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Original Research Article

A clinical study to compare the efficacy of crushing of middle turbinate with lateral partial turbinectomy for concha bullosa

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ABSTRACT

Background: Concha bullosa (CB), a pneumatized middle turbinate is most common variations of sino-nasal anatomy. Identified in approximately ~35% (range 14-53%) of patients, a large CB cause nasal obstruction, recurrent sinus infections and headache, may develop into mucocele or mucopyocele or affect olfaction. Endoscopic lateral partial turbinectomy (LPT) is the standard procedure for the treatment of CB. However, the recurrence of contact points and postoperative synechiae with subsequent frontal recess obstruction are common complications of this technique. Crushing of a pneumatized turbinate preserves the mucosa, less time consuming and carry less risk of complications. The aim of the study was to compare the efficacy of crushing with LPT for the treatment of CB.
Methods: This was a prospective cohort study conducted by convenient sampling in the Department of ENT, KIMS, Hubli, Karnataka, India. In 53 patients, 43 with unilateral and 10 with bilateral CB satisfying the inclusion and exclusion criteria were subjected to either crushing (group A) or LPT (group B). The success of both techniques were compared based on the relief of symptoms assessed by the visual analogue scale, nasal endoscopy and computed tomography (CT) scan after 6 months of surgery.
Results: The overall success rate of the outcome was equal between the two groups, with no statistical ($p>0.05$) difference.
Conclusions: Crushing the CB is as efficient as LPT for the treatment of pneumatized middle turbinate. However, surgically crushed CB can get re-pneumatization in some patients.

Keywords: Concha bullosa, Lateral partial turbinectomy, Crushing

INTRODUCTION

Nasal obstruction, a prevalent concern within otorhinolaryngology, often stems from anatomical variations like deviated nasal septum (DNS) and hypertrophied inferior turbinate. The advent of advanced diagnostic tools, including computed tomography (CT) scans and nasal endoscopy, has brought to light the frequent occurrence of pneumatized turbinates, specifically Concha Bullosa (CB), as a contributing factor to nasal obstruction.[1] The relationship between CB and sinusitis or septal deviation (SD) has been extensively explored, with some researchers suggesting a significant role of CB, especially the bulbous type, in the development of recurrent or chronic sinusitis.[2] The presence of SD is often linked to a substantial CB, which can impede sinus openings, exert pressure on adjacent structures, and lead to symptoms such as congestion or sinus pain.[3] The severity of CB symptoms is intricately tied to the degree of pneumatization. Various surgical approaches have been described to address CB, with endoscopic LPT being the most common. However, complications such as middle turbinate instability, and postoperative adhesions leading to osteo-meatal complex and frontal recess obstruction have been observed.[4] In contrast, crushing the pneumatized turbinate may pose a reduced risk of such

complications. The aim of the study was to fill a gap in the existing literature by conducting a comprehensive comparative analysis of the efficacy of crushing and LPT in the treatment of CB. Surgical outcomes including recurrence rates, middle turbinate stability, and the occurrence of postoperative complications will be meticulously examined. The findings from this research hold the potential to inform international practices in the surgical management of CB-related nasal obstruction.

METHODS

A prospective cohort study was conducted by convenient sampling between September 2015 to August 2016 on 53 patients aged above 13 years at Karnataka Institute of Medical Sciences, Hubli, Karnataka, India. The study was approved by the Institutional Ethics Committee. All patients had symptomatic concha bullosa proved clinically and radiologically by CT scan. Only those patients with CT which showed pneumatization greater than 50% of its vertical length of middle turbinate, were included and underwent CB surgery by using one of the two techniques which are endoscopic crushing and LPT. Patients who had allergic rhinitis or polypoid middle turbinate were excluded. Total 63 procedures were done for CB. 43 patients with unilateral CB and 10 patients with bilateral CB were allocated consecutively to either of the 2 groups: group 1 (crushing, n=31) and group 2 (LPT, n=32). All procedures were performed endoscopically and the surgery was done under general anesthesia.

The success of both techniques were compared on the basis of relief of symptoms assessed by the Visual Analogue Scale (Figure 1).[5] A zero-degree endoscope was used for both the techniques. The incidence of complications like synechiae, CSF leak, unstable turbinate and re-pneumatization of CB were assessed by nasal endoscopy and CT scan at about six months after surgery.

Surgical technique

Crushing

William Watson's forceps were modified by smoothening the serrated surface of the forceps to crush the turbinate without injuring the mucosa. After topical vasoconstriction of nasal cavity, infiltration anaesthesia with 1% lignocaine+1:100000 adrenaline infiltrated on anterior aspect of middle turbinate. Following this turbinate was held with the forceps and crushed from anterior to posterior direction. Gel foam was placed medial and lateral to the middle turbinate.

Lateral partial turbinectomy

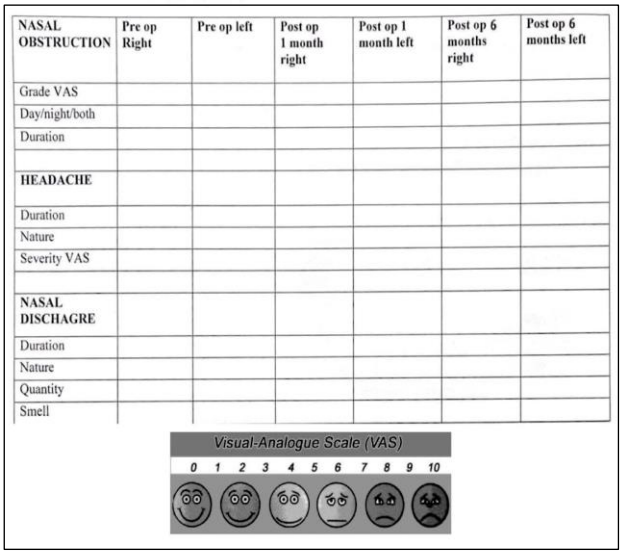
After topical vasoconstriction of nasal cavity, infiltration anaesthesia with 1% lignocaine+1:100000 Adrenaline infiltrated on anterior aspect of middle turbinate. Following this incision was made on anterior surface of MT with sickle knife and was extended inferiorly and superiorly. Lateral lamella was separated using Freer elevator, its attachments excised using FESS scissor and removed by Blakesley forceps. Gel foam was placed medial and lateral to the middle turbinate. These procedures were done according to the standard description in the literature.[4]

Follow up

Follow-up was done after 6 months of surgery. The outcomes were assessed in terms of: (1) subjective relief of symptoms assessed by visual analogue score (Figure 1), and (2) the middle turbinate status, synechiae, unstable turbinate and any other complications by diagnostic nasal endoscopy and repeat CT scan.

Statistical analysis

All the data were entered into the SPSS version 20.0 computer software and the results were tabulated. The level of significance was considered at $p<0.05$ at 95% confidence interval. The observations were compiled and subjected to statistical tests using the Chi square test, Yates's correction, and Fisher's exact test.



NASAL OBSTRUCTION	Pre op Right	Pre op left	Post op 1 month right	Post op 1 month left	Post op 6 months right	Post op 6 months left
Grade VAS						
Day/night/both						
Duration						
HEADACHE						
Duration						
Nature						
Severity VAS						
NASAL DISCHAGRE						
Duration						
Nature						
Quantity						
Smell						

Figure 1: Visual analog score.

RESULTS

Among the 53 patients who underwent surgery, 10 had bilateral CB. So, a total of 63 CB were operated. Among them, 22 were females (34.92%) of which 9 underwent crushing and 13 underwent LPT. 41 cases were male (65.8%), of which 22 underwent crushing and 19 underwent LPT. There was no statistical ($p>0.05$) difference in the gender distribution between the two groups (Table 1). In the present study, most of the patients were in the age group of 21 to 30 years. 16 patients were in the age group≤20 years (25.40%), 29 patients were in the age group 21-30 years (46.03%). 18 patients were in

the age group≥31 years (28.57%). The youngest patient was 15 years old and the oldest was 65 years old. The mean age was 28.44 years overall, 27.10 years in group A and 29.75 years in group B (Table 2).

The common presenting symptom in all the patients were nasal obstruction (82.55%), followed by headache associated with nasal obstruction. 16 patients underwent surgery only on the CB, and 28 patients underwent septoplasty along with the CB. In group A, 17 patients underwent septoplasty along with CB.

In group B, 11 patients underwent septoplasty along with CB. There was no statistically (p>0.05) significant effect of performing septoplasty on the outcome of the surgery (group A: p=0.5809, group B: p=0.9217). The status of relief of symptoms assessed after 6 months showed no statistically (p>0.05) significant difference among group A and group B (Table 3).

There were no major intra-operative complications in any of the 63 procedures. Post-operatively, the following complications were observed and there was no statistical (p>0.05) difference in the frequency of complications between the two groups. Synechiae was the most common complication among both groups (Table 4). A total of 7 cases (22.58%) had synechia in group A, and 4 cases (12.50) in group B.

Group A were 4 patients had synechiae between the lateral nasal wall and MT, and 3 patients had synechiae between the septum and MT. Group B were 3 patients had synechia between the MT and lateral nasal wall and 1 patient had synechia between the septum and MT. One patient in group B had an unstable turbinate and was asymptomatic by 6 months. No surgical intervention was required. Among 31 cases, 2 (6.45%) cases had re-pneumatization after 6 months of crushing. The two cases were 27-years old male and 38-years old female.

Table 1: Sex distribution in the two study groups.

Gender	Crushing	%	Lateral partial turbinectomy	%	Total	%
Male	22	70.97	19	59.38	41	65.08
Female	9	29.03	13	40.63	22	34.92
Total	31	100.00	32	100.00	63	100.00
Chi-square=0.9321, p=0.3353						

Table 2: Age distribution in study groups.

Age groups (years)	Crushing	%	Lateral partial turbinectomy	%	Total	%
≤20	8	25.81	8	25.00	16	25.40
21-30	16	51.61	13	40.63	29	46.03
≥31	7	22.58	11	34.38	18	28.57
Total	31	100.00	32	100.00	63	100.00
Chi-square=0.932, p=0.3353						
Mean age	27.10		29.75		28.44	
SD age	9.97		12.83		11.50	

Table 3: Comparison of two groups (crushing and lateral partial turbinectomy) with status of symptoms after 6 months.

Symptoms	Crushing (N)	%	Lateral partial turbinectomy (N)	%
Absent	27	87.10	28	87.50
Present	4	12.90	4	12.50
Total	31	100.00	32	100.00
Chi-square with Yates's correction=0.0001, p=1.0000				

Table 4: Comparison of two groups (crushing and lateral partial turbinectomy) with status of synechia at 6 months.

Synechia	Crushing (N)	%	Lateral partial turbinectomy (N)	%
Absent	24	77.42	28	87.50
Present	7	22.58	4	12.50
Total	31	100.00	32	100.00
Chi-square=1.1104, p=0.2920				

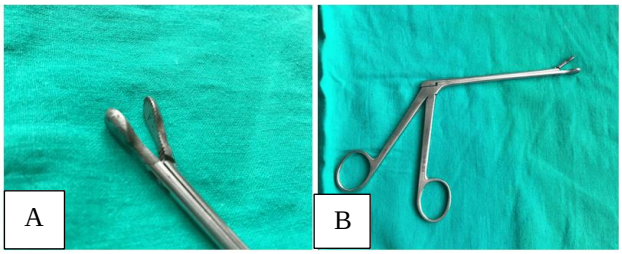


Figure 2 (A and B): William Watson's forceps (modified).

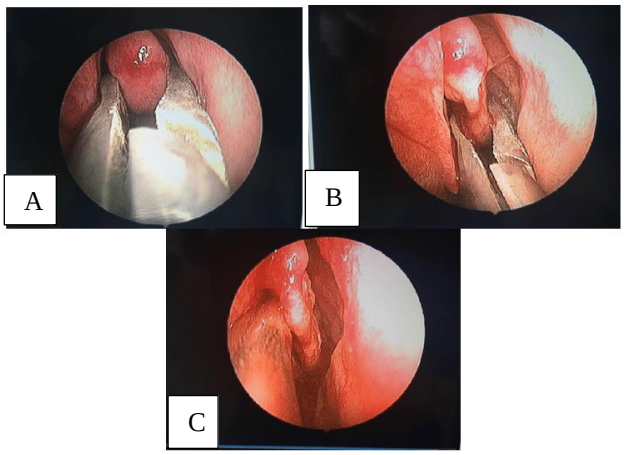


Figure 3 (A-C): Series of pictures showing the procedure of crushing.

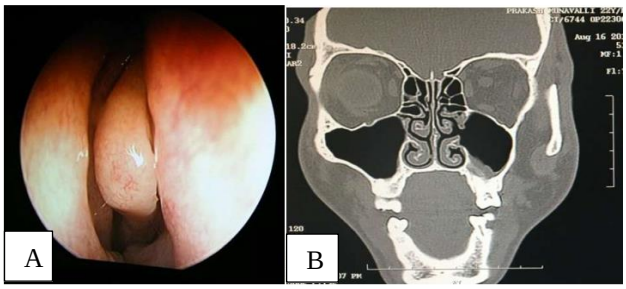


Figure 4 (A and B): Post-operation DNE picture and CT scan after 6 months of crushing.

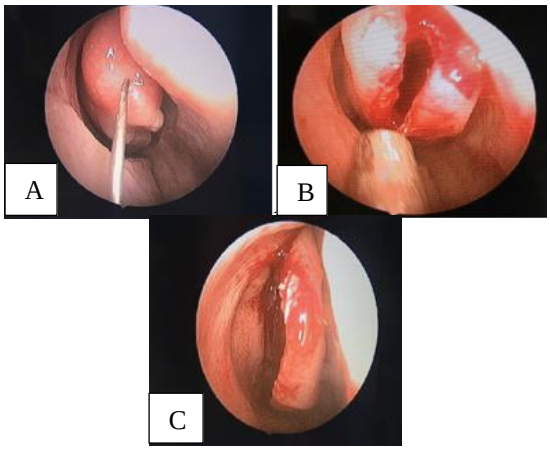


Figure 5 (A-C): Series of pictures showing the procedure of LPT.

DISCUSSION

Nasal obstruction is one of the common symptoms addressed in the ENT outpatient department. Various reasons lead to nasal obstruction, the most common being a deviated nasal septum. With the use of CT scans in evaluating these patients, CB is one of the most common anatomical variants encountered causing significant nasal airway narrowing. The relationship between CB and sinusitis or SD has been investigated in many studies.[3,7]

Some authors claimed CB, particularly bulbous type, has an important role in the development of recurrent or chronic sinusitis.[3,8,9] According to a study done to assess the prevalence of sinusitis with CB, sinusitis was more prevalent in cases having CB (48% of CB cases) than those had no CB (5.9% of cases with no CB). There are various surgical techniques designed to treat CB. These include partial or total resection and crushing of the turbinate.[6,10] Many studies were done to assess the outcome of crushing and the incidence of re-pneumatization of crushed CB.[11-13]

The aim of this study was mainly to determine the efficacy of crushing CB and compare it with the standard technique, LPT. There are 3 types of CB depending on the extent and site of pneumatization.[14] A study evaluated long-term results of crushing technique in 71 patients, dividing them into three groups according to their types (group 1 lamellar type, group 2 bulbous type, group 3 extensive type).[4] Comparison between groups showed significant post-operative reduction. There was no recurrence in long-term outcomes. More volume reduction was seen in the bulbous type of CB. Hence, in the current study, only those cases that had a bulbous type of CB with an extent of pneumatization of middle turbinate greater than 50% of its vertical length were included for the convenience of comparison.

In the present study, the age range was 15 years to 65 years (mean age=28.44 years). Most of the patients were in their third decade (46.03%). This is comparable to the age distribution as reported in other studies.[2,15]

Total 53 patients (43 unilateral CB and 10 bilateral CB) were included in present study. Contrarily, few studies showed greater prevalence of bilateral CB.[16-18] There were a total of 22 females (34.92%) and 41 males (65.08%) in the present study group. This is contrary to other studies wherein a female preponderance was noted.[3] There was a higher incidence of CB in females (58.9%) compared to males.

In our study nasal obstruction was the most common symptom (82.55%), followed by headache (25.40%). Another symptom was nasal discharge. Two patients presented with CSOM with SD and CB. The incidence of symptoms were same in other studies where they found nasal obstruction was presenting symptom in all the

patients, with headache or facial pain being the next most common.[14,15]

In both the surgical procedures, no major complications were noted. The most common minor complication noted in both the groups of the present study was synechiae, which was similar to the findings noted in the other studies.[19] Three (12.50%) patients developed synechiae who underwent LPT and 7 (22.58%) patients developed synechiae who underwent crushing. One patient who underwent LPT developed an unstable turbinate and was asymptomatic by 6 months. No surgical intervention was required. In other study, one group who underwent LPT, 3 (11.4%) patients developed synechiae and 1 (3.8%) had a severe epistaxis but none in the other group who underwent conchoplasty.[15]

In the present study 28 out of 32 CB cases who underwent LPT and 27 out of 31 CB cases who underwent crushing were symptom-free when evaluated at the end of 6 months. Different instruments were used in different studies to crush CB. In a study conducted by Willner et al the turbinate was grasped with a pair of pituitary forceps and crushed.[20] In another study done by Song et al the Jansen-Middleton rongeur was used to crush the pneumatized middle turbinate from inferior to superior.[21]

However, in the present study, we used William Watson's forceps, which was modified by smoothening the serrated edges to crush the turbinate. Among 31 cases that underwent crushing, 2 (6.45%) cases had re pneumatization after 6 months of procedure. The two cases were a 27-year-old male and 38-year-old female. Study analysis by comparative demography and other parameters between the two groups shows that there was no statistically significant difference between the two groups in terms of age or gender distribution or in terms of symptom severity at presentation.

CONCLUSION

The conclusion of this study was that the overall success rate of outcomes for both the groups were equal. There was no statistical ($p>0.05$) difference in the outcome of the two groups. The most common complication noted in both groups was synechiae with no significant ($p>0.05$) difference in the frequency. One patient who underwent LPT had an unstable middle turbinate, while two patients who underwent crushing had re- pneumatization after six months. The efficacy of crushing the CB is as good as LPT. However, it is inconclusive whether these therapeutic effects are maintained for long term. Surgically crushed CB can cause re-pneumatization in some patients as noted in our study.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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