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Alar Suspension Sutures in the Management of Nasal Valve Collapse

Jaiganesh Manickavasagam, MRCS, DOHNS, FRCS (ORL-HNS)[1], Isma Iqbal, MBBS MRCS, DOHNS[2], Smeeta Wong, MRCS, DOHNS[1], and Ullas Raghavan, FRCS (ORL-HNS)[1]

Abstract

Objective: This study assesses the efficacy of alar suspension sutures in the management of nasal valve collapse causing nasal obstruction. These sutures are inserted between the vestibular skin and lateral crura and hitched to the periosteum of the medial inferior orbital margin; this is a variation of the alar (change everywhere) suspension suture technique.

Method: A retrospective review of patients who underwent alar suspension suture insertion between January 2009 and December 2010 in the management of nasal obstruction was undertaken. Symptoms of nasal obstruction were assessed using the Visual Analogue Scale (VAS) and peak inspiratory flow rate (PIFR). This was measured preprocedure and repeated at 3, 6, and 12 months postoperatively.

Results: A total of 35 patients were identified, and 26 were included in the study; 90% of patients were satisfied with the outcome of surgery, supported by improvement in the VAS and PIFR scores. The mean difference in VAS preprocedure and postprocedure was 4.97 (*P* value = 0.00), and the average improvement in PIFR was 25.5 L/min (*P* value = 0.00).

Conclusion: Our study shows a significant improvement in patient's symptoms following insertion of alar suspension sutures. It is, therefore, a reliable, safe, and effective technique in treating nasal obstruction secondary to nasal valve collapse.

Keywords

facial plastics, nasal obstruction, nasal surgery, rhinoplasty, nasal obstruction, measuring clinical outcomes in facial plastic surgery

Introduction

The nasal valve was first described by Mink in 1903, and in 1970, Bridger further defined this area as the flow-limiting segment of the nasal airway.[1] This area, being the narrowest point in the nose is at risk of nasal valve collapse secondary to turbulent airflow. This weakness can be further compounded by other factors. This includes iatrogenic causes such as previous nasal surgery, trauma, ageing, and congenital weakness of the cartilage.

There are different surgical options that may be considered for management of nasal valve collapse resulting in nasal obstruction. However, these repairs tend to be complex with variable results and patient satisfaction. Surgical techniques such as cartilage graft insertion may be considered in managing nasal valve collapse. The cartilage graft reinforces the weakened area to reduce valve collapse[2] and can also widen the nasal valve angle.[3] Cartilage grafts include batten grafts, spreader grafts, and butterfly grafts.[2] Sutures, such as flare[4] and suspension sutures,[1] can be inserted to widen the nasal valve. This reduces narrowing of the nasal passage and turbulent airflow and hence valve collapse.

There are different techniques that may be used when inserting suspension sutures for nasal valve collapse. Paniello[3] described a technique of suspension suture insertion under local anesthetic. A polypropylene suture is passed through the endonasal mucosa and brought out through a transconjunctival incision. The suture is then anchored to the orbital rim by tying it around a screw fixed to the orbital rim.[3] An alternative method of suture anchoring used was to thread the suture through 2 holes drilled into the orbital rim.[3] Friedmann et al[5] modified the above technique by using a soft-tissue–bone anchor system to anchor the suture to the orbital rim. This soft-tissue–bone anchor did not

[1]Doncaster Royal Infirmary, Doncaster, UK
[2]Northern Deanery, Newcastle upon Tyne, UK

Corresponding Author:
Isma Iqbal, Northern Deanery, Freeman Hospital, Freeman Road, NE7 7DN, Newcastle upon Tyne, UK.
Email: ismaiqbal@doctors.net.uk

protrude as much as the fixation screw used by Paniello and hence reduced the postoperative fullness in the nasofacial groove.[5] Cartilage struts can be kept as an underlay attached and deep to the lateral crus of the lower lateral cartilage, with one end of the strut resting on the edge of the pyriform aperture.[6] A similar technique is the use of a split rib graft fixed to the margins of the pyriform aperture, supporting the lateral crus of the lower lateral cartilage.[7]

We describe our method of insertion of suspension sutures in the management of nasal valve collapse, reporting the outcome of patient satisfaction and peak inspiratory flow rate (PIFR) measured postoperatively following suture insertion.

Surgical Technique

In outpatients, a thorough history and examination was performed. Following topical decongestion with cophenylcaine (5% lidocaine and 0.5% phenylepinephrine) a modified Cottle's test was undertaken to assess for area of valve collapse. The site where maximal symptom relief was achieved was carefully noted and documented during the consultation (Figures 1 and 2; consent was taken for all images).

All the procedures were performed under general anesthetic by a single surgeon (UR) using the same surgical technique. A 3-0 Prolene suture was inserted into the nasal vestibule between the mucosa and the lateral crura (Figure 3) at the point where maximal symptom relief was achieved during the Modified Cottles Test. The needle of the Prolene suture was then cut, leaving a loop with 2 ends in the nasal vestibule. Following infiltration with Lignospan, a 1-cm incision was then made at the medial end of the inferior orbital margin (Figure 4). We, then, manually straightened a 42G Mayo's needle using a needle holder, and one of the cut ends of the suture was threaded through the eye of the needle and passed through the exit wound (Figure 5). This was then brought out through the incision in the inferior orbital margin, which was made earlier. The same process was repeated for the other end of the suture (Figure 6).

The suture was then threaded through the eye of a 32G Mayo's needle and hitched through the periosteum in the inferior orbital margin, tightened, and tied; the final appearance is as shown in Figures 7 and 8. This suture lifts and supports the valve. It is important to ensure that tension on the suture is not excessive before tying, to avoid unnecessary distortion of the nose. The sutures are not visible through the nose because there is only 1 loop hooked around the crura of the cartilage. The traction sutures and knots in the lower orbital periosteum are buried, and therefore, visibility is not an issue.

Methodology

A total of 35 case notes of patients who underwent alar suspension suture insertion for the treatment of nasal obstruction

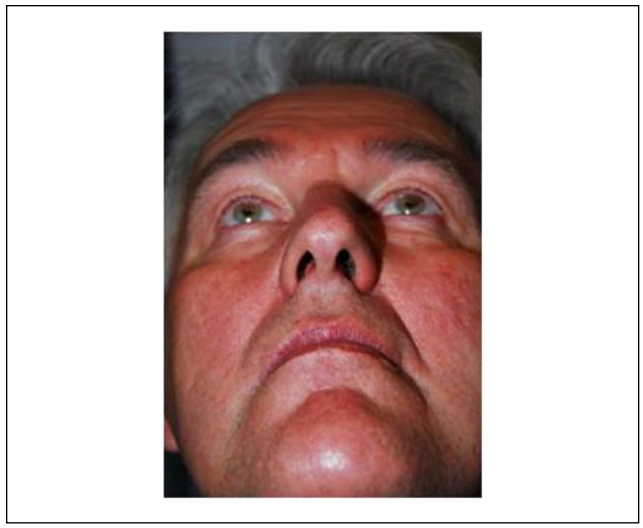

Figure 1. Preoperative alar position at rest.

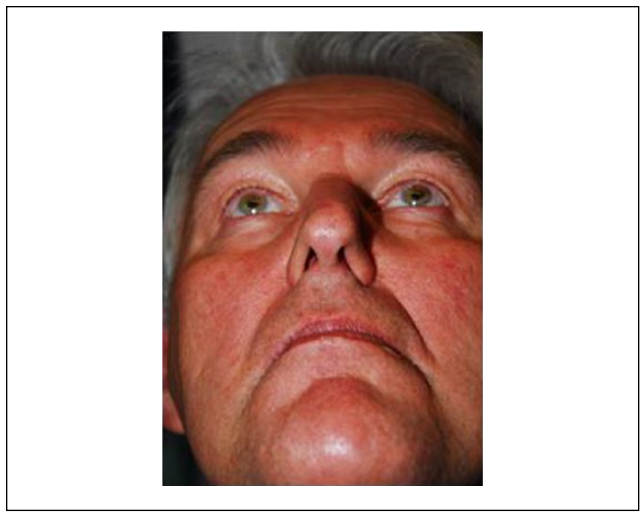

Figure 2. Preoperative alar position during inspiration.

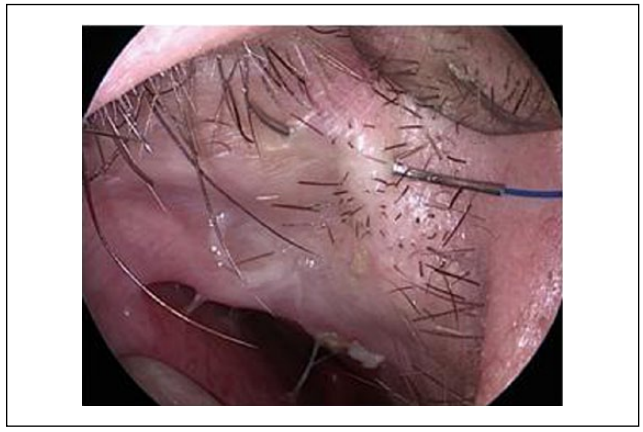

Figure 3. Prolene 3/0 suture inserted in the nasal vestibule between mucosal and lateral crura.

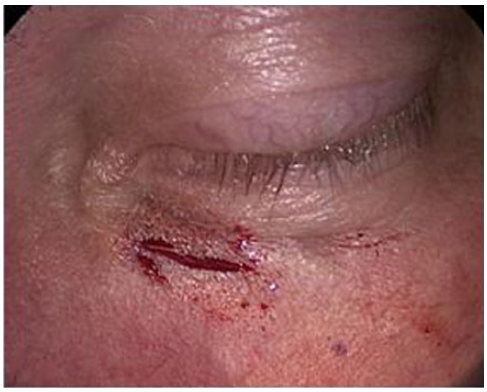

Figure 4. A 1-cm incision is made in the medial end of the inferior orbital margin after local anesthetic infiltration.

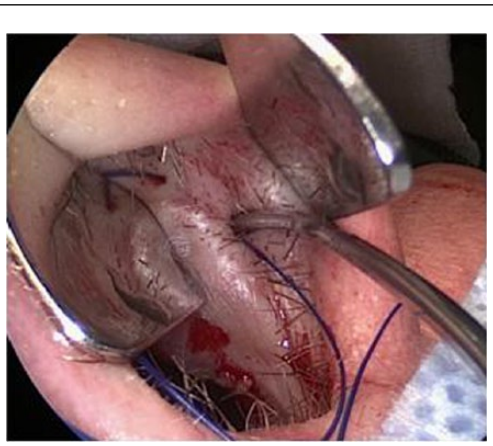

Figure 5. Passing 42G Mayo's needle through the exit wound of the suture.

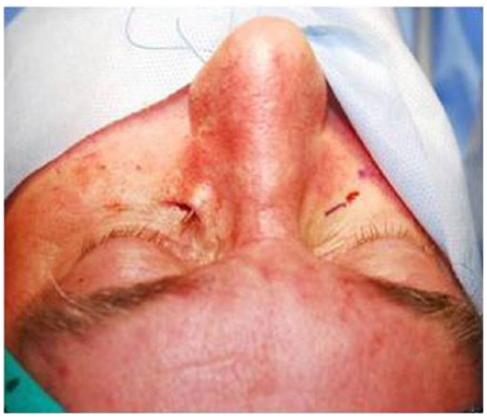

Figure 6. Suture brought out through incision.

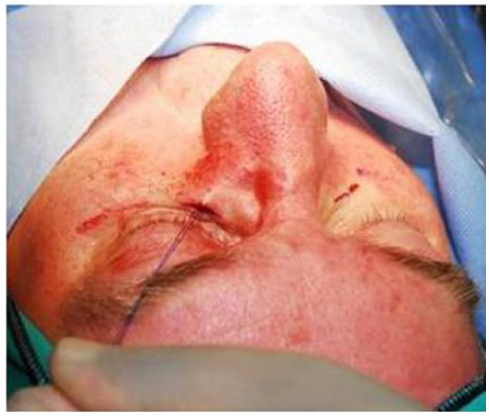

Figure 7. Both ends of sutures brought out through incision and tightened.

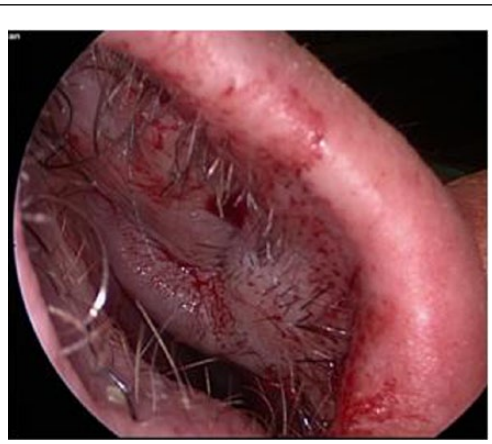

Figure 8. Final endonasal appearance of suture position.

secondary to nasal valve collapse between January 2009 and December 2010 were reviewed. Cases where patients underwent concurrent procedures and where case notes were irretrievable were excluded from our study. Out of 9 patients excluded from the study, 6 patients underwent concurrent procedures, and 3 notes were irretrievable. A total of 26 patients (15 male; 11 female) were included in this study.

Subjective assessment of nasal obstruction was assessed using the Visual Analogue Scale (VAS), where 0 signified no obstruction and 10, complete nasal obstruction. Nasal obstruction was measured objectively using the PIFR meter. This was performed preoperatively and repeated at 3, 6, and 12 months postoperatively. We report the results of patient symptoms postoperatively to assess the efficacy of nasal suspension sutures in the management of nasal valve collapse. Data were entered and analyzed using the Statistical Package for Social Science Version 15 software (SPSS15).

Results

Out of the 26 patients included in this study, 15 patients (58%) were male and 11 (42%) were female. Among them, 23 (88%) patients had bilateral sutures inserted, whereas 1 (4%) patient had a single right-sided procedure and 2 (8%) had a single left-sided procedure.

The preoperative VAS was 7.7, and the postoperative VAS was 2.9. This resulted in a mean difference in VAS of 4.97 (confidence interval [CI] = 4.48-5.46). Statistical analysis using the paired *t* test showed that results were highly significant, with a *P* value of 0.000.

Peak inspiratory flow rate was measured using a PIFR meter. This meter is a safe, simple, and rapid assessment tool used to measure nasal airway patency. It is preferred to acoustic rhinometry because the former gives a measure of dynamic nasal airway resistance during inspiration compared with acoustic rhinometry, which measures the minimum cross-sectional area and volume of the nasal airway and does not take into account changes in nasal airway resistance with respiration.

The average preoperative PIFR was 40.29 and postoperative PIFR was 64.15. The mean difference between the preoperative and postoperative values was 25.5 L/min (CI = 22.33-28.67). The results are highly significant, with a *P* value of 0.000.

Complications after insertions of the suspension suture were minimal. Two patients (8%) developed slipped sutures; this was recognized at 3 months, and they were offered another or alternate surgical management. Two patients (8%) developed neuralgia after 1 week. Patients who complained of neuralgia postoperatively at 3 months were started on a low-dose amytriptyline regime, which controlled their symptoms. This showed that the procedure was well tolerated, with minimal significant postoperative complications.

At 1 year of follow-up, there was no recurrence of nasal valve collapse, and sutures remained intact, demonstrating long-term stability. Follow-up is ongoing, and long-term results will be available in the future (Figures 9 and 10).

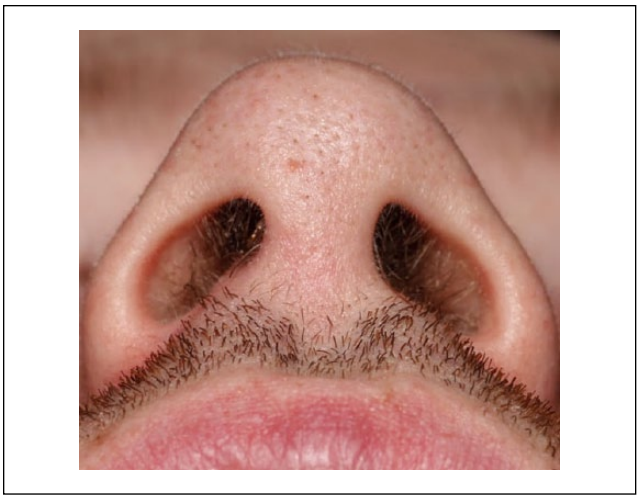

Figure 9. Preoperative view.

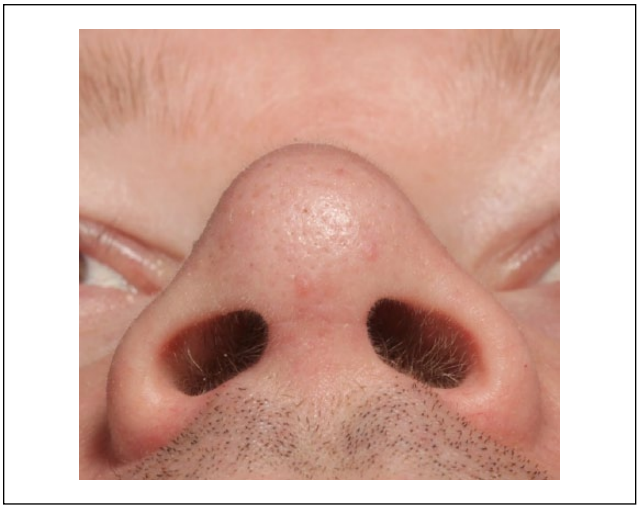

Figure 10. Postoperative view following alar suspension suture.

Discussion

Surgical management of nasal valve collapse may be broadly divided into techniques that increase the cross-sectional area of the nasal valve and those that strengthen the lateral nasal side walls.[8] There are a variety of surgical techniques used, and these techniques can be very complex and technically demanding.

Spreader graft insertion is an example of a technique that increases the cross-sectional area of the nasal valve. These grafts spread the upper lateral cartilages away from the dorsal septum and, thus, increase the nasal valve angle and hence reduce its tendency to collapse.[2] Graft insertion can be approached endonasally or externally and may require harvesting cartilage graft from the concha.

In the management of lateral nasal wall collapse, alar batten grafts may be a useful surgical option to strengthen the lateral nasal wall. This requires a strip of cartilage that spans from the pyriform aperture to the lateral crura. This cartilage is placed in a subcutaneous pocket at the point of maximal lateral nasal wall collapse. This technique also requires donor grafts to be used.

Although both these techniques may be useful in managing nasal valve collapse, they are time-consuming procedures and associated with both surgical site and donor site complications. If the outcome of the intervention is unsatisfactory to the patient, further surgery may become more technically demanding and may cause further structural weakness to the nasal cartilage.

Our surgical technique for insertion of suspension sutures is a technically less demanding procedure. It does not require harvesting of cartilage graft and, hence, is not associated with any donor site morbidity. This procedure merely repositions the alar cartilage without causing any significant change to the morphology of the alar cartilage. It also has the added advantage of being a reversible procedure, if there is any patient dissatisfaction. In case of failure of our technique, other surgical procedures can be undertaken without much difficulty.

Comparing our technique with that described by Paniello, it is less time-consuming because no drilling and screw fixation are required to anchor the suture to the periosteum. The outcomes, both subjective and objective, as seen from improvement in patients' symptom severity and improvement in PIFR were both statistically significant. The findings of our study are supported by that of Paniello[3] and Friedmann et al.[5] Our technique has the benefit of shorter operating time and the use of minimal material and instruments because there is no need for drilling or fixing screws.

One of the limitations of the study is the use of the VAS, because it is not a validated tool. It does, however, provide specific preoperative and postoperative subjective scores. The VAS was only recorded at 3 and 6 months postoperatively. Further values at 12 months postoperatively would have offered a more robust subjective assessment of the procedure.

Conclusions

Our technique for alar suspension is safe, cost-effective, and technically less demanding and yields statistically significant subjective and objective improvement in patient symptoms.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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