

Significance of Inner Nasal Valve In Septoplasty

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Abstract :

Background: Nasal obstruction due to deviated septum is commonly treated with conventional septoplasty. This surgery however is inadequate in cases of compromised nasal valves and leads to persistent symptoms. Hence, we stressed the evaluation of nasal valves before septal surgery & studied the outcome of the patients with valve area correction. **Aim:** To prove the significance of inner nasal valve in nasal surgery. **Objective:** To analyse the outcome of Open septoplasty. **Methodology:** A retrospective review of our patients undergoing Open septoplasty was analyzed from April 2016 to January 2021. The preoperative and post-operative evaluations were calculated & statistically analysed. **Results :** A total of 400 patients underwent Open septoplasty, out of which 392(98%) showed symptomatic improvement in breathing difficulty. Also, 220 patients out of total 400 underwent cosmetic correction along with open septoplasty & 209 (95%) out of these 220 were completely happy with the aesthetic improvement. **Conclusion:** Open septoplasty and Spreader grafts is best solution to improve Internal Nasal valve angle. Rim graft to improve external valve collapse. Spreader graft also gives aesthetic along with functional improvement.

Key words: Nasal obstruction, Septoplasty, Internal nasal valve, Spreader grafts.

Introduction:

Nasal obstruction is a common complaint in ENT practice. Various causes of nasal obstruction exist, common being deviated nasal septum, turbinate hypertrophy or dysfunctional nasal valve.¹ Various surgeries are carried out to relieve nasal obstruction &

align the septum centrally, septoplasty being one of the commonest.^{2,3} Dysfunctional nasal valve is a commonly missed cause of nasal obstruction & hence a common cause of failed septoplasty.^{1,4} Our study aims to review retrospectively the results of open septoplasty.

Methodology:

A retrospective review was conducted on 400 patients undergoing Open septoplasty in Gajanan ENT Hospital, from April 2016 to January 2021.

Inclusion Criteria: With clinical & investigational assessment, patients with history of post traumatic DNS, diagnostic nasal endoscopy showing high DNS or dorsal septal deviation or anterior grade III DNS, Computed Tomography Scan of nose & paranasal sinuses showing compromised valve area and patients with loop on rhinomanometry were included in the study.

Exclusion criteria: was patients with age less than 16 years, inferior turbinate hypertrophy grade III, spur or DNS at lower septal level which could be addressed by conventional septoplasty.

After fulfilling inclusion exclusion criteria, informed written consents were taken from each patient for surgery & the study.

Patients were evaluated by thorough history & physical examination. The preoperative and post operative nasal patency was gauged using clinical examination, rhinomanometry, nasal endoscopy or Computed Tomography scan of the nose & paranasal sinuses.

Clinical evaluation by cottle's test showed improvement in nasal obstruction in case of inner nasal valve dysfunction (**Figure 1**).



Figure. 1 Cottle's Test

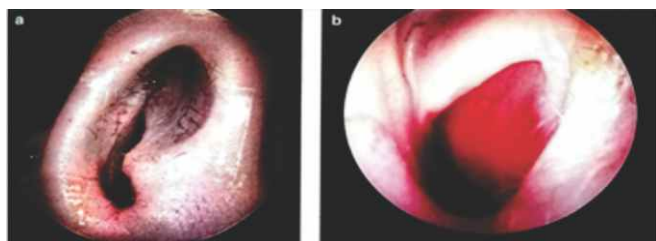


Figure. 2 Diagnostic Nasal Endoscopic picture showing inner nasal valve closed

Diagnostic nasal endoscopy was carried out bilaterally with a 4mm diameter, 0- degree rigid endoscope for each patient (Figure 2). The inner nasal valve area was visualized with the endoscope kept a 1-1.5 cm away from it. Turbinate hypertrophy & nasal valve narrowing or collapse was noted & documented by printed pictures.

Anterior Rhinomanometry was carried out using a 4 phase Rhinomanometer (4RhinoLab) (Figure. 3). Right nasal cavity was tested separately first followed by left side. Patient was made to breathe effortlessly at a constant frequency and amplitude. The test was done both preoperatively & 6 week post operatively and recorded in a printed format. Airflow, air pressure & degree of nasal obstruction were noted in these graphs.

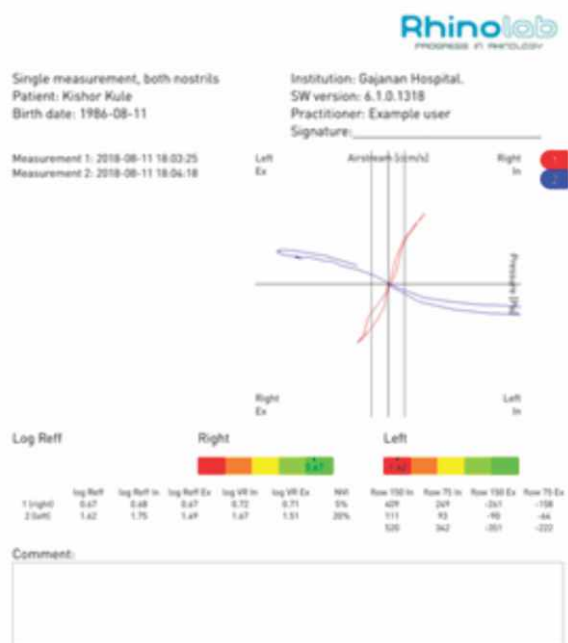


Figure. 3 Closed internal nasal valve shows loop pattern Bilateral internal nasal valve closed and left side severe nasal blockage.

A computed tomography scan of nose & paranasal sinuses was done & inner nasal valve angle narrowing noted (Figure 4). The inner nasal valve characteristics were observed in investigations of each patient & causes of its closure was noted.

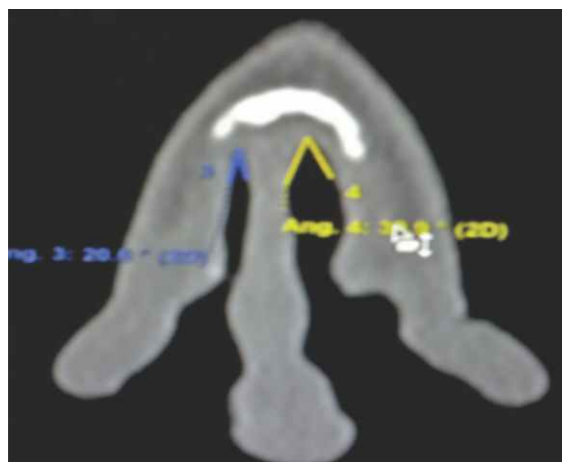


Figure. 4a Right inner nasal valve closed

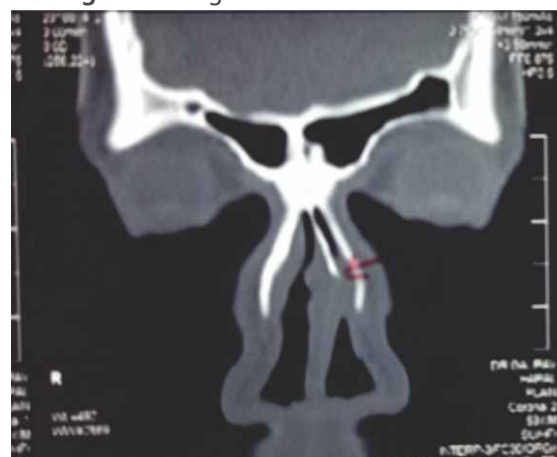


Figure. 4b Left inner nasal valve closed

Surgical intervention: The preoperative deformity was noted and surgical steps included accordingly. The surgical steps carried out were as follows:

Under general anaesthesia, patient in supine position was painted and draped. Local infiltration done by 0.2% Ropivacaine with Adrenaline 1:100000 facilitating hydrodissection. Infra cartilaginous & inverted 'V' transcollumela incision was taken and dorsal flap elevated along the SMAS plane. Bilateral ULC & LLC separated from the septal framework along the subperichondrial & subperiosteal planes. The deviated part of septum was excised, preserving a dorsal & caudal strip of 1-1.5 cm or septal dorsum straightening procedure was done.

The mainstay of treatment in inner nasal valve closure was the Spreader grafts (**Figure 5**). Spreader grafts were designed out of the excised septal cartilage & attached to dorsal septum, between the upper lateral cartilages & the upper part of septal cartilage on both sides by mattress suturing with Ethilon 4.0. The harvested cartilage are rectangular strips approximately 2.5 -3cm long, 3-5 mm wide & 1-1.5mm thick. In cases with inadequate septal cartilage, conchal cartilage or rib cartilage was used.

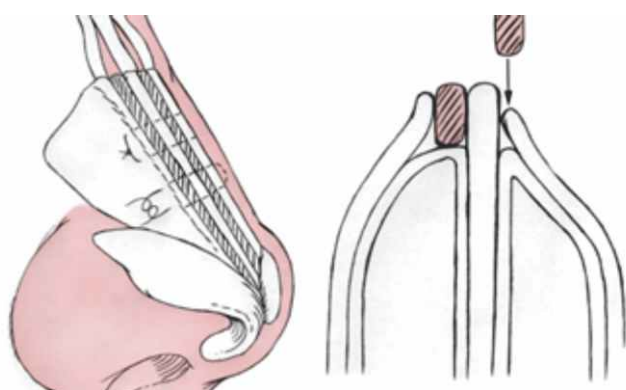


Figure. 5 Spreader grafts attached to septal cartilage in centre & upper lateral cartilage on either side.

The caudal septum was sutured to the anterior nasal spine at the inferior end, to align it in the midline & to give firm fixation (**Figure 6**).



Figure.6 Suturing of anterior nasal spine to caudal septum

Following are the intra-op pictures of open septoplasty with the septum aligned to center (**Figure 7**).

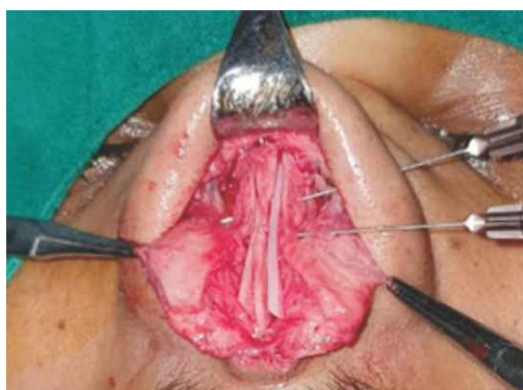


Figure. 7 Open septoplasty approach showing the nasal dorsum is exposed, and the nasal septum is separated from both the upper lateral cartilages.

The surgical treatment for bony valve closure involved

- Osteotomies-Paramedian, Transverse, low to low lateral osteotomies
- Lateralise the bone by elevator.
- Spreader graft extend upward & fixed with drill hole & TTC (transcutaneous transosseus circle suture) suturing (**Figure.8**).

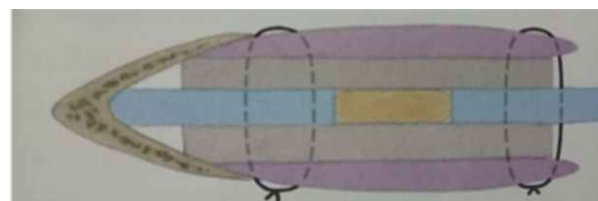


Figure. 8 TTC suturing at keystone area

In patients with external valve collapse, due to weak lower lateral cartilage additional rim grafts were inserted in the pocket made in the ala to increase the stiffness.

Post-operative evaluation: The patient was kept under observation for 2 days, for any complication like postoperative bleeding & discharged after removal of nasal packing, if any.

Results :

Our study included a total of 400 patients with narrow internal nasal valve, with 236 (58%) males & 164 (42%) females who underwent Open septoplasty. Objective improvement was noted on rhinomanometry done 6 weeks post operatively (**Figure 9a & 9b**).

Out of which 392 (98%) showed symptomatic improvement in breathing difficulty. Also, 220 patients out of total 400 underwent cosmetic correction along with open septoplasty & 209 (95%) out of these were completely happy with the aesthetic improvement (**Figure 10**).

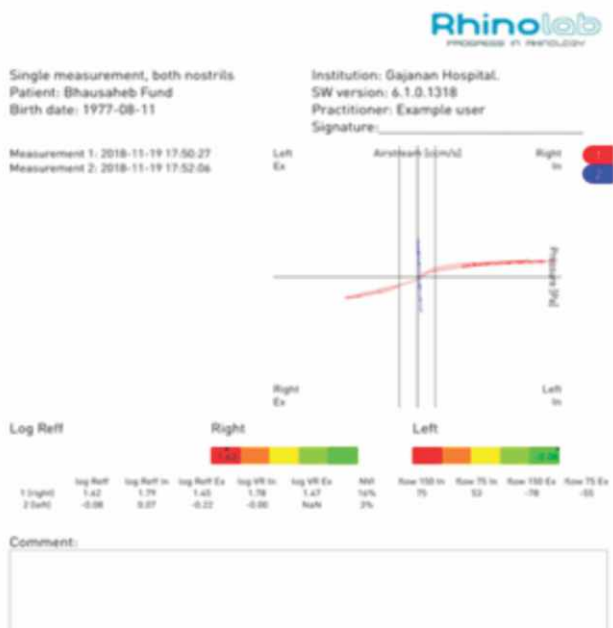


Figure. 9a Rhinomanometry graph showing Right nasal severe obstruction

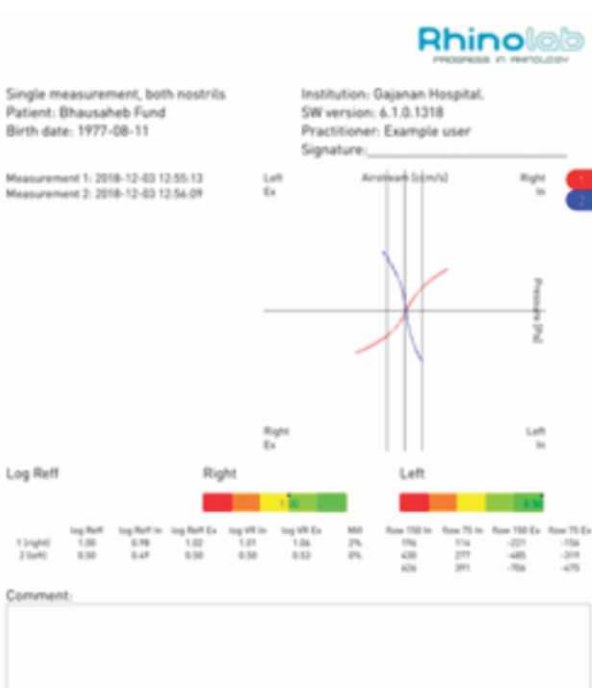


Figure. 9b Rhinomanometry showing significant improvement in right nasal airflow (6 weeks Post-operative)



Figure 10. A 28year old man with narrow inner nasal valve & external nasal valve collapse. (A) Before & (B) after surgery showed significant improvement functionally as well as aesthetically

Complication was noted in one case of 17years old male, who developed septal hematoma on post-operative 7th day, which was treated by aspiration & nasal packing.

Discussion:

The nasal valve can be subdivided into internal and external components. The internal nasal valve (INV) of the nose is formed by the angle between the caudal part of the upper lateral cartilage laterally & nasal septum medially (Figure 11). It is the narrowest part of the nasal airway ranging 10-15 degrees.^{5,6} The cross-sectional area of the nasal ala, or opening of the nasal vestibule, defines the external nasal valve. It has collumela medially & fibrofatty tissue with caudal edge of lower lateral cartilage laterally

Nasal valve collapse occurs when this narrowest part becomes narrower due to weak structural support. In such a case, when breathing in, airflow increases causing drop in air pressure leading to collapse of lateral nasal cartilaginous wall due to Bernoulli effect, causing nasal obstruction.^{5,7}

The Internal Valve

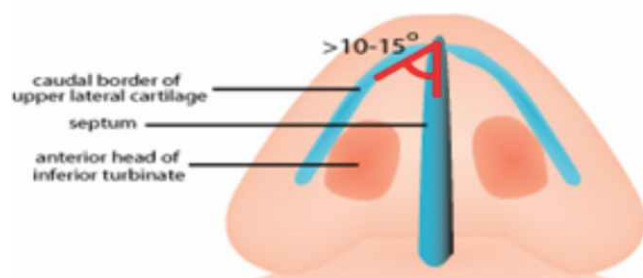


Figure. 11 Inner nasal valve anatomy

Nasal valve compromise leads to a functional problem affecting the nasal airflow for which a precise objective measurement is essential to study its surgical treatment. Most surgical procedures are evaluated using subjective assessment of nasal breathing to determine its success or failure.⁸⁻¹⁰ CT scan and nasal endoscopy are a relatively reliable tools for its objective assessment.^{11,12}

In our study, we evaluated the inner nasal valve closure of patients using detailed history, examination & investigations of nasal endoscopy, Computed Tomography scan of the nose & rhinomanometry. The causes of INV closure observed were as follows:

Primary Causes:

- Dorsal Septal deviation
- Mucosal abnormalities
- Upper Lateral cartilage collapse

Secondary Causes:

- Surgically induced mucosal Scarring
- Accidental nasal trauma

Also Causes of Bony valve closure were found to be

1. Trauma
2. Post surgery.

The literature shows that in cases of failure of conventional septoplasty, the common causes observed are lack of careful preoperative history & Examination, Enough Attention not given to external and internal nasal valve collapse, & the untreated Turbinate Hypertrophy.

The spreader grafts not only correct the nasal dorsal septum, but also gives symmetrical nasal dorsal aesthetic lines.^{13,14} Most importantly it opens the Internal

Nasal Valve area. Andre et al found that external approach for spreader graft has the advantage of placing the graft precisely in INV area with the help of needles to secure it before applying the sutures.^{15,16}

Although adding this technique requires longer operative time, it has advantage of accurate positioning and securing of the graft.¹⁵ We experienced similar observations in our study. Also we observed that spreader grafts can be extended superiorly to bony valve as well as inferiorly till anterior septal angle. It can be used in all kinds of cases including crooked nose & revision cases.

Studies also concluded that nasal valve dysfunction is an underdiagnosed entity and should be evaluated in every patient undergoing septoplasty to prevent failure of the surgery. Addressing the nasal valve surgically significantly improves the outcome.^{4,17} Our study had similar findings, as most 98% patients in our study were benefited by surgical corrections of nasal valves.

Limitations of our study are, long-term follow up could not be recorded for all patients. Although multiple studies have been carried out to evaluate inner nasal valve & corrective surgeries for the same, our study has advantage of long duration and significant sample size.

Conclusion:

Every patient undergoing septoplasty should be evaluated for nasal valve status. Open Septoplasty showed dramatic improvement in patients with closed nasal valves with spreader grafts playing a valuable role in restoration of normal Internal Nasal valve angle. Spreader graft also gives aesthetic improvement along with functional correction. Rim graft helps to improve external valve collapse.

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