



INCIDENCE OF TYMPANOSCLEROSIS IN CHRONIC OTITIS MEDIA OF MUCOSAL TYPE: A CROSS SECTIONAL STUDY

Naga Manohar Kapilavaya¹, Sanjusha P², Parveen Sulthana³, Ramachandra Rao Vengala⁴

¹Associate Professor, Dept. of ENT, Maharajah's Institute of Medical Sciences, Nellimarla, Andhrapradesh, India

^{2,3}Postgraduate, Dept. of ENT, Maharajah's Institute of Medical Sciences, Nellimarla, Andhrapradesh, India

⁴Professor, Dept. of ENT, Maharajahs Institute of Medical Sciences, India

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Corresponding author: Ramachandra Rao Vengala

Abstract:

Introduction: Chronic Otitis media (COM) is one of the most common pathologies of the ear, causing high morbidity to the patient in terms of ear discharge and hearing loss initially, which may proceed on to various other symptomatology. Many of the subjects suffering from COM have multiple degrees of tympanosclerosis, which, if not removed in total will obstruct the hearing mechanism. **AIM:** To know the incidence of tympanosclerosis in its various forms and involvement in chronic suppurative otitis media (CSOM) patients. **SETTINGS AND DESIGN:** The study was carried out in a Tertiary Hospital in Vizianagaram, Andhra Pradesh. It is a Prospective study, culminating in the treatment of the subjects. **MATERIALS AND METHODS:** Patients presenting to ENT OPD, from January 2019 to December 2019, and diagnosed as COM with Inactive mucosal disease were included in this study. All the patients were subjected to detailed ENT examination and investigations, otoscopic examination, and examination under a microscope. After due surgical investigations, the patients were subjected to explorative tympanotomy, sclerosis identified, and documented. **RESULTS:** Of the 122 patients included in the study, 24 patients had evidence of tympanosclerosis. (19.67%). Of them, 10(41.6%) were males, and 14(58.3%) were females. Seventeen patients (70.83%) were found to be having myringosclerosis; seven patients (29.16%) had sclerosis in the tympanic membrane and middle ear. In patients with myringosclerosis, the ossicular chain was found to be mobile in 14 (82.35%), discontinuous in 2(11.7%), footplate fixation in 1 (5.88%). In the 7 cases with sclerosis of the membrane along with middle ear, 3 (42.85%) cases had sclerotic patch at the body of incus, 2 (28.5%) cases had it at the head of the malleus, and the rest 2 (28.5%) had it dispersed. **CONCLUSIONS:** Tympanosclerosis is a known entity affecting patients suffering from COM, females more than males. It can be either affect the tympanic membrane, or either it can involve the middle ear, along with the tympanic membrane. Wherever the site of affection is, the surgeon must remove the sclerotic plaque, to give a better hearing to the patient.

Keywords: COM, EXPLORATIVE TYMPANOTOMY, INACTIVE MUCOSAL DISEASE, INCUS, MALLEUS, OSSICULAR CHAIN, TYMPANOSCLEROSIS

Introduction

Tympanosclerosis was first described in 1734 by Cassebohm as 'Chalky patches' in the Tympanic membrane. The term TYMPANOSCLEROSIS was coined by von Troltsch in 1873 and revived to introduce into English Literature by Zollner and Beck in 1955^{1,2}.

By Definition, Tympanosclerosis is characterized by hyaline degeneration of the fibrous layer of the Tympanic membrane and the middle ear mucosa. It refers to acellular material visible as white plaques in the Tympanic membrane and as white nodular deposits in the submucosal layers of the middle ear on otoscopy³.

Tympanosclerosis is a frequent complication of chronic otitis media affecting the infected middle ear mucosa, which is replaced by dense structureless collagenous, fibrous or hyalinized tissue containing small or significant deposits of calcareous material. These may be patchy or confluent. The tympanic cavity and ossicles are covered by

the white fibrous tissue, which may impede their movement^{4,5}.

Intratympanic tympanosclerosis is an insidious condition, which may take years to become manifest clinically. It is, therefore, difficult to determine its actual incidence. Most of the statistics quoted in literature are based on clinical or operative data and fail to take account of cases in the early asymptomatic category^{6,7}. However, etiology remains obscure, and pathogenesis of tympanosclerosis remains unclarified.

Materials and Methods

For a period of one year, from January 2019 to December 2019, a prospective study was undertaken in the patients presenting to ENT OPD at Maharajah's Institute of Medical Sciences, Vizianagaram, Andhra Pradesh.

All those patients being diagnosed as COM were categorized as those suffering from COM with the mucosal

type of disease and as those suffering from COM with the squamosal kind of illness.

The patients diagnosed as a mucosal type of COM were subjected to Otoscope examination and Examination under Microscopy and searched for myringosclerosis.

All those patients having myringosclerosis were included in the study.

Proper documentation and otoscopic photographs were taken.

All the subjects included in this study were taken up for surgery. Preoperative observations were made, and the subjects included in the study are divided into two groups, one group with myringosclerosis alone and another group with tympanosclerosis in the membrane and middle ear.

The subjects who had evidence of the squamosal type of disease (retraction pockets/Cholesteatoma), per-operatively, were excluded from the study. Any proof of cholesteatomatous nidus was removed surgically, and appropriate surgical management was carried out.

Results

In this study, 122 patients with COM were included. The incidence of Tympanosclerosis, irrespective of it involving only the tympanic membrane or the middle ear along with it, was 19.67%(24 patients).

Out of these 24 patients, 10 were males, and 14 were females. (41.6% and 58.3% respectively).

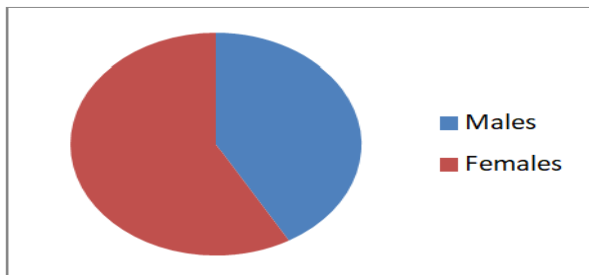


Figure 1: Showing Sex distribution of tympanosclerosis

Of the patients, 50% were in the age group of 15-25 yrs, 29.16% in the age group of 26-35yrs, 12.5% in the age group of 36-45yrs, 8.3% in the group of 46-55yrs.

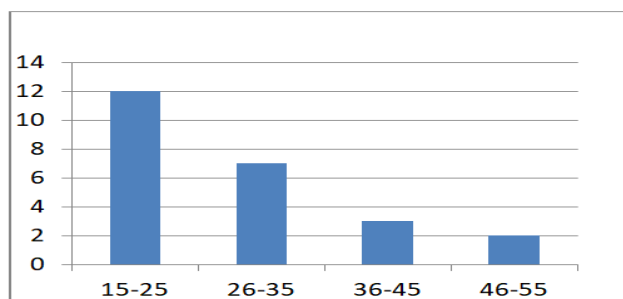


Figure 2: Showing Age distribution of Tympanosclerosis

Intraoperative findings were used to classify the patients into two groups, those having myringosclerosis and those having sclerosis in the tympanic membrane and middle ear. The first group comprised 17 patients (70.83%), and the latter consisted of the rest seven patients (29.16%).

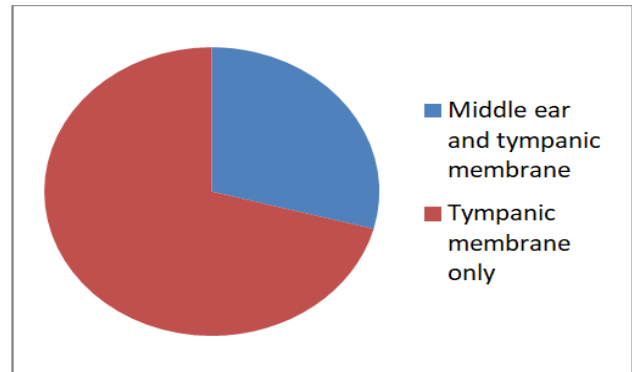


Figure 3: Showing site distribution of tympanosclerosis

All the cases taken for this study had a dry ear, and only those cases with a mucosal type of COM were included in this study. If any evidence of Cholesteatoma or retraction pockets were found per-operatively, those patients were removed from the study database.

The selected cases were operated after fulfilling the prerequisites for tympanoplasty. Intraoperative findings were given more importance as regarding involvement by sclerosis.

Audiological investigations, viz, Pure Tone Audiometry (PTA) showed different degrees of A-B Gap.

2 Patients (8.33%) had an A-B Gap of <20 dB, 16 patients (66.67%) had 20-40dB, 6 patients (25%) had >40 dB.

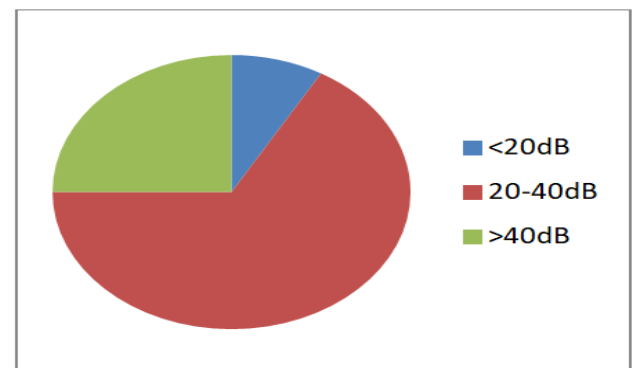


Figure 4: Showing A-B gap in PTA in patients presenting with tympanosclerosis

All the patients who had evidence of plain myringosclerosis had an A-B Gap of <40 dB, except one patient, who had an air-bone gap of >40 dB, despite having plain myringosclerosis. Maybe, it was because of extensive sclerosis.

Of the 17 patients confirmed with myringosclerosis alone, the ossicular chain was mobile in 14 cases. (82.35%). In the rest 3 cases, the ossicular chain was not mobile. It was discontinuous due to erosion in 2 cases (11.7%), and fixation of the footplate of stapes was found in 1 case. (5.88%).

Of the 7 cases with tympanosclerosis of the tympanic membrane and the middle ear, all the cases had decreased ossicular mobility. In 3 cases (42.85%), the tympanosclerotic patch was seen at the body of incus; in 2 cases (28.5%), it was found abutting the head of the malleus. In the rest 2 of the cases (28.5%), it was dispersed between facial recess, fallopian canal, crura of stapes.

Table 1: Showing Intra operative findings of CSOM

Ossicular chain	Myringosclerosis	The middle ear and tympanic membrane
Mobile	14	-
Eroded	2	5
Fixation of stapes	1	2



Figure 5: Left ear with myringosclerotic patches in posterior and anteroinferior quadrants, with a dry central perforation in anterosuperior quadrant



Figure 6: Right ear with myringosclerotic patches all through the tympanic membrane, with a dry central perforation in anteroinferior quadrant

Discussion

Tympanosclerosis is thought to be a complication of otitis media in which acellular hyaline and calcified deposits accumulate within the tympanic membrane and the

submucosa of the middle ear. In most patients, these plaques are insignificant and cause little or no hearing impairment. Tympanosclerotic plaques within the membrane appear as a semicircular crescent or horseshoe-shaped white plaque within the tympanic membrane.⁸ Tympanosclerosis is a consequence of resolved otitis media or trauma.

Hussl and Mueller⁹ found it as a frequent sequel of chronic OME, in 19.7% of drumheads 6 to years after the insertion of ventilating tubes for OME. They also noted that middle ear tympanosclerosis often was seen after recurrent bouts of AOM. To and Stangerup¹⁰ found a significant increase in ears in which grommets were placed (59%) compared with the contralateral ears, where the only myringotomy was done (13%).

Kinney found that 20% of 1495 patients undergoing surgery for chronic otitis media or its sequelae had tympanosclerosis. According to Gibb (1976), tympanosclerosis was described by Cassebohm as 'chalky patches' in the tympanic membrane as early as in 1734. Von Troltsch (1873) first created the term 'Taukensklrose' to describe sclerotic changes in the middle ear mucosa.

The term tympanosclerosis was then introduced by Zollner (1955) into the English literature (Ferlito, 1979) Wielinga et al. (1988) postulated that the damage to the lamina propria of the tympanic membrane occurs due to the direct action of hydrolytic enzymes in the serous fluid. Depending on the extent of calcification and localization of the process there comes to ossicular chain fixation and conductive hearing loss of various levels and, in rare cases, to deafness.¹¹

In a study by SaadAsiri Et al¹², the incidence of tympanosclerosis was found to be 11.6 percent (90 patients out of 775 CSOM cases). Most tympanosclerosis cases had dry ear (85.6 percent). Of the 57.8 percent who had myringosclerosis, their PTA showed an AB gap of 20–40 dB. When sclerosis affects both the tympanic membrane and middle ear, 61 percent of patients had an AB gap >40 dB. The association of Cholesteatoma and tympanosclerosis may be regarded as uncommon, 2.2 percent.

In a study by Wu Y et al.¹³, the incidence of tympanosclerosis was found to be 35.64 percent. Most tympanosclerosis cases had dry ear (77.78 percent). The majority of hearing loss associated with tympanosclerosis was of the conductive type. Of the 92.56 percent who had myringosclerosis, the PTA showed an AB gap <40 dB. When sclerosis affected both the tympanic membrane and middle ear, 45.45 percent of patients had an AB gap >40 dB.

In a study by K.Arumugam¹⁴, 72% of cases had only myringosclerosis, whereas the rest 18% had sclerosis in both tympanic membrane and middle ear.

In this study, patients suffering from COM were identified and included in the study; the total number is 122.

The incidence of Tympanosclerosis, irrespective of it involving only the tympanic membrane or the middle ear along with it, was 19.67%(24 patients), as evidenced by SaadAsiri et al. as 11.6% and Wu Y et al. as 35.64%.

Transtympanic Endoscopy can be carried out¹⁵

41.6% were males, and 58.3% were females. 50% were in the age group of 15-25 yrs, 29.16% in the age group of 26-35yrs, 12.5% in the age group of 36-45yrs, 8.3% in the group of 46-55yrs.

Depending on the extent of involvement by sclerosis, myringosclerosis comprised 17 patients (70.83%), and the rest seven patients had sclerosis both on the tympanic membrane and in the middle ear (29.16%).

Audiological investigations, viz, Pure Tone Audiometry was done and the findings recorder, The patients were categorized as, 2 Patients (8.33%) had an A-B Gap of <20 dB, 16 patients (66.67%) had 20-40dB, six patients (25%) had >40 dB.

In some patients with stapedia fixation, along with routine surgery, stapes mobilization may be required¹⁶.

All the patients included for the study were taken up for tympanoplasty. Intraoperative findings were given more importance as regarding involvement by sclerosis.

All the patients who had evidence of plain myringosclerosis had an A-B Gap of <40 dB,

One patient, who had plain myringosclerosis, had an air-bone gap of >40 dB, despite having plain myringosclerosis. Maybe, it was because of extensive sclerosis involving the whole pars tensa.

Of the 17 patients confirmed with myringosclerosis alone, the ossicular chain was mobile in 14 cases. (82.35%), proving that, though the sclerotic plaques were in the pars tensa, no ossicle was involved whatsoever.

In the rest 3 cases, the ossicular chain was not mobile. It was discontinuous due to erosion in 2 cases(11.7%), and fixation of the footplate of stapes was found in 1 case. (5.88%).

Of the 7 cases with tympanosclerosis of the tympanic membrane and the middle ear, all the cases had decreased ossicular mobility.

In 3 cases (42.85%), the tympanosclerotic patch was seen at incus; in 2 cases(28.5%), it was found attached to the

malleus. In the rest 2 of the cases(28.5%), it was dispersed between facial recess, fallopian canal, crura of stapes.

Manubrio-stapedioplasty has been shown to be an effective method for ossicular reconstruction in cases of malleus and incus fixation due to tympanosclerosis.¹⁷

In those patients with isolated malleus fixation with tympanosclerosis, performing a canaloplasty to clean the sclerotic plaques without damaging the normal anatomy of the ossicle system using a diamond burr is a safe surgical option that provides significant recovery in hearing levels¹⁸

Conclusions:

Tympanosclerosis is a long-term sequela of CSOM.

The incidence varies widely in the literature between 7% and 35% of all patients with a chronic middle ear infection. In this study, it was found to be 19.67%.

The exact etiology and pathogenesis of tympanosclerosis are as yet not well known.

The sclerosis was limited to the tympanic membrane in 70.83%, and in the rest (29.16%), it involved various parts of the middle ear, contributing to hearing loss, due to decreased ossicular mobility.

Analysis of intraoperative findings and audiometric data showed that the degree of hearing loss caused by tympanosclerosis is directly proportional to the degree of ossicular involvement and that hearing is minimally affected by small plaques in the tympanic membrane which doesn't impair the vibratory properties of the tympanic membrane.

Whenever surgery for a patient suffering from COM with the mucosal disease is contemplated, we should always be ready for tympanosclerosis, which may be found in a small percentage of patients. Thorough knowledge of the various proportions of patients with tympanosclerosis, the multiple sites affected can prepare us for any untoward surprises, helping the operating surgeon in giving the maximum possible hearing to the patient.

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