

CANAL WALL RECONSTRUCTION SURGERY IN RETRACTION PATHOLOGY- EXPERIENCE AT AL NAHDHA HOSPITAL*, OMAN.

Authors

Kashoob M. (1); Kumar S. (2); Naik J. Z (3)

Authors Affiliations:

(1)Resident Oman Medical Specialty Board, (2) Sr. Consultant, (3) Sr. Specialist, Department of Otolaryngology and Head - Neck Surgery, Al Nadha Hospital - a tertiary care Ministry of Health Teaching and referral hospital in Muscat (Oman)

Abstract

Objectives: Tympanic membrane retraction pathology is a frequently encountered middle ear problem that can be a self cleansing pocket, a deep sac with hidden cholesteatoma or a potential reservoir for its future formation. In selected cases, a defect in attic and posterior superior canal wall can result after surgical removal of the diseased epithelium and/or cholesteatoma. If this occurs, reconstruction is usually attempted. Avoiding an open cavity in such conditions is currently the preferred approach. We sought to study the cartilage reconstruction outcomes of the attic and/or posterior superior canal wall defects for selected cases of retraction pathology without a need for an open mastoid cavity. We investigated the short and long term results with regards to the resorption with time, displacement or recurrence of cholesteatoma.

Methods: This is a retrospective study conducted at Al Nahda Hospital in Oman between 2008 and 2014. A total 301 patients who underwent inside-out atticotomy with attic defect repair or cortical mastoidectomy with atticotomy and attic defect repair were included in the study. Staging and classification criteria for middle ear cholesteatoma proposed by the Japan Otological Society (JOS) were applied based on surgical and follow-up notes in cases with

recurrent cholesteatoma. The status of the reconstructed part of the outer attic wall with respect to survival and stability of cartilage was assessed carefully at less than six months (short term) and at more than two year periods (long term) after surgery.

Results: Out of 301 patients who underwent mastoid surgeries between 2008 and 2014, 72 patients met the inclusion criteria. Results of both surgical methods were then assessed. It was noted that the longer the duration after post-operative period (> 2 years), the more chance to have a recurrence of disease, displacement/resorption of the reconstructed part or retraction/perforation of tympanic membrane ($p < 0.026$). Moreover, the reconstruction part of the attic and posterior superior canal wall may be resorbed with time in some cases as shown in this study (9.4%). However, the rate is low and worth considering in all the cases of attic or selected atticocanal cholesteatomas.

Conclusion: Resorption and displacement of the reconstructed part of the attic and/or posterior superior canal wall was observed during the follow-up period of this study. This may have contributed to the retraction pocket reformation followed by the recurrence of cholesteatoma. It was noted to be more obvious during long duration of follow-up. Hence, we recommend a longer follow-up of at least 2 years post-

operatively even if the findings are showing good results during initial visits. Although the recurrence rate of disease with the used surgical methods in this study was 16.9%, in order to compare the results of this surgical method with either canal wall up or canal wall down, future surgical methods will require a randomized trial.

Key words: Cholesteatoma, mastoidectomy, reconstruction, cartilage, canal wall, atticotomy

Introduction

The term 'cholesteatoma' was first used by Muller in 1838 to describe what he thought was a neoplastic lesion with keratin flakes, appearing to look like cholesterol crystals. Over time, many other definitions describing cholesteatoma occurred such as an abnormal growth of keratinizing squamous epithelium in the temporal bone (1–3) which is commonly characterized as “skin in the wrong place” (4-5). A more recent consensus definition is: “Cholesteatoma is a mass formed by keratinizing squamous epithelium in the middle ear and/or mastoid, subepithelial connective tissue, and by the progressive accumulation of keratin debris with/without surrounding inflammatory reaction” (15). We added minor modifications to the last definition, which is: " A three-dimensional mass that is occupying the middle ear cleft, lined by a keratinizing squamous epithelium and has the characteristic to expand at the expense of other structures with a tendency to recur." Acquired cholesteatomas localized exclusively in the middle ear are further divided into primary acquired and secondary acquired forms (2, 6). Primary acquired cholesteatoma occurs as a retraction pocket, in which desquamated keratin epithelium accumulates behind an apparently intact eardrum, usually in the region of the pars flaccida (2, 3, 7). Secondary acquired cholesteatoma appears secondary to pars tensa retraction or epithelial migration into the middle ear through

a perforated eardrum, which is in turn caused by infection, trauma, or iatrogenic (2, 6). Congenital cholesteatoma is defined as a white mass that forms prior to birth behind an intact eardrum and has no history of otitis media or previous otologic procedures.

Canal wall down mastoidectomy (CWD) is had been widely accepted for long as the gold standard for management of cholesteatoma due to lower recurrence rate compared to canal wall up (CWU) mastoidectomy (8-12). However, it has several major disadvantages including recurrent infection and drainage from the open mastoid cavity. Other problems include the need for frequent otomicroscopic cleansing, water intolerance due to the risk of infection, calorically induced vertigo from non-isothermic air or water exposure and inability to wear a traditional hearing device when required (13).

Depending on the extent of the cholesteatoma at time of surgery, other surgical intervention could be used to avoid a combination of cavity-related problems and patient compliance in CWD mastoidectomy. Atticotomy with reconstruction of the lateral epitympanic wall and tympanoplasty with cartilage/perichondrium is a reliable treatment to achieve good morphological and functional results (14). This study aims to retrospectively study the outcomes of the attic and/or posterior superior canal wall reconstruction for selected cases of retraction pathology. This avoids an open mastoid cavity. The study evaluates results of two surgical methods: inside out atticotomy with attic defect repair (surgery 1) or Cortical mastoidectomy and atticotomy with attic defect repair (surgery 2) over a period of 6 years at Al Nahda Hospital in Oman.

Methodology

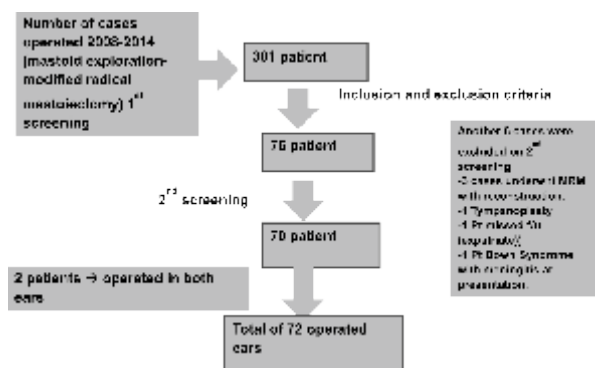
This study was conducted in Sultanate of Oman at a tertiary referral hospital among patients treated surgically based on criteria for middle ear cholesteatoma proposed by the Japan

Otological Society (JOS) during the period from January 2008 till January 2014. Data were retrieved from hospital records which are digitally maintained and secured. This study is a retrospective study based on chart analysis. All patients who underwent cholesteatoma surgery at Al Nahda Hospital with either atticotomy defect repair with cartilage (surgery type 1) or Cortical mastoidectomy, atticotomy with attic defect repair using cartilage (Surgery type 2) were included. On the other hand, patients with revision mastoid surgeries, cases with serious intratemporal and/or intracranial complication of cholesteatoma at presentation or patients who missed follow up during the study period were excluded. Data were collected initially recorded on paper sheets and then entered in Epidata software. Finally, data were converted to excel sheets to be used for analysis with SPSS 22 software.

Results and Data Analysis

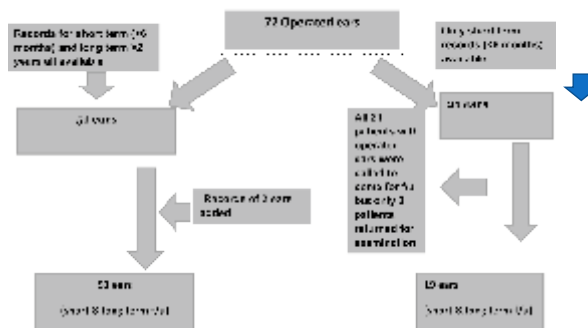
During the study period, 301 patients underwent mastoid surgery which included CWU and CWD procedures. Atticotomy with or without posterosuperior wall removal with subsequent repair of defect were also included. After initial screening, only 76 out of 301 patients met our inclusion criteria and rest were excluded. Six additional cases were also excluded during secondary screening for reasons described in (Figure I).

Figure I:



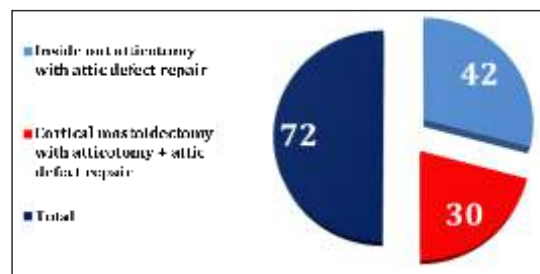
Interestingly, 2 patients had surgeries in both ears. In total, 72 operated ears (28 females and 44 males) were included. The oldest age was 52 years and the youngest was 9 years. As per hospital records, only 51 cases got records for both short term (<6 months) and long term (>2 year) follow-up. The rest of the patients (21 cases) got short term follow-up. Those 21 patients were contacted individually to come for a follow-up during time of collecting data, with two of them being able to attend because of no complaints presently, staying far from the hospital or commitments with work or social reasons (Figure II).

Figure II



Frequency tables, chi-square tests and paired t-tests were used to analyze the data. The final number of ears with available long-term records were 53 operated ears and 19 for short term follow-up. Forty two of the patients underwent the first and the other 30 underwent the second surgery. This data is presented in Figure III.

Figure III: Frequency of each operation.



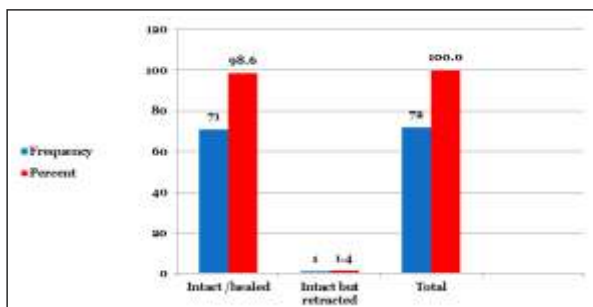
The longest duration of follow up was 10 years for one patient and 25 patients have records for up to 2 years of follow-up. The rest of the similar data

is shown in table 1.

Number of years:	Frequency	Percent
2	25	47.0
3	7	13.0
5	3	6.0
6	8	15.0
7	6	11.0
8	2	4.0
9	1	2.0
10	1	2.0
Total	53	100

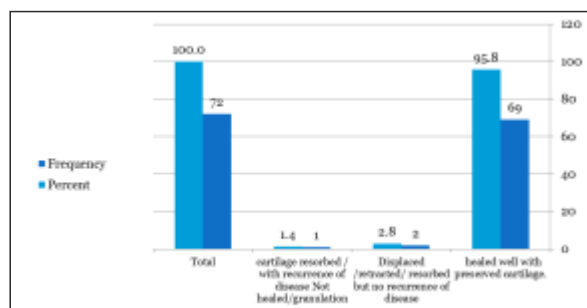
Looking at the results of short term follow up (<6 months), Tympanic membrane (TM) findings was normal (intact healed) for all operated ears, except one patient who was found to have an intact but retracted TM. The majority of cases found to have healed and preserved cartilage (69 ears), but 2 were found to have displaced or resorbed cartilage with no recurrence of disease. There was one exception to this - another one case who had a recurrence of disease as pointed on figure IV.

Figure IV: Tympanic membrane findings < 6 months follow up (%).



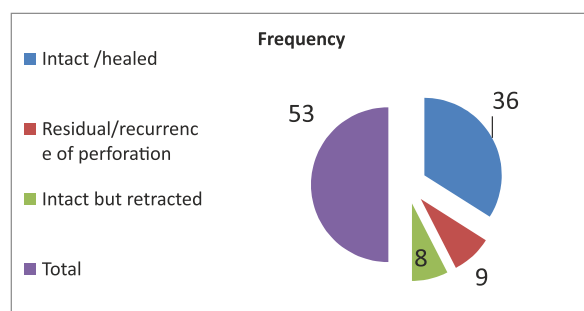
On the other hand, the same ears during the long term follow-up findings were different as described on figure V.

Figure V: Uptake of cartilage used for outer attic wall/canal wall at <6 months follow up.



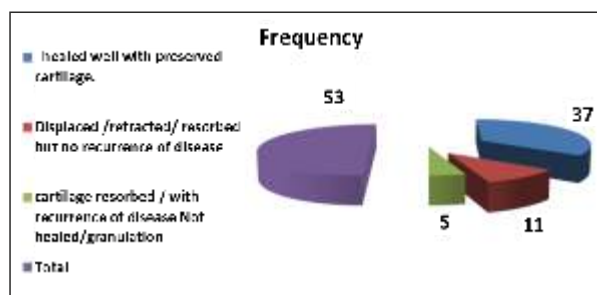
The tympanic membrane was found to be intact and healed in 36 ears. The residual/recurrence of perforation was found in 9 ears and retracted but intact TM in another 8 ears as shown in figure VI.

Figure VI: Tympanic membrane findings at > 2 years of follow up.



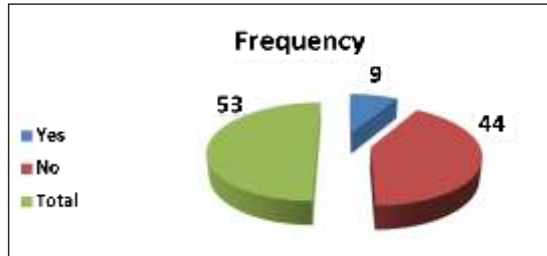
Regarding the uptake of cartilage reconstruction part during long term follow up, 5 ears got cartilage resorbed with recurrence of disease. The other 11 ears did not have any recurrence of disease but were found to have retracted or displaced cartilage. The rest of the patients (37 ears) were found to have well preserved and intact cartilage (Figure VII).

Figure VII: Uptake of cartilage used for outer attic wall/ canal wall at > 2 years.



The recurrence rate at long term follow up was found in 9 out of 53 ears (figure VIII).

Figure VIII: Recurrence of disease at > 2 years.



Discussion and Conclusion

The retraction pockets can be a self cleansing pockets or a pockets with cholesteatoma. This can involve the outer attic wall, posterior canal wall, or both. However, after removal of any pathological retraction pockets, different methods for reconstruction of the bony defects left behind are aimed to give more normal physiological function of the ear and avoid open cavity. Treatment of cholesteatoma should be individualized, as there is no single method that suits all cases (8). The most common causes of the formation of a retraction pocket after cholesteatoma surgery are dysfunctions of the eustachian tubes, pneumatization problems or resorption of graft material (9).

In this study reconstruction with conchal cartilage temporalis fascia, conchal perichondrium. Tragal cartilage perichondrium or combination of any of these was attempted using surgery types 1 or 2 as described earlier. Then, status of these reconstructions parts was retrospectively analysed on long and short term periods looking for the status (displaced, resorbed and possibility of recurrence of cholesteatoma with time). Upon following up on these cases on long term (>2years), it was evident that the reconstructed part of the attic and posterior superior canal wall may get resorbed with time in some cases (9.4%). This can probably contribute to retraction pocket reformation followed by recurrence of cholesteatoma. Although all of these cases found to be in stage II (9 ears), there is no statistically

significant association between different Staging (JOS) and recurrence of the disease in long term (P=0.100) (Table 2).

Table 2: There is no significant association between pars flaccida cholesteatoma staging JOS and the recurrence of the disease in a long period.

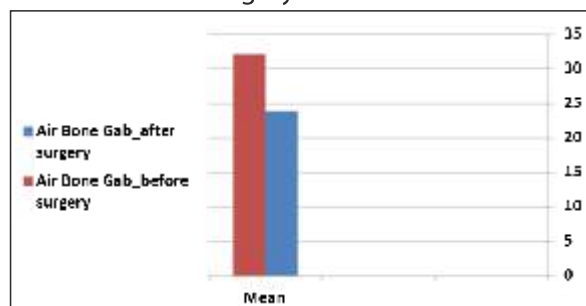
Stage of disease (JOS) and recurrence of disease in long term				
Stage of disease (JOS)	Recurrence of disease in long term	Total		Total
		Yes	No	
Stage I	Yes	0	0	0
Stage I	No	0	0	0
Stage II	Yes	9	0	9
Stage II	No	0	44	44
Total	Yes	9	0	9
Total	No	0	44	44

Table 3: There is a significant association between the duration of follow up and the recurrence of the disease in long period. Recurrence tended to be more frequent among those with longer follow-up duration.

Duration of follow up and recurrence of disease in long term				
Duration of follow up	Recurrence of disease in long term	Total		Total
		Yes	No	
Less than 2 years	Yes	0	0	0
Less than 2 years	No	0	0	0
More than 2 years	Yes	9	0	9
More than 2 years	No	0	44	44
Total	Yes	9	0	9
Total	No	0	44	44

It has also been noted that hearing improved, when compared between pre- and post-operative mean air bone gap, was reduced by around 10 dB as shown in Figure IX, although some of these patients were planned for second look for ossiculoplasty that was not done yet.

Figure IX: Overall mean of air-bone gab reduction before and after surgery.



Vartiainen et al (2000) reported recurrence on CWD after 10 years or more follow-up to be 17%. In those with a follow up of <10 years, the recurrence was 8.8% (10). Cody et al (1984) reported recurrence of 45% over 20 years of follow up in ears undergoing CWU (11). Moreover, the report of canal wall reconstruction (CWR) with obliteration by Gantz et al with an average of 48 months of follow-up was 7.7% that had safe retraction pockets. Two of these needed endaural attic clearance and another two had conversion to CWD.

Conclusion

In conclusion, the reconstruction part of the attic and posterior superior canal wall may get resorbed with time in some cases 9.4% as shown in this study. The recurrence rate of disease with the used surgical methods in this study is 16.9% in the long run. Notably the patients who had a stable reconstruction after 2 years is a significantly good number and procedure is worth considering in selected cholesteatoma patients with acceptable failure rates. However, to compare the results of this surgical methods used in this study with either CWU or CWD requires a randomized controlled study.

While the study shows some definite trends favoring reconstruction there were some limitations. Surgeries were done by different surgeons though from the same team. They had similar level of experience and cohesive principles towards middle ear surgery. The aim of this study is to share our experience with this approach of

management and it is not an attempt to have a direct comparison with other techniques.

References

- [1] Isaacson G, "Diagnosis of pediatric cholesteatoma," *Pediatrics*, vol. 120, no. 3, pp. 603–608, 2007.
- [2] Semaan MT and Megerian CA, "The pathophysiology of cholesteatoma," *Otolaryngologic Clinics of North America*, vol. 39, no. 6, pp. 1143–1159, 2006.
- [3] Dornelles C, Da Costa SS, Meurer L, and Schweiger C, "Some considerations about acquired adult and pediatric cholesteatomas," *Revista Brasileira de Otorrinolaringologia*, vol. 71, no. 4, pp. 536–546, 2005.
- [4] Robinson JM, "Cholesteatoma: skin in the wrong place," *Journal of the Royal Society of Medicine*, vol. 90, no. 2, pp. 93–96, 1997.
- [5] Gray JD, "The chronic ear. The treatment of cholesteatoma in children," *Proceedings of the Royal Society of Medicine*, vol. 57, pp. 769–771, 1964.
- [6] Bar'ath K, Huber AM, Stampfli P, Varga Z, and Kollias S, "Neuroradiology of cholesteatomas," *The American Journal of Neuroradiology*, vol. 32, no. 2, pp. 221–229, 2011.
- [7] Vital V, "Pediatric cholesteatoma: personal experience and review of the literature," *Otorhinolaryngologia—Head and Neck Surgery*, no. 45, pp. 5–14, 2011.
- [8]. Cody DT, McDonald TJ. Mastoidectomy for acquired cholesteatoma: follow-up to 20 years. *Laryngoscope* 1984;94:1027-30.
- [9]. Stangerup SE, Drozdiewicz D, Tos M. Cholesteatoma in children, predictors and calculation of recurrence rates. *Int J Pediatr Otorhinolaryngol* 1999;49:S69-73.
- [10]. Palva T. Surgical treatment of chronic middle ear disease. II. Canal wall up and canal wall down procedures. *Acta Otolaryngol* 1987;104:487-94.

[11]. Black B, Gutteridge I. Acquired cholesteatoma: classification and outcomes. Otol Neurotol 2011;32:992-5.

[12]. Vartiainen E. Ten-year results of canal wall down mastoidectomy for acquired cholesteatoma. Auris Nasus Larynx 2000; 27:227-9.

[13]. Roberson JB Jr, Mason TP, Stidham KR. Mastoid obliteration: autogenous cranial bone pate reconstruction. Otol Neurotol 2003;24(2): 132-140

[14]. Deng Y, Xing F, Wu Y, Chu T, Chen R, Chen E, Fan X (2012) Atticotomy with canaloplasty and tympanoplasty for limited epitympanic

cholesteatoma. Lin Chung Er Bi Yan Hou Tou Jing Wai Ke Za Zhi 26(16): 727-728-727-732

[15]. Olszewska E, Rutkowska J, Ozgirgin N. Consensus-based recommendations on the definition and classification of cholesteatoma. J Int Adv Otol 2015; 11(1):81-7.

How to Cite this Article:

Kashoob, M., Kumar S., Naik, J. Z - Canal Wall Reconstruction Surgery in Retraction Pathology- Experience at Al Nadha Hospital, Oman - UP State Journal of Otolaryngology and Head and Neck Surgery – Volume -8/ Special edition/ page 27-33

<https://doi.org/10.36611/upjohns/se/2020/2>