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Obstruction of the nasal valve

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Abstract
Obstruction of the nasal valve is an important cause of chronic nasal obstruction in adults. In a series of 500 patients, obstruction at the level of the nasal valve was diagnosed in 65 of them (13 per cent). The obstruction was unilateral in 57 patients (88 per cent). Forty-seven patients (72 per cent) had history of previous nasal surgery of accidental trauma. Causes of obstruction of the nasal valve included high septal deviations, a weak or deformed upper lateral cartilage, adhesions, and alar collapse. All patients underwent corrective nasal surgery and the surgical procedures were tailored according to the existing pathology. Post-operatively, the mean nasal patency score increased from 2.9 to 8.6, the mean nasal airflow increased from 579.5 to 727 cm/sec (at 150 Pa), and the mean nasal resistance decreased from 0.31 to 0.23 $Pa/cm^3\ sec^{-1}$.

Key words: Nasal obstruction

Introduction

The term nasal valve owes its origin to Mink and is defined as the slit-like cleft between the caudal end of the upper lateral cartilage and the septum (Haight, 1983; Kasperbauer and Kern, 1987). The upper lateral cartilage is the mobile limb of the valve. Dishoeck (1965) and Bridger and Proctor (1970) localized the valve at the junction of the upper and lower lateral cartilages.

Normally the upper lateral cartilage forms an angle of 10–20 degrees with the nasal septum (Haight, 1983). This angle widen and narrows under the influence of the nasal musculature during respiration. The valvular anatomy varies from patient to patient and exhibits definite racial variability.

The nasal valve is the most flexible and narrowest part of the nasal airway. Physiologically the nasal valve offers the greatest resistance to nasal airflow, and generally it functions as an inflow device controlling nasal airflow and resistance (Williams, 1972; Ogura, 1977; Viani and Jones, 1990). In spite of this fact little attention has been given to the contribution of nasal valve abnormalities to the problem of chronic nasal obstruction in adults. The present work evaluated this relationship.

Material and methods

Five hundred adult patients who had had chronic nasal obstruction for more than six months were randomly selected for the study. All patients were thoroughly examined with the rigid endoscope. Patients with nasal valve obstruction were asked to subjectively rate on a scale of 1–10 their nasal obstruction (1 being total obstruction; 10 being perfectly clear breathing).

Anterior active rhinomanometry was performed using the Rhinotest mp rhinomanometer. The technical arrangements and data calculations were made according to the National Standardization Committee for Rhinomanometry (Clement, 1984; Cole and Hoves, 1986).

The surgical procedures for each patient were tailored according to the existing pathology. The surgical procedures included: septoplasty, various types of cartilage grafts, composite grafts, advancement mucosal flaps, and division of adhesions with placement of silastic spacers.

Spreader grafts were usually harvested from the septum. The graft was placed between the anterior septal edge and the upper lateral cartilage. A small subperichondrial tunnel was dissected along the anterior edge of the septum on both sides, and a strut made of one or two layers of septal cartilage was introduced into the tunnel. If the position of the graft was unstable, the graft was sutured to the septum with fine absorbable material.

Correction of cicatricial webbing of the nasal valve usually required excision of the cicatricial tissue and covering of the denuded valve area with a flap from the septal mucoperichondrium.

Nasal adhesions, when present, were divided, and any other pathology, e.g. residual septal deformity, was corrected, then a silastic splint or spacer was inserted.

Post-operatively the patients were followed-up at

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TABLE I
THE AETIOLOGY OF CHRONIC NASAL OBSTRUCTION IN ADULTS

Cause	Number	Percentage
Chronic rhinitis (allergic and non-allergic)	290	57.9%
Deviated septum (not involving the valve area)	78	15.6%
Nasal valve obstruction	65	13%
Nasal polyps	25	5%
Atrophic rhinitis	15	3%
Miscellaneous	27	5.5%

monthly intervals for six months. At the end of the follow-up period each patient was asked to rate his nasal obstruction using the previous scale and rhinomanometry was then repeated.

The paired two sample *t* test for means was used for statistical analysis. All patients kindly agreed to participate in the research project.

Results

Nasal valve obstruction was diagnosed in 65 patients. (Table I) The patient population consisted of 38 males (58.5 per cent) and 27 females (41.5 per cent). The average ages of the male and female patients were 31 years (range 21 to 45 years) and 26 years (range 16 to 39 years) respectively.

In 57 patients the obstruction was unilateral. Thirty-four patients (53.8 per cent) had a history of previous nasal surgery and 13 patients (20 per cent) had a history of accidental trauma.

The duration of nasal obstruction ranged from six months to seven years (average 2.4 years). High septal deviation involving Cottle's area No. 2 was the most frequent cause of obstruction of the nasal valve. Other causes are shown in Table II.

TABLE II
AETIOLOGY OF NASAL VALVE OBSTRUCTION

Aetiology	No.	%
Septal deviation	39	60%
Weakened or deformed upper lateral cartilage	12	18.4%
Adhesions	10	15.4%
Alar collapse	4	6.2%

Nasal patency score

In all patients the mean pre-operative nasal patency score was 2.9; and the mean score at the end of follow-up was 8.6. The difference was statistically significant ($p<0.05$).

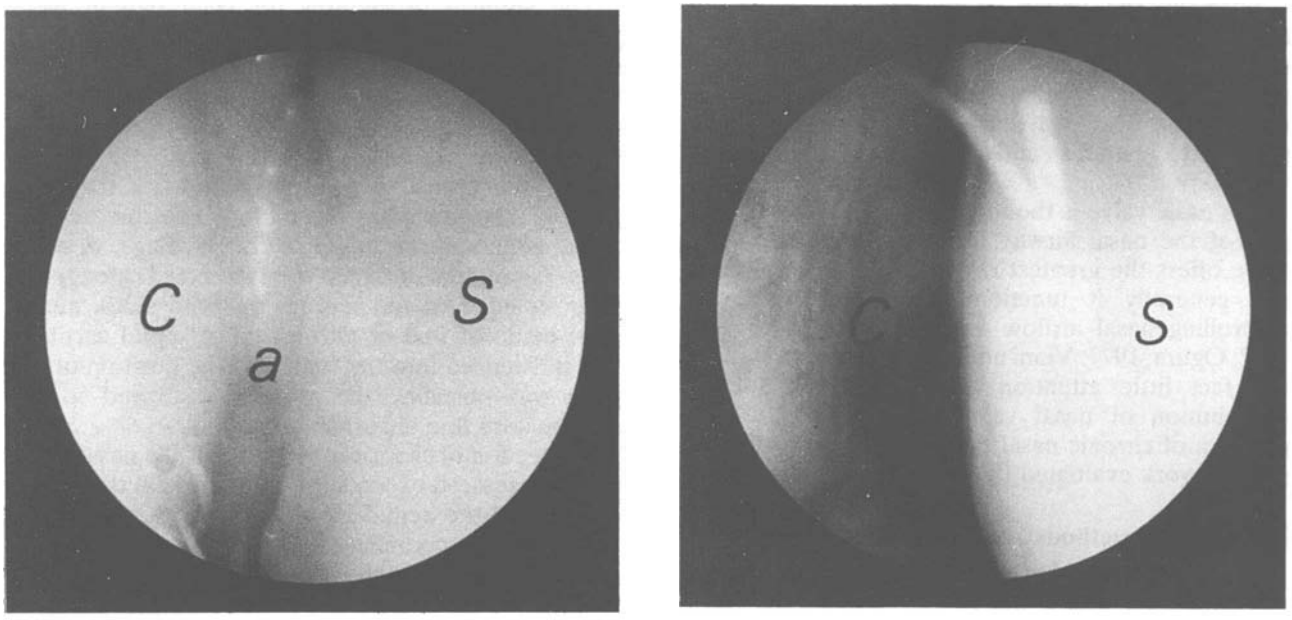
Nasal airflow and resistance

The mean nasal airflow (cm^3 sec^{-1} at 150 Pa) increased from 579.5 and 727 post-operatively. On the other hand, the mean nasal resistance (Pa/cm^3 sec^{-1}) decreased from 0.31 to 0.23 after surgery. The results showed that the nasal airflow increased an average of 29 per cent (significant at $p<0.01$ and $t = -8.9832$) and total nasal resistance decreased 23 per cent (significant at $p<0.01$ and $t = 6.6108$).

Examples of the cases are shown in Figures 1–3.

Discussion

The nasal valve has a vital role in the function of the nose since it is an important regulator of nasal air flow and resistance. Primary incompetence or collapse of the valve occurs when there is an intrinsic problem in the strength or relationship between the upper and lateral cartilages or an anatomical abnormality in this area. A secondary collapse is when this area is collapsed secondary to a narrowing



(a) (b)

FIG. 1

a : The nasal valve area totally obliterated with adhesions following septorhinoplasty.
b : The nasal valve after division of the adhesions and placement of a silastic spacer for three weeks. The valve appears normally opened and is lined with healthy mucosa.
C = Upper lateral cartilage. S = Nasal septum. a = adhesions.

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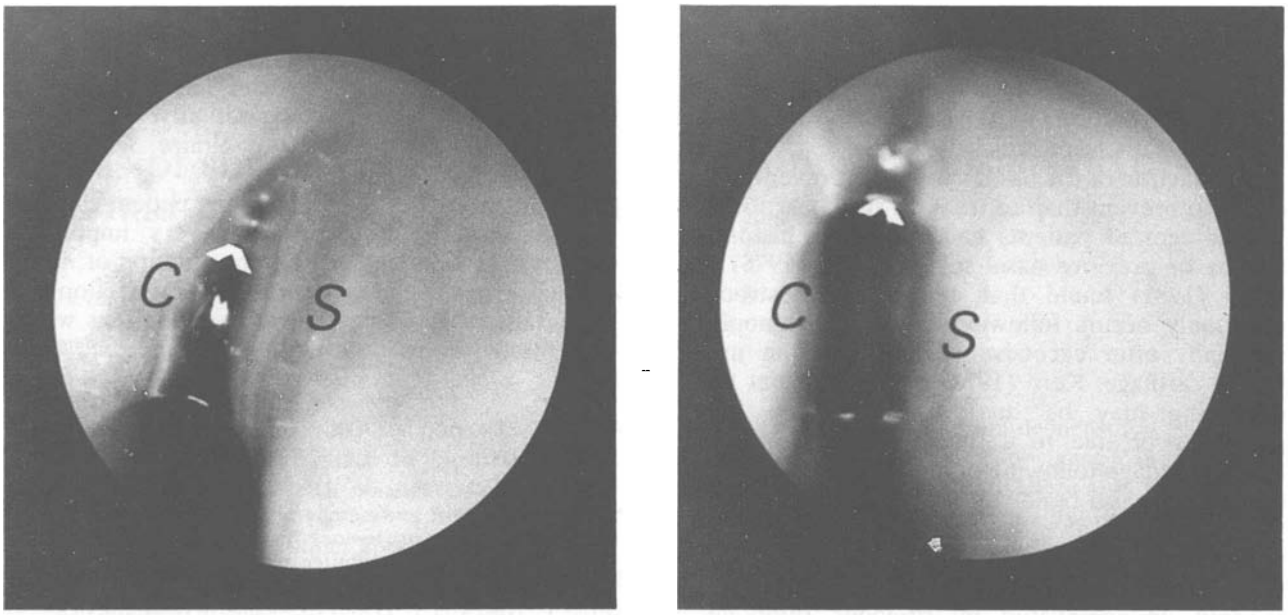


(a) (b)

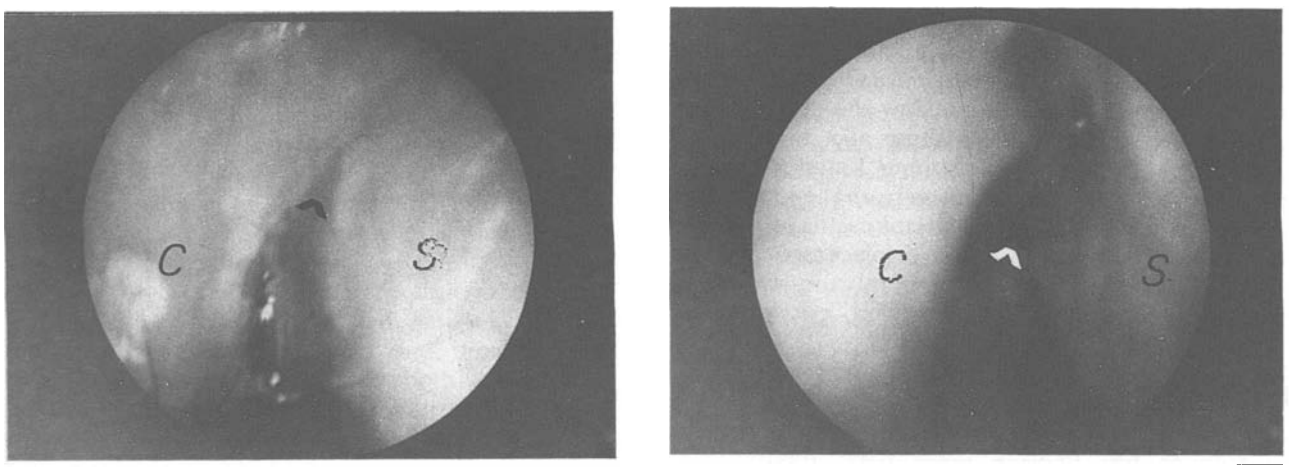
FIG. 2

a: Obstruction of the nasal valve (arrowhead) due to the presence of thick scar tissue at the site of the intercartilaginous incision as well as excessive resection of the upper lateral cartilage during previous rhinoplasty.
b: The nasal valve (arrowhead) after excision of the cicatrix and placement of a spreader graft. The inner surface of the upper lateral cartilage was covered with advancement septal flap.
C = Upper lateral cartilage. S = Septum.

elsewhere in the nasal airway as might be produced in allergic rhinitis which necessitates a more marked inspiratory effort and secondarily causes a collapse in the area of the nasal valve. Treatment of the primary cause of nasal obstruction will often mean resolution of collapse of the nasal valve.

Obstruction at the level of the nasal valve may be caused by a wide variety of pathological conditions which may involve the skeletal framework of the valve and/or its coverings. In the present work the two most frequent lesions were high septal deviation and weakening and/or deformity of the upper lateral cartilage. This agrees with the reports of Prez (1975) and Jeppesen and Jeppesen (1992) and points to the importance of Cottle's area No. 2 during septoplastic procedures, and avoidance of unnecessary or excessive resection of the upper lateral cartilage during rhinoplasty.

The primary goals of nasal valve surgery are to reconstitute the normal anatomy of the nasal valve and to improve the airflow without increasing the rigidity or the collapsibility of the nasal valve. There



(a) (b)

FIG. 3

a: Obstruction of the nasal valve (arrowhead) associated with post-operative alar collapse. A very thick cicatrix is also present at the site of the intercartlaginous incision.
b: The nasal valve (arrowhead) following correction of the collapsed ala and excision of the scar tissue. A spreader graft was also inserted and a mucosal flap was used to cover the inner surface of the upper lateral cartilage. The raw area on the septum was left to heal spontaneously and a silastic sheet was placed for three weeks.

is no single operation for nasal valve obstruction and one should deal with the obstruction in each case specifically according to the existing pathology. A variety of operations were used in the present series and the results were satisfactory.

Dysfunction of the nasal valve is a problem that is easier to prevent than to treat. In the present series 72 per cent of patients had a positive history of trauma or previous nasal surgery. Prez (1975) and Perry (1981) found that nasal valve obstruction commonly occurs following corrective rhinoplasty especially after excessive resection of the upper lateral cartilage. Kern (1978) mentioned that valve narrowing may be due to uncorrected septal pathology or due to a medially displaced upper lateral cartilage following hump removal and infracture of the nasal bone. Robinson and Buzet (1990) reported nasal valve dysfunction after resection of nasal cancer. Also Sulsenti and Palma (1989) found that obstruction of the nasal valve is frequently induced or aggravated by previous rhinological surgery. This agrees with findings of the present work and should encourage the adoption of certain preventive measures during the operation as well as the post-operative period.

Proper correction of septal deformities has been previously mentioned. If resection of the caudal aspect of the upper lateral cartilage is essential during septorhinoplasty, it should be carried out in a conservative way in order to avert post-operative valvular inspiratory collapse. Except when a significant amount of caudal septum must be excised or when there is significant returning of the upper lateral cartilage in relation to the lower lateral cartilage, shortening of the upper lateral cartilage is usually not indicated. At the end of the operation the upper lateral cartilages should come to lie at the same height as the cartilaginous dorsum of the septum. Excessive removal of upper lateral cartilages can lead to blunting and incompetence of the nasal valve. When loss of the cartilage is evident it must be replaced with an auricular or a septal graft.

Cutting through the nasal membranes when separating the upper lateral cartilage from the septum may cause scarring and/or the upper lateral cartilage to attach to the septum at a lower level. Both would compromise breathing. Junction tunnels, separating the overlying mucosa from the junction of the septum with the upper lateral cartilage, help to prevent cicatrix and further displacement of the upper lateral cartilage. As a general rule, whenever resection of cartilages is carried out, mucous membrane is best preserved. If redundant mucosa significantly wells up in the nasal valve after hump removal and osteotomy of the lateral walls, the excessive mucosa can be conservatively removed with angulated scissors to minimize scar tissue formation.

Finally, post-operative care of any patient who has had a nasal operation is also very important. Removal of clots and crustations, division of newly formed synechiae, and treatment of infection are important to avoid post-operative adhesions which may totally obstruct the valve area.

References

Bridger, G. P., Proctor, D. F. (1970) Maximum nasal inspiratory flow and nasal resistance. *Annals of Otology, Rhinology and Laryngology* **79:** 481–488.

Clement, P. (1984) Committee report on standardization of rhinomanometry. *Rhinology* **22:** 151–155.

Cole, P., Hoves, H. E. (1986) Resistance to respiratory airflow, comparison between different common methods of calculation. *Rhinology* **24:** 163–173.

Dishoeck, V. (1965) The part of the nasal valve and turbinate in total nasal resistance. *Rhinology* **3:** 19–26.

Haight, S. J. (1983) The site and function of the nasal valve. *Laryngoscope* **93:** 49–55.

Kasperbauer, B., Kern, B. (1987) Nasal valve physiology. *Otolaryngologic Clinics of North America* **20:** 4–21.

Kern, B. E. (1978) Surgical approaches to abnormalities of the nasal valve. *Rhinology* **16:** 156–189.

Jeppesen, F., Jeppesen, S. J. (1992) Insufficiency of the nasal valve and its treatment. *Ear, Nose and Throat Journal* **71:** 27–37.

Ogura, J. H. (1977) Fundamental understanding of nasal obstruction. *Laryngoscope* **87:** 1225–1232.

Perry, C. J. (1981) Nasal resistance before and after rhinoplasty. *British Journal of Plastic Surgery* **34:** 105–111.

Prez, J. D. (1975) Valvular obstruction of nasal airway. *Plastic Reconstructive Surgery* **56:** 307–313.

Robinson, J. K., Buzet, G. C. (1990) Nasal valve malfunction resulting from resection of cancer. *Archives of Otolaryngology, Head and Neck Surgery* **110:** 1419–1424.

Sulsenti, G., Palma, A. (1989) A new technique for functional surgery of the nasal valve area. *Rhinology* **(Suppl. 10),** 1–19.

Viani, L., Jones, A. S. (1990) Nasal airflow in inspiration and expiration. *Journal of Laryngology and Otology* **104:** 473–476.

Williams, H. L. (1972) A reconstruction of the relation of the mechanism of the nasal airflow to the function of the nose in respiration. *Rhinology* **10:** 145–161.

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