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Original Research Article

Paediatric acquired cholesteatoma, our experience in a tertiary care: two year prospective study

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ABSTRACT

Background: Aim of the study was to estimate the benefits of having high-resolution computed tomography (HRCT) of temporal bone on clinically evaluated paediatric patients of acquired cholesteatoma.
Methods: A total of 60 patients of paediatric age group (2-18 years) who were diagnosed with active squamosal type of chronic otitis media were selected for the study. HRCT of temporal bone was done in all the patients and findings were recorded.
Results: Most patients were in the age group of 11-15 years (46.6%). Findings of pars tensa were subtotal perforation in 2 patients (3.3%), small central perforation in 8 patients (13.3%) and postero-superior marginal perforation in 12 patients (20%). Pars flaccida retraction pocket with cholesteatoma was seen in 31 patients (51.6%) and perforation with cholesteatoma in 13 patients (21.6%). Scutum erosion was seen in 31 patients (51.6%), ossicular erosion in 12 patients (20%) and facial nerve paralysis in 2 patients (3.3%). On HRCT temporal bone we found soft tissue density in middle ear in 60 patients (100%), soft tissue density in mastoid in 53patients (88.3%), osscicular erosion in 54 patients (90%), scutum erosion in 46 patients (76.6%), facial nerve canal dehiscence in 5 patients (8.3%), semicircular canal dehiscence in 2 patients (3.3%) and dural plate dehiscence in 11 patients (18.3%).
Conclusions: HRCT of temporal bone is helpful in depicting a clearer picture of middle ear cavity structures involved by cholesteatoma and thus helpful in formulating a strategy for further management.

Keywords: Cholesteatoma, Paediatric, Temporal bone, HRCT

INTRODUCTION

Chronic otitis media (COM) is a common ear disease in developing countries. It is found both in paediatric and adult age group. In cases of COM, the presence of cholesteatoma increases the chances of complications as it has bone eroding properties.[1] COM can cause bony erosion with or without cholesteatoma but is commonly seen in COM with cholesteatoma.[2,3]

Aggressiveness of cholesteatoma is more in children than adults because of various pathophysiological factors.[4-10] Some studies have tried to define this on the basis of cholesteatoma perimetrix, while others did not find any correlation to support clinical aggressiveness of pediatric cholesteatoma on basis of histopathological findings.[11-14]

Pediatric cholesteatoma can be of two types; congenital and acquired. Various theories had been put forward for their formation. In 1933, Wittmaack proposed the most acceptable retraction pocket or invagination theory.[15] Acquired cholesteatoma can be divided in two types-primary and secondary. Primary acquired cholesteatoma develops from tympanic membrane retraction pocket while secondary develops from migration of epithelium through a perforated tympanic membrane or implantation of epithelium in middle ear.

In OPD, patients of COM present with various complaints like ear discharge, hearing loss, vertigo, tinnitus, facial asymmetry, headache, vomiting etc. On assessment they may have various intratemporal complications like labyrinthitis, mastoiditis, facial nerve paralysis etc or intracranial complications like meningitis, subdural abscess, otitic hydrocephalous, lateral sinus thrombophlebitis etc.

After proper clinical assessment, radiological assessment can be performed by investigations like X-ray, CT scan or MRI. Since CT scan is more specific in delineating the bony contour, therefore high-resolution computed tomography (HRCT) of temporal bone is very helpful in describing the status of various structures of mastoid bone in chronic otitis media.

Clinically it is easier to make a diagnosis of COM with cholesteatoma on otoscopy but the delineation of extension of disease is a bit challenging especially in cases of limited bony erosion of tegmen, semicircular canal, facial nerve canal etc.[16,-18] High-resolution computed tomography (HRCT) of temporal bone plays an important role in such a scenario and is also helpful in better management of pediatric cholesteatoma by observing various anatomical variations.[19]

Radiation exposure by CT scans is one of the common issue, but the study of Kim et al shows radiation hazard in paediatric cholesteatoma is not that high.[20]

Aim

Aim of the study was to estimate the benefits of having HRCT temporal bone on clinically evaluated paediatric patients of acquired cholesteatoma.

Objectives

The objectives of the study were to make a diagnosis of active squamosal type of COM on the basis of clinical examination of patients, to enlist the various relevant clinical findings of diagnosed patients and to correlate various clinically evaluated findings with HRCT temporal bone of patients.

METHODS

Study setting

A total of 60 patients of paediatric age group (2-18 years) who were diagnosed with active squamosal type of chronic otitis media were selected for the study after obtaining informed written consent from them or parents.

Study design

The current study is a prospective observational study.

Study duration

Study was done from April 2017 to March 2019 for a period of two years.

Sample size and sampling method

60 paediatric patients who were diagnosed with active squamosal type of chronic otitis media in the ENT department were taken up for the study. Sampling was done through simple random method.

Sample size (n) was calculated using the standard formula given below.

$$n=\frac{z^2\times p(1-p)/e^2}{1+\left(z^2\times p(1-p)/e^2N\right)}$$

Where, N=population size, e=margin of error (as a decimal), z=confidence level (as a z-score), p=percentage value (as a decimal)

Inclusion criteria

All the paediatric patients who presented in the otorhinolaryngology department with active squamosal type of COM and gave consent for the study.

Exclusion criteria

Patients who did not give consent for the study, patients with active and inactive mucosal type of COM and inactive squamosal type of COM, patients with prior history of ear surgery or fracture of temporal bone and patients with congenital ear diseases, ear malignancy or systemic diseases affecting the ear.

Procedure

All the patients were exposed to a thorough history taking and clinical examination in the outpatient department. Patients were evaluated for hearing loss using tuning fork tests, and then investigated by pure tone audiometry/ BERA, oto-endoscopy and necessary laboratory tests. HRCT of temporal bone was done in all the patients and findings were recorded. All the patients were then counseled regarding the nature of the disease, its progression, treatment, complications of the surgery and possible outcomes of the surgery.

RESULTS

Age distribution of patients involved in study is shown in (Table 1), 13 patients (21.6%) were in age group of 6-10 years, 28 patients (46.6%) were in age group of 11-15 years and 19 patients (31.6%) were in age group of >15 years.

Gender distribution of patients is shown in (Table 2). In the study 32 patients (53.3%) were males and 28 patients (46.6%) were females.

Table 1: Age distribution.

Age group (in years)	Frequency	Percentage
<5 yrs	0	0
6-10 yrs	13	21.6
11-15 yrs	28	46.6
>15 yrs	19	31.6

Table 2: Gender distribution.

Gender	Frequency	Percentage
Male	32	53.3
Female	28	46.7

Table 3: Duration of illness.

Duration of disease	Frequency	Percentage
<5 yrs	11	18.3
6-10 yrs	28	46.7
>10 yrs	21	35

Duration of illness of patients is shown in (Table 3). In 11 patients (18.3%) duration of illness is less than 5 years, in 28 patients (46.6%) duration is in between 6-10 years and in 21 patients (35%) duration is more than 10 years.

Laterality of disease is shown in (Table 4). Right ear was involved in 31 patients (51.6%), left ear was involved in 25 patients (41.6%) and bilateral ear were involved in 4 patients (6.6%).

Table 4: Disease involving ear.

Ear involved	Frequency	Percentage
Right	31	51.6
Left	25	41.6
Bilateral	4	6.6

Frequency of various symptoms is shown in (Table 5). Complain of ear discharge was in 60 patients (100%), hearing loss in 57 patients (95%), tinnitus in 14 patients (23.3%), vertigo in 18 patients (30%), headache in 11 patients (18.33%), nausea & vomiting in 12 patients (20%), facial asymmetry in 2 patients (3.3%), post auricular swelling in 6 patients (10%) and post auricular discharge in 3 patients (5%).

Frequency of external ear findings is shown in (Table 6). Post auricular fistula was seen in 3 patients (5%), post auricular swelling was seen in 6 patients (10%), deviation of pinna in 6 patients (10%), polyp in EAC in 12 patients (20%) and sagging of postero-superior canal wall in 2 patients (3.3%). Some other findings as mastoid tenderness were observed in 9 patients (15%), nystagmus was seen in 2 patients (3.3%) and facial nerve palsy was seen in 2 patients (3.3%).

Table 5: Frequency of various symptoms.

Symptoms	Frequency	Percentage
Ear discharge	60	100
Hearing loss	57	95
Tinnitus	14	23.3
Vertigo	18	30
Headache	11	18.33
Nausea and vomiting	12	20
Facial asymmetry	2	3.3
Postauricular swelling	6	10
Postauricular discharge	3	5

Table 6: Frequency of external ear findings and other findings.

Signs	Frequency	Percentage
Post auricular fistula	3	5
Post auricular swelling	6	10
Deviation of pinna	6	10
Polyp in EAC	12	20
Sagging of postero-superior canal wall	2	3.3
Mastoid tenderness	9	15
Nystagmus	2	3.3
Facial nerve palsy	2	3.3

Frequency of pars tensa findings is shown in (Table 7). Subtotal perforation was seen in 2 patients (3.3%), small central perforation in 8 patients (13.3%), granulation tissues in 12 patients (20%), postero- superior marginal perforation in 12 (20%), tympanosclerotic patch in 14 patients (23.3%) while it was not seen in 12 patients (20%).

Table 7: Frequency of pars tensa findings.

Findings	Frequency	Percentage
Subtotal perforation	2	3.3
Small CP	8	13.3
Granulation tissue	12	20
Postero-superior marginal perforation	12	20
Tympanosclerotic patch	14	23.3
Not visualized	12	20

Frequency of pars flaccida findings is shown in (Table 8). Retraction pocket with cholesteatoma was seen in 31 patients (51.6%), perforation with cholesteatoma was seen in 13 patients (21.6%), granulations with cholesteatoma in 4 patients (6.6%), erosion of scutum in 31 patients (51.6%), ossicular erosion in 12 patients (20%) while it was not visualised in 12 patients (20%).

Type of hearing loss observed on tuning fork tests is shown in (Table 9). Conductive hearing loss was observed in 47 patients (78.3%), mixed hearing loss was observed in 12 patients (20%) and dead ear in 1 patient (1.6%). While Romberg and Unterberger tests were positive in 2 patients each (3.3%).

Table 8: Frequency of pars flaccida findings.

Findings	Frequency	Percentage
Retraction pocket with cholesteatoma	31	51.6
Perforation with cholesteatoma	13	21.6
Granulations with cholesteatoma	4	6.6
Erosion of scutum	31	51.6
Ossicular erosion	12	20
Not visualized	12	20

Table 9: Tuning fork tests and other tests.

Finding	Frequency	Percentage
Conductive hearing loss	47	78.3
Mixed hearing loss	12	20
Dead ear	1	1.6
Fistula test	0	0
Romberg test	2	3.3
Unterberger test	2	3.3

Table 10: HRCT temporal bone findings.

Finding	Frequency	Percentage
Soft tissue density in EAC	12	20
Soft tissue density in middle ear	60	100
Soft tissue density in mastoid	53	88.3
Scutum erosion	46	76.6
Facial nerve canal dehiscence	5	8.3
Dural plate dehiscence	11	18.3
Sigmoid sinus plate dehiscence	4	6.6
Semicircular canal dehiscence	2	3.3
EAC posterior wall dehiscence	12	20
Ossicular erosion	54	90
Dehiscence of lateral wall of mastoid	6	10

HRCT of temporal bone findings is shown in (Table 10). Soft tissue density in EAC was seen in 12 patients (20%), soft tissue density in middle ear was seen in 60 patients (100%), soft tissue density in mastoid was seen in 53 patients (88.3%), scutum erosion was observed in 46 patients (76.6%), facial nerve canal dehiscence was observed in 5 patients (8.3%), dural plate dehiscence was observed in 11 patients (18.3%), sigmoid sinus dehiscence was observed in 4 patients (6.6%), semicircular canal dehiscence was observed in 2 patients (3.3%), EAC posterior wall dehiscence was observed in 12 patients (20%), ossicular erosion was observed in 54 patients (90%) and dehiscence of lateral wall of mastoid in 6 patients (10%).

DISCUSSION

The diagnosis of chronic otitis media (COM) implies a permanent abnormality of the pars tensa or flaccida, most likely a result of earlier acute otitis media, negative middle ear pressure or otitis media with effusion. Classification of com is shown in (Table 11).

In our study we had taken 60 patients below the age of 18 years with most patients being in the age group of 11-15 years (46.6%). While in studies of Palva et al, Smyth, Glasscock et al, Wullstein, Abramson et al and Edelstein etal ages varied from 9 to 18 years.[21-26]

Out of 60 patients 32 (53.3%) were male and 28 (46.7%) were female as were in the study of Diom et al.[27]

Right ear was involved in most cases i.e. 31 (51.6%) as was found in study of Glasscock et al, Edelstein et al, Diom et al and Gupta et al.[23,26-28]

Main complaint of the patients was discharging ear in 60 (100%). Other complaints were decreased hearing in 57 patients (95%), vertigo in 18 patients (30%). This is similar to the studies of Palva et al, Glasscock et al, Edelstein et al, Diom et al, Triglia and Khavasi et al.[21,26,27,29,30] Ear discharge and decreased hearing were the main complaints in majority of patients in above mentioned studies.

Other complaints were tinnitus in 14 (23.3%), nausea and vomiting in 12 patients (20%), headache in 11 patients (18.33%), postauricular swelling in 6 patients (10%) and post auricular discharge in 3 patients (5%), facial asymmetry in 2 patients (3.3%).

On examination, findings of external ear were post auricular fistula in 3 patients (5%), post auricular swelling 6 patients (10%), deviation of pinna 6 patients (10%), sagging of postero-superior canal wall 2 patients (3.3%), polyp in EAC 12 patients (20%) in comparison to studies of Khavasi et al which found aural polyp in 20% cases and Gamra et al which found attic polyp in 25% cases.[30,31] Mastoid tenderness was elicited in 9 patients (15%), facial nerve paralysis in 2 patients (3.3%) compared to studies of Khavasi et al and Gamra et al.[30,31] Facial asymmetry found in 1 (2.5%) in study of Gamra et al and 1 (5%) in study of Khavasi et al.[30,31] Findings of pars tensa were subtotal perforation in 2 patients (3.3%), small central perforation in 8 patients (13.3%), postero-

superior marginal perforation in 12 patients (20%). In comparison Palva et al found attic or a posterosuperior perforation in 52 (80%) while Khavasi et al found pars tensa perforation in 10%.

Table 11: COM classification.

COM classification	Synonyms	Otoscopic findings
Healed COM	Tympanosclerosis; healed perforation	Thinning and/or local or generalized opacification of the pars tensa without perforation or retraction
Inactive (mucosal) COM	Perforation	Permanent perforation of the pars tensa but the middle ear mucosa is notinflamed
Inactive (squamous) COM	Retraction	Retraction of the pars flaccida or pars tensa (usually posterio-superior) which has the potential to become active with retained debris
Active (mucosal) COM		Permanent defect of the pars tensa with an inflamed middle ear mucosa which produces mucopus that may discharge
Active (squamous) COM	Cholesteatoma	Retraction of the pars flaccida or tensa that has retained squamous epithelial debris and is associated with inflammation and the production of pus, often from the adjacent mucosa

Findings of pars flaccida were retraction pocket with cholesteatoma in 31 patients (51.6%), perforation with cholesteatoma 13 patients (21.6%) in comparison to studies of Palva et al, Khavasi et al, Gamra et al, Zorita et al and Sadé et al.[9,30-33] In a similar study Palva et al found attic or a posterosuperior perforation in 52 (80%), Gamra et al found cholesteatoma in 69%, attic perforation in 51%, pars flaccida retraction in 25% and an attic polyp in 25%.

Other findings were granulations with cholesteatoma in 4 patients (6.6%), scutum erosion in 31 patients (51.6%), ossicular erosion in 12 patients (20%).

On correlating clinical findings with HRCT temporal bone we found soft tissue density in middle ear in 60 patients (100%), soft tissue density in mastoid in 53 patients (88.3%) comparable to findings of Manolis et al, Khavasi et al, Gamra et al, Jackler et al, Gaurano, et al.[19,30-35]

Osscicular erosion was seen in 54 (90%) compared to studies of Ng et al, Manolis et al, Khavasi et al, Gamra et al, Joselito, Gaurano et al. Manolis et al found ossicular erosion in 23 (76.7%), Gamra et al in 75%, Gaurano et al in 92.19%.[18,19,30,31,32,35]

Scutum erosion was seen in 46 patients (76.6%) compared to Manolis et al who found it in 26.7% while Gaurano et al found it in 86%.

Facial nerve canal dehiscence was seen in 5 patients (8.3%) compared to studies of Magliulo et al, Ng et al, Khavasi et al, Gamra et al, Gaurano et al, O'Reilly et al. According to O'Reilly et al CT is less sensitive to facial canal dehiscence while Magliulo et al and Ng et al found an important role in depicting facial canal dehiscence.[16,18,30,31,35,36]

Semicircular canal dehiscence found in 2 patients (3.3%) while studies of Khavasi et al observed labrynthine fistula in 5% and Gamra et al observed it in 2.5%.[30,31]

Dural plate dehiscence was found in 11 patients (18.3%), sigmoid sinus plate dehiscence in 4 patients (6.6%) comparable to study of Gaurano et al which found dural plate dehiscence in 3% and sigmoid sinus plate dehiscence in 1.5%.[35]

CONCLUSION

Our study concluded that the clinical examination of a patient is a very crucial part. It is helpful in not just for a healthy doctor patient relationship but also for assessing the patient's present condition and in formulating a strategy for further management of COM. HRCT temporal bone is helpful in evaluating various clinically examined signs and symptoms and thus to formulate a plan for the extent of surgery required while keeping possible anatomical variations and disease extension in mind. HRCT temporal bone is also helpful in ruling out other diseases of middle ear cavity in case of suspicion.

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