

A Study of Canal Wall down Mastoidectomy with Soft-wall Reconstruction

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Abstract

Introduction: CSOM is a common clinical disease seen in an outpatient setting which causes social disability due to accompanying hearing loss. Treatment may be medical or surgical but aims to limit the disease and improve hearing loss.

Aim: Aim of this study is to evaluate the outcome of canal wall down (CWD) mastoidectomy with soft-wall reconstruction using cartilage in an unsafe ear.

Method: Prospective study conducted in 38 patients who had the atticointral disease (cholesteatoma and granulations in attic). Clinical examination, pure tone audiogram was done before and after surgery.

Results: Of 38 patients 84% had significant hearing improvement following surgery. After surgery, 79% showed well-healed ear with 10% showing no significant hearing outcome. 8% had ear discharge after surgery while 2% showed recurrence.

Conclusion: Early identification of cholesteatoma and intervention with soft-wall reconstruction lead to auditory and cosmetic improvement.

Key words: Canal wall down mastoidectomy, Cholesteatoma, CSOM, Soft-wall reconstruction

INTRODUCTION

Chronic otitis media is a common clinical ailment that affects people. Acute or recurrent infections of the middle ear may result in permanent perforation of the tympanic membrane and irreversible inflammatory changes within mastoid and middle ear known as chronic otomastoiditis. CSOM can be classified as mucosal and squamous type.^[1,2] Mucosal is perforation of pars tensa with or without inflammation of middle ear mucosa whereas Squamous is a retraction of pars flaccida or tensa with or without retained squamous debris associated with inflammation of adjacent mucosa. Further, it can be classified as active and inactive types.

Aural cholesteatoma is epidermal inclusion cysts of the middle ear or mastoid and can be classified as congenital or acquired. Expansion of cholesteatoma results in erosion of surrounding structures leading to local and intracranial complications.^[3] Cholesteatoma can be eradicated only by surgical resection. Canal wall up mastoidectomy maintains an intact posterior canal wall. Disease exposure is more difficult when the canal wall is left intact. Leaving a small focus of squamous epithelium behind is possible. Maintenance of the canal wall also provides potential spaces into which retraction pockets can form.^[4,5] The resulting increased incidence of residual or recurrent cholesteatoma is not trivial. The canal wall down mastoidectomy involves complete removal of the mastoid air cells, aggressive saucerization of the cortical edges of the mastoid, complete removal of the superior and posterior canal walls, and a wide meatoplasty. The advantages of canal wall down (CWD) mastoidectomy include excellent exposure for disease eradication and post-operative monitoring and low rates of residual and recurrent disease. However, the disadvantages of CWD mastoidectomy include cavity problems, such as continuous

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ear drainage, accumulation of keratin debris, caloric induced vertigo, and difficulty in fitting a hearing aid.^[6,7]

Aim

The aim of the study was to evaluate the outcome in CWD mastoidectomy with posterior canal wall reconstruction using cartilage.

MATERIALS AND METHODS

This prospective study conducted in the Department of Otorhinolaryngology, Tirunelveli Medical College Hospital, Tirunelveli. Inclusion criteria: Chronic suppurative otitis media, atticofacial pathology, retraction or perforation, posterosuperior marginal pathology, retraction/perforation, cholesteatoma or granulations, and secondary acquired cholesteatoma. Exclusion criteria: Chronic otitis media without cholesteatoma, acute otitis media with coalescent mastoiditis, persistent secretory otitis media, CSOM- tubotympanic type, and CSOM with intracranial complications. All selected patients had a detailed history taken based on the pro forma. They underwent thorough general and systemic examination. Complete ear nose and throat examination was done. Ears were examined by otoscopy and otoendoscopy to confirm pre-operative diagnosis of unsafe ear and to evaluate post-operative outcome. Pure tone audiogram was done preoperatively and postoperatively to assess the hearing outcome. Blood investigations, aural culture and sensitivity, X-ray mastoid, and computed tomography temporal bone were taken for pre-operative evaluation. Complications were documented. Patients were counseled about 3rd and 6th-month follow-up.

RESULTS

Our study group comprised 38 subjects. Only patients who had squamous active disease were managed surgically and post-operative hearing outcome assessed. Higher predominance in males in the younger age group 0–20 years and higher incidence in females in the middle age group 20–

40 years was observed Tables 1 and 2. 25 clients had moderate to severe HL Table 3, and 13 clients had Mod HL. 28 Clients presented with cholesteatoma while 10 had associated granulations Table 4. Conchal cartilage was utilized in 30 clients and nasal cartilage in 8 Table 5. There was a significant post-operative auditory improvement Table 6. Majority of clients had drastic improvement with complications occurring in a few Tables 7 and 8.

DISCUSSION

Conchal and septal cartilages were used for reconstruction. pre-operative audiogram done showed moderately severe HL in 65.7% of patients and moderate HL in 34% of patients. 73% of patients had cholesteatoma, and 27% had granulations along with cholesteatoma. Patients who had florid granulations were found to have poor outcome postoperatively. Conchal cartilage and septal cartilage were used in 78% and 28%, respectively. However, no significant difference in outcome was noted between both groups. All patients were followed up for a total period of 6 months. The post-operative audiological assessment was done at 3rd and 6th-month of review. Complications were looked for at 3rd and 6th-month. 84% had statistically significant auditory improvement while 11% had no significant change in hearing. 5% had worse hearing. Complications taken into account were discharging ear, recurrence and worsened hearing. 79% had dry, disease-free mastoid cavity with significant audiological improvement. Patients who had excessive disease had more chances of complications. Ear discharge was seen in 8% of cases. Recurrences were as low as 2%. No change or worse hearing was seen in 10% of subjects. Soft canal wall reconstruction seems to be effective as the disease is cleared from the mastoid cavity by CWD followed by reconstruction of canal wall. However, long-term outcome needs to be addressed. Till 6 months post-operative patients who underwent surgery showed no retraction pockets had good hearing and minimum complications. In a study by Black and Kelly.^[8] The authors used autograft conchal cartilage, hydroxyapatite

Table 1: Distribution of study patients in age group

Age in years	Number of patients (%)
0–20	14 (36.84)
20–40	13 (34.21)
40–60	9 (23.68)
>60	2 (5.2)

Table 2: Distribution of study patients in gender

Sex	Number of patients (%)
Male	17 (44.73)
Female	21 (55.26)

Table 3: Distribution of study patient's pre-operative hearing loss

Hearing loss	Number of patients (%)
Moderate to severe HL	25 (65.78)
Moderate hearing loss	13 (34.21)

Table 4: Distribution of study patient's pre-operative findings

Disease	Number of patients (%)
Cholesteatoma	28 (73.68)
Cholesteatoma with granulations	10 (26.31)

Table 5: Distribution of graft materials

Graft	Number of patients (%)
Conchal cartilage	30 (78.94)
Nasal septal cartilage	8 (21.05)

Table 6: Distribution of study patient's post-operative hearing

Hearing outcome	Number of patients (%)
Improvement	32 (84.21)
No significant change	4 (10.5)
worsened	2 (5.26)

granulate for cavity obliteration. 25 cases analyzed showed an airborne gap of <30 db can be reached in more than 70%. In our study, 84% showed improvement of 8–10 db in hearing with pre-operative AB gap of 38 ± 10 db and post-operative AB gap of 28 ± 10 db. 11% showed no change and 5% showed deterioration. *P* value was found to be statistically significant (<0.0001). Saunders 53 and associates compared the results of posterior canal wall skin with temporalis fascia to anterior based musculoperiosteal flap and found no significant differences in both groups in the long term. In our study, conchal cartilage and septal cartilage were used. 79% showed marked improvement. No significant difference was noted in the outcome with the use of different cartilage materials. Smith *et al.*^[9] reconstructed using an autogenous, bilaminar membrane. The resulting air-filled mastoid cavity is an anatomic extension of the middle ear cleft and is separated from the ear canal by a functional barrier that is continuous with the tympanic membrane. Compared to other methods the semitransparent nature allows inspection of the underlying cavity for residual or recurrent disease. In 30 cases long-term functional results in these cases remain satisfactory. In our study, opaque nature of cartilage restricted from visualizing the mastoid cavity, but post-operative recurrence and ear discharge were 3% and 8%, respectively. In a study by Hosoi *et al.*,^[10] soft-wall reconstruction followed by gel foam, fibrin glue was done with good cavity results and minimum retraction pockets. Our study uses cartilage, and no obvious retraction pockets were identified. In a study by Ishimoto *et al.*,^[11] seven patients after radical mastoidectomy with tragal cartilage fashioned for tympanic membrane and conchal cartilage for the posterior wall of EAC were followed up for 4 years postoperatively. 6 patients had dry ears with no post-operative complications with no hearing improvement. In our study, 79% had well-healed ears with worse hearing in 10%. In a study by Lee *et al.*,^[12] reconstruction using free-floating cartilages and double musculoperiosteal flaps. Air conduction thresholds were statistically improved ($P = 0.008$). The air-bone gap was significantly reduced following surgery ($P = 0.001$). There

Table 7: Distribution of study patient's post-operative complications

Complications	Number of patients (%)
Well healed ear	30 (78.94)
Ear discharge	3 (7.89)
Recurrence	1 (2.63)
No significant hearing improvement	4 (10.52)

Table 8: Distribution of study patient's post-operative follow-up requirement

Follow-up requirement	Number of patients (%)
No follow-up	30 (78.94)
Regular follow-up	8 (21.05)

were no other major complications in any of the patients. Long-term follow-up demonstrated gradual widening of the neo-EAC in 18 patients. In our study air-bone gap reduced significantly. In a study by Ravishankar and Datta,^[13] studied staged reconstruction and concurrent reconstruction and found that hearing improvement was same in both types. Disease severity decided the treatment modality. In our study, middle ear reconstruction was done according to the middle ear finding along with posterior wall reconstruction with good auditory improvement.

CONCLUSION

CWD mastoidectomy with posterior canal wall reconstruction is a better option in unsafe ear in our study. This technique has the advantage of complete disease clearances we do the CWD technique. As we also reconstruct the posterior canal wall, the incidence of complications decreases and the better hearing outcome is achieved. Long-term follow-up is needed to assess the long-term complications.

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