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Original Research Article

A study of the correlation between the pre-operative high resolution computed tomography findings and intra-operative findings in chronic otitis media-squamosal type

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ABSTRACT

Background: Chronic otitis media (COM) is characterized by ear discharge and hearing loss. There are two types of COM depending on the presence or absence of cholesteatoma. COM with cholesteatoma is termed as COM squamosal type and COM without cholesteatoma is termed COM mucosal type. COM squamosal type is associated with potential complications. If cholesteatoma is detected early, less invasive surgical methods can be used for hearing preservation and make ear safe from recurrent infections. A proper clinical examination can most often diagnose a cholesteatoma but require a high resolution computed tomography (HRCT) scan to assess the extent of the disease and potential complications. But most often the intra operative findings may not correlate with the HRCT findings. The aim of the study was to evaluate the clinical presentation of COM squamosal disease, preoperative HRCT and intra-operative findings and formulate a proper surgical intervention to avoid complications.
Methods: This is a comparative study of the pre-operative HRCT and intra-operative findings in COM squamosal type. In the present study of 35 patients with squamosal disease, the HRCT findings were compared with intra-operative findings.
Results: The study showed a good correlation between pre-operative HRCT of temporal bone and intra operative finding. The findings are statistically significant ($p<0.001$).
Conclusions: The study shows a good correlation between pre-operative HRCT temporal bone and intra-operative findings.

Keywords: Chronic otitis media squamosal, Pre-operative HRCT, Temporal bone, Cholesteatoma, Operative findings

INTRODUCTION

Chronic suppurative otitis media (CSOM) is defined as a chronically draining ear for more than 3 months with a defect in the tympanic membrane. The cause for tympanic membrane defect includes retraction pocket, perforation secondary to middle ear infection, persistent perforation following a ventilation tube placement and trauma. Chronic otitis media (COM) is a common condition in patients attending otorhinolaryngology outpatient department. The prevalence in India is more than 4% by World Health Organisation. COM is broadly classified into two types mucosal and squamosal. COM squamosal type is characterised by the presence of cholesteatoma. Cholesteatoma is defined as an accumulation of squamous epithelium and keratin debris trapped within the tympanomastoid segment. Chronic otorrhoea is most common presentation and if left untreated, cholesteatoma can lead to several potentially fatal complications. Long standing cases may present

with mixed hearing loss with involvement of inner ear. A high resolution computed tomography (HRCT) scan without contrast can delineate the extent of cholesteatoma.[1,2] This may help in evaluating suspected ossicular erosion, erosion of facial canal, tegmen tympani defect, labyrinthine fistula, petrous apicitis and other dreaded intracranial complications.

Computed tomography (CT) scans have a high negative predictive value in excluding cholesteatoma when there is no evidence of opacification in a well aerated tympanomastoid cavity. It should be noted that similarities in the density of CT scans for cholesteatoma, granulation tissue, fibrous tissue, mucosal oedema and effusion may greatly limit the ability of HRCT to distinguish among these entities. CT scans are preferable means to assess bone involvement, but it is limited in its ability to evaluate changes in soft tissues.

HRCT cannot always differentiate cholesteatoma from granulation tissue, mucosal oedema or effusion. In many cases, CT imaging reveals widespread homogenous opacification of the mastoid air cells leading to diagnostic confusion. In a study by Shah et al, in the correlation between pre-operative HRCT and intra-operative findings, the homogenous soft tissue in the middle ear cavity was diagnosed by HRCT with a sensitivity of 100%, but specificity in differentiating cholesteatoma and granulation was poor. A high sensitivity and specificity were noted in detecting the erosion of ossicles, facial canal, semicircular canals, mastoid cortex and cochlea. So, they concluded that HRCT is essential for the diagnosis and proper management of CSOM squamosal disease.[3]

The objective of this study was to find the correlation between pre-operative HRCT and intra-operative findings in patients undergoing mastoidectomy for chronic otitis media-squamosal type.

METHODS

This prospective study was conducted in the Department of ENT, Pushpagiri Institute of Medical Sciences, Thiruvalla, Kerala from January 2017 to January 2019. There were 35 patients included in the study. Patients with all age groups and either sex attending the OPD with complaints of ear discharge, hearing loss, pain or giddiness were evaluated and in whom COM squamosal type had been diagnosed were taken for the study.

Inclusion criteria

All patients with COM squamosal type who underwent HRCT temporal bone and any mastoid surgery were included in the study

Exclusion criteria

COM mucosal type, acute otitis media with or without complications, malignancy of temporal bone, granulomatous diseases of temporal bone, conditions that render the patients unfit for the surgery were excluded.

All patients who were diagnosed with COM squamosal type were evaluated by a HRCT temporal bone pre-operatively. The findings most commonly noted were soft tissue mass, erosion of scutum, ossicular erosion, tegmen erosion, erosion of sinus plate, facial canal dehiscence, labyrinthine fistula. These findings were compared with intra -operative findings. Operative procedures done were modified radical mastoidectomy, cortical mastoidectomy with various types of tympanoplasties.

The data were tabulated using Microsoft Excel and analyzed statistically in SPSS V22. Percentage, sensitivity, specificity, positive predictive value, negative predictive value of each finding were calculated. Chi-square test was applied to find the significance value of each finding. $P<0.005$ was considered as statistically significant.

RESULTS

In the study which included 35 patients, there were 20 males (57.1%) and 15 females (42.9%) (Figure 1). The age ranged from 11 years to 60 years. Perforations were on the right ear in 11 patients (31.4%), left ear in 14 patients (40%) and bilateral in 10 patients (28.6%) (Figure 2). All patients had a history of otorrhoea. Thirty one patients had associated hearing loss (88.6%). 11 patients complained of otalgia (31.4%). Only one patient had an associated vertigo (2.9%).

Table 1: Pre-operative findings.

Findings	No. of patients	Percentage (%)
Soft tissue attenuation	35	100
Sclerotic mastoid	24	68.6
Cellular mastoid	10	28.6
Automastoidectomy	1	2.8
Erosion of scutum	24	68.6
Erosion of tegmen	5	14.3
Erosion of sinus plate	6	17.1
Facial canal	9	25.7
Ossicular erosion	24	68.6

The soft tissue attenuation involved in the attic in 34 patients (97.1%), the mastoid antrum in 34 patients (97.1%), mesotympanum in 29 patients (82.9%), hypotympanum 2 patients (5.7%).

All the patients underwent surgery. Modified radical mastoidectomy in 32 patients (91.4%), cortical mastoidectomy with tympanoplasty in 3 patients (8.6%).

Correlation of pre-operative HRCT Temporal bone with intra-operative findings (Table 2).

Table 2: Correlation of pre-op HRCT temporal bone with intra-operative findings.

Findings	Sensitivity (%)	Specificity (%)	Positive predictive value (%)	Negative predictive value (%)	P value
Soft tissue attenuation	100	97.1	50	100	<0.001
Erosion of ossicles	72	100	100	81.2	<0.03
Erosion of scutum	85.7	100	100	63.64	<0.001
Erosion of tegmen	100	100	100	100	<0.001
Erosion of sinus plate	75	90.3	50	55	<0.001
Erosion of facial canal	60	90	50	93.1	<0.006
Erosion of lateral semicircular canal	66.6	96.9	66.7	96.88	<0.001

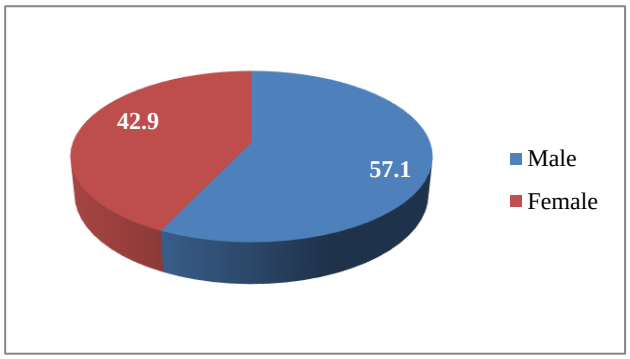

Figure 1: Gender distribution.

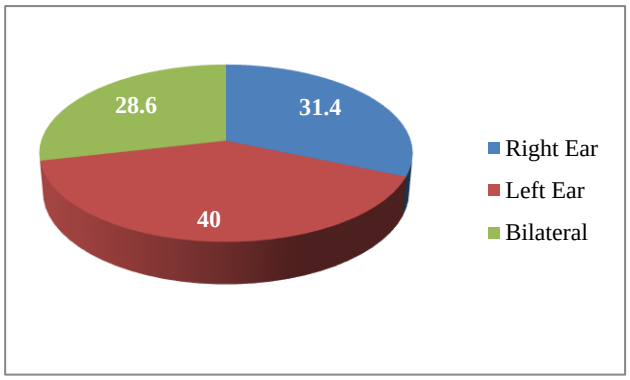

Figure 2: Side predilection.

DISCUSSION

In this prospective study of 35 patients, there were 20 males and 15 females and the ratio is 1.3:1. All of the patients studied had otorrhea of which 31 patients (88.6%) had hearing loss. A similar observation was noted by Aquino et al, Jothiramalingam et al.[4,5] The ear discharge will be usually foul smelling and scanty in COM squamosal type of disease. In this study 31 (88.6%) patients presented with foul smelling ear discharge. Based on the observations of Bluestone et al the diagnosis of cholesteatoma can be done effectively with otoscopic or microscopic examinations.[6] In the present study, on microscopic examination, polyps were seen in 8 patients (22.9%), granulations in 2 patients (5.7%) and erosions in 4 patients (11.4%). Aquino et al in Brazil study showed tympanic membrane perforation was mostly seen in the attic followed by marginal perforation in cholesteatoma cases.[4] In our study the perforations were mostly seen in the attic. Wahid et al in a study of 44 patients observed perforations in pars flaccid in 96.18% of patients.[1]

HRCT provides the exact anatomic location of cholesteastoma and its relationship to the contiguous structure. Comparison to the normal side is useful in doubtful cases. The distinctive features of cholesteatoma are the presence of soft tissue density in the tympanic cavity, erosions of ossicles, sinus plate, tegmen, facial canal, scutum, semicircular canals, labyrinth etc. These changes when associated with bony expansion of the tympanic cavity is highly suggestive of cholesteatoma. However, these changes are not specific as ectopic meningioma, malignant otitis externa may simulate cholesteatoma.[7,8] The key HRCT features in COM squamosal disease are soft tissue opacification in attic, aditus, mastoid air cells, blunting or erosions of the scutum, ossicles, tegmen, semicircular canal, facial canal and labyrinth. In cases of clinical suspicion of intracranial extension, contrast CT was advocated. The classical features of cholesteatoma are found in only about 50% of the cases.[9]

In present study, the preoperative HRCT of temporal bone diagnosed soft tissue attenuation in all 35 cases (100%). In a study by Prata et al, the sensitivity of HRCT in detecting cholesteatoma was 72.73%[10]. The literature shows sensitivity for HRCT ranges from 70 to 96.88%.[11-13] Sharma et al in their study on HRCT findings, found ossicular erosion in 90% of cases and scutum erosion in 84% of patients.[14] These findings were similar to the present study. Most of the cases had a sclerotic mastoid. After soft tissue attenuation, the most common findings noted were scutum erosion and ossicular erosion. In this study, modified radical mastoidectomy done in 32 cases and cortical mastoidectomy with tympanoplasty in 3 cases. In this study, the sensitivity of detecting soft tissue attenuation and tegmen erosion by HRCT were 100%. Specificity of detecting erosion of ossicles, scutum and tegmen were also 100%. Sensitivity of detecting facial

canal erosion was only 60%. These results were comparable to studies by Yildirim et al, Rogha et al and Payal et al.[15-17]

CONCLUSION

The present study shows that COM squamosal type affects all age groups. The common complaints are otorrhea and hypoacusis. Otoscopic and microscopic examinations helps in the clinical diagnosis. The study shows a good correlation between the findings on preoperative HRCT of temporal bone and intra operative findings. Soft tissue attenuations, bony erosions of ossicles, sinus plate, tegmen plate, facial canal and semicircular canals can identify pre operatively. It acts as a good road map to assist surgeons in surgical management of COM squamosal disease. The study showed a statistically significant association between preoperative HRCT findings and intra operative observations.

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