Original Research Paper

Volume - 7 | Issue - 7 | July - 2017 | ISSN - 2249-555X | IF : 4.894 | IC Value : 79.96

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A STUDY OF THE CLINICAL CORRELATION OF CLINICAL FEATURES, RADIOLOGICAL AND OPERATIVE FINDINGS IN CHRONIC SUPPURATIVE OTITIS MEDIA WITH CHOLESTEATOMA

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ABSTRACT Chronic suppurative otitis media (CSOM) with cholesteatoma is an unsafe type of disease, because cholesteatoma causes bone erosion causing various complications. Thirty patients having CSOM with cholesteatoma were taken for study. Institutional ethical committee clearance and consent from all the patients were taken for study on them.
In this prospective study the clinical features, radiological findings and operative findings were analyzed.
In the present study we found that –

- Maximum numbers of the patients were in the age group of 16 – 30 years (73.3%) and minimum in the age group of 31 – 45 years (3.3%).
- Otorrhea and the hearing loss were two major symptoms.
- Both cholesteatoma and granulation was found in maximum cases (36.6%), followed by cholesteatoma alone (23.3%) and polyp (23.3%).
- It shows that HRCT scan is more sensitivity for identification of the cholesteatoma (true positive 90%).

KEYWORDS : cholesteatoma, otitis media, scutum, mastoiditis

Introduction

Cholesteatoma is a common disease in India & in developing countries where conditions like poverty, overcrowding, illiteracy & poor hygiene are very common.[1] Chronic suppurative otitis media is an inflammatory process in middle ear space that results in long term more often permanent changes in tympanic membrane (TM).[1] Chronic suppurative otitis media is broadly divided into Chronic suppurative otitis media with cholesteatoma and without cholesteatoma.[1] Cholesteatoma is an erosive process defined by trapped squamous epithelium that produces and accumulates desquamated keratin debris. Most common locations are posterior attic, posterior mesotympanum and anterior attic.[1]

A cholesteatoma usually occurs because of poor eustachian tube function as well as infection in the middle ear. If the eustachian tube blockage persists, however, chronic changes in the tissues of the middle ear begin to occur. First the mucous secretions become thicker and therefore less likely to drain, and then the membranes themselves begin to thicken and become inflamed. At the same time, a vacuum develops in the middle ear due to the inability to admit fresh air through the eustachian tube, and suction from this vacuum begins to deform the eardrum. Eventually, the eardrum may become severely distorted, thinned, or even perforated.[1, 2] The deformity of the eardrum, along with the inflammatory changes of the middle ear, can lead to erosion of the bony structures of the ear including the ossicles and the walls of the middle ear.

Cholesteatoma can be congenital or acquired.[2] Congenital cholesteatoma comprises squamous epithelium retained in middle ear space during embryological migration of squamous cells. There is no connection with tympanic membrane and there is no history of ear discharge.

Acquired cholesteatoma can be divided into primary acquired and secondary acquired. Primary acquired cholesteatoma which include 80% of middle ear cholesteatoma develop behind intact tympanic membrane usually in the region of pars flaccida. Here cholesteatoma is present arising from retraction pockets in absence of infection and may be result of extension of squamous epithelium from pars flaccida into unresolved mesenchyme of epitympanum. This trapped squamous epithelium produces keratin debris that are desquamating and gets accumulated resulting in bone erosion with progressive enlargement.[3]. Secondary acquired cholesteatoma which accounts for 18% of middle ear cholesteatoma grow into middle car through a perforated tympanic membrane usually through pars tensa and sometime, pars flaccida.[2]

Pars flaccida cholesteatoma is located in upper 1/3rd portion of pars flaccida, here they grow lateral to head of malleus and body of incus causing erosion of scutum and medialisation of malleus and incus.[2] Pars tensa cholesteatoma occurs through a defect of tympanic membrane and is mostly localized in facial recess, sinus tympani and in mastoid region, it erodes long process of incus and stapes early and is enlarged medially causing lateralization of malleus and incus but there is no erosion of scutum.[2]

Pediatric cholesteatoma is more frequently infectious more aggressive more proliferative and associated with less favorable prognosis.[2] The primary characteristic differentiating pediatric cholesteatoma from its adult counterpart lies in its clinical behaviour.[3] Bony erosion is present in majority of cases with cholesteatoma initially is confined to ossicular chain and scutum as it expands it causes erosion of otic capsule, fallopian canal and tegmen occur, cholesteatoma are also associated with granulation tissue and aural polyp.[2] So, a clear understanding of the pathology of otitis media is important for the otorhinolaryngologist to be able to distinguish between infection that can be controlled by antibiotics and those that require surgical intervention[3.] However the definitive treatment for cholesteatoma is surgery. The global burden of illness from CSOM involves 65-330 million individuals with draining ear, 60 % of whom (39- 200 million) suffer from significant hearing impairment.

Complications of cholesteatoma include intra temporal which include mastoiditis, facial nerve paralysis, labyrinthine fistula, lateral sinus thrombosis.[1,2] Intra cranial complications include meningitis, subdural abscess, brain abscess, otitic hydrocephalus.[1, 2,] Labyrinthine fistula is the most common finding reported in intra temporal complications, seen in 4-13% of cases. Lateral semicircular canal is particularly susceptible for erosion due to its proximity to aditus and as it lies in path of enlarging cholesteatoma.[2] Facial nerve paralysis due to chronic otitis media with cholesteatoma in middle ear, damage to facial nerve is biggest fear of otologic surgeon.[2, 3] .Facial canal dehiscence is most commonly seen in tympanic segment of facial nerve and in cases where in the cholesteatoma is located in tympanic cavity, mastoid antrum, mastoid air cells the facial canal dehiscence is high. Direct invasion of facial nerve by inflammatory process, erosion of fallopian canal and presence of destructive cholesteatoma increases the incidence of intra operative damage of nerve.[1,2,3]

Otoscopically one can diagnose cholesteatoma but cannot determine its size and extent of lesion in epitympanum and mastoid.[3] In majority

of cases extent of cholesteatoma cannot be determined because clearing of debris by retraction pocket is not seen with otoscope.[2] To minimize intra operative errors of mild bony erosion particularly tegmen plate, lateral semicircular canal & horizontal portion of facial nerve canal, familiarity with radiographic variations & comparisons with normal side are valuable.[4,5]

Prior to availability of HRCT scan mainstay of radiological diagnosis for cholesteatoma was conventional filming and complex motion tomography however precise extent was difficult to delineate with these methods.[4,5] A major advance in imaging of the ear structures has occurred with the development of HIGH RESOLUTION COMPUTED TOMOGRAPHY (HRCT). Thin section HRCT with modern equipment allows by means of special algorithms, imaging of osseous structures up to a spatial resolution of 0.45 to 0.65mm.[5,6]

HRCT has the advantage of excellent topographic visualization devoid of artifacts from superimposition of structures.[5]HRCT scan is useful in determining size and extension of cholesteatoma and in assessing ossicles, facial nerve canal, semicircular canals and determining position and status of dural plate, sigmoid sinus & jugular bulb, it is useful in planning surgery but should not cause delay in surgery.[4,6]

Variety of standard surgical approaches currently used to remove cholesteatoma are categorized as canal wall down and intact canal wall approaches depending on site & extent of lesion.[4] Despite variable advancement in mode of investigations and treatment options, cholesteatoma and its complications are still a challenge to both otolaryngologists and radiologists.[4]

This study was conducted to compare clinical findings, radiological findings and surgical findings in chronic suppurative otitis media with cholesteatoma.

Aims and Objectives

1. To study the clinical features and its correlation with relevant clinical, radiological and operative findings in patients with acquired cholesteatoma secondary to chronic suppurative otitis media.
2. To analyze the distribution of cholesteatoma alone, cholesteatoma with granulation tissue or polyp.

Materials and Methods

Study setting – In the department of ENT, in a medical college and hospital in Andhra Pradesh.

Sample size – Thirty (30)

Study design – Prospective study conducted over a period of December 2014 to October 2016.

Methodology – Institutional Ethical Committee approval was taken before starting of the study. This study includes 30 patients who underwent surgical exploration of middle ear and mastoid for the removal of cholesteatoma. All patients had preoperative clinical evaluation by otoscopy, otoendoscopy or by examination under microscope, x ray both mastoids, HRCT temporal bone. Further evaluation was done intraoperatively directly under microscope.

Inclusion criteria:

1) Cases having chronic suppurative otitis media with cholesteatoma taken treatment in our hospital.
2) Came for regular follow up
3) Giving consent for study on them.

Exclusion criteria:

1) Chronic suppurative otitis media with out cholesteatoma
2) Lost follow up
3) Not giving consent for study on them

Results

Thirty patients having chronic suppurative otitis media with cholesteatoma were studied clinically, radiologically and intraoperatively. Out of 30 patients 14 were males and 16 were females. Table – 1 shows the age incidence of the patients. It shows maximum number of the patients were in the age group of 16 – 30 years (73.3%) and minimum in the age group of 31 – 45 years (3.3%).

Table 1: Age incidence

Age in years	No. of patients	Percentage
6-15	5	16.7
16-30	22	73.3
31-45	1	3.3
46-65	2	6.7
TOTAL	30	100

Table – 2 shows the different symptoms with which patients came to our hospital. Otorrhea and the hearing loss were two major symptoms.

Table 2: Symptom distribution (n=30)

Symptoms		No. of patients	Percentage
Otorrhea	Profuse	4	13.3
	Scanty	26	86.6
	Foul smelling	24	80
	Blood stained	6	20
Earache		3	10
Hearing loss		27	90
Vertigo		3	10
Headache		2	6.6
Vomiting		1	3.3
Facial nerve palsy		2	6.6
Post aural abscess		2	6.6

Table – 3 shows the distribution of the ear findings on clinical examination. It shows that both cholesteatoma and granulation was found in maximum cases (36.6%), followed by cholesteatoma alone (23.3%) and polyp (23.3%). So total 20 cases were having cholesteatoma on clinical examination.

Table 3 : Distribution of ear findings on clinical examination (n=30)

Pathology	No. of patients	Percentage
Cholesteatoma	7	23.3
Granulation tissue	3	13
Cholesteatoma + Granulation tissue	11	36.6
Polyp	7	23.3
Posterior canal wall sagging + cholesteatoma	2	6.6

Table – 4 shows the pro operative hearing loss evaluated in all the cases. It shows 91% cases having conductive hearing loss and only 9% having mixed type of hearing loss. Majority of the patients were having A-B gap 21 – 30 dB (46.6%), followed by 31 – 40 dB (26.6%).

Table 4 : Preoperative hearing loss

Type of hearing loss	No. of patients	Percentage
Conductive	27	91%
Sensorineural	0	0
Mixed	3	9%
A-B gap (db)		
0-10	0	
11-20	5	16.6%
21-30	14	46.6%
31-40	8	26.6%
>41	3	10%

In the x- ray study out of 30 cases 27 cases were having sclerotic mastoid and 24 cases we found cavity.

Table – 5 shows the extent of the cholesteatoma in high resolution computed tomography (HRCT) study. 90% of cases cholesteatoma was found in posterior epitympanum and 90% cases in mastoid antrum and air cells.

Table 5 : Extent of the cholesteatoma in HRCT scan (n=30)

Extent	No. of patients	Percentage
Posterior Mesotympanum	18	60%
Posterior Epitympanum	27	90%
Anterior epitympanum	6	20%
Mastoid antrum and air cells	27	90%
Perilabrynthine air cells	3	10%

Table – 6 shows the complications seen in the HRCT scan. Ossicular destruction is the commonest complication (90% cases), followed by facial canal dehiscence (20% cases).

Table 6 : Complications seen in HRCT scan (n=30)

Complications	No. of patients	Percentage
Ossicular destruction	27	90
Facial canal dehiscence	6	20
Lateral semicircular canal erosion	3	10
Sinus plate dehiscence	3	10
Dural plate dehiscence	3	10
Post auricular abscess	2	6.6

Table – 7 shows the comparison of ossicular involvement between clinical examination, HRCT findings and intra operative findings. It shows that clinical examination is less reliable than HRCT for identification of ossicular erosion.

Table 7: Comparison of ossicular erosion between clinical examination, HRCT findings and intra operative findings

Ossicles involved	Clinical examination	HRCT findings	Intra operative findings
Malleus	3	6	9
Incus	14	24	28
Stapes	9	15	18

Table – 8 shows the correlation of HRCT findings, plain x-ray mastoids and operative findings for evidence of cholesteatoma. It shows that HRCT scan is more sensitivity for identification of the cholesteatoma (true positive 90%).

Table 8: Correlation of HRCT finding, plain X-ray mastoid and operative findings for evidence of cholesteatoma

Surgical findings	HRCT (n=30)		Conventional plain X-ray mastoid (n=30)		Clinical examination (n=30)	
Choleste atoma	True positive	False positive	True positive	False negative	True positive	False negative
	27(90%)	3(10%)	26(86.6 %)	1(3.3%)	20(66.6 %)	7(23.3%)

Discussion

The prevalence of cholesteatoma is higher in underdeveloped countries than in developed countries .The diagnosis of cholesteatoma is usually made on otologic examination.[7].In cases in which diagnosis is not obvious, computerized tomography may demonstrate a soft tissue mass with characteristic ossicular displacement and erosion of the bone. Cholesteatoma in the hidden areas, such as the posterior tympanic recess, may be revealed by radiological examination even if it is not detected by on otological examination. Approximately one-third of individuals with chronic otitis media have their diagnosis made as an incidental finding during routine physical examination. However, when symptomatic, the two hallmark presenting symptoms are otorrhea and diminished hearing. Approximately 70-96% of cholesteatomas are acquired in nature. Since the signs and symptoms of ear disease may be lacking cholesteatoma they may go undetected for many years in children and adults.[8]

Commonest complaints in our study were otorrhea (100%) followed by hearing loss 27(90%), however there were 3 (10%) patients who presented with vertigo. These results are comparable to the studies done by Glasscock[9].

90% of the patients had complaints of hearing impairment in which majority, 14 patients, showed air bone gap between 21 – 30 db. All patients had conductive hearing loss except one patient, who had a mixed hearing loss with 30 dB AB gap. The common range (60%) of hearing loss was of mild degree with 30- 40 dB AB gap, Glasscock et al[9] had similar results in their series of 41 children.

Based on the observations of Bluestone et al,[8] the diagnosis of cholesteatoma is most effectively made with an otoscope, otoendoscope or more accurately with the otomicroscope. In this study there were 20 (66.6%) cases which showed characteristic cholesteatoma flakes on examination, with or without granulation tissue. All these were in agreement with the surgical findings. 3(10%) cases showed granulation tissue on examination which on surgery revealed granulation tissue in 2 cases and 1 case showed mucosal hypertrophy. This was in accordance to the results of Proctor [10] which suggested the association of granulation tissue in 93-95% of the cases of cholesteatoma. Polyp was seen in 7 patients (23.3%) on clinical examination. In every inflamed ear, a cholesteatoma may not be visible at the first presentation. Sometimes there is an aural polyp obscuring the attic or posterior pars tensa; such a case should be assumed to be a cholesteatoma until proved otherwise.[2]. In this study all these 7 cases showed cholesteatoma on surgical exploration.

Previous studies have measured the effectiveness of plain film examination in cases of cholesteatoma, rather than the more common erosive otitis media. In this study of the 30 patients reviewed, 27 (90%) patients were accurately diagnosed with cholesteatoma and correlated well with the surgical findings. Earlier series have given rates of detection of surgically confirmed cholesteatoma of about 45% - 75%. Mac Millian [11] detected cholesteatoma in 45% of cases with law projection and Brunner et al [12] detected cholesteatoma in 58% of cases with multiple plain films. The plain films demonstrated the extent of the disease in all these cases. The bony erosion could be appreciated including attic, aditus and antrum but however, the ossicular erosions were not well visualized. Out of the 30 patients, 24 patients x-ray mastoids revealed cavity lesion. In 27 cases there was considerable destruction and some loss of aeration of the mastoid air cells (mastoid sclerosis).

Dehiscence of the horizontal part of the facial canal was accurately diagnosed in 6 cases. In the studies performed by Jackler[13] and Garber[14] there were false negative cases observed in which HRCT failed to detect facial nerve dehiscence. However, Mafee et al found CT to be very accurate in the diagnosis of erosion of fallopian canal. However HRCT scan is 33.3% sensitive and 100% specific in detecting dehiscent fallopian canal as reported by Jackler et al[13].

In HRCT Scan erosion of the lateral semicircular canal was reported in 3 cases and all 3 correlated with surgical finding. This finding had a sensitivity of 100% and specificity of 94% which is similar to that reported by Mafee et al.[15], Rocher et al [16]reported HRCT scan to be 100% sensitive in predicting lateral semicircular canal fistula.

Conclusion

The diagnosis of cholesteatoma can be made with both otoscopic examination and radiological evaluation. In this study, 66.6% patients on otoscopic examination revealed cholesteatoma and were in agreement with the surgical findings, while 90 % patients showed true positive cases on HRCT Scan. Thus there was good correlation between the radiological evaluation and surgical diagnosis of cholesteatoma compared to the otoscopic diagnosis. HRCT scan is valuable in knowing the extent of disease, cases of suspected intracranial complications and in those cases in which diagnosis is not obvious. So cholesteatoma in the hidden areas of middle ear is difficult to be assessed on otoscopic examination. HRCT scan was found to be more specific in the diagnosis of cholesteatoma and in the diagnosis of lateral semicircular canal erosion, facial canal erosion, dural plate and sinus plate erosion.

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