Diagnostic Accuracy of High-resolution Computed Tomography (HRCT) Temporal Bone in the Evaluation of Chronic Suppurative Otitis Media

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Abstract

Chronic suppurative otitis media is a disease presented with recurrent purulent discharge through perforated tympanic membrane. Other clinical presentation varies form variable hearing loss, tinnitus, vertigo according to extent and complication of disease. Cholesteatoma is most common association of CSOM, and is characterized by presence of keratin and other desquamated tissue covered by squamous epithelium. Diagnosis of CSOM is readily made by otorhinolaryngologist with otoscopy or otoendoscopy, though extent of disease can be evaluated through HRCT temporal bone or MRI of middle and inner ear. HRCT temporal bone is now widely acceptable as investigation of choice for evaluation of CSOM as it has high efficacy to detect bony erosion. The present study is conducted over 73 patients in the department of radiodiagnosis, Dr. S.N. medical college, Jodhpur, Rajasthan over a period between 2020 to 2021 with the aim to evaluate the diagnostic efficacy of HRCT temporal bone to identify presence and extension of disease, alteration of mastoid aeration, bony and ossicular erosion with the comparison of intraoperative findings in the form of sensitivity, specificity, positive and negative predictive value. In this study 44 patients(60%) were male, mean age of presentation is 30.52 ± 9.70 years. Common clinical presentation was ear discharge (91.8%) and hard of hearing(64%). presence of soft tissue density is most consistent finding present in 71(97.3%) patients, alteration of aeration of mastoid is observed in 67 (91.8%) patients, erosion of incus in frequent followed by maleus and stapes. Facial canal and lateral semicircular canal erosion is less common observation. The study concluded that HRCT temporal bone is reliable and evidentiary diagnostic tool in identifying the presence of disease, ossicular erosion, and detecting complication following CSOM.

Keywords: Cholesteatoma, Ossicular erosion, Facial canal dehiscence, Lateral semicircular canal dehiscence

Introduction

Chronic suppurative otitis media (CSOM) is defined as chronic inflammation of the middle ear and mastoid cavity, which presents with recurrent episodes of ear discharges through a perforation of tympanic membrane which continue to mucoid material discharge for periods of from 6 weeks to 3 months.¹ Its prevalence varies according to the region, socioeconomic status, and development of the country, The 1993 World Development Report estimated that disability-adjusted life-years (DALYs) were lost from otitis media is about 5.12 million, developing world shows majority of cases measures approximately 91%. India has the
second highest prevalence of CSOM (7.8%) in the world, second to Tanzania (14%)

Chronic suppurative otitis media (CSOM) is a major cause of acquired hearing impairment in children, especially in developing countries. CSOM produces mild to moderate conductive hearing loss in more than 50% of cases. Causes of hearing loss can be conductive hearing loss or sensory hearing loss or both (mixed hearing loss). (2)

The term “Cholesteatoma” is defined as epidermal and connective tissue structure forming a sac composed of a stratified squamous epithelial outer lining and a desquamated keratin center conforming to middle ear cleft with capacity of progressive and independent growth involving the underlying bone and replacing the middle ear mucosa and tendency to recur. The presentation can be extradurally and intradurally. Extradurally, cholesteatoma most likely to involve the middle ear cavity but can extends in all segments of the petrous part of temporal bone including the external auditory canal, mastoid, &petrous apex(3). The prevalence rates for the extracranial and intracranial complications of COM have been reported as ranging between 0.69% and 5%. (4,5)

CSOM, by the contiguous spread produces chronic mastoiditis. In a rare condition the walls of the middle ear and mastoid cavityerosion, can expose the jugular bulb, facial nerve, membranous labyrinth, lateral sinus, & dura of temporal lobe. This may lead to major complications as facial nerve paralysis, labyrinthitis, lateral sinus thrombosis, brain abscessand meningitis. Contiguous or hematogenous spread of infection to the brain may produces permanently disabling and potentially fatal complications. (2)

**Imaging**

Conventional radiography has Limitations as it can only produces a composite single plane image of a tridimensional temporal bone resulting in superimposition, where obscuring of smaller and less dense structures by larger and denser structures.

MRI has expanded the range of pathology that can be accurately evaluated because it can image many soft tissue entities, blood vessel-related disorders of the temporal bone. But it has limitation for the evaluation of bony pathologies. (6)

HRCT provides excellent detail of bony landmarks within temporal bone due to inherent contrast. It has also added a whole new dimension to the evaluation of the temporal bone by allowing visualization of the soft tissue components within and adjacent to the temporal bone. (6)

Surgeon has the tool to diagnose the CSOM correctly, but has limitation in assessment of the extent of the disease, evaluation of mastoid bone, bony erosions and complication of the disease, and also has limited tools to find a planned surgery from the different available surgical procedures.

Because HRCT can assess these areas with unprecedented accuracy, it has allowed a better understanding of the etio-pathology, progression of the disease, detection of complications, with alteration of treatment modality for planning the surgical procedure from different surgical modalities, which has considerably reduced the morbidity and mortality pertaining to lesions in this region.

**Materials and Method**

The clinical observational study analysed the findings of the HRCT temporal bone (index diagnostic test) with the intraoperative findings (gold standard)

The study was conducted in the Department of Radiodiagnosis in collaboration with the Department of Otorhinolaryngology, Dr. S.N. Medical College, Jodhpur. A total 73 cases of CSOM prescribing HRCT temporal bone by the
Department of Otorhinolaryngology were intended to be taken up as study group. The study included data collection, data organization, presentation, data analysis, and data interpretation.

These cases comprised of both males as well as females of different age groups. A detailed history with regard to otorrhea, deafness, tinnitus, otalgia, and vertigo was taken and recorded systematically, paying attention to any associated symptomatology suggestive of impending or already established complications of unsafe chronic suppurative otitis media. Findings of otorhinolaryngological examination and Assessment of hearing were also recorded.

**Inclusion criteria**

All patients of age above 12 to 70 years were taken as a case, which includes both male and female who fulfill the following criteria

- Patient with chronic ear discharge.
- Patient with ear discharge with hearing impairment.
- Patient with the complication of CSOM.
- Patient which was refractory to the medical management for CSOM.
- Patient with recurrent CSOM after surgery.

**Exclusion criteria**

- Patients not willing for surgery after HRCT temporal bone study
- Patients left out during the study.
- Other diseased ear patients which were not posted for surgery.
- Patients unfit for surgery
- Hemodynamically unstable patients.

**Method**

All the CT scans in this study were performed using PHILIPS Ingenuity core 64-slice multidetector with Philips’s window workstation and software. After accounting detailed history of the patient and the complaints, hearing impairment, and complications if any, patients were subjected to HRCT of the temporal bone. Thin sections (0.67 mm) were obtained using a high spatial frequency algorithm with a 1024 x 1024-pixel matrix size and high spatial resolution, with 0.67 mm thin sections and 0.67 mm increments. Images were obtained in the axial, coronal, and sagittal planes with the patient in supine position with the neck completely extended.

Following areas of interest were considered at the preoperative scans and recorded in a standard format

1. Soft tissue mass
2. Aeration mastoid
3. Extent of the disease
4. Tegmen tympani erosion
5. Sinus plate erosion
6. Incus
7. Malleus
8. Stapes
9. Facial canal dehiscence
10. Lateral semi-circular canal (LSC) dehiscence

After that, the operating surgeon recorded operative findings on a standard proforma including all the findings mentioned above. Intraoperative findings were compared with the CT scan findings. In each of the above-mentioned areas, sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) was calculated - HRCT findings as compared to per-operative findings.

**Observations and Results:**

The study included 73 patients with Chronic Otitis Media who underwent Mastoid Exploration Surgery after initial evaluation of
HRCT temporal bone of the disease ear between January 2020 and December 2021, of which 44 were males and 29 females. There was a slight male predominance.

**Table 1: Distribution based on Gender of study subjects**

<table>
<thead>
<tr>
<th>Gender</th>
<th>No. of patients</th>
<th>Percentage</th>
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<tr>
<td>Male</td>
<td>44</td>
<td>60.3</td>
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<tr>
<td>Female</td>
<td>29</td>
<td>39.7</td>
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<tr>
<td>Total</td>
<td>73</td>
<td>100</td>
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</table>

The age of study subjects ranged from above 12 years to 70 years with mean age of 30.52 ± 9.70 years. Maximum incidence was seen in the age group of 12-20 years.

![Chart 1: age distribution of study population](chart1.png)

**Table 2: Clinical Symptoms**

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>No of cases</th>
<th>% of cases</th>
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</thead>
<tbody>
<tr>
<td>Ear discharge</td>
<td>67</td>
<td>91.8</td>
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<tr>
<td>Hard of hearing</td>
<td>47</td>
<td>64.38</td>
</tr>
<tr>
<td>Vertigo</td>
<td>07</td>
<td>9.58</td>
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<tr>
<td>Tinnitus</td>
<td>02</td>
<td>2.7</td>
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<tr>
<td>Others</td>
<td>01</td>
<td>1.36</td>
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</table>

Cholesteatoma formation is most common presentation noted in HRCT temporal bone. In our study HRCT has identify soft tissue mass in 70 patients (95.89%), correctly and confirmed the findings with operative findings, however only one patient (1.4%) out of 71, HRCT is failed to identify the soft tissue density.
Aeration of mastoid had identified in HRCT as replacement of normal air by fluid density of soft tissue density of cholesteatoma. In our study HRCT has diagnosed 66(90.41%) patients as altered aeration of mastoid, out of which 65(89%) patients has diagnosed it correctly, while in 2 (2.7%) patients HRCT has failed to identify altered aeration of mastoid as compared to intraoperative findings, only 1 (1.4%) patient has falsely diagnosed as compared to intraoperative finding.

Extension of disease is identified as extension of cholesteatoma in epitympanum, hypotympanum, and mastoid air cells along with extension into inner ear in a case of extensive disease. Widening of prussak’s space and blunting/erosion of scutum is also indicative of extension of disease beyond mesotympanum. In our study, HRCT has diagnosed extension of disease in 58 patients, out of which true positive are 57 patients, true negative are 13 patients, false positive & false negative are 1 and 2 patients respectively.

HRCT Temporal Bone showed 98.59% sensitivity and 100% specificity in determining the soft tissue mass in middle ear. Its Positive Predictive Value is 100% and Negative Predictive Value is 66.67% with a diagnostic accuracy of 99.89%. The calculated p value was <0.01, the association is considered to be extremely significant.

HRCT Temporal Bone showed 97.01% sensitivity and 83.33% specificity in determining the aeration of mastoid air cells. Its Positive Predictive Value is 98.48% and Negative Predictive Value is 71.4% with a diagnostic accuracy of 84.4%. The calculated p value was <0.01, the association is considered to be extremely significant.

HRCT Temporal Bone showed 96.61% sensitivity and 92.85% specificity in determining the extent of disease to middle ear, epitympanum and mastoid air cells. Its Positive Predictive Value is 98.27% and Negative Predictive Value is 86.66% with a diagnostic accuracy of 93.15%. The calculated p value was <0.01, the association is considered to be extremely significant.

Fig. (1)

Fig (1) showing normal middle ear cavity on HRCT images.
Image source-fig. (1) -department of radiodiagnosis, Dr. S.N. Medical College, Jodhpur.
Fig. (2) Intra-operative microscopic image showing cholesteatoma sac (black arrow), Fig. (3) shows soft tissue density in middle ear cavity (blue arrow).

Image source - Fig. (2)- department of otorhinolaryngology. Fig. (3)-department of radiodiagnosis. Dr. S.N. Medical College, Jodhpur.

Fig. (4)

Fig. 4: shows normal mastoid air cells on right side (blue arrow), and fluid density in mastoid air cells on left side (black arrow).

Image source-Fig. (4)-department of radiodiagnosis, Dr. S.N. Medical College, Jodhpur.

Fig. (5)

Fig.5 shows granulation and fluid in mastoid cavity.

Image source- department of otorhinolaryngology, Dr. S.N. Medical College, Jodhpur.
ossicular erosion

As the cholesteatoma extends, it involves middle ear ossicular chain and evaluated in HRCT as loss of normal radiological anatomy of the bone. In our study we find 45(incus), 29(malleus) and 22(stapes) erosion, while intraoperative findings are 47(incus), 29(malleus) and 20(stapes) erosion. Sensitivity and specificity of the incus, malleus and stapes are (Sn 91.48%, Sp 92.3%) (Sn89.65%, Sp93.18%) (Sn90%, Sp92.45%) respectively. The positive predictive value and negative predictive values are (PPV 95.5%, NPV 85.71%) for incus, (PPV 89.65%, NPV 93.18%) for malleus and (PPV 81.81%, NPV 96.07%) for stapes. Diagnostic accuracy were 92.24%, 92.91%, 92.26% respectively. The calculated p value was 0.0001, the association is considered to be extremely significant.

Fig. 6 shows normal HRCT image of malleus, incus and stapes, Fig. 7 shows head and long process of malleus. Fig. 8 shows normal ice-cream cone appearance formed by head of malleus and body of incus, Fig.9 shows molar tooth sign formed by body of incus and malleus.

Image source- department of radiodiagnosis, Dr. S.N. Medical College, Jodhpur.
Fig. (10)
Fig. 10 Intra-operative microscopic picture showing disarticulation of incudo-stapedial joint and erosion of lenticular and long process of incus.
Image Source: department of otorhinolaryngology, Dr. S.N. Medical College, Jodhpur.

Fig. (11)

Fig. (12)

Fig. (13)
Fig 11. shows erosion of long process of malleus, Fig 12 shows erosion of body of incus, Fig. 13 shows complete destruction of ossicular chain and replaced with soft tissue density.

source- Department of Radiodiagnosis, Dr. S.N. Medical College, Jodhpur.

Tegmen tympani and sinus plate are barrier for the cholesteatoma to extra auricular extension, thinning or loss of continuity in respective structures are identified in HRCT as erosion.

In our study, erosion of tegmen tympani is found in 15(20.54%) cases, while 16(21.9%) patients found positive in intraoperative findings. Out of which 13(17.8%) patients are correctly diagnosed, and 2(2.7%) patients are diagnosed positive which were actually not positive.

Sensitivity and specificity of HRCT to identify tegmen tympani erosion are 81.25% & 96.49% respectively. PPV is 86.6% & NPV is 94.8%.

diagnostic accuracy is 95.30%, The calculated p value was 0.0001, the association is considered to be extremely significant.

Sinus plate erosion is found in 11(15%) cases, while 10(13.7%) patients found positive in intraoperative findings. Comparison with intraoperative findings true positive is 9(12.3%), false positive are2 (2.7%), true negative is 61(83.56%), false negative is 1(1.4%).

sensitivity, specificity, PPV, NPV of HRCT temporal bones are 90%, 96.82%,81.81% & 98.38% respectively, diagnostic accuracy is 96.29%.

The calculated p value was 0.0001, the association is considered to be extremely significant.

Fig. 14: Intraoperative image showing sigmoid sinus plate erosion.
Image source- department of otorhinolaryngology, Dr. S.N. Medical College, Jodhpur.

Fig. 15
Fig. 16

Fig. 15 shows sigmoid sinus plate erosion, Fig.16 shows tegmen tympani erosion.
Image source- Fig. (15) & (16)- department of radiodiagnosis, Dr. S.N. Medical College, Jodhpur
Facial canal dehiscence and lateral semicircular canal dehiscence are the complication of cholesteatoma lead to non-hearing related symptoms like facial palsy and vertigo. Discontinuity of normal anatomy of these structures is observed as dehiscence.

In our study we identify 7 cases of facial canal dehiscence and 6 cases of LSC dehiscence, out of which facial canal dehiscence is correctly identified in all 7 patients and LSC dehiscence in 5 patients, while in 1 case HRCT failed to identify facial canal dehiscence and in 2 cases HRCT failed to identify LSC dehiscence.

Sensitivity, specificity to identify facial canal dehiscence are 85.71%, 100% respectively. PPV & NPV are 100% & 98.48%. Diagnostic accuracy is 99.03%, The calculated p value was 0.0001, the association is considered to be extremely significant.

Sensitivity, specificity, PPV & NPV for LSC dehiscence are 71.4%, 98.48%, 83.33%, & 97.01%. diagnostic accuracy is 96.37%, The calculated p value was 0.0001, the association is considered to be extremely significant.

Fig. (17)
Fig. 18
Fig. 19
Fig. 17: Intraoperative image showing tympanic segment of bony facial canal erosion. Fig. 18: shows lateral semicircular canal erosion, Fig.19 shows tympanic segment of bony facial canal erosion.

Image source-Fig. (17)- department of otorhinolaryngology. Fig. (18) & (19)- department of radiodiagnosis,Dr. S.N. Medical College, Jodhpur.
### Table 3:
comparative analysis of HRCT temporal bone and intraoperative findings

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<td>positive</td>
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### Table 4
comparative analysis of HRCT temporal bone and intraoperative findings

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<th>NPV</th>
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<td>100</td>
<td>66.67</td>
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<td>98.48</td>
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<td>84.4</td>
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<td>Extent of disease</td>
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<td>92.85</td>
<td>98.27</td>
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<td>86.66</td>
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<td>100</td>
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<td>92.45</td>
<td>81.81</td>
<td>96.07</td>
<td>92.26</td>
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Table 4- showing comparative analysis of HRCT temporal bone and intraoperative findings
Discussion

The study is conducted in the department of radiodiagnosis, Dr. S. N. Medical college, Jodhpur. Its aim is to find the effectiveness of HRCT temporal bone to diagnose the disease, extension and complication by comparing these findings with intraoperative findings.

The study included 73 patients with Chronic Otitis Media who underwent Mastoid Exploration Surgery after initial evaluation of HRCT temporal bone of the disease ear between January 2020 and December 2021, of which 44 were males and 29 females. There was a slight male predominance.

The age of study subjects ranged from above 12 years to 70 years with mean age of 30.52 ± 9.70 years. Maximum incidence was seen in the age group of 12-20 years. 23 patients were below the age of 20 years, 19 were between 21-30 years, 13 were between 31-40 years, 10 were between 41-50 years, 4 were between 51-60 years, 4 were between 61-70 years.

This observation was in agreement with that of Jaiprakash Tak & Ajeet Kumar Khilnani, and contradictory to the findings of Jyotindu Debnath & Raju A. George. In our study, most of the patients presented with ear discharge or hard of hearing or both, while other complaints included tinnitus and vertigo.

Presence and extent of disease

In our study, soft tissue density was the most common and consistent finding. comprising 70 patients shows soft tissue density, while the figure was 71 in intraoperative findings. The sensitivity and specificity were 98.59% and 100% respectively. The results are consistent with the findings of Juveria Majeed & L. Sudarshan Reddy and Meeta Bathla, Hiren Doshi & Atul Kansara. Cholesteatoma further extends to epitympanum, hypotympanum, aditus and antrum and other potential space of auditory cavity, with bony erosions, widening of ear cavity and prussak’s space (Small space lying between neck of malleus and pars flacida). Our study finds extension of disease in most of the cases with sensitivity and specificity 97.01% & 83.3%. These findings are in line with the findings of Meeta Bathla, Hiren Doshi & Atul Kansara with the sensitivity 100% and specificity 94%.

Replacement of normal air in mastoid air cells with cholesteatoma is suggesting mastoiditis, HRCT has superior detection capacity for disruption of normal mastoid air cells. In our study we find sensitivity of 96.61% and specificity of 92.85%. These findings are in contract with Md Izhar Khan, Seema Patel, Kalpana Dasgupta with 100% sensitivity and specificity, and findings of Pramod V, Raghuraj U.

Ossicular erosion

Erosion of the ossicles is commonly seen with cholesteatomas, as they enlarge and come in contact with contiguous structures in the middle ear. In our study, the long process of the incus was the most commonly eroded followed by head of malleus.

Our study revealed 45 patients with incus erosion with sensitivity/ specificity of 91.48% & 92.3% and PPV/ NPV are 95.5% & 85.71% respectively. These findings are in agreement with the study of Karki S, Pokharel M, Suwal S, Poudel R which demonstrate sensitivity, specificity, PPV, NPV 100%, 80%, 75%, 100% respectively, and with Mariam Aljehani and Rayan Alhussini interpreted 100% sensitivity and specificity.

Malleus erosion is next ossicle to eroded by cholesteatoma. in our study, we find strong radiosurgical correlation of findings with sensitivity, specificity, PPV, NPV are 89.65%, 93.18%, 89.65% & 93.18% respectively. These findings are in relation with the study done by Ramandeep singh at al. their interpretation of
study in the form of sensitivity, specificity are 89% & 100%. study done by Shantanu mandal at al shows the results as 90% sensitivity and 75% specificity.

Stapes erosion is seen in the form of foot plate, head and crus of stapes, in our study HRCT temporal bone has correctly diagnosed stapes erosion in 18 patients with sensitivity, specificity, PPV, NPV are 90%, 92.45%, 81.81% & 96.07% respectively. These findings are in agreement with the study done by Mariam Aljehani and Rayan Alhussini(15) interpreted 100% sensitivity and specificity.

**Tegmen tympani erosion**

In our study, HRCT Temporal Bone reported tegmen erosion in 15 cases of which 13 patients had tegmen erosion intraoperatively and 2 had intact tegmen. And HRCT reported intact tegmen in 58 patients of which 3 had tegmen erosion intraoperatively and 55 had intact tegmen. We inferred that HRCT Temporal Bone has 81.25% sensitivity and 96.49% specificity for diagnosing tegmen erosion. It has a PPV of 86.66% and NPV of 94.8% with a diagnostic accuracy of 95.30%. The calculated p value was 0.0001, the association is considered to be extremely significant.

This was in contradiction to the findings of Agarwal R. et al.(17) whereas Mariam Aljehani and Rayan Alhussini(15) observed 100% sensitivity, specificity, negative and positive predictive values. Our findings were similar to the study done by Mehrdad Rogha et al.(18) it observed that sensitivity of pre-operative HRCT for tegmen erosion is 75%, specificity is 96.9%, positive predictive value is 60% and negative predictive value is 96.77%. Likewise, Yildirim-Baylan M et al.(19) observed that its sensitivity for dural plate erosion is 98%, specificity is 66.7%, positive predictive value is 96.1% and negative predictive value is 80%.

**Facial Canal Dehiscence:**

In our study, HRCT Temporal Bone identified facial canal dehiscence in 7 patients. Out of these, all 7 patients had intraoperative facial canal dehiscence. In 66 patients, HRCT reported intact facial canal, while intraoperatively dehiscence was seen in 65 of these 66 patients. Therefore, we inferred that HRCT has 87.5% sensitivity and 100% specificity for Facial Canal Dehiscence. It has a PPV of 100% and a NPV of 98.48% with a diagnostic accuracy of 99.03%. The calculated p value was 0.0001, the association is considered to be extremely significant.

Thus, we infer that HRCT Temporal Bone is a valuable diagnostic tool for detecting sigmoid sinus plate erosion. These observations were in agreement with Agarwal R. et al.(17) who observed that preoperative HRCT scan temporal bone correlates well for the detection of disease presence and shows good radiosurgical agreement for sinus plate erosion. Mariam Aljehani and Rayan Alhussini(15)& Mehrdad Rogha et al.(18), observed 100% sensitivity, specificity, negative and positive predictive values of HRCT Temporal Bone in detecting sinus plate erosion. Whereas, Yildirim-Baylan M et al. (19) observed that sensitivity of pre-operative HRCT for sigmoid sinus plate erosion is 98%, specificity is 66.7%, positive predictive value is 96.1% and negative predictive value is 80%.

**Sigmoid Sinus Plate Erosion:**

In our study, HRCT Temporal Bone reported sigmoid sinus plate erosion in 11 cases, and intraoperatively sinus plate erosion was seen in 10 of 73 patients. We found that HRCT showed 90% sensitivity and 96.82% specificity in assessing sigmoid sinus plate erosion. It has a PPV of 81.81% and NPV of 98.38% with a diagnostic accuracy of 96.29%. The calculated p value was 0.0001, the association is considered to be extremely significant.
sensitivity and specificity of pre-operative HRCT for facial canal was 80 and 100%.

Mariam Aljehani and Rayan Alhussini\(^{(15)}\) shows partial agreement with our study and observed that sensitivity of preoperative HRCT for facial canal erosion is 97.8%, specificity is 77.6%, positive predictive value is 93.9% and negative predictive value is 40%. Mehrdad Rogha et al.\(^{(18)}\) reported that its sensitivity for facial canal dehiscence is 66.7%, specificity is 75.8%, positive predictive value is 20% and negative predictive value is 75.75%. And, Yildirim-Baylan M et al.\(^{(19)}\) found that sensitivity for facial canal dehiscence is 98.1%, specificity is 25%, positive predictive value is 94.4% and negative predictive value is 50%.

**Lateral Semicircular Canal Erosion:**

In our study, HRCT Temporal Bone reported Lateral Semicircular Canal Fistula in 6 patients out of which intra-operatively, LSCC erosion was present in 5 patients and was absent in 1 patient. Thus, we observed that HRCT Temporal Bone showed 71.4% sensitivity and 98.48% specificity for detection of Lateral Semicircular Canal Fistula (LSCC). It has a PPV of 83.33% and a NPV of 97.01% with a diagnostic accuracy of 96.37%. The calculated p value was 0.0001, the association is considered to be extremely significant.

Hence, we can say that HRCT is a good diagnostic tool in determining LSCC Fistula. This was similar to the findings of Agarwal R. et al.\(^{(17)}\) while Khan I. Md et al.\(^{(12)}\) reported the sensitivity and specificity for detecting erosion of lateral semicircular canal (LSCC) was 77.78 and 98.2%. Unlike our findings, Mehrdad Rogha et al.\(^{(18)}\)observed its sensitivity for lateral semicircular canal dehiscence is 75%, specificity is 87.5%, positive predictive value is 42.85% and negative predictive value is 96.55%. Nearly similar to our observations, Yildirim-Baylan M et al.\(^{(19)}\) reported that the sensitivity of preoperative HRCT for semicircular canal dehiscence is 98.1%, specificity is 75.0%, positive predictive value is 98.1%, and negative predictive value is 75%.

**Conclusion & Summary:**

This study was conducted in the department of radiodiagnosis, Dr. S.N. Medical College, Jodhpur, Rajasthan.

This is a clinical observational study to compare the preoperative HRCT Temporal Bone finding with intraoperative finding in patients with Chronic Otitis Media undergoing surgeries.

Data of 73 patients who had undergone mastoid exploration surgery between January 2020 and December 2021 was observed. Radiological findings of preoperative HRCT Temporal Bone were compared with their intraoperative findings. We derived following conclusion –

Out of 73 patients 44 were males and 29 females. There was a slight male predominance in patients with Chronic Otitis Media.

The mean age of patients recruited in our study was 30.52 ± 9.70 years and maximum incidence of Chronic Otitis Media was seen in age group of 12-20 years.

We observed that soft tissue density was the most observable findings consistent with cholesteatoma and granulation tissue and shows desirable sensitivity and specificity. Thus, we conclude that HRCT Temporal Bone can identify cholesteatoma and granulation tissue in a patient with positive history of CSOM.

In detecting the extent of disease to epitympanum, hypotympanum, aditus ad antrum and other potential space of auditory cavity, with bony erosions, widening of ear cavity and prusech’s space (Small space lying between neck of malleus and pars flacida), HRCT Temporal Bone has good sensitivity specificity, PPV & NPV with Its diagnostic accuracy for reporting extent of disease is 93.15%.
HRCT Temporal Bone has better sensitivity, specificity, PPV & NPV for incus, malleus and stapes erosion. Its diagnostic accuracy in determining ossicular erosion is ~92%. Thus, HRCT is a good diagnostic tool in assessing ossicular erosion.

HRCT Temporal Bone showed 81.25% sensitivity and 96.49% specificity, 86.66% PPV and 94.8% NPV for diagnosing tegmen erosion. Its diagnostic accuracy for tegmen erosion is 93.15%. Therefore, we can say that, it a good modality for diagnosing tegmen erosion.

For diagnosing sigmoid sinus plate erosion, HRCT Temporal Bone has a sensitivity of 90%, specificity of 96.82%, PPV of 81.81% and NPV of 98.38%. Diagnostic accuracy of HRCT for sigmoid sinus plate erosion is 95.30%. It is a good diagnostic test for sigmoid sinus plate erosion.

The sensitivity of HRCT Temporal Bone for Facial Canal Dehiscence is 87.5%, specificity is 100%, PPV is 100% and NPV is 98.48%, with a diagnostic accuracy of 99.03%. HRCT Temporal Bone is a good diagnostic test for Facial Canal Dehiscence.

For diagnosing Lateral Semicircular Canal Fistula, HRCT Temporal Bone has 71.4% sensitivity, 98.48% specificity, 83.33% PPV and 97.01% NPV and a diagnostic accuracy of 96.37%. Thus, it is useful tool in diagnosing LSCC Fistula.

This study reflects that preoperative HRCT Temporal Bone provides a road map for the surgical approach in a patient with Chronic Otitis Media. It is a very useful modality to assess the extent of disease, ossicular chain erosion, scutum erosion, Dural plate and sinus plate erosion, facial canal dehiscence and LSCC fistula.

Overall, HRCT Temporal Bone, proved the anatomic details, defines the extent of disease and severity of bony destruction and is a useful guide to a surgeon in planning the surgery. In the modern times, it also considered as a very important application in medicolegal cases.

Bibliography


