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Comparing Intraoperative Findings in Case of Cholesteatoma With Preoperative Hrct Temporal Bone - A Case Series.

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I. Introduction

Cholesteatoma is well- demarcated non neoplastic lesion in the temporal bone (middle ear cleft), which is commonly described as "squamous epithelium at wrong place."[1] Cholesteatoma (Greek: chole+stear = fat, oma = tumor) was named first by German anatomist/pathologist Johannes mullar[2]. However this term is incorrect because the lesion does not contain fat and is not of a neoplastic nature

Cholesteatoma has been recognized clinically and radiologically and looks like soft tissue mass-like opacity in the middle ear cavity and mastoid antrum associated with smooth bony erosion of the ossicles.The association of bone erosion is highly suggestive of Cholesteatoma.

High resolution computerized tomography (HRCT) is most valuable for detection of early erosive changes in the ossicles, particularly in the smaller parts such as the incudo-stapedial junction and sinus tympani.

Imaging studies

The following criteria proposed by **Liu & Bergerom** were used to diagnose Cholesteatoma by HRCT **temporal bone** [3]

- Erosion and destruction of the lateral wall of the attic (scutum)
- Widening of the aditus and antrum
- Labyrinthine fistula
- Displacement of the ossicular chain
- Destruction of the ossicles
- Dehiscence of tympanic roof (tegmen tympani)
- Erosion of facial canal
- Destruction of mastoid (automastoidectomy cavity)
- Dehiscence of the sigmoid plate
- Erosion of the roof the external auditory canal (posteriosuperior wall)
- Complete or partial destruction of malleus & incus & sometimes displacement medially or laterally.

II. Aims & Objectives

1. Study the clinical profile of patient with chronic suppurative otitis media with Cholesteatoma.
2. Assess the extension of Cholesteatoma by preoperative HRCT temporal bone
3. Decide the approach for surgery & expected intra-operative & postoperative complication as per HRCT temporal bone
4. Find the correlation between preoperative HRCT temporal bone finding & intra-operative finding of Cholesteatoma

III. Material And Methods

This hospital based observational descriptive study was conducted in Department of ENT, RUHS College of Medical Sciences , Jaipur, Rajasthan, supported by Department of radio-diagnosis and modern imaging.

Source of data:

The main source of data for this study was patients from the department of ENT of RUHS College of Medicals Sciences, Jaipur between Dec. 2015 to Dec 2017

A total of 50 patients clinically diagnosed Cholesteatoma of middle ear cleft, were subjected to HRCT of the temporal bone.

Ctmachine:

All the HRCT scans were performed at our institute using light speed advantage helical CT (16 multislice scanner with advanced windows workstation), general electric medical systems, USA.Patients were scanned in the axial and coronal (supine or prone) axes. Scout films were taken routinely in all patients before starting the scan. Scanning commenced from the lower margin of the external auditory meatus and extended upward to the arcuate eminence of the superior semicircular canal as seen on lateral topogram. Slight extension of the head was given to avoid gantry tilt and thereby protect the lens from radiation. Coronal images were obtained perpendicular to the axial plane from the cochlea to the posterior semicircular canal. Contiguous 2mm thick slices were obtained at 3mm interval using an ultra high algorithm with a scan time of 4 seconds at a 133kv tube voltage. The ma selected was 70. At 133kv, the noise level is low, bone penetration is better and there is minimal beam hardening. At 70 ma, the soft tissue differentiation is better. A long scan time of 4 seconds increases the image sharpness but there is a greater probability of motion artifacts. Non contrast films are sufficient but intravenous contrast was administered to study the intracranial or extracranial extension of middle ear disease

Best projections

Structure	Axial	Coronal	Both
1.Carotid Canal			+
2. Jugular Foramen	+		
3. Cochlear Aqueduct			+
4. Internal Auditory Meatus			+
5. Inner Ear ❖ Cochlea and Vestibule ❖ Lateral Semicircular Canal ❖ Anterior and Posterior Semicircular Canals		 +	 + +
6. Facial Nerves ❖ Labyrinthine and Tympanic Segment ❖ Genu ❖ Mastoid Segment	 + 	 +	 +
7. Prussak's Space Attic		+	
8. Scutum		+	
9. Aditus, Antrum and Central Mastoid Tract	+	+	
10. Tegmen Tympani		+	
11. Tensor Tympani Muscle	+		
12. Sigmoid Sinus Groove	+		
13. Tensor Tympani Tendon			+
14. Fossa Incudus	+		
15. Round Window		+	
16. Facial Recess	+		
17. Pyramidal Eminence	+		
18. Sinus Tympani	+		
19. Lateral Malleolar Ligament		+	
20. Superior Malleolar Ligament		+	
21. Anterior Malleolar Ligament	+		
22. Patterns Of Pneumatization	+		
23. Tympanic Membrane		+	
24. Anterior Epitympanic Recess	+		
25. Posticulus		+	
26. Subiculum		+	
27. Stapes Foot Plate			+
28. Stapes Super Structure	+		
29. Incus Lenticular Process	+		
30. Incus Long Process		+	
31. Incus Body	+		
32. Malleus Head			+

33. Malleus Manubrium		+	
34. Malleus Neck			+
35. Malleus Lateral (Short) Process		+	
36. Malleoincudal Articulation	+		
37. Incudo Stapedial Articulation	+		
38. Stapedio Vestibular Region	+		

IV. Observations And Results

This study comprised of 50 cases of all ages and both sexes. Both temporal bone of each patient were examined. Total number of temporal bones which underwent ct examination was being 100.

Table 1: Age and Sex Distribution of Patients

Age (in years)	Male (in numbers)	Female (in numbers)	Total (in numbers)
0 – 10	1	2	3
11 – 20	11	7	18
21 – 30	12	5	17
31 – 40	0	6	6
41 – 50	0	2	2
51 – 60	1	0	1
61 – 70	1	0	1
Total	26	22	48

- There are a total of 50 patients- 26 male and 22 females in our study.
- Male preponderance with 52% male patients was there in our study.
- Majority of patients being from the age of 11- 20 years.

Figure 1: Distribution of Cases According To Age and Sex.

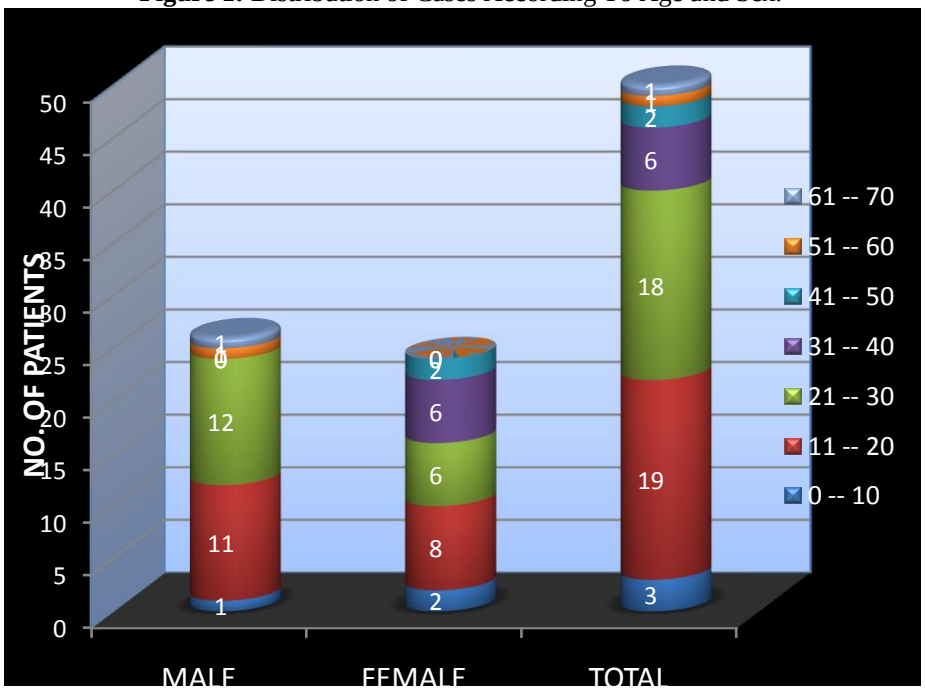


Table 2: Ear-Side Affected

Ear side affected	No. Of patients
Left	24
Right	16
Bilateral	10

- Majority of the patients suffered from unilateral ear disease, whether right or left. However bilateral involvement of temporal bone is much less than unilateral involvement.

- In our study there were 24 patients with left ear affected, 16 patients with right year and 10 patients had bilateral involvement of year.

Figure 2: Ear-Side Affected

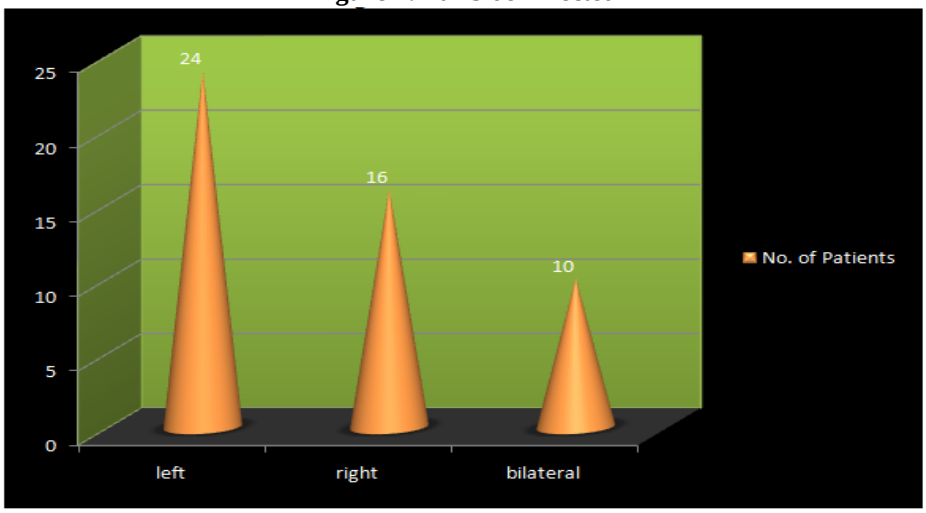


Table 3: Distribution of Clinical Features

Clinical features	No. Of patients	Percentage
Ear discharge	50	100
Hearing loss	45	90
Tinnitus	5	10
Ear pain	5	10
Vertigo	3	6
Facial nerve weakness	2	4
Headache	1	2
Vomiting	1	2
Fever	1	2

- Most common complaint among all patients is ear discharge (100%) and hearing loss (90%)
- Facial nerve weakness, tinnitus, headache are relatively less common and seen in complicated cases only.

Figure 3: Distribution of Clinical Features

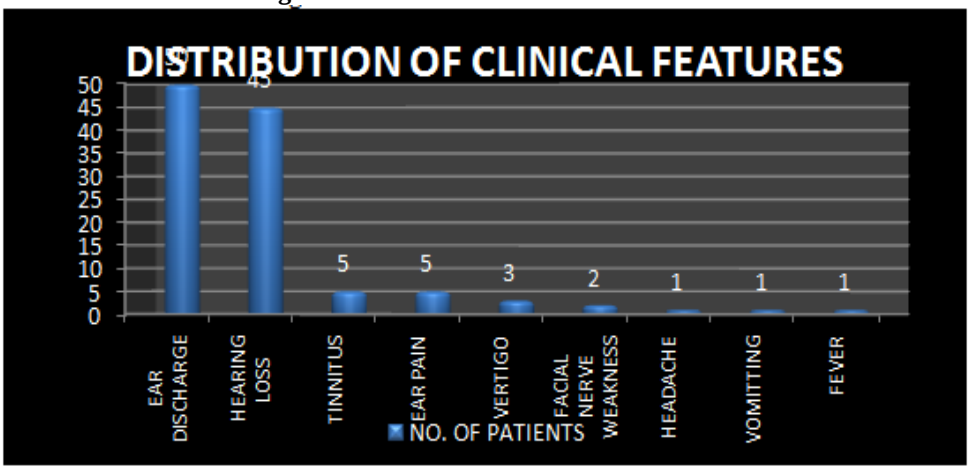


Table 4: Comparison of HRCT and intraoperative findings in compared to presence or absence of Cholesteatoma.

	HRCT Temporal Bone Finding	Intra Operative Findings
External Auditory Canal	10	10
Ossicular Chain	44	44
Malleus Handle	16	20
Head	14	18
Incus	42	44
Stapes	24	26
Presence of Soft Tissue		

Epitympanum	45	42
Mesotympanum	20	16
Hypotympanum	12	10
Protympanum	7	8
Mastoid Antrum	35	35
Aditus	35	35
Post. Superior Wall	9	9
Erosion of Scutum	15	15
Facial Canal Dehiscence	3	2
Facial Canal Erosion	4	2
Erosion of SCC	4	5
Dural Plate Dehiscence	3	3
Sinus Plate Dehiscence	2	2
Promontory	0	0
Jugular Bulb	1	1
Mastoid Air Cells(Sclerotic)	32	35

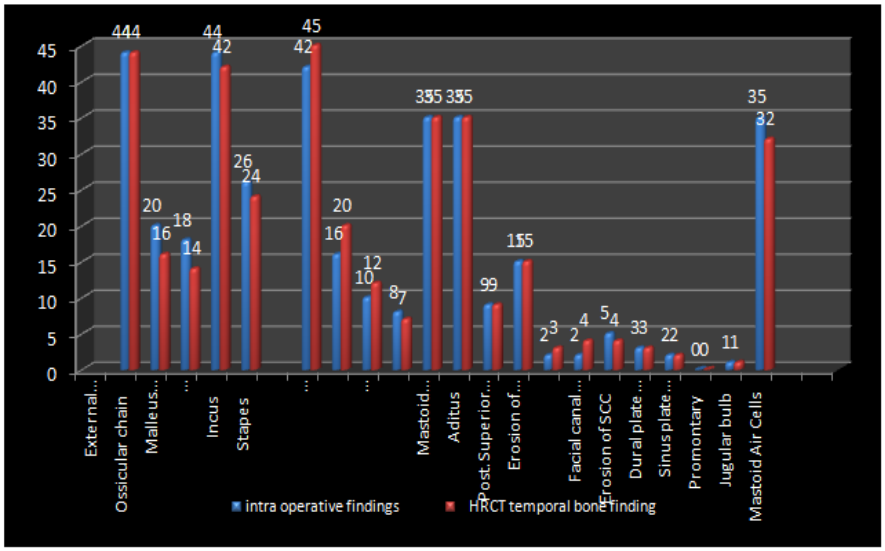
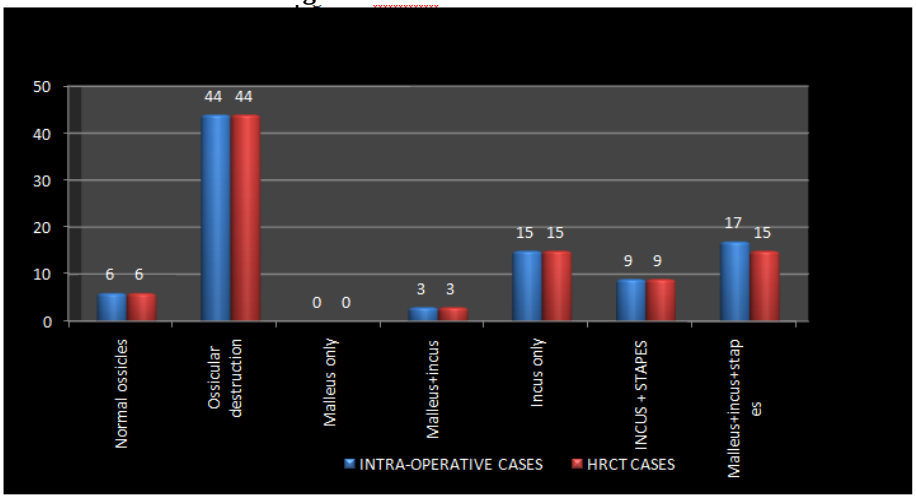


Table 6: Ossicular Involvement

Ossicular involvement	**Intra-operative cases**	**HRCT cases**
Normal ossicles	6	6
Ossicular destruction	44	44
Malleus only	0	0
Malleus+incus	3	3
Incus only	15	15
Incus + stapes	9	9
Malleus+incus+stapes	17	15

Figure 6: Ossicular Involvement



V. Discussion

Age And Sex Distribution

- Male preponderance with 52% male patients over females (48%) was there in our study
- **Sadé et al**.[4]found a male predominance (55.7%) over females (44.3%) for this disease.

So our study is comparable with Sade et al.

- Majority of patients being from the age of 11- 30 years (range from 10 yrs to 65 yrs) in our study while study done by

Ear involved

- Majority of the patients suffered from unilateral ear disease, whether right or left. However bilateral involvement of temporal bone is much less than unilateral involvement.
- In our study there were 24(48%) patients with left ear affected, 16(32%) patients with right year and 10(20%) patients had bilateral involvement of year
- **Aquino**[5] found bilateral Cholesteatomas in 19.6% of cases; the contralateral ear was normal in 47.6% of cases.
- **Abramson et al**[6] have found that Cholesteatomas are bilateral in children in more than 10% of cases; for **Sheehy et al.**[7] this rate is 8.0%.

Clinical features

Most common complaint among all patients is ear discharge (100%) and hearing loss (90%) while facial nerve weakness, tinnitus, headache are relatively less common and seen in complicated cases only in our study **Sadé et al**.[4] found that a discharge was the first symptom in 62.0% of cases; hypoacusis was present in 11.0% of cases.

Ossicular chain erosion

- In our study there are various ossicular chain involvement of malleus (handle and head), incus and stapes, out of these incus most commonly involved
- The ossicular chain is the first structure to be damaged. Two points should be made: we have never seen a damaged stapes alone; and the most commonly damaged ossicle is the incus.
- In our study erosion of incus present in the 42 cases(84%) in HRCT finding while in intra operative finding erosion of incus present in the 44 cases(88%) which was the most commonly involved ossicles by the Cholesteatoma

Swartz[8] **et al,** has shown that the incus was involved in 100% of cases where the ossicular chain was damaged. **Aquinoi et al**[5] shows partial or complete destruction of ossicles may be seen in 80% of patients with cholesteatomas.

Soft tissue density

In our study there soft tissue density present in the epitympanum, mesotympanum, hypotympanum, protympanum, mastoid antrum and aditus. Out of these most commonly epitympanum involved. In our study there soft tissue density present in epitympanum in 45 (90%)cases in HRCT finding while in intra operative finding their soft tissue density present in 42(84%) cases Sadé et al.[4] shows that Cholesteatoma may be located in any of its possible sites, although the attic was involved more frequently so our study comparative with this study.

Erosion Of Posterosuperior Wall And Scutum

In our study posterosuperior canal wall erosion present in 9 cases in HRCT finding while in intra operative finding. In our study erosion of scutum present in the 15 cases in HRCT finding while in intra operative finding erosion of scutum present in the 15 cases. In the study of **Walshe et al** [9] Scutum erosion was present in 6 of the 20 patients in ct however in surgery scutum erosion was present in 7 patients

Facial Nerve Canal Dehiscence And Erosion

In the present study facial canal dehiscence in 3 cases and erosion in 4 cases in HRCT finding while in intra operative findings facial canal dehiscence in 2 cases and erosion in 2 cases. **N w chee, t y tan**[10] the radiosurgical agreement was found to be poor for the facial nerve canal.

Semicircular canal erosion

In our study semicircular canal erosion present in 4 (8%) of the 5 cases in which it occurred. **O'donoghue**[11] shows erosion of the labyrinth was clearly depicted in 4 of the 5 cases in which it occurred. So our study comparative with this study.

Dural plate and sinus plate dehiscence

In the present study in dural plate dehiscence in 2 cases and sinus plate plate dehiscence in 2 cases in HRCT finding while in intra operative finding dural plate dehiscence 3 cases and sinus plate dehiscence in 2 cases.

Mastoid air cells

In our study sclerotic mastoid air cells seen in 32cases in HRCT finding ,while in intra operative finding sclerotic mastoid air cells seen in 35cases.in the present study. Identifying soft tissue density is excellent in the HRCT temporal bone .**Ranga Reddy Sirigiri** [12] shows disease present in 19 cases in HRCT while 22 cases in intraoperative in the mastoid air cells.

VI. Summary & Conclusions

This prospective observational study was conducted in RUHS College of Medical Sciences,Jaipur with an aim to see the role of correlative study of HRCT temporal bone with intraoperative findings of middle ear Cholesteatoma A total of 50 patients were recruited for study and subjected to HRCT temporal bone

1. Majority of patients being from the 11- 30 years of age
2. Male preponderance with 52% male patients over females (48%)
3. Majority of the patients suffered from unilateral ear disease
4. Most common complaint among all patients is ear discharge (100%) and hearing loss (90%) Non dependant soft tissue density with ossicular involvement occurs in 44 Cases (88%).
5. Most common finding is ossiclular chain erosion in which incus is most commonly involved.
6. Diagnostic accuracy of HRCT temporal bone in detecting ossicular erosion was100% and detecting soft tissue density in epitympanum, mesotympanum, hypotympanum, mastoid antrum and aditus was 100% and detecting in protympanum was 98%.
7. Diagnostic accuracy of HRCT temporal bone in detecting posterosuperior wall erosion , scutum erosion, erosion of facial canal dural and sinus plate dehiscence was 100% and erosion of SCC was 98% and detecting sclerotic mastoid was 96%.erosion was100% and detecting soft tissue density in
8. Finally non dependant soft tissue density with ossicular chain erosion was most important criteria for diagnosis of Cholesteatoma.

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