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Original Research Article

Diagnostic efficacy of high-resolution computed tomography findings in patients of chronic suppurative otitis media atticoantral type

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ABSTRACT

Background: High resolution computed tomography (HRCT) provides information about anatomy and pathology of temporal bone and middle ear cleft, thus becoming important imaging modality in diagnosis and pre-operative planning in patients of chronic suppurative otitis media (attico-antral) CSOM (AA) type. The aim of study was to study disease extension and plan surgery accordingly in patients of CSOM (AA) and to study correlation between the HRCT findings and intra-operative findings of CSOM (AA) like soft tissue density mass, ossicular chain erosion, facial canal dehiscence, semi-circular canal erosion.
Methods: Study of 70 patients clinically diagnosed of having CSOM (AA) in period between August 2018 to March 2020 was done at Sola civil hospital, Ahmedabad. All patients were advised HRCT temporal bone except those who had contraindications to CT scan, analysed and operated. Pre-operative CT-scan findings and intra-operative findings were compared for statistical analysis.
Results: Soft tissue density was found in 100% of cases on HRCT temporal bone. Bony erosion seen in 25% of cases. 90% showed ossicular erosion. Lateral semi-circular canal fistula was observed in 10% of cases with facial canal dehiscence in 10% of cases. Intra-operative findings showed accuracy of HRCT in detecting soft tissue density to be 100%; bony erosion was observed in 25% cases. 10% patients had lateral semi-circular canal fistula. Facial canal dehiscence was seen in 15% cases.
Conclusion: HRCT has proved quite useful and reliable to identify the disease extension before surgery and plan surgery accordingly.

Keywords: HRCT temporal bone, Middle ear, CSOM, Cholesteatoma

INTRODUCTION

Chronic aural suppuration can be with or without cholesteatoma. Cholesteatoma (Keratoma) is presence of stratified squamous epithelium in middle ear cleft.[1] It might be present with keratin debris and dry or can be with active malodorous discharge. Other symptoms include hearing loss and sometimes pain. It is potentially dangerous as it causes bone resorption further leading to many intracranial or extracranial complications. Diagnosis of CSOM (AA) is done clinically. But its extent cannot be determined clinically.[2,6]

High resolution scan is highly accurate in delineating the extension of disease. It can inform about the soft tissue presence although it cannot differentiate between different types of tissues present like between polyp or granulations.[1] Gross or minimal bony erosion which indicates potential intracranial complications can also be detected by HRCT of temporal bone. All these help in

pre-operative planning of surgery and complete removal of the disease.[3]

Aim of the study was to correlate the CT scan findings with intra-operative findings and determine the diagnostic efficacy of CT scan.

METHODS

Analytical study of 70 patients who were clinically diagnosed of having CSOM-(AA) type in period between August-2018 to March-2020 was carried out at GMERS medical college and Sola civil hospital. The patients were sampled by purposive (non-probability) technique. All the patients underwent bilateral temporal bone high resolution CT imaging at sola civil hospital using SIEMENS CT scan machine with slice thickness of 0.9 mm and inter-slice gap of 1.25 mm (2.0-0.75). All the patients who gave consent were operated based on imaging and findings of both were correlated.

Inclusion criteria for the study included all the patients who came in OPD of Sola civil hospital, ENT department, who were diagnosed of having CSOM-(AA) clinically, underwent HRCT temporal bone and were operated based on that.

Exclusion criteria included patients with history of trauma, neoplasm in external ear and any other pathologies and inner ear pathologies were excluded. All patients in whom CT was contra-indicated or those who did not undergo surgery after the scan were excluded.

In statistical analysis all the data was recorded in Microsoft excel sheet. The efficacy of HRCT was determined in terms of sensitivity and specificity.

The study was approved by institutional ethical committee.

RESULTS

The patients diagnosed of having CSOM-(AA) most commonly presented with chief complaint of intermittent foul smelling otorrhoea-40%. 30% had complaint of continuous ear discharge. Reduced hearing was seen in 20 % of patients. Otoscopic findings revealed postero-superior quadrant region granulations in 52%. Attic erosion in 26%, polyp coming from middle ear into external auditory canal in 10% patients. (Table 1 and 2).

There were total 33 males and 37 females involved in the study.

Primary site of disease seen on CT scan showed posterior mesotympanum to be involved most commonly that is 43% followed by posterior epitympanum which had 40% involvement. Anterior epitympanum involvement seen in 5% patients and anterior mesotympanum involvement in 3% patients.

Table 1: Symptoms of patients with attico-antral disease.

Symptoms	Percentage (%)
Continuous ear discharge	30
Intermittent foul-smelling ear discharge	40
Reduced hearing	20
Earache	7
Tinnitus	1
Facial weakness	2

Table 2: Otoscopic findings and their percentages.

Findings	Percentage (%)
PSQ region granulations	52
Attic erosion	26
Polyp coming from middle ear into EAC	10
Marginal perforation	7
Attic perforation	5

Mastoid antrum involvement was seen in 96.6% of patients of atticoantral disease on CT scan. Scutum erosion was seen in 23% patients. Ossicular erosion was observed in 90% of all patients. The most common involved ossicle was incus followed by malleus and lastly stapes. Among extra-cranial complications of cholesteatoma, lateral semi-circular canal erosion was present in 10% patients and fallopian canal dehiscence in tympanic segment in 10% patients (Table-3).

On comparing intra-operative findings with HRCT findings, it was found that mesotympanum involvement in 97% patients intraoperatively whereas it was 100% on HRCT Temporal bone. Attic and mastoid antrum involvement were 100% correlated. Ossicular involvement was seen in 90% people in HRCT whereas it was present in all patients intra-operatively either in form of mild erosion or total necrosis.

Dural plate erosion was observed 4% on HRCT but was observed in only 2% of those people intra-operatively. Lateral semi-circular canal erosion was seen in 6% of patients on HRCT but it was seen only in 4% patients intra-operatively. Fallopian canal dehiscence, most commonly of tympanic segment had been observed in 10% subjects but was seen in 15% patients intra-operatively. Normal horizontal facial canal is seen in figure 3. There were no intracranial complications seen.

Sensitivity and specificity of HRCT with respect to intra operative findings are given in Table 3.

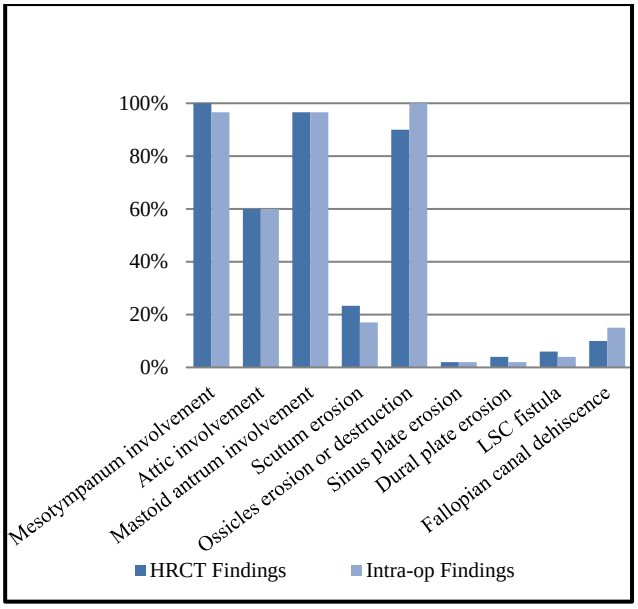

Figure 1: Correlation between HRCT and intra-operative findings.

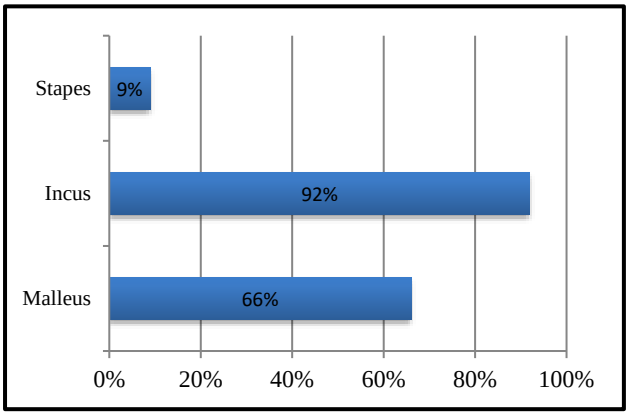

Figure 2: Ossicles involved.

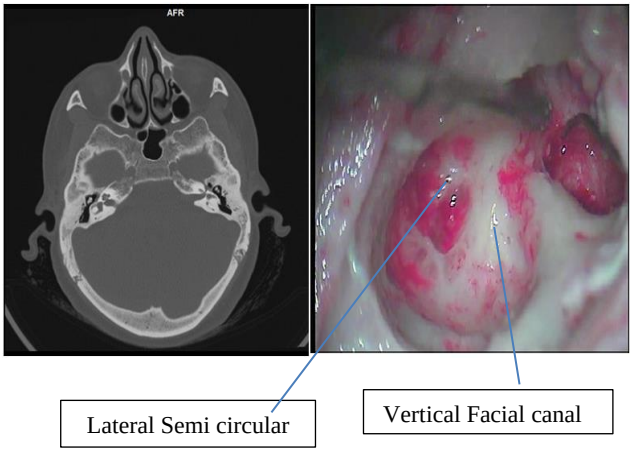

Figure 3: Normal horizontal facial canal on left side. Intra-operative image of open mastoid cavity of lateral semi-circular canal and vertical facial canal.

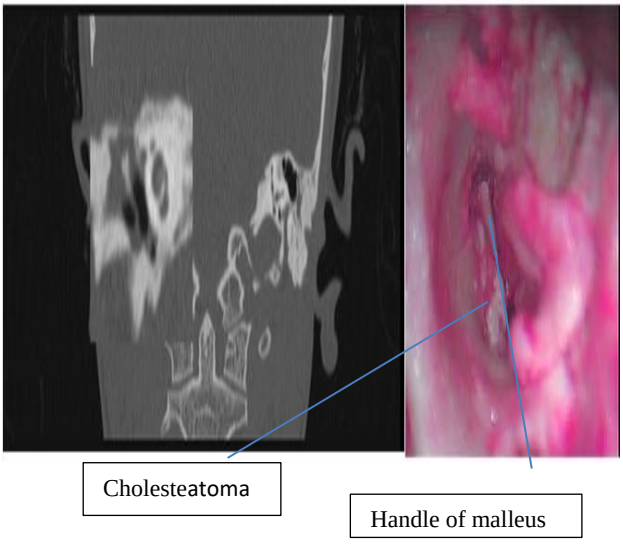

Figure 4: CT scan of disease in epitympanum causing erosion of ossicles. Cholesteatoma sac in right middle ear with handle of malleus seen intra-operatively.

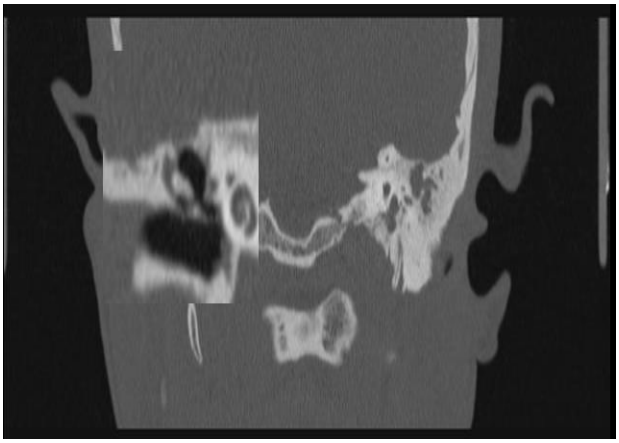

Figure 5: Disease in sinus tympanic and facial recess.

Figure 6: Ossicular erosion with erosion of posterior canal and lateral semi-circular canal erosion with auto cavity on right side.

Table 3: CT scan findings in patients with sensitivity and specificity of HRCT.

HRCT findings	% of patients	Sensitivity (%)	Specificity (%)
Mesotympanum involvement	100	100	100
Attic involvement	60	100	100
Mastoid antrum involvement	96.6	100	100
Scutum erosion	23	100	92.7
Ossicular erosion or destruction	90	90	100
Sinus plate erosion	2	100	100
Dural plate erosion	4	100	98
LSC fistula	10	100	98
Fallopian canal dehiscence	10	66	100

Table 4: Comparison of this study with other studies.

HRCT findings	Nikki (%)	Sunita (%)[2]	Payal (%)[11]	Sonika (%)[4]
Mesotympanum involvement	100	96	-	89
Attic involvement	60	36	-	-
Mastoid antrum involvement	96.6	80	-	100
Scutum erosion	23	30	-	-
Ossicular erosion or destruction	90	-	89	-
Sinus plate erosion	2	-	12	11
Dural plate erosion	4	10	-	11
LSC Fistula	10	4	9	4.2
Fallopian canal dehiscence	10	16	9	4.2

DISCUSSION

Chronic suppurative otitis media is divided into tubotympanic (safe) and attico-antral type (unsafe) type. Attico-antral disease has presence of cholesteatoma sac in middle ear and mastoid antrum. Cholesteatoma is presence of keratinized stratified squamous epithelium in middle ear. It has a central are called matrix which is surrounded by stroma called peri matrix. It is either of congenital type or acquired type. Congenital cholesteatoma present with main complain of hearing loss without any previous history of ear discharge or trauma. On the other end, the acquired type presents with chronic foul-smelling ear discharge with hearing loss. Sometimes the presentation is directly in the form of some complication like facial nerve paralysis.[1,5]

They can either be primary acquired or secondary based on any previous history of ear disease. The most common site of origin of acquired cholesteatoma is posterior epitympanum, followed by anterior epitympanum. They spread via either posterior, anterior or inferior route. Other rare sites of origin of cholesteatoma are external auditory canal, petrous apex. The disease arises most commonly in Prussak's space and cause medial displacement of ossicles whereas those arising in mesotympanum cause lateral displacement of ossicles.[5]

It is considered dangerous because of its capacity to cause bone damage and causing serious extra-cranial complications like subperiosteal abscess, labyrinthine fistula, coalescent mastoiditis, petrous apicitis, facial paralysis and intra-cranial complications like meningitis, brain abscess, lateral sinus thrombosis, epidural abscess, otitic hydrocephalus.

HRCT, when done pre-operatively provides with significant information about the soft tissue presence, its extent and bone damage done by that soft tissue. It is highly helpful in visualizing the status of ossicles, lateral semi-circular canal, facial nerve, mastoid pneumatisation, Dural plate and sinus plate status, erosion of tegmen can also be seen.[7] Although it cannot differentiate about the type of soft tissue like granulation and polyp.[9]

Table 4 compares the study with studies carried out by other otorhinolaryngologists. In this study, it was found that the most common presenting symptom was ear discharge similar to study done by Gyanu et al also most common symptom was ear discharge (100%) and hearing loss (96%).[9] Mesotympanum involvement by disease was seen in all the patients compared to other study done by Dashottar et al where there was 96% involvement and 89% in study done by Ganotra.[2,4] Ossicular erosion was observed in 90% of patients in the study while it was found to be 89% in study done by Chavda et al.[11] Similarly, lateral semi-circular canal involvement was observed in 6% patients while other study had 23% involvement. HRCT proved highly effective in showing ossicular erosion which correlated well intra-operatively,

specifically for malleus and incus, similar to a study conducted by Rogha et al which showed good radio surgical correlation for malleus.[10] The study showed that incus was the most commonly involved ossicle which was similar to findings in study done by Happani et al.[3]

The study showed 100% sensitivity for mesotympanum involvement similar to that found to be 96% in study done by Dashottar et al but the specificity findings were different in both studies. A high sensitivity and specificity (82-100%) of HRCT was found in detection of erosion of scutum, tegmen tympani and ossicles by Dashottar and higher sensitivity rates were found in my study for the same ranging from 90-100%. For facial canal erosion on HRCT, a sensitivity of 66% was found when compared to intra-op findings as compared to 50% in study done by Dashottar et al.[2]

HRCT temporal bone before surgery helped in carrying out pre-operative planning and evaluation and helped the surgeons in being more vigilant during the surgery. Also, it helped in planning for ossicular reconstruction.

The study was carried out in academic environment and the CT scan findings were concluded by resident doctors, there might have been some limitation due to lack of relative experience and learning curve. This study may not be applicable to a wide range of population due to limited number of the cases in our study. The slice thickness in CT scan is 0.9 mm compared to the required thickness of 0.5 mm.

CONCLUSION

The study hereby concludes that HRCT Temporal bone is "Gold Standard" modality for pre-operative work-up in cholesteatoma patients. It is highly effective in determining the extent and spread of the disease. No other radiological investigation gives so much information about bony erosion as CT scan. Thus, HRCT Temporal bone should be done for every patient of cholesteatoma of ear before planning the surgery.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Edelstein DR, Parisier SC, ChengHan J. Acquired Cholesteatoma in the Pediatric Age Group. otolaryngol clinics North Am. 1989;22(5):955-66.
2. Dashottar S, Bucha A, Sinha S, Nema D. Preoperative temporal bone HRCT and intra-operative findings in middle ear cholesteatoma: a comparative study. Int J Otorhinolaryngol Head Neck Surg. 2019;5:77-82.
3. Happani H, Kalola J, Rathod H, Trivedi A. Role of HRCT temporal bone in patients with chronic supparative otitis media. International Journal of Contemporary Medicine Surgery and Radiology. 2018;3(3):C70-2.
4. Kanotra S, Gupta R, Gupta N, Sharma R, Gupta S, Kotwal S. Correlation of high-resolution computed tomography temporal bone findings with intra-operative findings in patients with cholesteatoma. Indian J Otol. 2015;21(4)280-85.
5. Kumar A, Wiet R. Aural complications of otitis media. In Aina Julianna Gulya, Llyod B Minor, Dennis S. Poe. 6th edition Surgery of the Ear. People's medical publishing house- USA Shelton, Connecticut. 2010.
6. Rogha M, Hashemi SM, Mokhtarinejad F, Eshaghian A, Dadgostar A. Comparison of Preoperative Temporal Bone CT with Intraoperative Findings in Patients with Cholesteatoma. Iran J Otorhinolaryngol. 2014;26(74):7-12.
7. Kangsanarak J, Fooanant S, Ruckphaopunt K, Navacharoen N, Teotrakul S. Extracranial and intracranial complications of suppurative otitis media. Report of 102 cases. J Laryngol Otol. 1993;107:999-1004.
8. Ajalloueyan M. Modified radical mastoidectomy: techniques to decrease failure. Med J Islam Republic Iran. 1999;9:179-83.
9. Modwal A, Saboo R, Saxena G, Sapra G. A Study of the Correlation of the Clinical Feature, Radiological Evaluation and Operative Finding in CSOM with Cholesteatoma. Sch J App Med Sci. 2014;2(6):3259-69.
10. Rogha M, Hashemi SM, Mokhtarinejad F, Eshaghian A, Dadgostar A. Comparison of preoperative temporal bone CT with Intraoperative findings in patients with cholesteatoma. Iran J Otorhinolaryngol. 2014;26:7-12.
11. Chavada PS, Khavdu PJ, Fefar AD, Mehta MR. Middle ear cholesteatoma: a study of correlation between HRCT temporal bone and intraoperative surgical findings. IntJ Otorhinolaryngol Head Neck Surg. 2018;4:1252-7.

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