Shiraz E-Med J. 2023 May; 24(5):e133899. https://doi.org/10.5812/semj-133899.

Published online 2023 May 31. **Research Article**

Clinical and Surgical Features of Acquired Middle Ear Cholesteatoma: A 10 Years Population-Based Study

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Received 2022 December 11; **Revised** 2023 April 16; **Accepted** 2023 May 07.

Abstract

Background: Cholesteatomas are benign destructive lesions of the temporal bone that may lead to life-threatening complications.
Objectives: This study described the clinical and surgical characteristics of chronic otitis media patients with acquired middle ear cholesteatoma.
Methods: Among 1790 patients with chronic otitis media detected during almost 10 years, 449 suffered from cholesteatoma. The clinical features and surgical data were investigated.
Results: Among the chronic otitis media patients, 449 (25.0%) cases had cholesteatoma with a mean age of 32.2 ± 16.1 SD years, and 62.8% were male. The most common symptom was otorrhea (53%), followed by hearing impairment (37.9%). Erosion of the facial nerve canal was observed in 33.1% of patients, dural plate erosion in 4.8% of cases, and labyrinthine fistula in 10.3% of patients. Moreover, ossicular chain erosion was observed with the highest frequency in incus (40%), followed by malleus (33%) and stapes (26%). Amongst the surgically treated patients, 59.3% underwent mastoidectomy with canal wall preservation, 29.7% underwent modified radical mastoidectomy, and radical mastoidectomy was performed in 11% of patients.
Conclusions: Cholesteatoma was seen in about a quarter of patients with chronic otitis media. Based on our findings, cholesteatoma can be associated with serious complications such as facial nerve canal erosion (33.1%), dural plate erosion (4.8%), and labyrinthine fistula (10.3%). Regarding the functional importance of the hearing system and the high prevalence of disease complications, middle ear cholesteatoma needs long-term follow-up.

Keywords: Cholesteatoma, Middle Ear, Surgery

1. Background

Cholesteatoma is a non-neoplastic, erosive mass composed of desquamated keratin and squamous debris in a fibrous matrix (1). Cholesteatoma of the middle ear is one of the important disorders of the auditory system. This disease can affect the auditory system and balance, causing both sensorineural hearing loss and conductive hearing loss (2). According to the World Health Organization report, the prevalence of chronic otitis media was different by region, from approximately 0.3% to 14%. Among them, cholesteatoma is a rare disorder (1: 10,000 per year) (3).

Acute mastoiditis is one of the main infectious complications of cholesteatoma. Besides, petrositis, facial nerve palsy, and intracranial infection are other complications. Non-infectious complications of this disease include tympanic membrane perforation, bone erosion, labyrinthine fistula, and tympanosclerosis, the main causes of hearing disorders worldwide (4).

Hence, cholesteatoma will not resolve naturally; the only treatment for cholesteatoma is surgical removal. Generally, the main goal of surgery is to remove the disease and get a dry ear without infection. Thus, hearing preservation is the second goal of surgery. Reconstruction of the middle ear is not always possible in one stage; therefore, the second operation may be performed six to twelve months later. The second operation attempts to restore hearing while examining for disease recurrence (5). Although the type of surgery can vary depending on disease extension and location, a tympanomastoidectomy is one of the most common surgeries (6). The progressive nature of cholesteatoma, its fatal consequences, and the lack of long-term studies in Iran underline the need for a population-based investigation of this disease.

2. Objectives

In this survey, we reported our experience in epidemiology, the signs and symptoms, the various effect of the disease on middle ear structures and mastoid, and the type of surgery in patients with middle ear cholesteatoma over 10 years. The study's large population and long duration made the present study novel research of its kind.

3. Methods

3.1. Design Overview

This cross-sectional study was approved by the local Ethics Committee of Shahid Beheshti University of Medical Sciences (IR.SBMU.MSP.REC.1398.769), and all participants gave written informed consent.

3.2. Setting and Participants

The study was conducted at the Department of Otolaryngology and Head and Neck Surgery, Taleghani Hospital, Tehran, Iran, over 10 years (August 2008 - June 2018). The study included all adult patients referred to our otolaryngology clinic with chronic otitis media. Medical records were reviewed for demographic characteristics, surgical data, and clinical presentation. All patients who were investigated in the study had chronic otitis media with cholesteatoma with an age older than 18 years. Patients with congenital cholesteatoma, chronic otitis media without cholesteatoma, adhesive otitis media, history of head trauma, noise exposure, use of ototoxic drugs, and previous ear surgery were excluded.

4. Results

Over 10 years, 1790 patients with chronic otitis media were detected; among them, 449 (25.0%) cases of cholesteatoma were reported (Table 1). The participants were adult patients with ages ranging between 19 and 68 years old (mean: 32.2 ± 16.1 SD). 62.8% of patients were male. Bilateral disease was observed in 8.9% of patients, and the right side was slightly more involved (53.7%). Hearing loss was reported by (37.9%) of patients, and (53%) of cases complained of otorrhea.

Although surgery is the preferred treatment for acquired cholesteatoma, in our report, 435 patients underwent surgery. Based on the medical data, surgery was not performed on the 14 patients because of the patient's preference or poor general condition.

Among the different surgical techniques, mastoidectomy with canal wall preservation was done in 59.3% of patients, modified radical mastoidectomy was performed in 29.7% of cases, and radical mastoidectomy in 11% of cases. The surgical data showed facial nerve canal erosion in 33.1% of patients (84.1% in the tympanic segment and 15.9% in the vertical segment), dural plate erosion in

Table 1. Clinical and Surgical Characteristics of Acquired Ear Cholesteatoma

Variables	Frequency (%)
Gender	
Male	62.8
Female	37.2
Age (y)	
< 30	51.0
31 - 40	24.1
41 - 50	18.6
> 50	6.2
Symptoms	
Hearing loss	37.9
Ottorhea	53
Vertigo	11
Involved ear	
Right	53.7
Left	46.3
Both	8.9
Ossicular erosion	
Incus	40
Malleus	33.1
Stapes	26.8
Facial nerve canal erosion	
Tympanic segment	84.1
Vertical segment	8.2
Both	7.7
External canal erosion	15.2
Dural plate erosion	4.8
Lateral sinus erosion	6.2
Labyrinthine fistula	10.3
Surgical technique	
Intact canal wall mastoidectomy	59.3
Modified radical mastoidectomy	29.7
Radical mastoidectomy	11.0
Ossicular chain reconstruction	
First stage	62.1
Second stage	37.9

4.8% of cases, external auditory canal erosion in 15.2% of patients, and labyrinthine fistula in 10.3%. Moreover, ossicular chain erosion was observed with the highest frequency in incus (40%), followed by malleus (33%) and stapes (26%).

Ossicular chain reconstruction was performed in the primary surgery in 62.1% of patients and in the second stage in (37.9%) of patients. Also, a pathologist confirmed the diagnosis of cholesteatoma in 91.7% of cases.

5. Discussion

Cholesteatoma is a fatal disease that can become a major threat if left untreated. Our study showed that acquired cholesteatoma occurred slightly more common in men with a mean age of 32.2 ± 16.1 SD years. Otorrhea was the most common complaint (53%), followed by hearing loss (37.9%). These findings align with a study by Aquino et al., who worked on 1,146 cases (960 adults and 186 children). They found that the incidence of cholesteatoma was significantly associated with gender and age. The incidence of this disease was higher in men (66.6%) than in women (33.4%). Furthermore, the most common symptoms were otorrhea (66.5%), tinnitus (23.3%), and hearing loss (7.6%) (7).

According to our study, facial nerve canal damage was seen in about 18% of cases. Furthermore, 80% of them were detected in the tympanic segment, and none occurred during surgery. Although the prevalence of facial nerve canal damage is variable in previous studies, it has been reported to be less than 20%, with the tympanic segment as the most reported site (8-10). A study by Lin et al. reported that facial nerve canal erosion was 33.3%. Among them, 87.2% occurred in the tympanic segment, 7.7% in the vertical segment, and 5.1% in both tympanic and vertical segments (11). In 2019, Rosito et al. conducted a study to find the prevalence and complications of labyrinthine fistula in 333 patients with cholesteatoma. The study reported labyrinthine fistula in 9 (2.7%) patients. In 8 cases, the initial fistula diagnosis was made by imaging and confirmed during surgery (12).

Ossicular chain damage was evaluated in various studies. The prevalence was reported from 82% (75% observed in incus) to 94% (86.1% in incus, 66% in stapes, and 43% in malleus) (13, 14).

Depending on the location and extension of cholesteatoma, the disease can recur and lead to further problems. Therefore, follow-up is necessary. The recurrence rate of this disease is estimated at 5 to 13%. Although this recurrence usually occurs in the first 5 years, some studies suggest that recurrence is possible even 14 years after primary surgery (15).

Although the present study had no follow-up to provide more data regarding surgical outcomes, several studies evaluated different surgical techniques in patients' follow-ups. Among them, tympanoplasty with intact canal wall mastoidectomy showed favorable effects on hearing in the long term. Although stapes reconstruction may be associated with a short-time hearing effect, it could improve hearing for a long time (16). Another study performed a retrograde mastoidectomy for cholesteatoma in 242 ears with an average follow-up of 20 months. This technique removed the cholesteatoma posteriorly through the canal wall from the epithelial area to the mastoid, creating an open mastoid cavity. In 58% of the patients, primary surgery was performed; the remaining cases underwent a second operation. In 88% of patients, initial hearing reconstruction was performed. Approximately 34% of the disease recurred after surgery, 90% of which occurred in the first 5 years after surgery. Also, they concluded that hearing outcome was significantly higher in patients undergoing posterior canal wall surgery compared to the CWD technique (postoperative air-bone gap of 17.6 versus 22.5 dB, $P < 0.05$) (17). Another study was performed on 65 patients with cholesteatoma and followed them for 24 months. Bondy operated on 30 patients with modified radical mastoidectomy (BMRM), and 35 patients were treated by canal wall-up tympanoplasty (CWUT). In the BMRM group, no case of disease recurrence was detected. While, In the CWUT group, residual cholesteatoma was reported in 2 cases (5.7%), and three patients (8.57%) showed recurrent disease in the follow-up. Statistical analysis in these patients reported a significant percentage of residual cholesteatoma in patients undergoing CWUT surgery ($P = 0.005$). Also, no hearing impairment was reported in any patients (18).

Facial nerve damage after surgery has been reported in patients with cholesteatoma. The risk of nerve injury is higher when the nerve is not covered by its normal bony fallopian canal. In a study of patients with cholesteatoma, facial nerve canal erosion was found in 30% of the primary cases and 35% of the revision surgeries. The erosion of the facial nerve canal is a serious condition, and surgeons should pay special attention to this nerve during surgery (19).

Although our study includes some limitations in follow-up issues, we provide valuable results with a high sample size in acquired middle ear cholesteatoma. To improve further upon these findings, we are now collaborating with other physicians to enroll additional patients and add long-term follow-up in a prospective trial.

5.1. Conclusions

Cholesteatoma was seen in about a quarter of patients with chronic otitis media. Despite our perception of the disease, cholesteatoma can be associated with serious complications such as facial nerve canal erosion (33.1%), dural plate erosion (4.8%), and labyrinthine fistula (10.3%).

Regarding the functional importance of the hearing system and the high prevalence of disease complications, middle ear cholesteatoma needs long-term follow-up.

Footnotes

Authors' Contribution: BB developed the original idea and the protocol, abstracted and analyzed data, wrote the manuscript, and is a guarantor. MA contributed to the development of the protocol, abstracted data, and prepared the manuscript.

Conflict of Interests: The authors declared no conflict of interests.

Ethical Approval: This was a cross-sectional study approved by the local ethics committee of Shahid Beheshti University of medical sciences IR.SBMU.MSP.REC.1398.769.

Funding/Support: This study received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Informed Consent: All participants gave written informed consent.

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