Open Access
Full Length Article

ORIGINAL ARTICLE

Comparison of Efficacy of Canal Wall up Mastoidectomy with Canal Wall Down Mastoidectomy in Surgical Management of Otitis Media with Cholesteatoma

Sadaf Raffat Mustafa
Assistant Professor, Department of ENT, Railway Hospital, Rawalpindi

ABSTRACT

Objectives: To compare the efficacy of Canal Wall Up (CWU) Mastoidectomy with Canal Wall Down (CWD) Mastoidectomy in the surgical management of chronic otitis media with cholesteatoma in local population.

Patients and Methods: A total of sixty patients with chronic otitis media, cholesteatoma and granulation tissue were enrolled. Patients were randomly divided into two groups; Group A patients underwent CWU Mastoidectomy while Group B patients underwent CWD Mastoidectomy. Both groups were followed for 6 months, for recurrence of the disease and associated complications. Chi-square test was applied as a test of significance, to compare the outcomes of CWU Mastoidectomy and CWD Mastoidectomy. a p-value <0.05 was considered as statistically significant

Results: Disease recurrence rate was significantly higher in group A (CWU) while complications rates were higher in group B (CWD) patients. Persistent discharge, conductive deafness, and development of mastoid cutaneous fistula were reportedly higher in group B patients (P<0.05).

Conclusion: CWD operations have a higher probability of permanently curing the patient of the cholesteatoma but with higher rates of post-surgical complications. CWU procedures have the advantage of maintaining a near normal anatomy but with a higher risk of residual or recurrent cholesteatomas. Choice of a particular surgical procedure depends on the preference of the surgeon, the nature, and extent of the pathology and the general health of the patient.

Key Words: Cholesteatoma, Chronic Otitis Media, Mastoidectomy, Otitis media.

Author`s Contribution
[1,2]Conception, Synthesis and Planning of the research, Discussion & Analysis

Address of Correspondence
Dr. Sadaf Raffat Mustafa
drsadafrafat@yahoo.com

Article info.
Received: Mar 24, 2017
Accepted: May 14, 2017

Cite this article: *Mustafa SR. Comparison of Efficacy of Canal Wall Up Mastoidectomy with Canal Wall Down Mastoidectomy in Surgical Management of Otitis Media. JIMDC. 2017; 6(2):78-82.*

Funding Source: *Nil*
Conflict of Interest: *Nil*

Introduction

Chronic Otitis media (COM) is an inflammatory disease of the middle ear, that lasts for more than three months.[1] When associated with cholesteatoma, it is characterized by the presence of keratinized stratified squamous epithelium within the cavities of the middle ear. The incidence of cholesteatoma has been reported in between 1.0-12.6 cases per 100,000 inhabitants.[2,3] Cholesteatomas may grow large enough to erode the middle ear structures and the mastoid bone behind the middle ear.[4] Problems with the middle ear, such as fluid in the middle ear, a hole in the eardrum, or injury to the small, middle ear bones, can cause hearing loss.[5] In rare situations, infections in the middle ear can spread deep inside the inner ear, causing a sensorineural hearing loss and dizziness.[6] Rare, but serious, complications include brain infections, such as an abscess or meningitis. A chronic infection and a cholesteatoma can also cause injury to the facial nerves and facial paralysis.[7] Surgical management of chronic otitis media with and without cholesteatoma has been a matter of debate for years.[8,9]The primary goal of surgery for COM is to eradicate disease and obtain a dry and safe ear. Restoration of hearing is by necessity, a secondary consideration because any attempt at middle ear

reconstruction will fail in the setting of persistent inflammation and otorrhea.[10]

There are two major types of mastoidectomies: canal wall down (CWD) and canal wall up (CWU), and the debate as which technique is to be adopted still exists in 21st century.[11] The mastoid bowl or cavity created by a CWD technique often fills with earwax and need frequent ear canal cleaning, protection from water and possible hearing changes. Another disadvantage of the CWD mastoidectomy is that the operation changes the architecture of the ear canal. Therefore, the hearing may be diminished to some degree as a result of this change of architecture. The CWU mastoidectomy was developed to address some of the limitations of CWD mastoidectomy but is associated with higher rates of recurrence.[12] Recent publications have emphasized the need for clinicians to take note of the outcomes of their surgery, not just in terms of technical success, but also in relation to the impact of the treatment upon the patient's lifestyle and wellbeing.[13] Currents study rationale was based on authors' experience and belief for a need of individualized treatment in these patients. This study aims to compare the efficacy of CWU mastoidectomy with CWD mastoidectomy in the surgical management of chronic otitis media with cholesteatoma in the local population.

Patients and Methods

This experimental study was conducted after ethical approval and informed consent from all the enrolled patients. The study was carried out at ENT department, PIMS, Islamabad from July 2007- July 2008. A total of sixty patients with chronic otitis media, cholesteatoma and granulation tissue were enrolled. Patients were randomly divided in two groups; Group A patients underwent CWU mastoidectomy while Group B patients underwent CWD mastoidectomy. Both the groups were followed for 6 months (monthly basis) and observed for hearing outcome, recurrence of disease including cholesteatoma, granulation tissue and complications such as facial paralysis, meningitis, suppurative labyrinthitis, persistent ear discharge, conductive deafness and mastoid cutaneous fistula. Data was analyzed using SPSS software version 20.0. Chi-square test was used as a test of significance to compare the outcomes of CWU mastoidectomy and CWD mastoidectomy. p-value <0.05 was considered as statistically significant.

Results

The present study includes 60 patients; 30 in each group. Demographic data is presented in table 1. As shown in the table, mean age of the patients in group A was 27.10±2.29 SD and in group B it was 27.33±2.95 SD. There were 70 males and 30 females in group A and in group B there were 63 males and 37 females. Disease recurrence rate was significantly higher in group A (CWU) ($p<0.05$), however complication rate was found higher in group B (CWD) patients. Persistent discharge, conductive deafness, and mastoid cutaneous fistula were reportedly significantly higher in group B patients ($p<0.05$) (Table 2).

Table 1: Demographic profile of study population (N=60)

Gender	Group A (n=30) N (%)	Age (years) Mean ± SD	Group B (n=30) N (%)	Age (years) Mean ± SD
Male	21 (70)	26.64 ± 1.91	19 (63)	28.18 ± 2.48
Females	9 (30)	27.67 ± 2.06	11 (37)	26.18 ± 3.63
Total	30 (100)	27.10 ± 2.29	30 (100)	27.33 ± 2.95

Table 2: Comparison of recurrence and complications of disease in both groups (N=60)

Variables	Group A (n =30) N (%)	Group B (n=30) N (%)	p-value
Recurrence	25(83.33)	12 (40)	0.001
Complications			
Facial Paralysis	01(3.33)	5 (16.67)	0.085
Meningitis	07(23.33)	2 (6.67)	0.071
Suppurative Labyrinthitis	0(0)	2 (6.67)	0.150
Persistent Discharge	03(10)	12 (40)	0.007
Conductive Deafness	09(30)	18 (60)	0.020
Fistula	1(3.33)	07(23.33)	0.023

Discussion

The objectives of mastoidectomy in cholesteatoma are to get a disease-free and dry ear, the prevention of recurrent disease and the maintenance of hearing or the possibility to reconstruct an affected hearing mechanism. The choice of the surgical technique for chronic ear disease depends on a number of factors including preference of the surgeon, nature of the pathology and the general health of the patient. Our results showed that with canal wall up technique the rate of recurrence of disease is significantly higher as compared to those in canal wall down technique. Our results are comparable with the published data by Hulka and Mc Elveen et al. In their randomized, blinded study, they suggested that with canal wall up mastoidectomy rate of recurrence was significantly higher as compared to the rate after canal wall down surgery.[14] The results of a national comparative audit of 611 mastoidectomies by 55 consultants were published by the Royal College of Surgeons of England in 1995. The study also showed the higher rate of recurrence after canal wall up mastoidectomies.[15] A recent paper by Sadé et al which examined the strategies used in cholesteatoma surgery, presented data on 200 CWD procedures found the same higher rates of recurrence after canal wall up procedures.[16] Gantz et al analyzed 130 cases studied in 2005, and according to his results the recurrence rate after canal wall reconstruction technique was significantly higher and the patients required a repeat surgery.[17] A possible explanation of the increased rate of recurrence in CWU technique may due to the fact that external auditory canal wall is conserved. However, preservation of the pneumatized epitympanum and mastoid cavity creates conditions conducive to the development of tympanic retraction pockets and recurrence of cholesteatoma. As pointed out by Palva and Virtanen, the more air-filled spaces there are, the higher the probability of retraction pockets.[18] Accordingly, there have been several efforts aimed at reducing the air-filled mastoid cavity. Several surgeons have attempted obliteration of the mastoid cavity with abdominal fat or soft tissue after a CWU mastoidectomy and have reported slightly better results with respect to hearing and drum retraction compared with the air space reservoir technique.[19] However, a retraction pocket is still developed in the remaining epitympanic space in these techniques. Other surgeons have attempted to seal off the mastoid cavity with a bony septum at the antrum level, but the functional result was disappointing because of the absorption of bony septum, which resulted in an incomplete block between the middle ear and the mastoid cavity.[20] Others also tried combination of canal wall up mastoidectomy and type I tympanoplasty to evaluate the therapeutic effects in terms of disease clearance and hearing improvement, and reported better outcomes.[21]

Our results also showed that with canal wall down technique, the rate of developing complications (conductive deafness, persistent ear discharge and developing a fistula) was significantly higher when compared with those in canal wall up technique. With CWD mastoidectomy, the operation changes the architecture of the ear canal which results in diminished hearing to some degree as a result of this change of architecture. Similar findings were observed by Kos MI et al, who reported that complication rate was higher with canal wall down surgery.[22] Hulka and McElveen in their study concluded that canal wall down mastoidectomy was significantly superior to the intact canal wall technique in visualizing middle ear pathology and in getting permanent eradication of the disease.[14] However, they reported significantly higher rate of complications after canal wall down procedure. A national comparative audit published by the Royal College of Surgeons of England in 1995, reported significantly greater number of "wet" ears with canal wall down than with canal wall up mastoidectomies.[15] Findings of persistent ear discharge after canal wall down technique reported by Sadé et al are comparable to our results.[16] Gantz BJ in his study of 130 cases, reported the same higher rates of complications after canal wall down surgeries.[19] Several surgeons have improvised to get slightly better results. They reported that the use of endoscope has improved visualization in CWU techniques with better outcomes.[23-25] others tried mastoid obliteration with autologous bone and reported it to be safe, low-cost, with low recurrence rates - similar to traditional canal wall down procedures and with greater water resistance and quality of life improvements.[26-27]

In summary, numerous factors help in determining which technique is best. Sometimes, this decision is not possible

until the operation has begun and a clear understanding of the extent of disease has been obtained. Canal-wall-down operations have the highest probability of permanently curing the patient of cholesteatoma but with higher rates of post-surgical complications. Canal-wall-up procedures have the advantage of maintaining a near normal anatomy, but they have a higher risk of persistent or recurrent cholesteatomas. The risk of recurrence is sufficiently high so that most surgeons advise an obligatory second-look tympanomastoidectomy, 6 months to 1 year following the initial operation. Our study results are similar. Keeping in view all the arguments in favor and against different types of surgical techniques, it is difficult to recommend one type as a technique of choice. What surgical procedure would be best for the patient depends on the preference of the surgeon, the nature and extent of the pathology, and the general health of the patient. Furthermore, surgeons have personal beliefs regarding specific techniques which are largely based on their own area of expertise. We recommend, that for patients who are difficult to follow, have the extensive disease, or have the disease in an ear with severe to profound hearing loss, CWU surgery may be preferred.

Conclusion

Canal-wall-down operations have a higher probability of permanently curing the patient of the cholesteatoma but with higher rates of post-surgical complications. Canal-wall-up procedures have the advantage of maintaining a near normal anatomy but with a higher risk of residual or recurrent cholesteatomas. Choice of a particular surgical procedure depends on the preference of the surgeon, the nature, and extent of the pathology and the general health of the patient.

References

1. De Azevedo AF, Pinto DC, De Souza NJ, Greco DB, Gonçalves DU. Sensorineural hearing loss in chronic suppurative otitis media with and without cholesteatoma. Brazilian journal of otorhinolaryngology. 2007; 73(5):671-4.
2. DeAntonio R, Yarzabal J-P, Cruz JP, Schmidt JE, Kleijnen J. Epidemiology of otitis media in children from developing countries: A systematic review. Int J Pediatr Otorhinolaryngol. 2016; 85:65–74.
3. Chaudhry S, Ahmad Z, Khan FB, Afzal M. Frequency of otitis media in patients of nasal polypi. J Ayub Med Coll Abbottabad JAMC. 2010; 22(2):83–5.
4. Cho YS, Seo IS, Woo HC, Kang MK, Chung WH, Hong SH. Changes in external ear resonance after 3 types of surgery in the patients with chronic otitis media. Otolaryngol--Head Neck Surg off J Am Acad Otolaryngol-Head Neck Surg. 2001; 125(4):364–9.
5. Minovi A, Dombrowski T, Shahpasand S, Dazert S. Audiometric Results of Open Cavity Tympanomastoidectomy in Advanced Attic Cholesteatoma. ORL. 2015 ;77(3):180–9.
6. Anwar K, Gohar MS. Otomycosis; clinical features, predisposing factors and treatment implications. Pak J Med Sci. 2014; 30(3):564.
7. Jindal M, Riskalla A, Jiang D, Connor S, O'Connor AF. A systematic review of diffusion-weighted magnetic resonance imaging in the assessment of postoperative cholesteatoma. Otol Neurotol off Publ Am Otol Soc Am Neurotol Soc Eur Acad Otol Neurotol. 2011; 32(8):1243–9.
8. Trinidade A, Page JC, Dornhoffer JL. Therapeutic Mastoidectomy in the Management of Noncholesteatomatous Chronic Otitis Media: Literature Review and Cost Analysis. Otolaryngol--Head Neck Surg off J Am Acad Otolaryngol-Head Neck Surg. 2016; 155(6):914–22.
9. Tomlin J, Chang D, McCutcheon B, Harris J. Surgical Technique and Recurrence in Cholesteatoma: A Meta-Analysis. Audiol Neurotol. 2013; 18(3):135–42.
10. Minovi A, Dombrowski T, Shahpasand S, Dazert S. Audiometric Results of Open Cavity Tympanomastoidectomy in Advanced Attic Cholesteatoma. ORL. 2015; 77(3):180–9.
11. Shirazi MA, Muzaffar K, Leonetti JP, Marzo S. Surgical treatment of pediatric cholesteatomas. The Laryngoscope. 2006; 116(9):1603–7.
12. Kim M-B, Choi J, Lee JK, Park J-Y, Chu H, Cho Y-S, et al. Hearing Outcomes According to the Types of Mastoidectomy: A Comparison between Canal Wall Up and Canal Wall Down Mastoidectomy. Clin Exp Otorhinolaryngol. 2010; 3(4):203–6.
13. Azevedo AF de, Soares AB de C, Garchet HQC, Sousa NJA de. Tympanomastoidectomy: Comparison between canal wall-down and canal wall-up techniques in surgery for chronic otitis media. Int Arch Otorhinolaryngol. 2013; 17(3):242–5.
14. Hulka GF and McElveen JT Jr: A randomised blinded study of canal wall up versus canal wall down mastoidectomy determining the differences in viewing middle ear anatomy and pathology. Am J Otol 1998, 19(5):574-578
15. Harkness P, Brown PM, Fowler SM, Grant HR, Ryan RM and Topham JH: Mastoidectomy audit: results of the Royal College of Surgeons of England comparative audit of ENT surgery. Clin Otolaryngol 1995; 20(1):89-94.
16. Sadé J: Surgical planning of the treatment of cholesteatoma and post-operative follow-up. Ann Otol Rhinol Laryngol 2000; 109(4):372-6.

17. Gantz BJ, Wilkinson EP, Hansen MR. Canal Wall Reconstruction Tympanomastoidectomy with Mastoid Obliteration. *Laryngoscope*. 2005; 115(10):1734-40
18. Palva T, Virtanen H. Ear surgery and mastoid air cell system. ArchOtolaryngol 1981;107(2):71–3
19. Montandon P, Benchaou M, Guyot JP. Modified canal wall-upmastoidectomy with mastoid obliteration for severe chronic otitismedia. ORL J OtorhinolaryngolRelat Spec 1995; 57(4):198–201
20. Villarejo PL, Banos EC, Ramos J.The antrum exclusion technique in cholesteatoma surgery. J Laryngol Otol 1992; 106(2):120–3
21. Zhang L. Therapeutic outcomes of canal wall up mastoidectomy in combination with Type I tympanoplasty in otitis media. Pak J Med Sci. 2016; 32(3):565–9.
22. Kos MI, Castrillon R, Montandon P, Guyot J-P. Anatomic and functional long-term results of canal wall-down mastoidectomy. Ann Otol Rhinol Laryngol. 2004; 113(11):872–6.
23. Badr-el-Dine M. Value of ear endoscopy in cholesteatoma surgery. Otol Neurotol Off Publ Am Otol Soc Am Neurotol Soc Eur Acad Otol Neurotol. 2002 ;23(5):631–5
24. Ayache S, Tramier B, Strunski V. Otoendoscopy in cholesteatoma surgery of the middle ear: what benefits can be expected? Otol Neurotol off Publ Am Otol Soc Am Neurotol Soc Eur Acad Otol Neurotol. 2008; 29(8):1085–90
25. Wahid FI, Khan A, Khan IA. An Otogenic Trapezius Abscess: A Case Report. Iran J Otorhinolaryngol. 2012; 24(68):147.
26. Alves RD, Cabral Junior F, Fonseca AC de O, Bento RF. Mastoid Obliteration with Autologous Bone in Mastoidectomy Canal Wall Down Surgery: a Literature Overview. Int Arch Otorhinolaryngol. 2016; 20(1):76–83.
27. Suzuki H, Ikezaki S, Imazato K, Koizumi H, Ohbuchi T, Hohchi N, et al. Partial mastoid obliteration combined with soft-wall Reconstruction for middle ear cholesteatoma. Ann Otol Rhinol Laryngol. 2014; 123(8):571–5