

Short Communication

Concha bullosa: reducing middle meatal adhesions by preserving the lateral mucosa as a posterior pedicle flap

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Abstract

Background: Concha bullosa, an extensively pneumatized middle turbinate, may obstruct the paranasal sinuses. Messerklinger's partial lateral turbinectomy is commonly used to debulk the concha bullosa, leaving a raw surface with the potential for adhesions.

Materials and methods: A modified technique of partial lateral turbinectomy is described. A posterior pedicled mucosal flap covers the inferior raw surface of the medial lamella of the middle turbinate. Three-month follow up of a consecutive series is compared with concurrent controls.

Results: Two (7 per cent) of 28 posterior pedicled flap and four (21 per cent) of 19 traditional partial lateral turbinectomies developed mild middle meatal adhesions ($p = 0.011$). Posterior pedicled flap reduced the need for post-operative cleaning of the middle meatus.

Conclusion: The posterior pedicled mucosal flap is a simple modification to partial lateral turbinectomy that covers the raw surface facing the lateral nasal wall, significantly reducing adhesions and speeding recovery.

Keywords: Endoscopy; Turbinates; Surgical Procedures, Operative; Treatment Outcome

Introduction

A concha bullosa is an extensively pneumatized middle turbinate¹ occurring with an incidence of 5 to 25 per cent in the normal population.² It is found more commonly in patients with sinus disease, occurring in 17 to 80 per cent.¹ Fifty-five per cent are unilateral.²

A concha bullosa has the potential to cause crowding and obstruction of the middle meatus and nasal cavity, either on the ipsilateral side or, with a corresponding septal deviation, on the contralateral side. This can result in obstruction of the ventilation and mucociliary drainage of the maxillary, anterior ethmoid and frontal sinuses or of nasal airflow.^{3–5} Additionally, the concha bullosa itself may become diseased and require drainage.⁶

Prior to endoscopic sinus surgery, total middle turbinectomy was used to treat concha bullosa. Subsequently, this was linked with atrophic rhinitis.⁷ Pirsig (1972) and Huizing (1978) described partial resection, removing only the medial lamella of the middle turbinate.^{8,9} This has been associated with olfactory dysfunction.¹⁰

The evolution of endoscopic sinus surgery saw Messerklinger (1978) describe partial lateral turbinectomy. This debulks the concha bullosa, allows access to the middle meatus, bulla and uncinate and provides direct aeration of any diseased mucosa in the concha or connecting ethmoid cells, but sacrifices the lateral mucosa

with the lateral lamella.¹¹ This technique and some simple modifications are currently the most utilized.^{5,6,11–13}

Partial lateral laminectomy results in the raw edges of the medial lamella facing the lateral wall of the middle meatus. The rate of middle meatal adhesions has been described as 6 to 15 per cent, particularly when combined with uncinectomy and other ethmoid surgery.^{6,10} These adhesions can be responsible for blocking the mucociliary clearance of the sinuses which drain into the middle meatus and, consequently, resulting in surgery failure. Various temporary spacers such as gelfilm, gelfoam, splints and merocel sponges reduce such adhesions.¹⁴ Techniques that preserve the lateral mucosa, such as submucosal resection, crushing and 'turbino-plasty', have also been demonstrated to reduce adhesions.^{6,15} However, adjoining ethmoid cells do not have open aeration or drainage, and the concha bullosa is never fully visualized. Additionally, small diseased rests of mucosa may result in the late formation of mucocoeles.¹ Other techniques which have been described with the aim of reducing adhesions include that of May *et al.*, which involves resection of the anterior inferior third of the concha bullosa and crushing together medial and lateral lamellae,¹³ and that of Wigand, in which the medial lamella is folded over and fixed to the roof of the ethmoid using fibrin glue.¹⁰

This paper presents a simple modification of the partial lateral turbinectomy that preserves the lateral mucosa as a postero-inferior pedicled flap. By replacing the lateral

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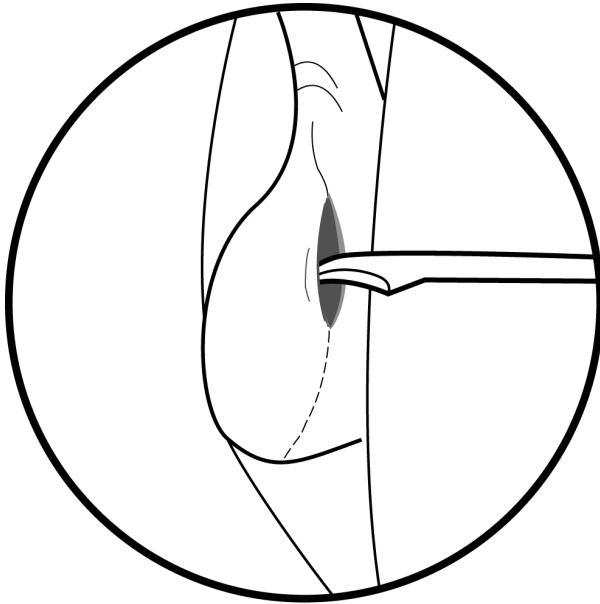


FIG. 1
Vertical incision with sickle knife.

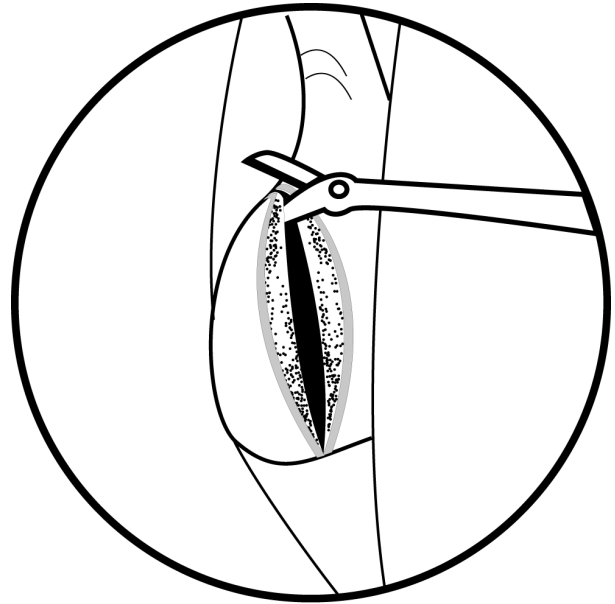


FIG. 3
Dividing the superior edge of the lateral lamella.

mucosa along the inferior inner surface of the medial lamella, the intention is to allow the concha bullosa and adjacent ethmoid cells direct aeration and free drainage, while apposition between the mucosa of the cut edge of the medial lamella and the preserved flap allows primary healing with reduced granulation tissue and middle meatal adhesions. A prospective, consecutive series is compared with concurrent controls to assess: rate of middle meatal adhesions; resolution of symptoms; and toilet requirements in the post-operative period.

Materials and methods

Ethics committee approval was granted and informed consent obtained from all patients undergoing functional

endoscopic sinus surgery in whom the presence of a concha bullosa was clinically significant. This was determined by pre-operative coronal and axial computed tomography (CT) scans and applying the term 'concha bullosa' as defined by Bolger *et al.*¹ The study group comprised those whose operation was performed by the authors, with the preservation of the lateral concha mucosa by the technique described below. Consecutive controls were obtained by reviewing patients with concha bullosa treated by other surgeons on the same unit. All control concha bullosae were treated with partial lateral turbinectomy as described by Kennedy and Zinreich.¹² Gelfilm was used in all patients. The study period was from February to December 2003.

Uncinectomy, ethmoidectomy, frontal sinus surgery, septoplasty and inferior turbinate surgery were performed concurrently as clinically indicated in each individual. Post-operative review was at 2 and 4 weeks and 3 months by both non-investigating and investigating surgeons to reduce the risk of bias. The incidence of adhesions between the middle turbinate and lateral nasal wall on the side of the treated concha bullosa and the resolution of symptoms of sinusitis and nasal obstruction were noted. Significant crusting was defined firstly as requiring toilet at the planned follow up of 2 and 4 weeks and 3 months and secondly by the need for additional follow-up visits.

Surgical technique

Step 1: routine preparation

The nose was prepared as for any endoscopic sinus surgery. We used cophenylcaine spray instilled pre-operatively and then, under general anaesthetic, cotton wool pledgets in 2 ml of 5 per cent cocaine and 1 ml of 1:1000 adrenaline placed in the middle meatus and nasal cavity and left for 10 min. Using endoscopic guidance, 0.5 ml of 2 per cent lignocaine/adrenaline was injected submucosally into the anterior surface of the middle turbinate.

Step 2: mucoperiosteal flap

A sickle knife was used to make a vertical incision into the anterior face of the middle turbinate slightly lateral to its

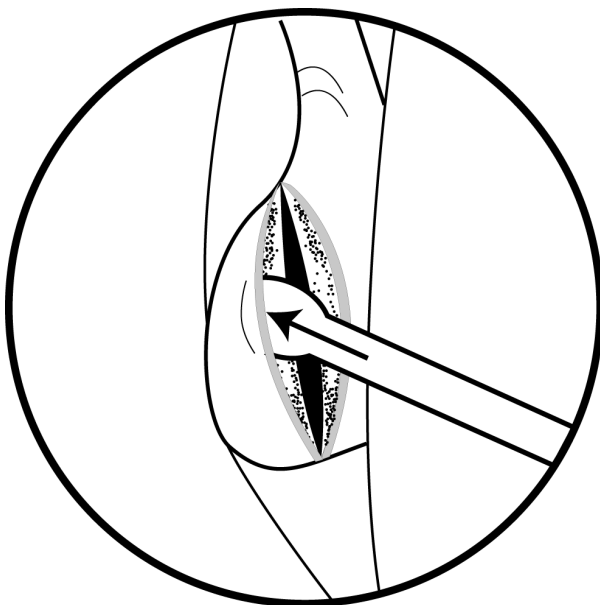


FIG. 2
Raising the lateral mucosal flap.

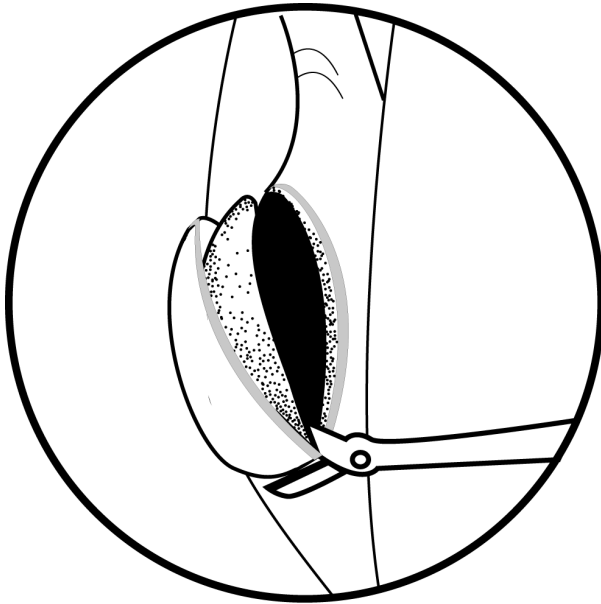


FIG. 4

Dividing the inferior edge of the lateral lamella.

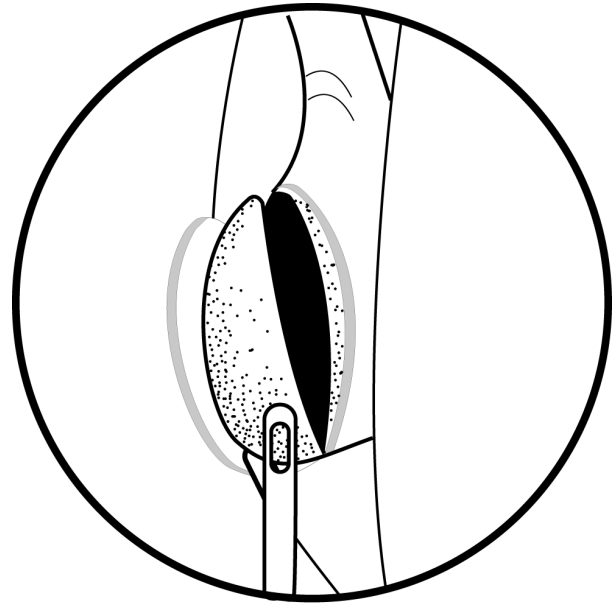


FIG. 5

Removing the bony lateral lamella.

origin (Figure 1). A Freer's dissector was used to create a plane between the bone of the lateral lamella and the lateral mucosal surface (Figure 2). It is important to begin this whilst the lateral lamella is still quite fixed.

Step 3: lateral lamella resection

Straight scissors were used to divide the lateral lamella of the concha bullosa and its overlying mucosa near its superior and inferior borders, posteriorly to the basal lamella of the middle turbinate (Figures 3 and 4). This sharp division, along with the preservation of the horizontal ground lamella, prevented destabilization of the middle turbinate. The mucosal flap was then sequentially raised and folded posteriorly until the bony lateral lamella could be removed using 45° Blakesley forceps (Figure 5). The mucosal flap was fashioned to be pedicled ultimately on the inferior surface of the horizontal ground lamella. Any disease could now be removed from the inner surface of the concha bullosa and any further surgery on the uncinate and ethmoids could be undertaken without loss of the lateral mucosa.

Step 4: flap laid

The pedicled lateral mucosal flap was then laid over the inner inferior surface of the medial lamella of the concha bullosa, taking care not to obstruct adjoining ethmoid cells (Figure 6). Rolled gelfilm was placed in the middle meatus to help hold the flap in place.

Step 5: post-operative care

Patients were started on normal saline nasal spray from the first post-operative day.

Results and analysis

Twenty-eight posterior pedicled flap procedures were performed on 19 patients (nine for bilateral disease) between February and December 2003, with a mean age of 41 years (range 21 to 74). Eleven patients were female and eight male. Twelve control patients underwent 19 procedures (seven for bilateral disease). Seven were

female and five male. The mean age of controls was 46 years (range 30 to 71).

The mean total duration of surgery in patients with bilateral concha bullosa was 91 min (range 55 to 120 min) with the mucosa-preserving technique and 84 min (range 60 to 120 min) in the control group. The mean total surgery time in patients with unilateral concha bullosa was 80 min (range 50 to 115 min) with the mucosa-preserving technique and 77 min (range 65 to 90 min) for unilateral controls.

The mean follow up was 5 months with a minimum of 3 months.

One of the posterior pedicled flap patients developed an adhesion. Four (21 per cent) of the control patients

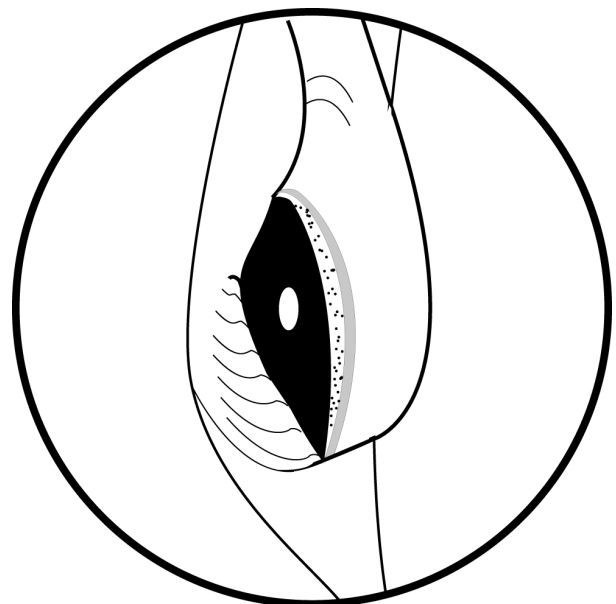


FIG. 6

Laying the posterior pedicled mucosa on the lower edge of the medial lamella.

TABLE
 PATIENTS REQUIRING NASAL TOILET FOR POST-OPERATIVE CRUSTING AT FOLLOW UP,
 OR ADDITIONAL VISITS FOR TREATMENT OF CRUSTING

Treatment	2 weeks	4 weeks	Additional visit	3 months
Traditional concha ($n = 19$)	2 (63%)	5 (26%)	2 (11%)*	0
Posterior pedicled flap ($n = 28$)	11 (39%)	2 (7%)	0	0
p	0.009	0.011	0.044	0

*One patient with a firm adhesion at 6 weeks required surgical division of adhesions.

developed middle meatal adhesions ($p = 0.011$). All adhesions were noted at the first follow up at 2 weeks and divided in the outpatient clinic under topical anaesthesia. One control patient had adhesions at the 4-week visit and was seen at 6 weeks with firm adhesions that required re-operation. The remainder of adhesions did not recur in the follow-up period.

Two patients (7.1 per cent) in the posterior pedicled flap group and two patients (10.5 per cent) in the control group ($p = 0.423$) had recurrent frontal sinusitis symptoms within the study period. One patient with recurrent frontal sinusitis in the control group had middle meatal adhesions on the concha side that required division in the outpatient clinic. Symptoms resolved after division of adhesions and medical treatment. None of the posterior pedicled flap patients with recurrent frontal sinusitis had adhesions. None of the remaining three patients with recurrent symptoms had further surgery in the follow-up period. All other patients in both the study group and control group had resolution of symptoms by the first post-operative assessment.

Therefore, including both adhesions causing recurrent sinus symptoms and adhesions requiring a general anaesthetic for division, the rate of clinically significant adhesions was zero in the posterior pedicled flap group and two (10.5 per cent) in the control group ($p = 0.044$).

The need for toileting of the middle meatus was documented at 2 and 4 weeks and at 3 months. Additional reviews were also recorded. The results are summarized in the Table.

Discussion

Concha bullosa is a common anatomic variant that may contribute to obstruction of the ipsilateral or contralateral middle meatus.³ Partial lateral turbinectomy is the current gold standard for treatment.¹⁰ The posterior pedicled mucosal flap is a simple modification to the partial lateral turbinectomy that, judging from the operating times in our results, adds approximately 3–6 min per side to the procedure.

Adhesions are a common complication of traditional partial lateral turbinectomy because the abraded middle meatus remnant faces the lateral nasal wall.⁶ This study demonstrates that preserving the lateral mucosa via a posterior pedicled flap significantly reduces adhesions, particularly clinically significant adhesions ($p = 0.044$). This may be because it covers the main potential contact surface or that primary mucosa-to-mucosa healing minimizes granulation tissue. Alternatively, it may be that the mucoserous glands and goblet cells that are within the mucosa of the lateral concha and not in the thin mucosa lining of the inner surface of the concha may provide lubrication that is important in preventing drying and crusting. Wigand's work demonstrated the significant variations in the mucosa of the nasal cavity and paranasal sinuses and our own histological sections confirm these. Although the exact mechanism is not clearly elucidated, it

is indicative of the benefit of this modification that, despite the small numbers, we were able to demonstrate that this is statistically highly significant ($p = 0.011$). The benefit is additional to that conferred by spacers, as gelfilm was used in both flap and control arms in this trial.

There are a few potential criticisms of this study. Despite the small patient numbers, statistical significance was achieved for a number of important outcomes. The mean follow up was only 5 months and the minimum was 3 months, but most post-operative adhesions begin development within the first few weeks post-operatively. A longer term review is planned. The fact that different surgeons operated on the control and posterior pedicled flap groups introduces another possible outcome variable, but prevents surgeons with a preconceived bias inadvertently sabotaging the technique. It should also be emphasized that this was not a randomized trial but a control trial to assess the initial potential value of this technique.

In the long term, one might hypothesize that maintaining the resilient lateral mucosa with its secretory elements decreases the risk of atrophic rhinitis. Further recruitment and longer term follow up is planned to assess this.

Conclusion

A mucosa-preserving posterior pedicled flap is a minor modification to partial lateral turbinectomy for concha bullosa that is simple to learn and quick to perform, and reduces adhesions while speeding recovery.

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