

# Surgery in Cholesteatoma: Ten years Follow-up

M. Ajalloueyan

## Abstract

**Background:** During last decades, many otologists attempted to make a long standing dry ear, resulting in better hearing after cholesteatoma surgery. This study evaluated the prognosis of two common methods of cholesteatoma ear surgery considering ten years follow-up.

**Methods:** This retrospective analysis was done using medical records of 108 adult patients with cholesteatoma. After ten years of operation, in these patients we compared the results of the two major trends of canal wall up (CWU) and canal wall down (CWD).

**Results:** Among these patients, 72 (67%) and 36 (33%) underwent the CWD and CWU method respectively. During follow-up, 8% of patients with CWD and 21% of those with CWU had undergone at least one revision operations. Ten yrs after primary surgery, 93% of the ears were dry, 90% with intact tympanic membrane, with 42% of CWD and 52% of CWU groups having fair hearing. One deaf individual was found in each group. The recurrence rate was reported in 6% of CWD and 17% CWU patients, and independent of the size of cholesteatoma, mastoid status or foot plate erosion. The major predisposing factors for recurrence were retraction and discharge, especially in combination. Intact tympanic membrane was more frequent in CWD group, although there was no significant difference between the recurrence rates of these two groups.

**Conclusion:** The result of this study indicated a need for improving surgical techniques in order to lower the recurrence rate and improvement of hearing, especially with the help of endoscopes.

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**Keywords** • Chronic • otitis media • cholesteatoma • surgery

## Introduction

**C**hronic otitis media (COM) is a worldwide and well known disease, which is more common in developing countries due to poor sanitary and health referral systems. The major and dangerous cause of COM is acquired cholesteatoma or dermoid cyst. Cholesteatoma is a histologically benign disease, however; the natural behavior may be characterized by locally aggressive and invasive properties associated with significant morbidity and occasional mortality.<sup>1</sup> Cholesteatoma is diagnosed by direct otoscopy in the office or during operation, as well as in conventional radiography and CT scan films.

Department of Otolaryngology,  
Baqiyatallah Medical Sciences University,  
Tehran, Iran.

### Correspondence:

Mohammad Ajalloueyan MD,  
Department of Otolaryngology,  
Baqiyatallah Hospital,  
Baqiyatallah Medical Sciences University,  
Tehran, Iran.

**Tel:** +98 21 22587117

**Fax:** +98 21 88790298

**Email:** [ajall2001@bmsu.ac.ir](mailto:ajall2001@bmsu.ac.ir)

It is shown that interleukin-1a, a major cytokine in cholesteatomatous keratinocytes, activates neutrophils and lymphocytes during the inflammatory process. Furthermore, this cytokine stimulates osteoclasts and releases collagenase and prostaglandin E-2 from fibroblasts.<sup>2</sup> These features may all lead to subsequent bone destruction and other complications of cholesteatoma such as meningitis, brain abscess, labyrinthitis and facial nerve paralysis.<sup>2</sup> The recurrence rates in relation to the length of observation time was variably stated to be between 7.6% and 57%, and surgery is the only strategy to eradicate this cyst.<sup>3</sup> The aims of surgery are to achieve a dry, self cleaning ear and completely eradicated the disease.

Literature review shows numerous techniques as to the preference of surgeons despite much controversy in establishing the optimal technique for managing cholesteatomas.<sup>4</sup> Undoubtedly, results of long-term follow-ups may play a major role in comparing and judging between numerous presentations. However, there are few prolonged follow-up studies having been reported previously.<sup>5-9</sup> Therefore, this study evaluated and compared the results of ten-year follow-up of two major trends in cholesteatoma ear surgeries namely canal wall up and canal wall down, considering dry ear, cholesteatoma recurrence and hearing improvement.<sup>10</sup>

## Patients and methods

As a primary operation, 129 patients with cholesteatoma (COM) were subjected to CWU or CWD mastoidectomy between 1989 and 1994. All the patients underwent one stage of ear surgery, CWU for small confined cholesteatomas not beyond the aditus and CWD for large or hidden cysts. Of these, 108 which had at least 10-yr follow-up enrolled in the study. The final evaluation was made by an independent otologist. All patients under 14-yr-old were excluded due to some discrepancies in the pediatric ear surgical strategy.<sup>11</sup>

Twenty-one patients less than 14-yr age (16.2%) departed from the study due to migration or death unrelated to ear complications and considerations of safe dry ear. As a rule, all supratubal, sinus tympani, perifacial nerve, foot plate, and labyrinthine cholesteatomas were treated with CWD mastoidectomy and

tympaanoplasty. Others which were less than 5 mm or confined to middle ear or attic underwent a CWU procedure. Tympanoplasty and ossiculoplasty were performed with autologous fascia, cartilage or cortical bone materials when ever possible. In these ears we have used silastic sheeting in order to prevent adhesion formation. Apparently, most of these patients suffered from permanent dysfunction of their Eustachian tube. Surgical operations involving 72 CWD and 36 CWU were performed on 108 patients. The characteristics of the patients are shown in Table 1. Conventional mastoid views were obtained and evaluated whether they were normal, sclerotic or cloudy, suspicious to cholesteatoma. Furthermore, air and bone conduction thresholds were determined, using a clinical audiometer calibrated according to Richter et al.<sup>12</sup> Hearing level was defined as the mean air conduction thresholds at 0.5, 1, 2 and 4 kHz.

The patients were under follow-up for a minimum of 10 yrs. They were visited monthly during the first year, every four months during the second year and annually thereafter. Recurrence of cholesteatoma was considered as both residual and recurrent disease with retraction pockets containing keratin.

### Surgical technique

The technique for CWD and CWU mastoidectomy and tympanoplasty has been published previously.<sup>4</sup> In CWD, the surgeon removes the remnants of posterior canal wall and in CWU saved or reconstructs the wall. In CWD method, we removed mastoid tip, locked in hypotympanum, supratubal area and sinus tympani. The wide mastoid bowl was obliterated using four periosteal flaps situated superior, inferior, anterior and posteriorly. When much bone and the tip was removed; cavity became beveled and smaller, and bone chips or pate were not necessary.<sup>13</sup> Myringoplasty was done using autologous temporalis muscle fascia.

### Statistical analyses

Data are presented as mean±SD. For evaluation of categorical items the univariate analysis and Chi-square test was used. Multivariate logistic regression analysis was used for determining the independent variables and  $p < 0.05$  was considered as significant.

**Table 1:** Mean age, gender, sign and symptoms in patients operated due to cholesteatoma.

	Age(range)(Y)	M	F	OT No (%)	HL No (%)	FP No (%)
CWD	46 (16-81)	43	29	0	54 (75)	1 (1.4)
CWU	31 (21-69)	26	10	26 (72)	19 (53)	1 (0.3)
Total	39 (16-81)	69	39	91 (84)	73 (68)	2 (1.8)

OT= Otorrha; HL= Hearing loss; FP= Facial paralysis; CWD= Canal wall down; CWU= Canal wall up

## Results

Among 108 patients (aged from 15 to 73 yrs) with cholesteatoma, 39 (36%) were female and 69 (64%) male. The incidence of cholesteatoma was significantly higher in men ( $p < 0.05$ ). The statistical characteristics of the patients are shown in Table-1. CWD was done in 72 (67%) of patients and 36 (33%) experienced the CWU mastoidectomy/ tympanoplasty trend. At the time of surgery, 23 (21%) ears were dry, 15 (21%) in CWD and 8 (22%) in CWU groups.

All patients had perforated tympanic membrane or attic retraction pocket. Tympanic membrane perforations were marginal in 98 (91%) and central in 10 (9%) patients. Attic retraction was noticed in 26 (24%) patients with or without perforation. Attic cholesteatoma were found in 23 (21%) and cholesteatoma originated from the mesotympanum in 85 (79%) patients. During the surgery, cholesteatoma was limited to the tympanic cavity and /or attic in 31 (29%) ears and extended into the antrum in 65 (60%) ears; and filled the entire mastoid bowl in 12 (11%) ears.

The major complications caused by the disease were brain abscess in one, facial nerve paralysis in two, deafness in four, labyrinthine fistula in five, and meningitis in seven patients. Recurrence of cholesteatoma was noticed in 10 (9%), four in CWD and six in CWU. In patients with less than three yrs follow-up the recurrence rate was 3% (3 out 108 patients) which was significantly lower than that after seven yrs (10%,  $p < 0.05$ ). Whereas, the recurrence rate between the two surgical groups were not significantly different.

Ten yrs after surgery, 102 (94%) ears were dry with no significant differences between two groups. However, all the moist or discharging ears belonged to the CWU group. In general, intact tympanic membrane was seen in 86 (79%) patients which was reported in 67 (93%) patients of CWD and 21 (58%) patients of CWU groups with their differences being statistically significant ( $p < 0.05$ ). The most common sites for residual cholesteatoma were observed in 10 revision surgeries included sinus tympani in four, supratubal region in three, foot plate in two patients, and hypotympanum in one case. The hearing levels of the patients are presented in Table 2. The overall hearing better than 40 dB was 45%, 40-60 dB in 50% and poor or deaf in 5% with no significant difference between the two groups.

**Table 2:** Hearing levels at 10 years postoperation.

Hearing (dB)	CWD No (%)	CWU No (%)	Total No (%)
H>40	30 (42)	19 (52)	49 (45)
60>H>40	39 (54)	15 (42)	54 (50)
60>H	3 (4)	2 (6)	5 (5)

H= hearing loss; CWD=Canal wall down; CWU= Canal wall up

## Discussion

This study was designed to evaluate the prognosis of two common trends of cholesteatoma ear surgery, namely CWU and CWD method, considering 10 yrs follow-up. According to a previous study evaluating 90 patients who underwent intact canal wall mastoidectomy for cholesteatoma, the recurrence rate of 25% was reported after a mean follow-up of 9.2 yrs.<sup>9</sup> The recurrence rate of 6.3% was observed in patients with attic cholesteatoma after a mean follow-up of 11 yrs.<sup>13</sup> A recent study reporting the results of tympanoplasty in 151 patients combined with cholesteatoma after a mean follow-up of 14.5 yrs detected a 26.5% failure of which 47.5% were due to attic retraction pockets and 10% resulting from large residual cholesteatomas.<sup>7</sup>

The rate of cholesteatoma recurrence in patients with <10 yrs follow-up was 8.8% which was significantly lower than in patients with follow-up of 10 yrs. Our study showed that 94% of ears were dry 10 yrs after operation with intact tympanic membrane in 93% of CWD and 58% in CWU groups. Furthermore, a useful hearing level, better than 40dB, was reported in 45% of our patients, which was comparable to the reports of Kapur, Cody and their colleagues.<sup>7,8</sup>

The ideal treatment for cholesteatoma is a one-stage procedure which can completely eradicate the disease and avoid the recurrence.<sup>14</sup> Our study, however, revealed lower recurrence rate after CWD method in comparison with CWU trends which was in agreement the results of Hirsch, Silvola and their colleagues,<sup>15,16</sup> and different from others.<sup>13</sup>

Our treatment policy was to use CWD method for large cholesteatomas whereas only patients with small cholesteatomas were subjected to canal wall up procedures. The recurrence rate of 6% in CWD which was acceptable in comparison with previous studies.<sup>17</sup> Although, the 17% of recurrence rate in CWU group was relatively high, this inconsistency extended to the improvement of hearing level of the patients as some studies showed better results in hearing level after CWU mastoidectomy in comparison to CWD method.<sup>17,18</sup> Our results showed that 18% of CWD operated patients had hearing level of 20 dB or better and 45% had 40 dB or better with differences between CWU and CWD groups not statistically significant.

The higher recurrence rate in CWU group may indicate that the removal of posterior canal wall in some cases might be essential for total eradication of cholesteatoma. In fact, it can signify the importance of disease eradication in

comparison with surgical procedure. Obviously, it is possible to improve the surgical techniques, by side-viewing rigid endoscopes and CT scan which make it possible to have a better view of the less visible corners of the cavity.<sup>17,19</sup>

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