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Assessment of Results of Conchomeatoplasty Using Subjective and Objective Parameters in Canal Wall Down Mastoidectomy

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Abstract

Introduction:

Conchomeatoplasty is an important step of canal wall down mastoidectomy performed to promote dry, self-cleaning ear. Various techniques of conchomeatoplasty have been described and each has documented good results. However, a consistent and reliable method of assessing the outcome has not been explored. This study focuses on assessing the results of radial incision technique of conchomeatoplasty advocated by us using both subjective and objective parameters.

Materials and Methods:

A prospective observational study was designed to assess 55 patients of canal wall down mastoidectomy with conchomeatoplasty. These patients were evaluated for the ear canal size at 3 and 6 months post operatively. A modified chronic ear survey questionnaire where patients' activity restriction, symptoms and medical resource utilization subscale were noted for subjective outcome. Objective evaluation analysed otoscopic visibility of superior limit, floor of mastoid bowl and sino-dural angle.

Results:

The mean size of external auditory meatus at 3 and 6 months were 9.861 mm and 10.145 mm respectively. At 6 months follow up, there was a significant association between visibility of landmarks and size of external auditory canal as well as with the necessity of water restriction. However, there was no association of size of ear canal with interference with social activity, frequency or quantity of ear discharge and frequency of physician's visit.

Conclusion:

Using subjective and objective parameters facilitates a consistent and measurable assessment of the outcome of conchomeatoplasty rather than considering the size of meatoplasty alone. The radial incision technique advocated in the present study gives good postoperative results.

***Keywords*:** Radial incision, Conchomeatoplasty, Chronic ear survey questionnaire, Chronic otitis media, Mastoid bowl, Patient satisfaction, Activity restriction

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Introduction

Conchomeatoplasty is an essential part of canal wall down mastoidectomy which is performed to promote dry, self-cleaning ear and to allow for inspection of the mastoid cavity during follow up out patient visits.

An adequate meatoplasty allows proper ventilation of the mastoid bowl, prevents microbial growth, accumulation of debris and recurrence of disease in the mastoid cavity (1).

However, the importance of assessment of the results of conchomeatoplasty has not been studied in the literature so far. Various techniques have been documented by different authors to achieve adequate meatoplasty.

Authors have mentioned diverse modifications of the skin flap of the external auditory canal, removal of the conchal cartilage in the inferior and posterior quadrant and also removal of antero superior part of the cartilaginous ring of the ear canal, to facilitate circumferential widening of the meatoplasty (2). In addition, use of tension sutures for suturing the remnant conchal cartilage with the mastoid periosteum has also been recorded (3). All these techniques have been reported to have good outcome and there are no superiorty or inferiority trials on it till date.

An ideal meatoplasty should be able to give cosmetically acceptable results while avoiding canal stenosis or disease recurrence after mastoidectomy (4).

At the same time, it should facilitate easy inspection of the mastoid cavity during follow up. Traditionally a large meatoplasty has been perceived to have a better outcome (5).

But there is no evidence to show the association between the size of conchomeatoplasty and the outcome of surgery. A consistent and validated means of outcome assessment of conchom- eatoplasty has not been discussed in the literature so far (6).

The lack of a standardized assessment tool makes it challenging to definitively correlate the dimensions of the meatoplasty with the clinical outcome.

This study aims to assess the post-operative results of the present technique of radial incision conchomeatoplasty and to evaluate the outcome of conchomeatoplasty using both subjective and objective parameters.

Materials and Methods

The study was done in a rural tertiary care hospital, with a study design being prospective observational in nature. For the study, 55 patients who were diagnosed with Chronic Otitis Media with or without cholesteatoma and who underwent canal wall down mastoidectomy with conchomeatoplasty with the present technique during a period of two years were considered. Convenience sampling method was advocated. The patients who had undergone revision mastoidectomy, chronic otitis media with complications, mastoid obliteration procedures and history of malignancy in head and neck region, traumatic injury to pinna, allergic rhinitis and with history of diabetes were excluded from the study.

The technique of conchomeatoplasty advocated by us was different from that in existing literature. In this technique, two radial incisions were placed in the external auditory canal. The first posterior superior incision began in root of ascending limb of helix. The second radial incision was in the posterior inferior quadrant, from the bony cartilaginous junction medially to the conchal cartilage laterally (Fig1).

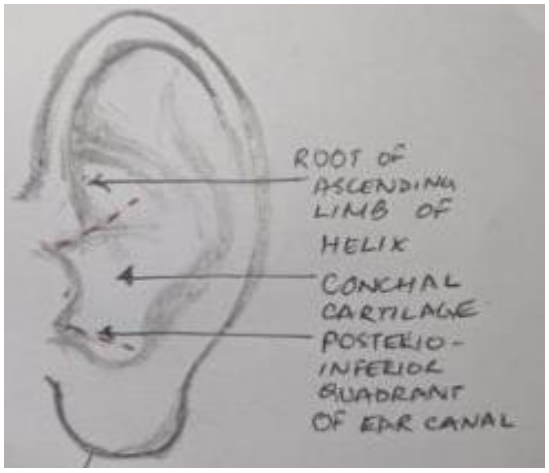

Fig. 1. Diagramatic representation of radial incisions below ascending limb of helix to concha and posterio-inferior quadrant of external auditory canal to concha in the left ear

The skin flap was then elevated from the cartilage so as to obtain a laterally based flap exposing a large part of the conchal cartilage (Fig. 2).

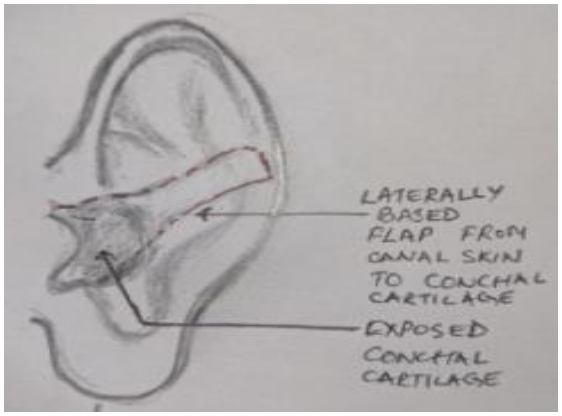

Fig. 2. Diagramatic representation of elevation of canal skin as a laterally based flap from lateral to the bony cartilaginous junction to the conchal bowl

This part of cartilage from the conchal bowl was removed and the size of the resultant meatoplasty was checked per operatively using the tip of surgeon's little finger as is often done traditionally (Fig 3,4).

Fig. 3. Intra operative image of elevation of canal skin as a laterally based flap

Fig. 4. Intraoperative image of excision of conchal cartilage

No tension sutures were applied and there was no necessity of removal of soft tissue from the posterior part of pinna. The patient was followed up postoperatively at 3 months and 6 months for assessing the size of meatoplasty. Both the primary and secondary outcome variables were studied for assessing the results of meatoplasty during both the the follow-ups.

Primary outcome variables included the following objective measures: the calliper-measured size of the meatoplasty along the outermost part of the external auditory canal in its greatest diameter, at 3 and 6 months, and the otoscopic findings of the mastoid bowl at 6 months. Objective otoscopic evaluation analyzed the visibility of three key landmarks: the superior limit of the mastoid cavity, the floor of the mastoid bowl, and the sino-dural angle. To ensure reproducibility in measurement and eliminate inter-observer variability, all postoperative measurements of the external auditory canal were performed by a single, dedicated independent staff member who was not part of the surgical team. Measurement of the size of the conchomeatoplasty was done using Vernier callipers at a standardized landmark,which was taken at the outermost part of the external auditory canal along its greatest diameter (Fig. 5,6). Intra-observer reliability was maintained by taking the average of three consecutive calliper measurements taken during each visit.

Fig. 5. Measuring the size of external auditory canal at the greatest diameter with Vernier Calipers

Fig. 6. Left meatoplasty at 6 months follow up

The secondary outcome variable was based on a modification of the Chronic Ear Survey Questionnaire (6,7) with questions based on hearing outcomes being subtracted from the questionnaire without any additions, hence maintaining the validity of the questionnaire. Accordingly the patients were asked about the following:

Activity Restriction-Based Subscale

A1 At the present time, how severe a limitation is the necessity to keep water out of your ears?

- Severe
- Moderate
- Mild
- None

A2 In the past 4 weeks, has your ear problem interfered with your social activities with friends, family, or groups?

- All of the time
- Most of the time
- Some of the time
- None

Symptoms subscale:

S1 Drainage from your ear is:

- Severe
- Moderate
- Mild
- None

S2 In the past 6 months, please estimate the frequency that your affected ear has drained:

- Constantly
- Sometimes
- Not at all

Medical Resource Utilization Subscale:

M1 In the past 6 months, how many separate times have you visited your physician, specifically about your ear problem?

- >5 times
- 3-4 times
- 1-2 times
- Not at all

For deducting the correlation between the various outcome variables, the size of external auditory canal were grouped as wide if it is more than 11 mm, adequate size if it is 8 to 10 mm, narrow if it is 5 to 7 mm and tight if less than 5. A total of 55 patients were included in the study. (Table 1).

Table 1. Number of patients as per post operative sizes of external auditory canal at 3 and 6 months follow up

Group	Diameter in mm	No of patients at 3 months	No of patients at 6 months
Wide	>11mm	19	23
Adequate	8 -10 mm	15	16
Narrow	5-7 mm	16	12
Tight	<5 mm	5	4

Results

To evaluate the changes in canal dimensions over time, the absolute size of the external auditory meatus measured at 3 months was compared to the size at 6 months using a paired t-test. The mean size of the external auditory meatus was 9.861 mm (S.D +/- 2.14) at 3 months and 10.145 mm (S.D +/- 1.98) at 6 months. The paired t-test revealed a statistically significant mean increase between the 3 and 6 month intervals ($p < 0.05$), indicating a small widening of the canal with resolution of oedema over the post operative period of 6 months. Consequently, the patient Chronic Ear Survey Questionnaire metrics (activity restriction, symptoms, and medical resource utilization subscales) were correlated specifically against the 6-month canal measurements using the Chi-square test of independence. When analyzing the association between the three categories of the size of the meatoplasty and the subjective necessity for water restriction, a statistically significant association was observed ($x^2 = 18.35$, d.f. =9, $p< 0.05$).

Similarly, there was a statistically significant association between the size of the meatoplasty and the objective otoscopic visibility of surgical landmarks ($x^2 = 15.42$, d.f. = 6, $p < 0.05$), with wider canals demonstrating clearer visibility (Table 2).

Table 2. Subjective and objective parameters assessment in different patient groups at 6 months follow up

Subjective Parameters	Size of conchomeatoplasty	WIDE N=23	ADEQUATE N=16	NARROW N=12	TIGHT N=4	p value
Necessity for water restriction	None	1	1	1	1	<0.05
	Mild	2	3	1	1	
	Moderate	7	2	4	1	
	Severe	13	10	6	1	
Interference with social activity	All the time	3	1	1	2	>0.05
	Most of the time	3	5	1	0	
	Some of the time	6	7	2	1	
	None	11	3	8	1	
Discharge from ears	Severe	6	4	5	0	>0.05
	Moderate	4	5	4	1	
	Mild	7	4	1	2	
	None	6	3	2	1	
Frequency of discharge from ears	Constantly	5	5	2	1	>0.05
	Sometimes	6	5	7	2	
	Not at all	12	6	3	1	
Frequency of physician visits	>5 time	3	2	1	1	>0.05
	3-4 times	3	5	4	0	
	1-2 times	4	4	5	2	
	Not at all	13	5	2	1	
Visibility of landmarks	All 3 visible	19	9	6	1	<0.05
	2 visible	3	4	5	1	
	1 visible	1	3	1	2	

Conversely, no statistically significant association was found between the postoperative canal size and the severity or frequency of ear discharge ($p > 0.05$). Furthermore, canal size did not significantly associate with the frequency of physician visits or the degree to which ear problems interfered with social interactions ($p > 0.05$) (Table 2).

On objective analysis of the visibility of landmarks in the post-operative mastoid cavity at 6 months, all three landmarks (superior limit, floor, and sino-dural angle) were completely visible in 63.6% (n=35) of patients. In 23.6% (n=13) of patients, only two landmarks were visible, while the remaining patients presented with one or fewer visible landmarks due to narrowing. No severe post-operative scarring, complete canal stenosis, or major cosmetic deficits of the pinna were reported within this short period of follow up, although delayed healing with local granulation tissue was observed and managed in one patient.

Discussion

The conchomeatoplasty in canal wall down mastoidectomy is a crucial procedure to ensure a self-cleaning mastoid bowl and prevent disease recurrence. The size of the meatoplasty has traditionally been considered as the principal factor determining the success of the procedure (7). However, the present study has suggested a contradiction to this established belief wherein it has been found that the success of the procedure may not be determined by the size alone. This is in conformity with Kristen et al who disputed the idea of a large sized meatoplasty for a dry ear after tympanomastoid surgery (8).

Various techniques of conchomeatoplasty that has been described in the literature have reported good outcome. Faramarz M et al had reported a technique of meatoplasty where two incisions were placed at 12 and 5 O clock in the canal skin and conchal cartilage along with three polyglactin 910 in the posterior cartilaginous ring in a radial fashion (9). Our radial incision technique is based on similar principle where the incisions facilitate to widen the cartilaginous meatus along the posterior canal without the use of any tension sutures or removal of fibrofatty tissue hence maintain the aesthetics of the pinna and external canal. Raut and Rutka described a technique called Toronto Meatoplasty emphasising the need of removing tragal and conchal cartilage along with fibrofatty tissue for patients undergoing endaural canal wall down mastoidectomy (10). Joon Choi IK et al described in his novel technique partial excision of the cavum conchal cartilage and suturing its anterior end to the mastoid periosteum (11). Tunkel had described a technique called Z meatoplasty where an

incision was made along the posterior and inferior margin of the concha and continued at the posterior ear canal and down into the superior cartilaginous canal (12). Hunsaker had proposed conchomeatoplasty wherein the skin flap was based posteriorly similar to the present study. In addition a skin graft was used by Hunsaker to cover the defect of the conchal bowl (13) .

In the radial incision technique of meatoplasty advocated in the present study the mean diameter at 6 months was 10.145 mm. This is comparable to Wormald et al who had documented to have achieved a mean diameter of 10.1 mm in his technique of meatoplasty (14). The exposure of the mastoid bowl with our technique was sufficient to facilitate examination of the mastoid bowl during follow up (15,16). In 87% of our patients at least two of the three landmarks were visible.

The conchal cartilage excision has been advocated by most authors as it not only widens the ear canal but also prevents canal stenosis. This is in conformity of the present study where we removed a large piece of conchal cartilage from the conchal bowl (16,17). Similar to the present technique ,the necessity of removal of cartilage of floor of the canal has been emphasised in several studies (18,19).

The existing literature describes a variety of techniques with each reporting a favourable outcome in terms of size of external canal, achievement of dry ear, hearing improvement and prevention of restenosis or granulation tissue. But the reporting of outcomes have been found to be heterogenous and variable which makes comparison of the techniques difficult (20). Kristen et al had used a modification of the Chronic Ear Survey Questionnaire in assessing the results of conchomeatoplasty. This validated instrument has also been used in the present study to assess the outcome of the radial incision technique used by the authors. By using this questionnaire, it was possible to analyse the outcome from the patient's perspective and effectively remove bias of the operating surgeon. Additionally, the present study sought to view the post-operative landmarks in the mastoid bowl, namely the superior limit, floor and the sino dural angle. By visualising these landmarks at 6 months follow up it was possible to objectively evaluate the results in a consistent and comparable manner.

It was observed in the present study that there was no significant association between the size of meatoplasty and the frequency and amount of ear discharge, frequency of physician's visit or interference with social activity. Hence, it was observed that a large sized meatoplasty may not be an absolute necessity for a dry ear. The present study suggests that a compilation of all the subjective and objective parameters in assessment of the success of meatoplasty gives a holistic and comprehensive criterion for measurement of outcome rather than relying on the size of meatoplasty alone.

A primary limitation of this study is its single-arm, prospective observational design. Because there is no parallel control group or another surgical technique to which the results were compared, these findings cannot be used to prove superiority or advantages of the radial incision technique over other established meatoplasty methods.

Additionally, our follow-up period was limited to 6 months which is insufficient to evaluate long-term cavity outcomes, late-stage meatal stenosis or disease recurrence rates which often emerge years after a canal wall down mastoidectomy.

Longer-term, multi-arm comparative trials are required to fully evaluate the outcome of this radial incision technique. By using a validated instrument like the Chronic Ear Survey Questionnaire, this study successfully captured outcomes from the patient's own perspective, reducing operating surgeon bias.

Our data revealed no significant association between the size of the meatoplasty and the frequency or quantity of ear discharge, physician visits or social integration. This suggests that relying only on the physical dimensions of a meatoplasty provides an incomplete picture of surgical success.

Conclusion

Conchomeatoplasty represents a crucial surgical step in canal wall down mastoidectomy. Our findings describing the postoperative size and shape of the external auditory meatus suggest that the physical size of the meatoplasty may not be the sole determinant of patient satisfaction or symptom resolution. Incorporating both subjective and objective parameters helps integrate clinical observations with patient expectations,

providing a more comprehensive framework for analyzing post-operative outcomes. Within the short follow up period of 6 months, the evaluated radial incision technique demonstrated favorable clinical results in the patients.

References

1. Osborne JE, Terry RM, Gandhi AG. Large meatoplasty technique for mastoid cavities. Clin Otolaryngol 1985;lO: 357-60.

2. Eisenman DJ, Parisier SC. Meatoplasty: the cartilage of the floor of the ear canal. Laryngoscope. 1999;109:840-842.

3. Joseph B Nadol.Revision Mastoidectomy. Otolaryngologic Clinics of North America. 2006; Vol 39: 723-40.

4. Tong MC, Liu KC, Hasselt C. Sling stitch endaural meatoplasty. Laryngoscope. 1996; 106 (11): 1438–40.

5. Murray DP, Jassar P, Lee MSW, Veitch DY. Z-meatoplasty technique in endaural mastoidectomy. J Laryngol Otol. 2000;114:526-527

6. Ralli G, Milella C, Fusconi M, Torre LA. Quality of life measurements for patients with chronic suppurative otitis media: Italian adaptation of "Chronic Ear Survey" . Acta Otorhinolaryngo-logicaItalica. 2017; Vol 37: 51-57.

7. JB Nadol Jr, H Staecker, R E Gliklich.Outcomes assessment for chronic otitis media: the Chronic Ear Survey.Laryngoscope.2000 ;Vol 110 (3. 3): 32-5.

8. Kristen L. Hovis, BA, Matthew L. Carlson, MD, Alex D. Sweeney, David S. Haynes. The one-cut meatoplasty: novel surgical technique and outcomes. Am J Of Otolaryngol Head And Neck Medicine And Surgery. 2015; Vol 36:130 – 135.

9. Faramarz M, Mojtaba MD, Parisa M, Mohammad GM, Ehsan SK, Meatoplasty in Canal wall down Surgery: Our Experience and Literature Review. Iranian Journal of Otorhinolaryngology. 2017;Vol 29(1): 11-17.

10. Raut VV, Rutka JA. How I Do It, A Targeted Problem and Its Solution: The Toronto Meatoplasty: Enhancing One's Results in Canal Wall Down Procedures. Laryngoscope. 2002 ;Vol 112: 2093-2095.

11. Joon Choi IK, Jae-Jin S, Jeong HJ, Sun O C. A Novel Meatoplasty Method in Canal Wall Down Tympanomastoidectomy: A Perichondrial Posterior Fixation Technique. Clinical and Experimental Otorhinolaryngology. 2009; Vol. 2, No. 4:164-168

12. David E.Tunkel. The z-meatoplasty for modified radical mastoidectomy in children. Arch Oto Laryngol Head Neck Surg.2006 ;Vol 132: 1319-1322.

13. Hunsaker DH. Conchomeatoplasty for chronic otitis externa. Arch Otolaryngol Head Neck Surg. 1988; Vol 114(4):395–8.

14. Wormald PJ, Van Hasselt CA. A technique of mastoidectomy and meatoplasty that minimizes factors associated with a discharging mastoid cavity. Laryngoscope. 1999; Vol 109(3):478–82.

15. Mirck PG. The M-Meatoplasty of the External Auditory Canal. Laryngoscope. 1996; 106(3):367–9.

16. Paparella MM, Kurkjian JM. Surgical treatment for chronic stenosing external otitis. (Including finding of unusual canal tumor). Laryngoscope. 1966; 76(2): 232–45.

17. Soliman T, A Fatt-Hi M, Kadir A. A simplified technique for the management of acquired stenosis of the external auditory canal. J Laryngol Otol. 1980; 94(5): 549–52.

18. R J Harvey, P Fagan, M Baldwin Reduction meatoplasty with a post-auricular island flap. Journal of Laryngol & otology. 2007; Vol 121 (2): 158-159.

19. Jackson CG, Glasscock III ME, Nissen AJ. Open Mastoid procedures; contemporary indications and surgical techniques. Laryngoscope 1985, 95:1037-43.

20. Mariam Aljehani , Ibrahim Tawfiq, Fida Al-Muhawas, Abdulrhman Alsanosi. SAGE Open Medicine 2025,Volume 13: 1 –16.