

Treatment of external nasal valve (alar rim) collapse with an alar strut

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Abstract

Alar (external valve) collapse may be iatrogenic or can occur as a consequence of ageing or trauma. We have utilized an autogenous cartilage graft inserted as an underlay graft to the alar rim to treat 17 patients who have presented with nasal obstruction due to alar collapse. We report the short- and medium-term functional results and the cosmetic sequelae of our approach and conclude that this procedure offers an improvement in nasal airway performance in patients with external valve collapse without producing serious adverse cosmetic sequelae.

Key words: Nose; Nasal Obstruction; Surgery, Plastic

Introduction

In most instances nasal airway obstruction of the nose results either from septal deviation or from mucosal hypertrophy. However, in an unknown percentage of cases obstruction is due to weakness of the lateral wall of the nose which moves medially during the inspiratory phase of the nasal cycle. The majority of such paradoxical movement occurs at the level of the alar rim or external valve and when it is pronounced, results in nasal obstruction.¹

The commonest cause of alar rim collapse is previous surgery with over-resection of the cephalic margin of the lower lateral cartilage^{2,3} although it can also occur after well-executed nasal reconstruction⁴ and may follow non-surgical trauma. In other cases collapse of the external valve is associated with weak, malpositioned or strangely-shaped lateral crura which are lying in a more cephalad position than usual: such patients have been described as exhibiting a 'parenthesis' deformity⁵ (Figure 1). Inspiratory collapse is also said to be more common in elderly patients since, with age, the fibrous attachments between the upper lateral cartilage and the lateral crura weaken, as does the interdomal ligament. Moreover the nasal muscles atrophy. All of these features predispose to alar collapse.⁶

Conservative measures to correct this include the use of a Francis alar dilator or spot-welding of the nasal tissues near the pyriform aperture with diathermy.⁷ More radical solutions have also been

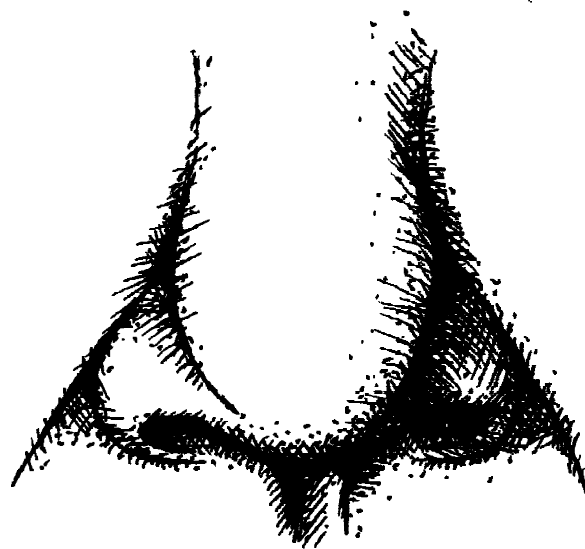


FIG. 1

The characteristic 'parenthesis' deformity of the nasal tip.

advocated and these have included transposition of the caudal end of the upper lateral cartilage,⁸ the use of onlay bone grafts inserted through external incisions⁶ and the use of suspensory slings wired to the inferior orbital rim.⁹ A conchal cartilage graft placed over both alae as an onlay has also been proposed¹⁰ as have composite grafts to widen the nasal floor.¹¹

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The objective of this paper is to describe the results of utilizing an underlay autogenous cartilage graft inserted deep to the lateral crus of the lower lateral cartilage in patients who have presented to us with nasal obstruction and bilateral alar rim collapse. The approach used has mirrored that of Gunter and Friedman¹² and we have utilized their technique, with minor modifications, in managing these patients.

Materials and method

Seventeen patients with lower lateral nasal wall collapse had surgery over a three-year period. The group was comprised of four females and 13 male patients whose ages ranged from 34 to 71 years (mean 46.3 years). No patient had a history to suggest sinus disease. Two patients had a personal history of atopy affecting the lower respiratory tract and both were on appropriate long-term medication under the supervision of their General Practitioners. Four others had a history of seasonal allergy but this appeared mild and non-contributory to their current airway problem. No investigations for atopy were undertaken in any of the patients included. Seven patients admitted to smoking cigarettes (between five and 25 a day) and two had smoked in the distant past.

The nose was routinely assessed by rigid endoscopy prior to surgery. The endoscope passed easily in all cases and no intercurrent disease was apparent in any of the patients examined. Six patients had previous septoplasty with or without turbinate surgery, but none had had a previous rhinoplasty or any previous surgery or trauma to the lower lateral cartilage.

In all cases there was a varying degree of bilateral alar collapse after minimal inspiratory effort. Four patients had tried Francis alar dilators to alleviate their symptoms but had been intolerant of their use; the remainder had either declined to try this prosthesis or were actively seeking a surgical cure for their airway problem.

Surgery was undertaken using the same method in all cases. The patients assessed functional outcome for each nostril at six months and 18 months using a visual analogue scale. On each occasion patients were asked the degree of nasal blockage that they routinely experienced and were asked to score their symptoms on a scale from 0 to 10 (0 being totally blocked and 10 being no sensation of blockage). Because of concern as to possible adverse cosmetic sequelae, the senior author and the patients also evaluated the appearance of the nose at 18 months using a visual analogue scale. Patients were asked whether they were satisfied or dissatisfied with the appearance of their nose and were asked to score the appearance from 0 (highly dissatisfied) to 10 (highly satisfied).

Surgical technique

All patients had an open approach rhinoplasty with insertion of a graft to underpin the lateral crus of the lower lateral cartilage. The risks of open approach rhinoplasty (of the scar, tip oedema and alterations in sensation over the tip) were explained prior to

surgery in each case. Following a stair step (Gunter)¹² incision and elevation of the soft tissues, the lateral crus on each side was everted using a double-skin hook placed at the cephalic rim. A mucosal packet was then created by dissecting the vestibular mucosa from the under surface from the junction of the intermediate crus towards the piriform aperture. Although sharp dissection was required initially, when the relevant plane was established, the mucosa could most often be gently peeled away using a cotton bud dipped in saline. A tunnel over the piriform aperture then fashioned endonasally by making a stab incision above the inferior turbinate and elevating the skin over the lateral surface of the nasal bone. The lateral aspect of the mucosal pocket previously created was then connected to this tunnel by sharp dissection.

Prior to this septal or conchal cartilage was harvested so that a cartilage strut approximately 3–4 mm in width and of appropriate length could be prepared. A single graft was then sutured to the deep surface of the lateral crus on each side. To facilitate this the graft was first anchored by attaching a 3.0 plain catgut suture to its lateral end and by passing this suture, from above, into the tunnel over the nasal bone and through the skin to exit over the face of the maxilla (Figure 2). The graft was then further secured to the deep surface of the lateral crus with one or two sutures of 5-0 Vicryl. The wounds were closed using 3.0 plain catgut to the alar margin and mattress sutures of 5.0 silk to the skin.

All patients received 8 mg of intravenous Dexamethasone intra-operatively followed by 2 mg of

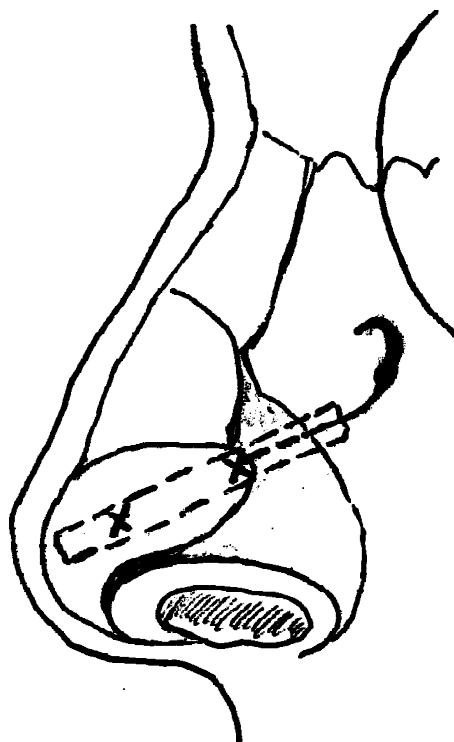


FIG. 2

The cartilage strut placed deep to lateral crus of the lower lateral cartilage.

oral Dexamethasone four times a day for five days post-operatively. No antibiotics were given.

Statistical analysis

Data are presented as median (inter-quartile range; IQR) and statistical analysis performed by non-parametric tests. Visual analogue scale scores for functional outcomes at the pre-operative period, at six months and at 18 months were analysed separately by the Wilcoxon matched-paired sign-rank test and Spearman's rank correlation. Visual analogue scale scores for cosmesis at 18 months as scored by surgeon and patients were compared by the Wilcoxon matched-paired sign-rank test.

Results

One patient developed very marked initial oedema inspite of steroids but this had almost settled completely at six months and was inconspicuous at the last follow-up, 18 months following surgery. Three patients had a degree of residual collapse at six months. On each occasion this was unilateral and did not worsen during the subsequent follow-up period. No patient had a subjective impression of obstruction and all were satisfied with the functional result that had been achieved. As a consequence no revision surgery has, to date, been necessary in any of these patients.

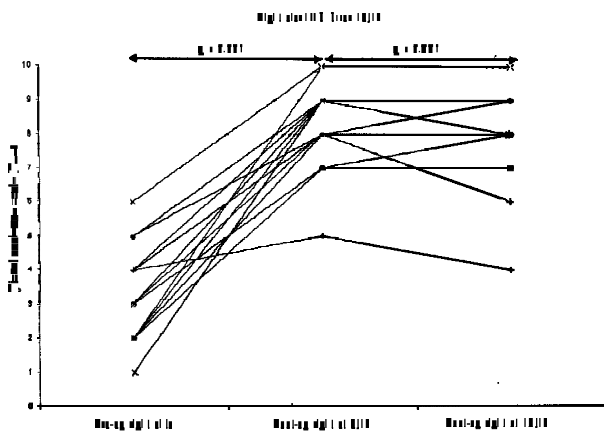


FIG. 3(a)

Functional outcomes of right nasal airway.

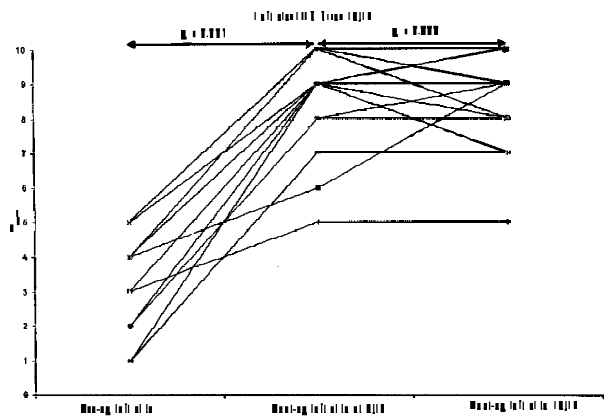


FIG. 3(b)

Functional outcomes of left nasal airway.

Statistical analysis of the improvements in nasal airway performance for the right nostril at six months showed that the improvement achieved was significant ($p < 0.001$) and these results were sustained at 18 months ($p > 0.5$) (Figure 3a). Similar statistically significant results were also seen with the left nostril (Figure 3b). Moreover the visual analogue scale scores at 18 months were highly correlated with the scores at six months for each side (Right side $r = 0.705$, $p = 0.002$; Left side $r = 0.702$, $p = 0.002$).

With regards to cosmetic evaluation, Figure 4a shows the surgeon's scores on the X-axis and the patient's assessment scores on the vertical axis. The graph shows that for each score given by the surgeon the patient's assessment was the same or better. This data is summarized in a box plot form (Figure 4b). It shows that the median patient visual analogue scale score was eight with an interquartile range of seven to nine whereas the surgeon's median score was six with an interquartile range of four to six ($p < 0.001$).

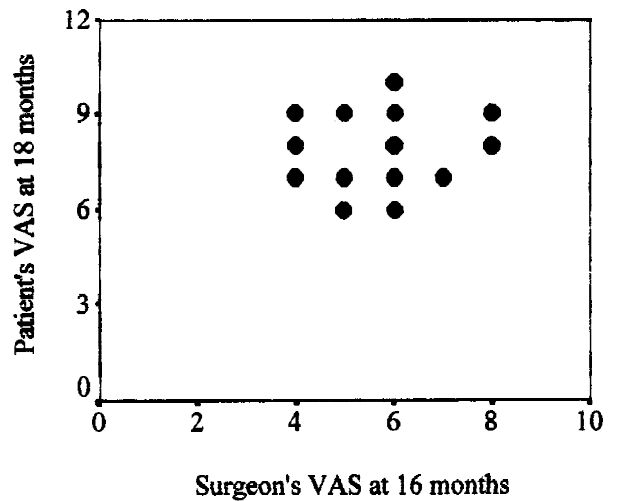


FIG. 4(a)

Visual analogue scale scores for cosmesis.

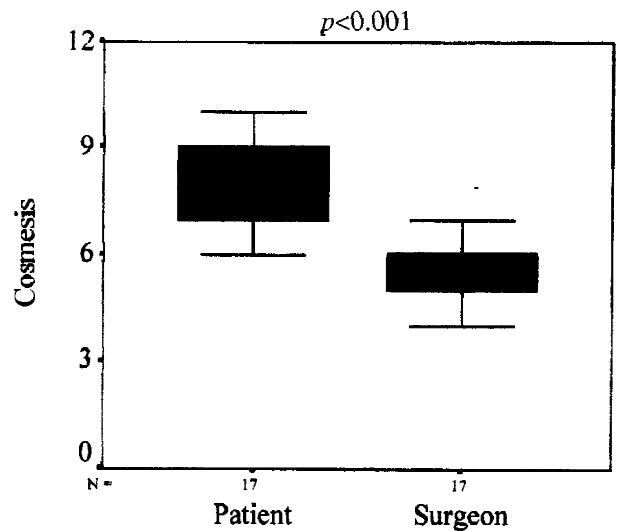


FIG. 4(b)

Cosmetic evaluations at 18 months post-operatively.

Discussion

Nasal airway obstruction is normally considered to be due to skeletal malformation or to a mucosal disorder (atrophy, ciliary dysfunction or mucosal hypertrophy due to atopy or vasomotor challenges). In turn, a skeletal disorder is normally believed to be consequent upon either septal deviation or turbinate hypertrophy. However, in an unknown number of patients, the skeletal malformation causing obstruction is either due to pathology at the junction of the upper lateral cartilage and the dorsal septum (the internal nasal valve) or to collapse of the lower lateral cartilages on inspiration. The action of the latter constitutes an 'external nasal valve'.

The objective of any approach to problems in this area must be to prevent inspiratory collapse while avoiding deleterious cosmetic sequelae. We have no experience of onlay grafts such as those suggested by Bridger⁶ but it seems likely that such surgery would adversely alter the cosmetic appearance of the nose. We have utilized an onlay graft of cartilage, such as has been advocated by Hage,¹⁰ to prevent collapse in two patients who had developed airway problems following previous cosmetic rhinoplasty with resection of the cephalic margin of the lower lateral cartilage. Such an approach was necessary in these cases as, with only a residual caudal rim of lateral crus remaining, the lateral crural strut graft suggested here is impossible to secure. However there was no doubt that this graft compromised the cosmetic appearance of the nose and it is our experience that onlay grafts to the alar rim or placed to overlie the junction of the lower and upper lateral cartilages, that can also be effective and that we have also tried, are frequently cosmetically unacceptable to the patient. This is especially so in those with thin skin and it was this that caused us to seek an alternative method of surgically correcting this problem.

The ergonomics of onlay grafts, as well as being potentially unacceptable to the patient, also seem empirically unsound since simple physical principles would suggest that supporting a structure which has a tendency to collapse inwardly would be most readily achieved by internal buttressing, rather than laying material on its outer surface.

The present technique using an underlay graft seems to result in a satisfactory cosmetic outcome. While no patient having surgery was led to anticipate an improvement in nasal appearance as a result of surgery, it was a concern to ensure that the nose was not altered in a way that would be considered cosmetically unacceptable. It is clear from the results that cosmesis was felt to be satisfactory in the majority of cases by the patients, and the surgeon who analysed the results also considered the nose to be cosmetically satisfactory in the majority of instances. It is of interest that the results for the patients are statistically significantly better for the patients than for the surgeon: perhaps this is not too surprising for it seems that patients are more likely, maybe subconsciously, to consider the score they

register as an overall mark of their satisfaction with the operation – in spite of being asked to consider only the cosmetic appearance.

By 18 months even the patient who developed marked tip oedema had a satisfactory cosmetic result, and significant improvements in nasal airway performance also appear to be sustained at 18 months in spite of three cases of minor residual collapse. There is, of course, a theoretical risk of cartilage absorption or softening with time and longer follow-up might produce cases where the initial symptoms have recurred and further surgery is warranted. However, this has not been true to date.

In conclusion, surgery seems beneficial in cases of external nasal valve or alar rim collapse and alar strut surgery with an underlay graft appears to provide a good medium-term correction of this abnormality without serious adverse cosmetic sequelae. Whether such benefits will be sustained with longer follow-up is, at present, uncertain.

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Mr G. S. Kenyon takes responsibility for the integrity of the content of the paper.

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