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STUDY ON CHOLESTEATOMA INDUCED LABYRINTHINE FISTULA IN TERTIARY CARE HOSPITAL

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ABSTRACT

Labyrinthine fistula is one of the largest common extra-cranial obstacles of cholesteatoma. The causes of cholesteatoma-induced labyrinthine fistula remain unknown. Cholesteatoma and its complications pose a great burden on the economic and health sectors in developing nations. The objective is to estimate the prevalence of labyrinthine fistula in cholesteatomatous chronic otitis media and to analyze the potential risk factors, clinical presentation, and post-surgical improvement concerning hearing and vertigo in the study cohort. The study was conducted in the Department. Of Otorhinolaryngology, Sri Lakshmi Narayana Institute of Medical Sciences, Pondicherry (Affiliated to Bharat Institute of Higher Education and Research, Chennai) between 2016-2019 over 3 years. All patients diagnosed with COM with cholesteatoma were reviewed retrospectively in a tertiary healthcare center. Of the total 324 cases reviewed, 21 cases had a labyrinthine fistula. Results were studied concerning incidence, risk factors, clinical features, fistula location, type, and post-surgical improvement in hearing and vertigo. Results: The Incidence rate of LF in our learning was 6.48%. 16(76.1%) patients were male and 5 (23.9%) females. The youngest patient was a 10-year-old male; the oldest patient was a 51-year-old female, and the mean age was 34. The left ear (76.1%) was affected more than the right. All cases were from rural areas, and 16(76.1%) were farmers. Ear discharge (85%) was the most common symptom, followed by hearing loss (76%) and vertigo (47%). A very peculiar risk factor of self-cleaning the ear was noticed in all patients. Out of the 16(76.1%) patients who underwent surgery, it was observed that the lateral semicircular canal was the most common site of the fistula. According to Dornhoffer's radiological classification, Type II LF was the most common type. A foreign body (a piece of the twig) was found intraoperatively in one patient with a type III labyrinthine fistula. Two patients had multiple fistulae. Six patients had associated mastoid fistula, and one had facial nerve paralysis. All patients except one were free of vertigo following surgery. Postoperatively, the bone conduction was the same as pre-operative value in 12/16(74%) patients. The incidence of the labyrinthine fistula is still superior in developing countries, predominantly in rural populations, where the habit of self-cleansing the ear is common. Common symptoms are ear discharge, hearing impairment, and vertigo. All the cases had a habit of frequent self-cleansing of the external ear as an important risk factor. It has also been observed that the male population is at risk, and the left ear is affected more. Therefore, implementing awareness programs on maintaining aural hygiene in rural health centers may reduce the incidence of cholesteatomatous labyrinthine fistula, thereby preserving hearing and vestibular functions and improving the quality of life.

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1. INTRODUCTION

Because of its bone-eroding properties, chronic otitis media with cholesteatoma can cause various problems. Chronic otitis media with cholesteatoma can create various issues due to its bone-eroding qualities. Labyrinthine fistula (LF) is the most serious problem in clinical practice among infra-temporal abnormalities [1]. The labyrinthine fistula is found in the lateral semicircular canal in roughly 90% of patients (LSCC) [2]. Neither the symptoms nor the clinical examination are sensitive or specific to the condition [3]. The use of CT in the pre-operative diagnosis of LF is critical. In earlier investigations, CT has been shown to have 50% sensitivity in the diagnosis of LF. However, due to high-resolution CT and smaller incisions, more recent investigations have demonstrated sensitivity between 85 and 100 percent (0.5 mm slices) [4,5]. The treatment of labyrinthine fistula caused by cholesteatoma is still debatable. Because cholesteatoma illness might worsen with the remaining matrix and bone resorption can rise, a review of current data supports total removal of the matrix from the fistula and restoration with bone sealing [6]. The gentle and cautious removal of the matrix and the careful closure of the labyrinthine fistula results in a high percentage of hearing preservation and a safe and dry ear, avoiding the need for a second-look operation [7,8]. Cholesteatoma and its complications are well prevalent in developing countries. Overcrowding due to poor socio-economic status and lack of awareness in oral hygiene are known risk factors. However, clinically, only a few risk variables are given substantial weight. Such situations might surprise the surgeon during the intraoperative period and provide a challenge [9].

2. METHODS

In this retrospective analysis study, between 2016 and 2019, a cohort comprising 324 cases of acquired cholesteatoma was analyzed. Of these, 21 cases were diagnosed with labyrinthine fistula.

Inclusion criteria

The inclusion criteria are patients diagnosed with acquired cholesteatoma.

Exclusion criteria

The exclusion criteria are patients without an acquired cholesteatoma and patients with a history of previous surgery. Data regarding age, sex, clinical presentation, fistula test, audiological tests, radiological investigations, surgical procedure, and post-surgical improvement in hearing and vertigo were studied and tabulated. Surgical data were examined to determine the LSCC's fistula type using Dornhoffer and Milewski's classification [18], one of the most widely used categories to standardize results in recent research. [12, 19–21]. In this investigation, however, type II was not subdivided. In this retrospective analysis, a single-stage procedure in the form of canal wall down mastoidectomy and fistula repair with two layers of temporalis fascia was performed.

Table 1. Dornhoffer and milewski classification

Fistula type 1:	Bony labyrinthine erosion with an undamaged endosteum
Fistula type 2	Endosteum opened with intact membranous labyrinthine
Fistula type 2A	Intact perilymphatic space
Fistula type 2B	Distressed perilymphatic space
Fistula type 3	Perilymphatic space has been opened, and the membranous labyrinthine has been involved or destroyed.

3. RESULTS

In the present study, out of 324 cases of acquired cholesteatoma, 21 patients were found to have a labyrinthine fistula; the incidence was 6.48%. It was more common in males 16 (76.1%) than in females 5(23.9%). The left

ear (76.1%) was affected more than the right. The largely affected population was from the rural sector of society (21 patients) with poor socioeconomic status. Most of them are farmers (16 patients). All the patients gave a peculiar history of self-manipulation of the external auditory canal for cleaning purposes. The most common symptoms were otorrhea in 18 cases (85%) and hearing loss in 16 cases (76 %). The other indications found were dizziness in 10 patients (47%), aural fullness in five patients (28.5%), tinnitus in four patients (19%), headache in 4 patients (19%), and otalgia in three patients (14%).

Table 2. Fistula test assessment at different hearing levels in cases

Fistula type	Normal <21 dB	21–40dB n(%)	41–70 dB	71–90 dB	90–110 dB
I	4(19%)	2(9%)	2((9%)		
II	1(5%)	6(28%)	3(14%)	1(5%)	
III		1(5%)			1(5%)
Total	5(24%)	9(41%)	5(23%)	1(5%)	1(5%)

Table 1 shows that the Fistula test was positive in three (14%) patients. Pre-operatively, 24% (n = 5/21) patients had normal bone conduction (BC), 67% (n = 14/21) patients had preserved BC, and 9% (n = 2/21) had profound sensorineural hearing loss (SNHL.

Table 3. Preoperative CT scan predicting the existence of a lateral semicircular canal fistula

FISTULA	**NUMBER**
TYPE 1	6/8 (75 %)
TYPE 2	11/11 (100 %)
TYPE 3	2/2(100%)
TOTAL	19/21 (90 %)

Table 2 presents the type II fistula, the most common type, according to Dornhoffer classification. The fistula was identified on a CT scan and confirmed during surgery in all but two patients.

Table 4. Postoperative bone conduction thresholds and fistula

Hearing outcome	**Type 1**	**Type 2**	**Type 3**	**Total**
Improved/unchanged	6(37%)	5(31%)	1(6%)	12(74%)
worse		1(6%)	2(12%)	3(18%)
Dead			1(6%)	1(6%)

Table 4 presents 74% of patients with preserved or improved hearing after surgery, equivalent to most contemporary studies in which the cholesteatoma matrix was entirely removed (Table 3). Figure 1 demonstrates an LF in a CT scan. It was found that two patients had multiple fistulae intraoperatively [FIGURE 2]. Six (29%) patients had associated mastoid fistula, and one patient (4%) had associated facial nerve paralysis. In a patient with Type III fistula, a foreign body (a piece of the twig) was accidentally discovered intraoperatively [FIGURE

3]. Of the 18 patients referred for follow-up, 17/18 (94%) patients were free of vertigo following surgery. Postoperatively, the bone conduction was similar to the pre-operative value in 12/16 (74%) patients.

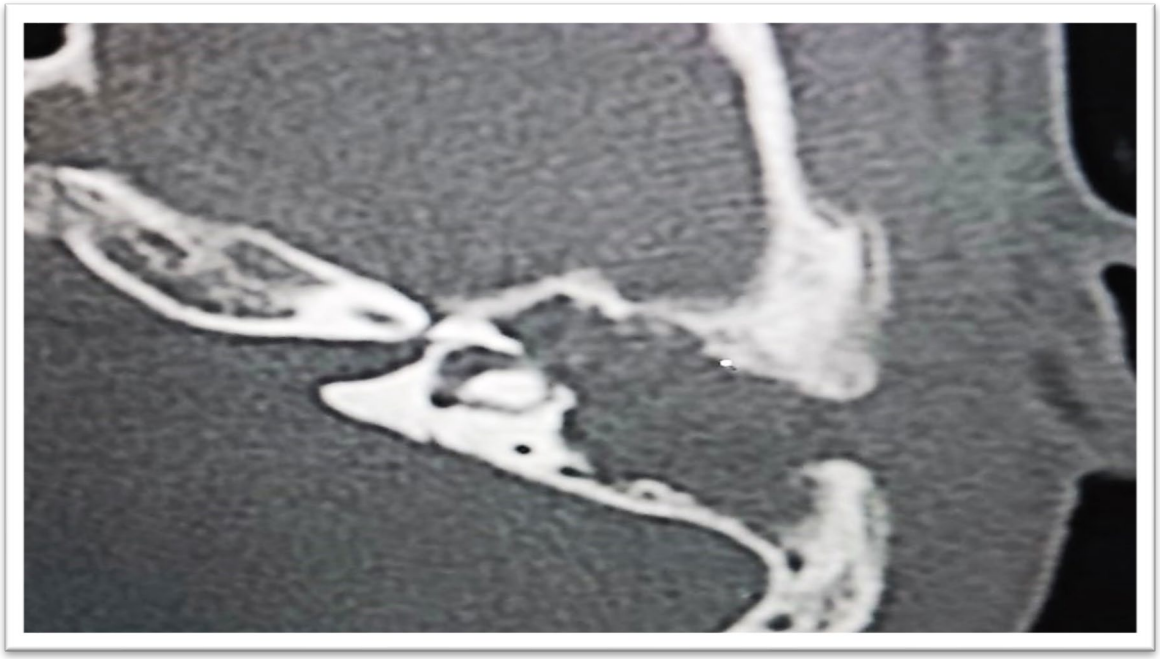

Figure 1. Preoperative CT showing Type II fistula lateral semicircular canal

4. DISCUSSION

We encountered one such case where a foreign body (a piece of the twig) surprised us during routine mastoid surgery for cholesteatoma with a labyrinthine fistula. This case encouraged us to retrospectively analyze all labyrinthine fistula patients in cholesteatomatous chronic otitis media. Labyrinthine fistulas are a frequent complication of chronic otitis media with cholesteatoma [10]. In the present research, in 3 years, 21 out of 324 patients operated on cholesteatoma presented a fistula of the lateral semicircular canal, which indicated an incidence of 6.48. However, in the present study, the incidence is relatively higher, which can be attributed to the short study period of 3 years compared to other studies reporting the incidence for a study period of a minimum of 5 years [11]. The most affected patients were from rural areas with poor socioeconomic status. Labyrinthine fistulas acquired following cholesteatoma as a complication of chronic otitis media may not manifest straightforwardly. A combination of otologic symptoms may lead to complicated ways that are hard for the patient to explain, especially when people lack awareness. Hence, rural people with inadequate access to information and healthcare settings tend to report cholesteatoma late, which then results in the formation of a labyrinthine fistula [12].

A record of vertigo is present in 64 percent of patients with labyrinthine fistula; fistula diagnostics may be positive in up to 50 percent of patients. Profound SNHL is noted in 15% of patients [13]. Similarly, in our study, the commonest site was found to be the lateral semicircular canal, which can be due to its anatomic proximity to the middle ear. Despite the illness degrading the bone labyrinth, there were no clinical indications and symptoms of vestibular involvement in 10 (47%) patients [14]. The entire membranous labyrinth might describe this, and the cholesteatoma matrix itself shelters the inner ear fluid from middle ear pressure or sound waves [15]. Most of these people will have no issues unless inflammatory mediators or toxins drift into the inner ear fluid [16].

Data regarding other clinical features could be more reliable due to being affected by variables such as the patient's memory and avoidance of prompt medical care. Dizziness was most commonly reported because most patients were farmers, and dizziness/vertigo decreased work efficiency [17]. Hearing loss was a complaint of long duration, which suggests it was the most neglected symptom, which can also be the cause of a patient's delayed reporting. The risk factors identified in the present

study included self-manipulation for cleaning purposes and occupational exposure to dust and vegetative flora, as most farmers were farmers [18]. Some of the causes of secondary acquired cholesteatoma include infection, trauma, or impaction of skin into the middle ear, which can occur as a consequence of self-cleaning of the external auditory canal, as seen in our cases. Hence, the lack of awareness regarding oral hygiene and the odd practice of self-cleaning is associated with an increased incidence [19]. Similarly, in our study, the type II fistula was the most common type [20, 21]. In the present study, a foreign body was found intraoperatively in a type 3 labyrinthine fistula patient. During surgery, it was found that a part of the twig was inside the fistula. No similar finding has been described in the literature. This provides supportive evidence of how self-cleansing with twigs could be a potential risk factor.

Further studies are required to support the evidence. Removing the matrix overlaying the fistula and lowering the posterior canal wall is the most contentious aspect of surgical care of cholesteatoma-induced fistulas. The notions have evolved throughout the decades, and there has lately been a movement in agreement toward total excision of the cholesteatoma matrix from the fistula [22]. According to studies, the risk of labyrinthine injury from removing the epithelium that lines the fistula is minimal compared to the long-term danger of labyrinthitis from a residual epithelium over the fistula that remains to manufacture collagenase [23]. In a study of 23 patients with fistulas, Kobayashi T et al. discovered that not only the length of the fistula but also its location, the number of fistulae, and even retaining the posterior canal wall had no statistically significant impact on hearing preservation [24]. In their study, Chen Z et al. found that delicate and precise removal of the matrix and careful closure of the labyrinthine fistula results in considerable hearing preservation and a safe and dry ear, avoiding the need for a second-look operation [25,26].

5. CONCLUSION

The present study ascertained that the incidence of labyrinthine fistula due to an acquired cholesteatoma is relatively higher in developing countries with a predominantly rural population, where the habit of self-cleansing the ear is a common practice. The left ear is affected more and is common in males. Implementing awareness programs on maintaining aural hygiene in rural health centers may reduce the incidence of cholesteatomatous labyrinthine fistula, thereby preserving hearing and vestibular functions and improving the quality of life.

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Nil

COMPETING INTEREST

The authors declare no conflict of interest.

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