.

Through the stair step external transcolumellar approach, the distal nasal framework is exposed. The mucoperichodrial flaps are then elevated. The ULCs are separated from the septum by means of a No. 15 scalpel from the keystone area to the anterior septal angle.

Next, the initial tip work is done, followed by modification of the nasal dorsum. This sequence establishes the balance between the tip and dorsum which is crucial to the aesthetic results.

Harvesting of the septal cartilage was done, from which SGs were fashioned leaving at least 10mm caudal and dorsal L-strut (Figs. 1,2) **[5]**.

Spreader grafts were optimally fashioned from the postero-inferior portion of the harvested septal cartilage as this has the most consistent width (2-3mm) and length (20-30mm) (Fig. 3). They were usually contoured to 5-6mm in height, 2-3mm in thickness and 20-23mm in length.

Subsequently, the grafts were positioned either unilaterally or bilaterally parallel to the septum according to the deformity addressed (Figs. 4,5).

Their position may be visible at or above the septal plane. The SGs were secured in position to both sides of the septum with two or three horizontal mattress sutures using PDS 5/0. The procedure was concluded by re-draping the skin and closing the transcolumellar incision using 6/0 nylon. The intranasal incisions were closed using 5/0 monofilament absorbable suture material. Internal nasal splints were placed to stent the septum and an external contouring nasal splint was finally applied.

RESULTS

The post-operative results of groups I and II were compared and evaluated regarding the presence of nasal obstruction symptoms as well as the status of the INV area by means of an otoscope through a medium sized ear speculum.

Nasal obstruction due to INV was observed in ten patients included in group I (83%). While only one patient in group II suffered nasal obstruction due to INV distortion (8.3%).

Patients with INV problems were re-operated upon later to relieve the symptoms.

DISCUSSION

The INV defines the slit like cleft between the caudal end of the ULC and the septum. An INV angle narrower than 10-15 degrees can cause nasal obstruction **[6]**.

Reduction rhinoplasty inherently decreases the nasal airway cross-sectional area unless surgical measures are taken to prevent this (Figs. 6-11).

Fig. (1): Harvesting of cartilaginous septum.

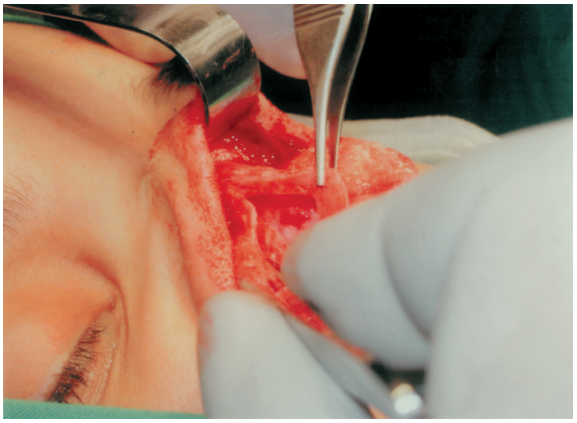

Fig. (2): Caudal and dorsal L-strut after harvesting of cartilaginous septum.

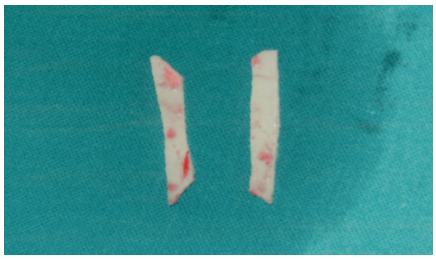

Fig. (3): Spreader grafts after fashioning from harvested cartilaginous septum.

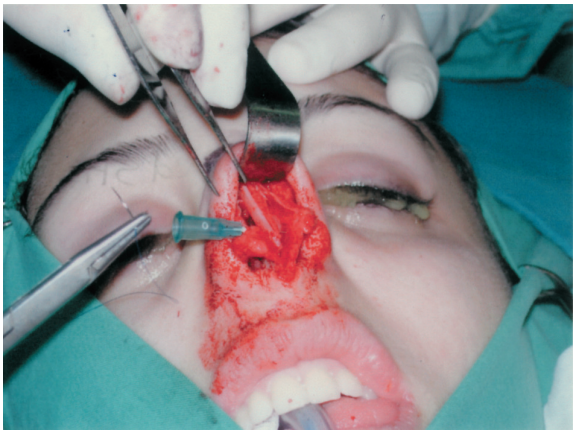

Fig. (4): Unilaterally placed spreader graft.

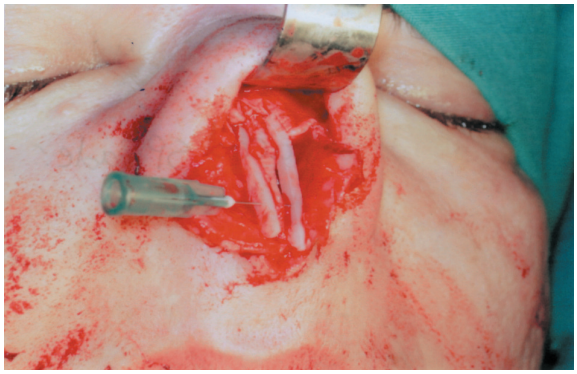

Fig. (5): Bilaterally placed spreader grafts.

Fig. (6): A case of nasal hump preoperative frontal view.

Fig. (7): Preoperative right lateral view of the same patient.

Fig. (8): Preoperative left lateral view of the same patient.

Fig. (9): Postoperative frontal view of the same patient.

Fig. (10): Postoperative right lateral view.

Fig. (11): Postoperative left lateral view.

The middle third of the nose has largely been overlooked in its importance and far more attention has been given to the nasal tip for aesthetic reasons. One of the most disturbing sequel of nasal surgery is the post-operative nasal obstruction where it didn't exist prior to the surgery. The most common cause of INV obstruction in the post-rhinoplasty patient is the uncorrected abnormality of the nasal septum. Other causes include; medial displacement of the ULCs after hump removal, flaccid collapse of the cartilaginous framework secondary to over-zealous resection of the lower and ULCs, and scarring leading to INV stenosis secondary to inter-cartilaginous incision used for access.

Middle vault reconstruction is recommended for all patients who are predisposed to middle vault collapse after rhinoplasty. Predisposing factors include; full thickness muco-cartilaginous transaction of each ULC from the septum, over resection of the dorsal septum; and excessive resection of the ULCs. Therefore, septal deviation was corrected in accordance with the septal pathology.

Since nasal hump reductions may lead to progressive collapse of the side wall, it is advisable to re-attach the ULCs to the dorsal margin of the septum **[7]**.

Yet, the primary goal of the SG application is reconstitution of the normal anatomy of the INV, thus improving the airflow at this area. They were designed to lateralize the ULCs by the width of the graft and thereby increasing that cross-sectional area, restoring the INV and strengthening the weakened septal L-strut, recreating dorsal aesthetic lines and thus maintaining a straight dorsal alignment with widening of the narrow middle vault **[8]**.

Therefore, SG should be applied when the nasal septum is weak and in need of reinforcement.

The dysfunctional INV is frequently missed in the evaluation of nasal airway obstruction due to distortion from the nasal speculum as well as distraction by external irregularities or the deviation. The authors examined the nasal cavity particularly the INV using an otoscope with a medium sized ear speculum. This instrument provides an undistorted, bright and magnified view of the INV.

In conclusion, patients for whom SG were used had significantly less nasal complaints and INV angle constriction when compared with patients for whom primary reattachment was done. Hence, primary reattachment should be avoided due to high rate of postoperative INV stenosis (83%). Spreader grafts applications and submucoperichondral dissection for the reconstruction of the INV through an external approach can eliminate this functional mishap. They should be applied when the straightened septal cartilage looks weak and needs support since SG not only improve the INV, but also straighten and reinforce the septal cartilage.

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