

Original article:

Study of evaluation of role of High Resolution Computed Tomography in diagnosis of temporal bone pathologies

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Abstract:

Introduction: Radiological assessment of the inflammatory diseases of the middle ear and inner ear is challenging and involves deep understanding of anatomy.

Methodology: Total 100 eligible study participants were enrolled in the study. All patients (including paediatric age group) of both sexes referred from ENT department to Radiology department in Government Medical College and Hospital, Aurangabad. Total 100 eligible patients who were ready to participate and had given such written informed consent were included in the study.

Results : HRCT was done in all the 100 study patients. Findings of the congenital anomalies on HRCT and during surgery was 100% same. There was agreement of HRCT findings with Intra-operative findings in 75% of AOM/safe CSOM patients and 82.35% of unsafe CSOM patients. Overall accuracy was 87.88% in all the pathologies who were subjected to surgical exploration

Conclusion: HRCT was found to be useful in the evaluation of pathologies of temporal bone including infective, congenital and trauma. In our study more than half of the study patients. HRCT is highly efficient in assessing the extent of the fracture line in temporal bone trauma and involvement of other structures.

Keywords: Radiological assessment , Computed Tomography, HRCT

Introduction:

Radiological assessment of the inflammatory diseases of the middle ear and inner ear is challenging and involves deep understanding of anatomy.¹ High-resolution computed tomography (HRCT) excels in the evaluation of middle ear disease process and adjacent bone because of its high sensitivity in the presence of soft tissue disease and bone erosion. HRCT is the best imaging technique for diagnosing tuberculous otomastoiditis (TOM), malignant otitis externa, otosclerosis and in middle ear infections, cholesteatoma, etc. In patients with temporal bone trauma, HRCT accurately evaluates the fracture lines, fracture plane orientations, ossicular disruptions, otic capsule involvement, associations with air in the temporomandibular joint (TMJ), facial nerve injury, and fracture mimics, to name few categories.^{2,3,4}

HRCT imaging is necessary for anatomic determination of chronic otitis media, suspicion of congenital anomalies and to detect any loss of surgical landmarks caused by prior operation.³ Watts et al., have shown that HRCT is less expensive and provides useful information about surgical trend⁴ and, thus, if a co-ordination can

be made between the otologist and radiologist with an appropriate familiarity of the surgeon with HRCT scans, preoperative imaging is essential and very helpful. Knowledge of the mastoid pneumatization aids in the planning of surgical approach e.g. whether to do canal wall down or up type of surgery.⁵

Methodology:

This prospective study was carried out from 1st December 2019 to 31st October 2021 during which all the eligible patients of both sexes referred from ENT department to Radiology department in Government Medical College and Hospital, which is a tertiary care centre in a city of Maharashtra state were considered. This institute caters patients from nearby 4-6 districts in Maharashtra as there are no tertiary care centres in those districts.

All patients (including paediatric age group) of both sexes referred from ENT department to Radiology department in Government Medical College and Hospital, Aurangabad.

Total 100 eligible patients who were ready to participate and had given such written informed consent were included in the study.

Inclusion criteria:

- 1.All patients referred from ENT department, GMCH, Aurangabad to Radiology department, GMCH, Aurangabad.
- 2.Patients with congenital malformations.
- 3.Temporal bone trauma patients.
- 4.Patients including all age groups

Exclusion criteria:

- a.Unconscious patients.
- b.Vitally unstable patients.
- c.Highly irritable patients.
- d. Patients with neoplastic lesions.

Results:

Most common age of presentation in the study was 11-20 years with 24% followed by 21-30 years and 31-40 years with 18% each while the least common age group was >60 years with 8% of the patients.

There was male predominance in the study with 64% of the patients being male and the rest 34% were females.

Most common clinical feature was chronic ear discharge 29.0% followed by hearing loss/difficulty in hearing in 25.0% and otalgia in 22.0% patients while the least common presentation was microtia, self fall and small ears was present in only 1 % of the patients.

Table 1: Temporal bone structures involved in traumatic patients

Structure	No. of patients	Percentage
Tympanic membrane	9	39.13
Ossicles	9	39.13
External ear	6	26.09
VII CN	3	13.04
Inner ear	1	4.35
Tegmen tympani	1	4.35
Others	2	8.70

Tympanic membrane and ossicle were involved in each 39.13% of the study patients. Inner ear and tegmen tympani were involved in only 4.35% traumatic patients each.

Table 2: Involvement of ossicles in study patients.

Ossicles	All study patients (%)	Infective (%)	Traumatic (%)
Incus and malleus	17 (58.62)	8 (42.11)	8 (88.89)
All three ossicles	5 (17.24)	4 (21.05)	0
Only Incus	3 (10.34)	3 (15.79)	0
Only Malleus	2 (6.9)	2 (10.53)	0
Incus and stapes	2 (6.9)	2 (10.53)	1 (11.11)
Total (100%)	29	19	9

Most commonly involved ossicles in overall study were incus and malleus in 58.62% of the study patients and the least common were only malleus and incus and stapes were involved in 6.9 % patients each. Incus and malleus were most commonly ossicles involved in 42.11% of the infections and the incus and stapes were least commonly affected in 10.53% patients. Incus and malleus were most commonly affected in 88.89% of the traumatic patients.

Table 3: Correlation between HRCT and operative findings

Pathology	HRCT done (n=100)	Operated cases (n=33)	Agreement with Intra-operative findings	Percentage
Congenital anomalies	6	4	4	100
AOM/ safe CSOM	29	4	3	75
Unsafe CSOM	18	17	14	82.35
Trauma	23	8	8	100
Total accuracy		33	29	87.88

HRCT was done in all the 100 study patients. Findings of the congenital anomalies on HRCT and during surgery was 100% same. There was agreement of HRCT findings with Intra-operative findings in 75% of AOM/safe CSOM patients and 82.35% of unsafe CSOM patients. Overall accuracy was 87.88% in all the pathologies who were subjected to surgical exploration.

Discussion:

This prospective study conducted at the Department of Radiology, in a tertiary care center and teaching hospital in a city of Maharashtra in which 100 eligible patients which were referred to the radiology department for HRCT temporal bone. All the necessary ethical permissions were taken and investigations were done only after informed written consent of the study patient. The consent was obtained from parent in case where the patient is <18 years of age. The synopsis was presented before Institutional Ethical Committee (IEC) and the same was sent to the MUHS for the approval after making corrections as per the suggestions of the committee. The data

collected by case record form were entered in the Microsoft Excel 2013 and the analysis was done with the help of SPSS software 20.0 version. Charts, tables, graphs, line diagram were drawn at the appropriate places.

CT is a standard examination technique in diagnosis and treatment of temporal bone diseases. HRCT imaging is necessary for anatomic determination of chronic otitis media, suspicion of congenital anomalies and to detect any loss of surgical landmarks caused by prior operation. ⁶Watts et al., have shown that HRCT is less expensive and provides useful information about surgical trend and, thus, if co-ordination can be made between the otologist and radiologist with an appropriate familiarity of the surgeon with HRCT scans, preoperative imaging is essential and very helpful. Knowledge of the mastoid pneumatization aids in the planning of surgical approach e.g. whether to do canal wall down or up type of surgery. Hence the present study was carried out with an aim to study any normal variation, congenital anomalies in the structure of temporal bone and to evaluate various infective pathologies and traumatic injuries of temporal bone and their complications with HRCT.³⁻⁵

Out of 100 study patients, the treatment in 67% cases was medically managed and the surgery was done in 33% of the study patients. HRCT was done in all 100 patients. Findings of the congenital anomalies on HRCT and during surgery was 100% correspondent. There was agreement of HRCT findings with intra-operative findings in 75% of safe CSOM patients and 81.25% of cholesteatoma patients. Overall accuracy was 87.88% in all the pathologies.

Similar study results with agreement of 100% for congenital anomalies and 83.33% for cholesteatoma were found in the study by CL Thukral et al.⁷

Jackler et al. found cholesteatoma to be present in 80% of cases diagnosed on HRCT which were surgically explored.⁸ This was very similar to our 87.88% overall accuracy.

Conclusion:

HRCT was found to be useful in the evaluation of pathologies of temporal bone including infective, congenital and trauma. In our study more than half of the study patients. HRCT is highly efficient in assessing the extent of the fracture line in temporal bone trauma and involvement of other structures.

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