CHRONIC OTITIS MEDIA: HIGH RESOLUTION COMPUTED TOMOGRAPHIC EVALUATION OF THE TEMPORAL BONE WITH SURGICAL CORRELATION

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ABSTRACT

PURPOSE

To correlate the sensitivity and specificity of High Resolution Computed Tomography (HRCT) findings of temporal bone in chronic otitis media with surgical findings.

MATERIALS & METHODS

HRCT of temporal bone of fifty patients with chronic otitis media were evaluated prospectively between July 2012 and December 2013. The various pathological findings, complications and important anatomical variations were evaluated. These findings were compared with intraoperative findings. Statistical methods were carried out using SPSS for Windows (Version 16.0) and Minitab (Version 11.0) for windows. The sensitivity, specificity, false positive and false negative rates were calculated. The level of significance was considered significant for P-values <0.05.

RESULTS

HRCT is reliable for all the parameters like scutum erosion, ossicular erosion, mastoid pneumatisation, low lying dura, anterior lying sigmoid, Korner's septum, cholesteatoma extension in middle ear and mastoid, and presence of complications like mastoiditis, mastoid abscess, mastoid cortex dehiscence, sigmoid sinus plate erosion, facial canal dehiscence, tegmen mastoideum erosion, labyrinthine fistula and intracranial complications with a P value <0.05 but not reliable for tegmen tympani erosion and posterior fossa dural plate erosion. Among the findings related to adjacent neurovascular structures, facial canal dehiscence was commonest followed by anterior lying sigmoid sinus and low lying dura. In ossicular erosion, incus was most commonly involved followed by stapes and malleus. Most of the mastoid in this study was sclerotic followed by pneumatised and diploic. The epitympanum and mastoid antrum were the most commonly involved areas in cholesteatoma followed by aditus, mastoid air cells, posterior tympanum, mesotympanum, hypotympanum, protympanum and perilabyrinthine air cells in decreasing order of frequency.

CONCLUSIONS

HRCT temporal bone is a reliable investigation in preoperative evaluation of chronic otitis media and its complications, but unreliable for tegmen tympani and posterior fossa dural plate erosion.

KEYWORDS

HRCT, Cholesteatoma, Chronic Otitis Media, Temporal Bone.

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INTRODUCTION: Chronic otitis media (COM) is a longstanding inflammation of the middle ear cleft without reference to aetiology or pathogenesis. Due to the strategic location of the tympanomastoid compartment, separated from the middle and posterior cranial fossa by the thinnest of bony partitions, otitis media has the potential for intracranial extension.

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Hence, it becomes very important to know the location and extent of the disease before proceeding to surgical treatment. Radiological examination of the temporal bone helps us to achieve this objective. It is important to differentiate between the two types of COM: The chronic mucosal disease and the chronic otitis media with cholesteatoma because of higher risk of complications associated with the cholesteatoma group which can lead to life threatening conditions. Early recognition of the disease is important to adopt a surgical procedure to save the patient from loss of hearing and to prevent grave intracranial complications. The present work, has been undertaken to study the role of High Resolution Computed Tomography (HRCT) of temporal bone as a diagnostic modality in COM.

MATERIALS & METHODS: Between July 2012 and December 2013, fifty patients with COM were evaluated prospectively. Both inpatients and outpatients were included and all the information available from the clinical records of the emergency department, pre-hospitalisation records, inpatient records with discharge summary and any surgical records were used. Patients with electric devices at the skull base, such as cochlear implants, those who have undergone previous temporal bone surgeries and those with history of trauma to the temporal bone were excluded from the study. The study was performed with the approval of our institutional review board. Written informed consent was taken from every patient.

HRCT Examination: All the HRCT scans were performed at our institute on the GE HiSpeed Dual-Slice CT. Initial lateral topogram was followed by helical acquisition in axial and coronal planes. Scanning extent of coverage is from the lower margin of the inferior mastoid to the arcuate eminence of superior semi-circular canal as seen on lateral topogram. Scanning angle of 30º to anthropological baseline parallel to lateral semi-circular canal was used. Coronal images were obtained perpendicular to the axial plane. Scanning parameters: 120 kV, 140 mA, 1 mm section thickness, 2 mm interval, 2-mm beam collimation, 0.562:1 pitch.

The contralateral temporal bone was included for comparison. The images were reconstructed with a bone algorithm. All images were interpreted on GE advantage workstation using source images, multiplanar reformations and required window settings. Intravenous contrast was administered to study the intracranial extension of middle ear disease when necessary. All the patients underwent mastoidectomy by a postaural approach and intraoperative findings were noted. All radiological findings were tabulated and correlated with intraoperative findings. All the patients were followed up till the end of the study.

STATISTICS: Statistical methods were carried out using SPSS for Windows (Version 16.0) and Minitab (Version 11.0) for windows. Frequencies**,** Descriptive statistics, Crosstabs (Contingency coefficient test) methods were used for statistical analysis. False positive, false negative, sensitivity, specificity and P value were calculated. The level of significance was considered significant for P-value <0.05.

RESULTS: The demographic factors are tabulated in Table 1, symptomatology and clinical findings are tabulated in Table 2. Side of the ear affected with otoscopic findings are tabulated in Table 3. Table 4 shows type of COM and surgery done. Table 5 describes type of mastoid pneumatisation and anatomical variations. Table 6 depicts sensitivity and specificity of HRCT findings comparing with intraoperative findings. Fifty patients with COM were evaluated. In this study, it was found that majority (40%) of patients were aged between 21-30 years. The mean age was 26.9 years; sex ratio was equally distributed; majority (96%) belonged to the low socioeconomic status. Nearly two-thirds had atticoantral disease (64%) and they underwent canal wall down mastoidectomy which included one radical mastoidectomy for cochlear promontory fistula.

The remaining patients with tubotympanic disease (36%) underwent canal wall up mastoidectomy. Pre-operative HRCT scan diagnosed non-dependent soft tissue mass in 29 patients with 2 false positive and 5 false negative interpretations. On the whole, HRCT was 84% sensitive and 88.8% specific in identifying soft tissue mass. Bony erosion, an additional sign for the presence of cholesteatoma was identified in half of the cases which correctly predicted presence of cholesteatoma in 78% cases. In the protympanum, soft tissue density was found in 6 patients and soft tissue density with bone erosion was found in 5 patients. But during surgery, cholesteatoma was found in just 7 cases. So there were 4 false positive cases giving HRCT 100% sensitivity, but 90% specificity to detect cholesteatoma in the protympanum.

In mesotympanum, 24% & 4% had only soft tissue and soft tissue with bone erosion respectively. During surgery, cholesteatoma was found in 20% cases only. With 18% cases in agreement, there were 5 false positive and 1 false negative case. Hence, the sensitivity was 90% and specificity 87.5%. In posterior tympanum, 24% had only soft tissue while 8% had additional bone erosion. Surgery detected the presence of cholesteatoma in 22% cases. With 22% cases in agreement and 5 false positive cases, sensitivity was 100% whereas specificity was 87.1%.

In epitympanum, 10% & 46% cases had only soft tissue density and bone erosion with soft tissue density respectively. During surgery, 58% had presence of cholesteatoma with 56% cases in agreement, as there was one false negative case. Hence, sensitivity was 96.5% and specificity was 100%. In hypotympanum, 22% and 6% cases had soft tissue density and soft tissue density with bone erosion respectively. With 12% cases having cholesteatoma during surgery, all 12% cases were in agreement. So with 8 false positive cases, sensitivity was 100% and specificity was 81.8%.

In the perilabyrinthine cells, 14% had soft tissue with bone erosion. 8% had cholesteatoma during surgery. With 8% cases in agreement and 3 false positive cases, sensitivity was 100%, while specificity was 93.4%. In case of aditus, 52% of patients had soft tissue with bone erosion. With 52% cases having cholesteatoma during surgery, 48% cases were in agreement as there were 2 false positive and false negative cases respectively. So sensitivity was 92.3% and specificity was 91.6%. In the antrum, 22% & 36% cases had soft tissue and soft tissue with bone erosion respectively.

During surgery, 56% had cholesteatoma. So 52% cases were in agreement with 2 false positive and false negative cases. So the sensitivity was 92.8% and specificity 90.9%.

In mastoid air cells, 2% & 46% cases had soft tissue density and soft tissue with bone erosion respectively. 54% had cholesteatoma during surgery so a total of 48% cases were in agreement. So with 3 false negative cases, sensitivity was 88.8%, specificity was 100%. HRCT accurately detected scutum & mastoid cortex erosion, in all the cases (100% sensitivity and specificity). Malleus, Incus

and Stapes were found to be eroded in 30%, 48% and 30% respectively in HRCT and 30%, 56% and 40% respectively intraoperatively. So HRCT is 100% sensitive and specific to diagnose Malleus erosion.

In case of Incus, there were 4 false negative cases giving a sensitivity of 85.71%, specificity of 100%, positive predictive value of 100% and negative predictive value of 84.61%. Whereas in Stapes, 5 cases were false negative, making sensitivity 75%, specificity 100%, positive predictive value 100% and negative predictive value 85.7%. Mastoid was found to be well-pneumatised in 44%, sclerotic in 50% and diploic in 6% in HRCT as well as intraoperatively. Hence HRCT is 100% sensitive and specific to know the type of mastoid pneumatisation. Facial canal dehiscence was found in 4% of patients in HRCT whereas intraoperatively it was seen in 12% patients with 4 false negative cases (sensitivity 33.33% and specificity 100%).

Tegmen tympani dehiscence was not seen in HRCT in any patient. Intraoperatively it was seen in one patient. So sensitivity was 0% and specificity was 100%. HRCT correctly detected cochlear promontory fistula in one case (100% sensitivity and specificity). Sinus plate dehiscence was seen in 12% cases in HRCT, but intraoperatively it was present in 16% cases. Hence 2 false negatives make sensitivity of 75% and specificity 100%. Tegmen mastoideum dehiscence was seen in 2% and 6% patients in HRCT and intraoperatively respectively. False negative value was 2. Hence sensitivity was 33.33% and specificity 100%.

No posterior fossa dural plate erosion was detected in HRCT, but it was present in 3 patients intraoperatively. So 3 sensitivity was 0% and specificity 100%. Sigmoid sinus plate erosion was found by HRCT in 12% and 16% of patients in HRCT and intraoperatively respectively. Lateral semi-circular canal dehiscence was seen in 2% patients in HRCT but it was present in 8% patients intraoperatively.

False negative results were seen in 3 cases. So sensitivity was 25% and specificity 100%. HRCT correctly detected complication of mastoiditis i.e. subperiosteal abscess in 8% patients with 100% sensitivity and specificity. Intracranial complications were detected in only 10% cases by HRCT, whereas it was present in 12% patients intraoperatively.

The complications were 2 cases of sigmoid sinus thrombosis, one case each of meningitis (Diagnosed clinically) with pneumocephalus, subdural empyema and brain abscess. Subdural empyema and brain abscess were evacuated 2 months prior to mastoid surgery. HRCT missed one case of perisinus abscess. So with 1 false negative value, sensitivity was 83.33% and specificity 100%. Labyrinthine fistula was seen in 2% and 10% of patients in HRCT and intraoperatively respectively. Out of this, 12% were seen in lateral semi-circular canal and 3% in cochlear promontory. One case each of low lying dura, anterior lying sigmoid sinus and Korner's septum were correctly identified on HRCT (100% sensitivity and specificity).

Age	No. of Pt.	Sex (M/F)	Status (Low/Mid)
0-10	2	1/1	2/0
11-20	13	8/5	12/1
21-30	20	8/12	20/0
31-40	9	3/6	7/2
41-50	5	3/2	5/0
51-60	1	1/0	1/0
Total	**50**	**24/26**	**47/3**

Table 1: Demographic Factors

Age	Symptoms							Clinical					
	Ear discharge	Hear loss	Ear pain	tinnitus	vertigo	Fever	Head ache	Post Auricle scar	Post Auricle swelling	Mastoid Tender ness	Facial palsy	Nystagmus	Fistula test
0-10	2	1	1	-	-	1	-	-	1	1	-	-	-
11-20	13	10	3	-	1	2	1	1	-	1	-	-	-
21-30	20	10	8	2	4	1	2	5	2	4	2	-	2
31-40	9	6	2	1	1	1	0	-	-	-	1	1	-
41-50	5	3	2	2	-	-	-	1	-	-	-	-	-
51-60	1	1	-	-	-	-	-	-	-	-	-	-	-
TOTAL	**50**	**31**	**16**	**5**	**6**	**5**	**3**	**7**	**3**	**6**	**3**	**1**	**2**

Table 2: Symptomatology & Clinical Examination

Tympanic Membrane	Right	Left	Bilateral*	Total
Attic perforation	5	3	1	9
Marginal perforation	4	5	1	10
Central perforation	7	7	4	18
Non-visualisation	4	5	3	12
TOTAL	**20**	**19**	**9**	

Table 3: Affected Side & Otoscopic Findings

*Non-visualisation of Tympanic membrane was due to either polyp or sagging of posterior meatal wall
+Two had bilateral disease with attic perforation on one side and marginal perforation on other side.

Disease	Number of Patients	Percentage	Surgery
TTD	18	36	CWU
AAD	32	64	CWD

Table 4: Type of CSOM & Surgery Done

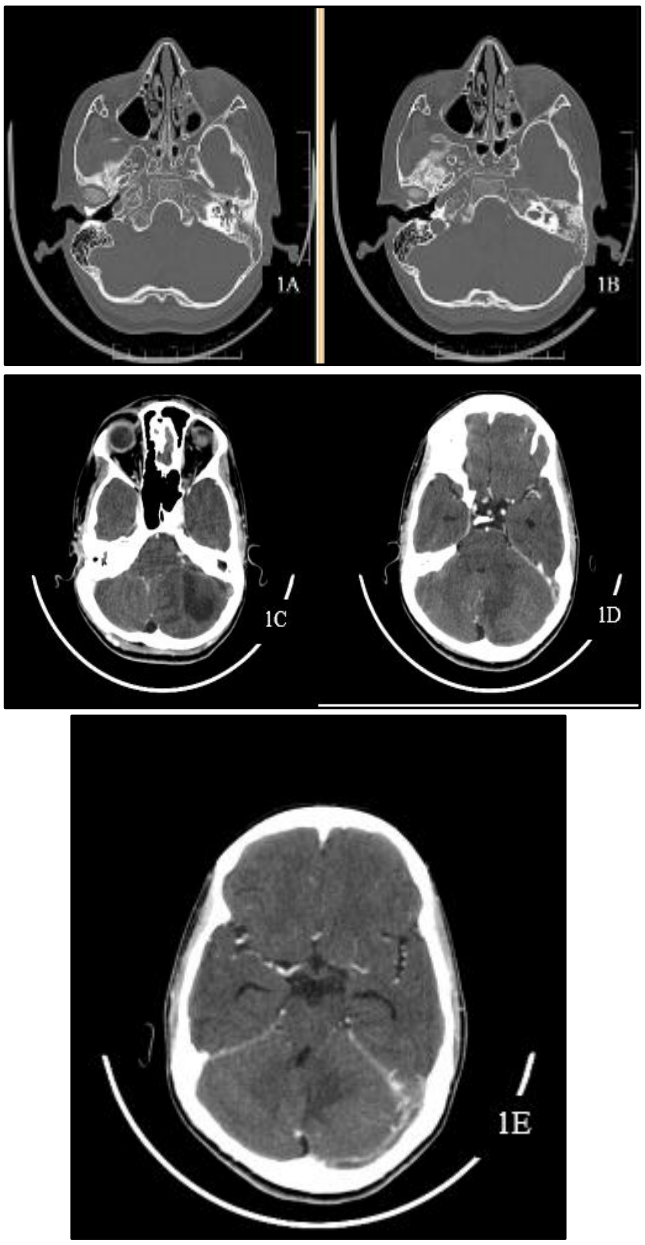
TTD: Tubotympanic Disease. AAD: Atticoantral Disease. CWU: Canal Wall Up. CWD: Canal Wall Down.

Findings	HRCT	Intraoperative
Well-pneumatised	22	22
Sclerotic	25	25
Diploic	3	3
Low lying dura	1	1
Anterior lying sigmoid sinus	2	2
Facial canal dehiscence	2	6

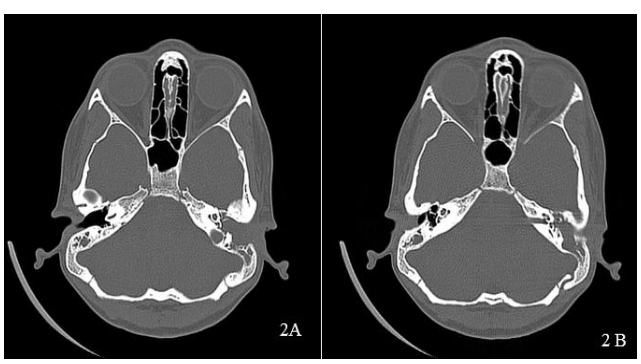
Table 5: Mastoid Pneumatisation HRCT Vs. Intraoperative Findings

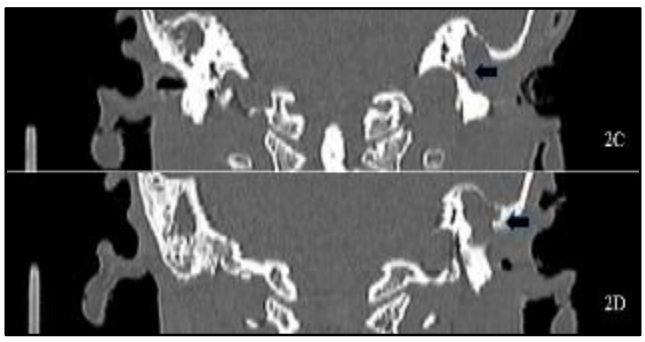
	HRCT	IO	FP	FN	Sensitivity	Specificity
Protympanum involved	11	7	4	0	100	90
Mesotympanum involved	14	10	5	1	90	87.5
Posterior tympanum involved	16	11	5	0	100	87.1
Epitympanum involved	28	29	0	1	96.5	100
Hypotympanum involved	14	6	8	0	100	81.8
Perilabyrinthine cells involved	7	4	3	0	100	93.4
Aditus involved	26	26	2	2	92.3	91.6
Antrum involved	28	28	2	2	92.8	90.9
Mastoid air cells involved	24	27	0	3	88.8	100
Scutum erosion	23	23	0	0	100	100
Malleus erosion	15	15	0	0	100	100
Incus erosion	24	28	0	4	85.71	100
Stapes erosion	15	20	0	5	75	100
Facial canal dehiscence	2	6	0	4	33.33	100
Tegmen tympani erosion	0	1	0	1	0	100
Cochlea erosion	1	1	0	0	100	100
Erosion mastoid cortex	4	4	0	0	100	100
Sinus plate erosion	6	8	0	2	75	100
Tegmen mastoideum erosion	1	3	0	2	33.33	100
Posterior fossa dural plate	0	3	0	3	0	100
LSCC erosion	1	4	0	3	25	100
Mastoiditis and mastoid abscess	4	4	0	0	100	100
Intracranial complication	5	6	0	1	83.33	100

Table 6: HRCT Findings Vs. Intraoperative Findings

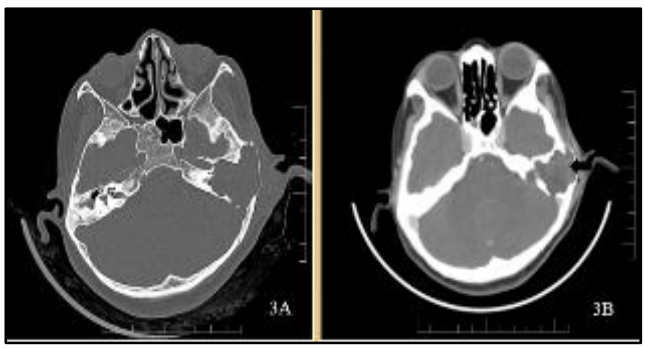


Figures 1A-1E: A 12-year-old female with CSOM and intracranial complications: Soft tissue opacification of middle ear cavity and mastoid on left side with sigmoid sinus plate erosion resulting in sigmoid and transverse sinus thrombosis. A well-defined peripherally enhancing hypodense lesion is noted in left cerebellum suggestive of abscess (Confirmed intraoperatively).





Figures 2A-D: Axial sections (2A & B) show soft tissue opacification of left middle ear cavity and mastoid with erosion of ear ossicles (Only part of malleus is remaining). Coronal sections depict erosion of lateral semi-circular canal wall (2C) and scutum (2D) indicated by arrows.



Figures 3 A & B: Cholesteatoma complicated with mastoiditis and mastoid abscess: Soft tissue opacification of left middle ear cavity and mastoid with complete erosion of ossicles, sigmoid sinus plate with breech in mastoid cortex. On contrast study, ill-defined lesion with mild peripheral enhancement is noted involving left middle ear and mastoid cavity suggestive of abscess.

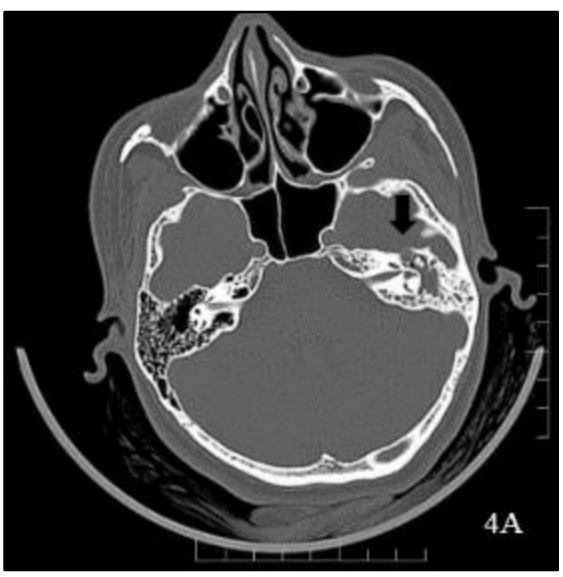


Figure 4A: Axial section showing soft tissue mass in the epitympanum, Prussak's space with erosion of tegmen tympani on left side.

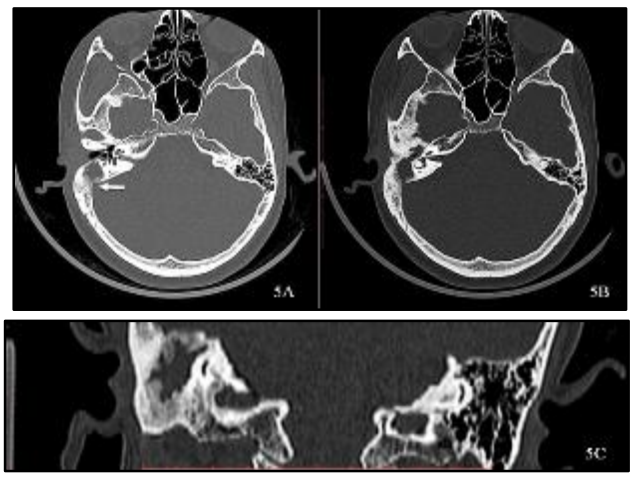


Figure 5 A-C: Axial section (FIG A) shows soft tissue opacification of middle ear cavity and mastoid air cells on right side with sigmoid sinus plate erosion. On contrast study (not shown), no evidence of sigmoid sinus thrombosis noted. FIG B shows erosion of ear ossicles with only a part of malleus visible. However, on surgery, incus was also normal with eroded stapes footplate. Coronal section (FIG C) shows soft tissue opacification of mastoid air cells with resultant destruction resulting in a single cavity. Sclerosis of adjacent mastoid cortex noted.

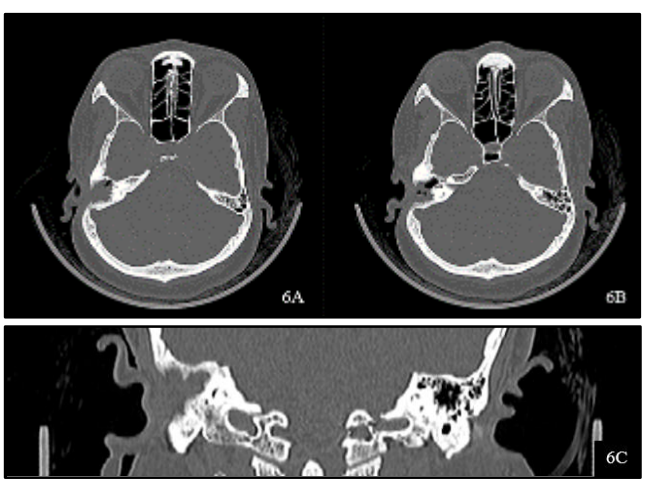


Figure 6 A-C: Axial and coronal sections showing soft tissue opacification with pockets of air within middle ear and mastoid cavity with erosion of ossicles resulting in a unilocular cavity with breech in mastoid cortex. Surgical findings were consistent with radiological findings.

DISCUSSION: In this study, a total number of 50 patients with COM were randomly selected. The mean age in the present series was about 26.88 years which is similar to study by Gerami et al[1] Paperella & Kim.[2] claim an average of about 35.1 years. The variation is because of chronic otitis media is more common amongst children in our country. Male: female ratio was 0.923:1 which is in accordance with Petros V. Vlastarakos et al[3] In this study, 96% belonged to the low socioeconomic status, which reflects that the disease is rampant among low socioeconomic class people. It suggests that lack of hygiene, poor nutritional status and reduced resistance to infection are the probable causative factors. In this study, non-dependent soft tissue opacity was present in 90% of patients with chronic otitis media with cholesteatoma.

This is similar to findings by Ranga Reddy Sirgiri.[4] (92%). HRCT was 84% sensitive and 88.8% specific in identifying soft tissue mass. Mafee et al[5] and O'Reilly et al[6] have similar results, whereas Jackler et al[7] and Garber et al[8] found it to be less sensitive and specific. However, HRCT is less sensitive in differentiating cholesteatoma from granulations. In this study, in detecting cholesteatoma in protympanum, HRCT had 100% sensitivity which is in agreement with study by Ranga Reddy Sirigiri et al[4] but 90% specificity which is slightly higher.

In case of mesotympanum, HRCT had a sensitivity of 90% and specificity of 87.5% in detecting cholesteatoma which is similar to findings by Walshe P.[9] In posterior tympanum, HRCT had a sensitivity of 100% which correlates well with studies by Walshe P.[9] whereas specificity was 87.1% which is slightly higher than 75% as given by Ranga Reddy Sirigiri et al[4] In epitympanum, HRCT had sensitivity and specificity of 96.5% and 100%, which are similar to findings by Ranga Reddy Sirigiri et al[4] in hypotympanum, aditus and antrum, HRCT sensitivity in detecting cholesteatoma were 100%, 92.3% & 92.8% respectively which correlates well with observations by Ranga Reddy Sirigiri et al[4] and specificity were 81.8%, 91.6% & 90.9% respectively which are higher than Reddy Sirigiri et al.[4]

In mastoid air cells, HRCT sensitivity was 88.8% and specificity was 100% which is similar to observations by Gerami et al[1] In the perilabyrinthine cells, HRCT sensitivity was 100%, which correlates well with study by Ranga Reddy Sirigiri et al[4] while specificity was 93.4%. Bony erosion correctly predicted presence of cholesteatoma in 78% cases. This value is close to data by O'Donoghue et al[10] and Firas Q. Alzoubi et al[11] who found in 80% cases. Mafee et al[7] (1988) found bone destruction in 100% cases of acquired cholesteatoma. Scutum erosion was seen in 65% cases with cholesteatoma which is less than that seen by Gaurano et al[12] (86%). But HRCT detected scutum erosion accurately in all the cases. So HRCT is 100% sensitive and specific to detect scutum erosion as per this study. This is in accordance to study by Rocher et al[13] but contrasts with study by Vlastarakos PV et al[3] where no correlation was found.

HRCT correctly detected ossicular erosion in 85.7% cases which is similar to studies by Mafee et al[5] and Schwartz et al[14] but contrasts with study by O'Reilly BJ.[6] where poor correlation was seen. Most commonly involved ossicle in this study was incus in 56% cases which is similar to studies by Mafee et al[5] and Jackler et al.[7] HRCT detected erosion in malleus correctly in all cases. So HRCT is 100% sensitive and specific to diagnose malleus erosion. This is correlating with studies by Zhang et al[15] and Chee NW et al[16] In detecting erosion of Incus HRCT was only 85% sensitive but 100% specific which correlates with studies by Zhang X et al[15] and Chee NW et al[16]

In detecting erosion of Stapes HRCT was only 75% sensitive but 100% specific. This is similar to studies by O'Donoghue et al[10] but contrasts to studies by Chee NW et al[16] where excellent correlation was found and Zhang X et al[15] who found that HRCT was poor in detecting Stapes erosion. In this study, well-pneumatised mastoid was seen in 44%, sclerotic in 50% and diploic in remaining 6%. These values are comparable to studies by Ashwani Sethi et al[17] patients.

According to this study, HRCT is 100% sensitive and specific to know the type of mastoid pneumatisation comparing with surgical findings. This is in agreement with findings of Vlastarakos et al[3] In this study, the incidence of facial canal dehiscence was 18.75%. This is much lower than incidence seen by Maglilo et al[18] (27%). The site was tympanic segment in 83% of cases whereas according to Maglilo et al[18] it was tympanic segment in 92% cases. HRCT had 4 false negative cases, making it 33.33% sensitive but 100% specific. Similar results were found by Firas Q Alzoubi et al[11] and Garber et al[8] but poor and insignificant correlation was observed by O'Reilly BJ[6] and Chee NW et al[16], whereas Mafee et al[5] found HRCT to be 100% accurate.

HRCT was found to be poorly sensitive to detect Tegmen Tympani erosion which agrees with results by Jackler RK[7] and Gerami et al[1] but which disagrees with findings by Vlastarakos et al[3] and Chee NW et al[16] where moderate agreement was seen and Rocher et al[13] and Firas Q. Alzoubi et al[11] who found it 100% sensitive. HRCT was found to be 100% sensitive and specific in detecting cochlear promontory fistula in this study which is similar to study by Firas Q. Alzoubi et al[11] In our study, mastoid cortex erosion was seen in 12% of patients with cholesteatoma which is higher than seen by Suat Keskin et al[19] (7%).

Mastoiditis complicated with subperiosteal abscess was found in 8% cases of chronic otitis media. This is similar to findings by Leskinen et al[20] (7%). HRCT was found to be 100% sensitive in detecting cortical erosion of mastoid which disagrees with findings of Ranga Reddy Sirigiri et al[4] (75%). HRCT was found to be an excellent tool to detect the other complications of mastoiditis like mastoid abscess with 100% sensitivity and specificity.

With 2 false negative cases HRCT was 75% sensitive for detecting sigmoid sinus plate erosion which is again in contrast to studies by Vlastarakos et al[3] where it was 100%. HRCT has 33.33% sensitivity in detecting Tegmen mastoideum erosion but is 100% specific. In case of posterior fossa dural plate erosion, HRCT was poorly sensitive as it missed all the 6% cases. This is similar to study by O'Reilly BJ et al[6] HRCT was also 25% sensitive in detecting lateral semi-circular canal erosion. This is similar to study by Vlastarakos et al[3] and Zhang X et al[15] but in contrast to studies by Gerami et al[10] and Jackler RK.[7] where it was poor and Firas Q. Alzoubi et al[11] and Rocher P.[13] where it was 100% sensitive.

Except for one case of perisinus abscess HRCT detected all the other intracranial complications correctly giving it high sensitivity. The complications were two cases of sigmoid sinus thrombosis, one case each of meningitis (diagnosed clinically) with pneumocephalus, subdural empyema and brain abscess. In this study, low lying dura was correctly detected in 2% of patients by HRCT giving it 100% sensitivity and specificity correlating with studies by Zhang X et al[15] and Chee NW et al[16] Liu Zhaohui et al had a higher incidence of low lying dura (21.8%) in his study.
HRCT failed to detect one case of anterior lying sigmoid out of two making it 50% sensitive but 100% specific in detecting this anatomical variation. The incidence of anterior lying sigmoid is low compared to study by Zelikovich El (36.5%) but higher than Tomura et al[21] (1.6%).

In this study, HRCT correctly detected presence of Korner's septum in 2% of patients implying 100% sensitivity and specificity. Other findings like an incomplete bony covering of a high-positioned jugular bulb, severe asymmetry of the jugular foramen, deep sinus tympani was seen in 2.4%, 4% and 5.9% of patients in studies by Tomura et al[22] but not seen in this study. In this study, labyrinthine fistula was seen in 15% of patients with cholesteatoma. Out of this, 12% were seen in lateral semi-circular canal and 3% in cochlear promontory. This value is slightly higher compared to study by Suat Keskin et al[19] (9%).

In this study, sigmoid sinus plate erosion was found by HRCT in 18% of patients with cholesteatoma. This value is higher than 14% as reported by Abdel. Rahim Ahmed Abdel. Karim et al[22] In our study, tegmen erosion was seen in 12%, out of which tegmen tympani was involved in 3% and tegmen mastoideum in 9%. This value is much higher than studies by Suat Keskin et al[19] who found tegmen erosion in only 5% patients. Increased complications show more aggressive disease in this study.

So overall HRCT has got a P value <0.05 for all the parameters mentioned above except for tegmen tympani and posterior fossa dural plate erosion. The extent of involvement of middle ear and mastoid in cholesteatoma in HRCT are as follows: Epitympanum, antrum, aditus, mastoid air cells, posterior tympanum, mesotympanum, hypotympanum, protympanum and perilabyrinthine air cells are 88%, 88%, 81%, 75%, 50%, 44%, 44%, 34% and 24% respectively. This is similar to studies by Ranga Reddy Sirigiri et al.[4] A further population based study for a longer duration is needed to make a more reliable comparison with the standard studies.

CONCLUSION: HRCT is the imaging modality of choice for temporal bone and middle ear pathologies. This study proves HRCT temporal bone is a reliable investigation in preoperative evaluation of chronic otitis media and its complications except for tegmen tympani and posterior fossa dural plate erosion.

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