

Incidence of Tympanosclerosis in Chronic Suppurative Otitis Media Patients in a Tertiary Care Hospital

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Abstract

Introduction: Tympanosclerosis is an anatomoclinical entity which causes thickening and fusion of collagenous fibers into a homogenous mass with final deposition of scattered intracellular and extracellular calcium and phosphate crystals in the subepithelial tissue of tympanic membrane and middle ear structure.

Aim: This study aims to study the incidence of tympanosclerosis in chronic suppurative otitis media (CSOM) patients.

Materials and Methods: Patients with CSOM admitted for surgery were subjected to detailed ENT examination and investigation which included otoscopy, tuning fork tests with 256, 512, and 1024 Hz, free-field hearing, pure tone audiometry, X-ray mastoids, and computed tomography (CT) temporal bone. CT temporal bone can be used to determine the extent of disease in the middle ear and ossicles fixation.

Results: In 62 patients with CSOM, the incidence of tympanosclerosis was found to be 17.7% (11 cases). In patients with tympanosclerosis, the lesions were confined to tympanic membrane alone in 72% (8 cases) while the involvement of both tympanic membrane and middle ear was found in 18% (2 cases). In tympanosclerosis, 9% (1 case) had an AB gap of <20 dB, 63.6% (7 cases).

Conclusion: Tympanosclerosis is long-term sequelae of CSOM. The hearing loss associated with tympanosclerosis was of the conductive type in the majority of cases.

Key words: Chronic suppurative otitis media, Hearing loss, Tympanosclerosis

INTRODUCTION

Tympanosclerosis is irreversible pathological sequelae of chronic inflammation of middle ear cleft and signifies the end result of simultaneously operating healing process. The exact etiology of tympanosclerosis is not extensively understood. The possible following long-term otitis media and insertion of tympanostomy tube of tympanosclerotic plaques (TSPs) essentially consist of white chalky calcareous deposits beneath the lining epithelium. This is caused by thickening and fusion of

collagenous fibers into a homogeneous mass interspersed with intra- and extra-cellular deposition of calcium and phosphate crystals followed by ossification to a variable extent. The clinical significance of the TSP depends on the anatomical disposition. It may present as isolated deposit in the tympanic membrane and middle ear or extend to ossicular ligaments, ossicles, interosseous joints, muscles, tendons, and submucosal space, leading to a varying degree of immobility of ossicular chain. Tympanosclerosis clinically has been rarely found in active ears and with cholesteatoma.^[1,2] This has not been supported by pathological temporal bone specimens.^[3] TSP depending on its size, site, and involvement of ossicular chain affects severely the sound transfer mechanism, and hearing restoration results in the following tympanoplasty. Clinically significant tympanosclerosis has been defined as requiring direct surgical removal to affect hearing improvement. It has been found to be present in less than half of those patients manifesting any degree of tympanosclerosis.^[4]

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Thus, significant TSP will necessitate surgical intervention in such ears during tympanoplasty procedure to make it functionally effective and rewarding.

Aim

This study aims to study the incidence of tympanosclerosis in chronic suppurative otitis media (CSOM) patients.

MATERIALS AND METHODS

This prospective observational study, patients of CSOM admitted for surgery, was examined. All the patients presented with a history of deafness and/or otorrhea of varying duration. They were subjected to detailed ENT examination and investigation which included otoscopy, tuning fork tests with 256, 512, and 1024 Hz, free-field hearing, pure tone audiometry, and X-ray mastoids. Pure tone averages of 0.5, 1, 2, and 3 KHz were taken to assess the hearing level pre- and post-operatively. The presence of tympanosclerosis was observed by otoscopic and/or microscopic examination. Intratympanic tympanosclerosis has been subdivided into “open” and “closed” varieties, depending on the integrity of the tympanic membrane. The tympanosclerotic aggregations can vary in size, ranging from small isolated deposits to huge masses which may completely submerge the ossicles and obscure normal landmarks. Preoperatively, the ossicular mobility, middle ear mucosa, and degree of tympanosclerosis in the tympanic membrane and middle ear were noted. The removal of tympanosclerosis was decided intraoperatively. The majority of TSP are of rubbery consistency and have a lamellar structure so that they can be readily separated into a series of concentric onion layers. Less commonly, the plaques are densely hard and adherent to the underlying bone. Data were presented as frequency and percentage. Damage to inner ear as a result surgical procedure is possible and serious concern results in the form of sensory neural hearing loss.

RESULTS

In this study, 62 patients with CSOM were included. The incidence of tympanosclerosis in our study was found to be 17.7% (11 cases of 62 patients of CSOM). In this study, six female patients and five male patients were included [Figure 1]. About 45.4% (5 cases) of patients with tympanosclerosis were greater than the age of 21 years [Figure 2].

On analysis of intraoperative findings in patients with tympanosclerosis, the lesions were confined to tympanic membrane alone in 72% (8 cases) while the involvement of both tympanic membrane and middle ear was found in 18% (2 cases) [Figure 3].

About 63.6% (7 cases) had a dry ear at the time of presentation which was confirmed intraoperatively. On the other hand, 18.1% (2 cases) had a discharging ear at the time of presentation. Peroperatively, 9% (1 case) had edematous middle ear mucosa with glue and 9% (1 case) had an associated cholesteatoma of these two discharging ears. On examination of the ossicular chain, 63.6% (7 cases) had a mobile chain, 18% (2 cases) had a fixed chain while 9% (1 case) showed erosion of the ossicular chain. On analysis of the audiometric data of 11 patients with tympanosclerosis, 9% (1 case) had an AB gap of <20 dB, 63.6% (7 cases) had an AB gap of 20–40 dB while 27.2% (3 cases) had an AB gap of more than 40 dB [Figure 4]. When the AB gap was correlated with the site of tympanosclerosis, 71.4% (5 of 7 cases) had an AB gap of <40 dB when tympanosclerosis was confined only to the tympanic membrane. On the other hand, 50% (1 of 2 cases) had an AB gap of more than 40 dB when tympanosclerosis involved both the tympanic membrane and middle ear.

DISCUSSION

Intratympanic tympanosclerosis is an insidious condition, which may take years to become manifest clinically. It is, therefore, difficult to determine its true 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.^[5,6]

Tympanosclerosis developed in 13% of ears with secretory otitis media treated with paracentesis compared with 59% with grommet tube insertion. Kay *et al.* in the meta-analysis of 134 studies regarding sequelae of tympanostomy tube insertion revealed 32% incidence of post-intubation tympanosclerosis compared with 10% of controls.^[7]

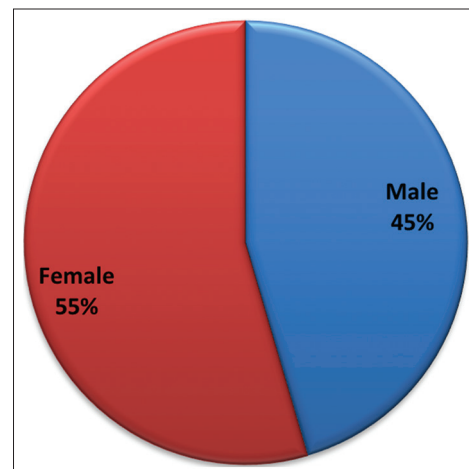


Figure 1: Distribution of gender

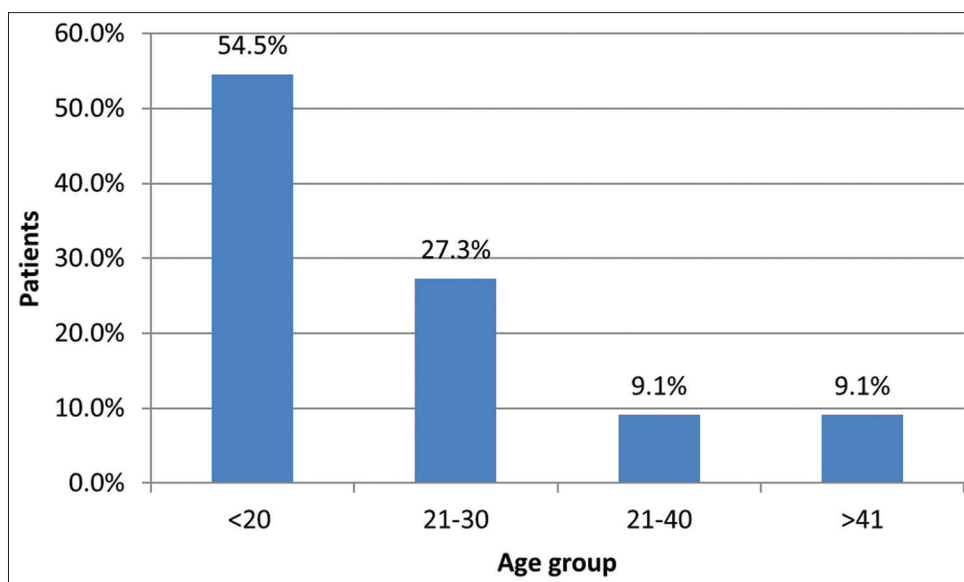


Figure 2: Distribution of age group

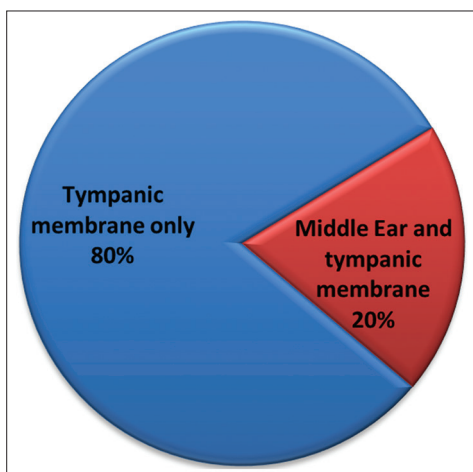


Figure 3: Distribution of site in intraoperative findings

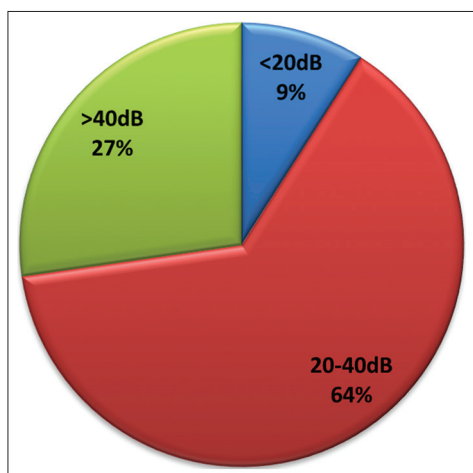


Figure 4: Distribution of degree of hearing loss

uncovered on routine biopsy. Indeed, Friedmann^[8] reported that of 60 histologically confirmed cases, only 32 were diagnosed clinically. In a review of over a 1000 operations performed for all types of middle ear disease, Austin^[4] reported the presence of tympanosclerosis in the tympanic membrane or middle ear to be 32% irrespective of its clinical significance. Tympanosclerosis can be bilateral in 40–60% of cases.^[9] However, the existence of the condition does not necessarily equate with its clinical importance.

Myringosclerosis was more common in children following grommet insertion hearing loss which was minimal or nil. Tympanosclerosis was more common in adults following chronic otitis media or hearing loss depends on the size and extent of involvement of ossicles or fixation.

Clinically, tympanosclerosis can either be myringosclerosis or intratympanic. Myringosclerosis occurs when the disease affects only the tympanic membrane and appears as white “chalky patches.” In most cases, it is asymptomatic or has little effect on hearing (Tos *et al.*, 1983),^[10] but if the plaques involve large areas of tympanic membrane or if they are adherent to the bony annulus, handle of malleus, or promontory, the mobility of the drum will be greatly reduced resulting in marked hearing loss (Wielinga and Kerr, 1993).^[11] It might be either open (80%) with tympanic membrane perforation or closed (20%) with the intact drumhead. The incidence of tympanosclerosis following the previous history of otitis media ranges from 14% to 43% in different clinical series. In the review, Tos and Stangerup demonstrated an association between ventilation tube placement and tympanosclerosis. Tympanosclerosis developed 13% of ear with secretory

This suspicion is underlined by several histological studies, in which a number of subclinical cases were

otitis media treated with paracentesis, compared with 59% treated with grommet tube insertion. In addition, Kay *et al.*'s recent meta-analysis of 134 studies regarding sequelae tympanostomy tube insertion revealed 32% incidence of post-intubation tympanosclerosis compared with 10% of controls. The intratympanic type is frequently associated with marked conductive or mixed hearing loss. The degree of hearing loss depends on the extent of tympanosclerotic involvement of the ossicular chain (Kamal, 1997).^[12]

CONCLUSION

Tympanosclerosis is long-term sequelae of CSOM. The incidence varies widely in literature between 7% and 33% of all patients with a chronic middle ear infection. The degree and extent of tympanosclerosis plaques will eventually determine the severity of hearing loss.

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