

Correlative Study between Preoperative HRCT Finding and Intra Operative Finding of Attico-Antral Disease

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Abstract

Background: To find the correlation between preoperative HRCT finding & intra-operative finding of attico-antral disease.

Methods: The proposed study was conducted in the Department of Otorhinolaryngology, Mathura Das Mathur Hospital, Dr. S. N. Medical College Jodhpur, on patients of chronic suppurative otitis media -attico antral disease admitted between July 2011 to January 2013. All the patients were evaluated by detailed history, clinical and otoscopic examination as per attached Performa. Then preoperative HRCT-temporal bone both in axial and coronal was done. The operative findings were correlated with finding of HRCT temporal bone.

Results: The HRCT was highly sensitive and specific investigation in diagnosing soft tissue mass density suggestive of cholesteatoma, but not able to differentiate between cholesteatoma and granulations. The HRCT was also very good technique for identifying erosion of lateral semicircular canal, sinus plate destruction, tegmen plate erosion, Malleus Handle and Incus destruction.

Conclusion: The present study shows that there was good correlation between HRCT finding and operative finding. It was both sensitive and specific in diagnosing cholesteatoma, disease extension, bony erosion and ossicular destruction. High resolution computed tomography was less sensitive to identify the facial canal dehiscence and stapes suprastructure erosion.

Keywords: HRCT, CSOM, cholesteatoma, attico antral disease

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Introduction

Cholesteatoma has been known for more than 300 years in the medical literature; still its

precise detection with the use of cross-sectional imaging techniques remains

challenging. As before, the diagnosis of a cholesteatoma at first presentation is mainly based on clinical suspicion. HRCT provides information about bony changes and intracranial complications; however, it is inaccurate for characterizing the soft-tissue mass in the temporal bone. In the past 7 years, improvements in MR imaging techniques have enhanced the sensitivity and specificity of radiologic diagnosis, which may lead to future avoidance of second look surgeries in cases of residual/recurrent-cholesteatomas. "Cholesteatoma" is a well-demarcated non-neoplastic lesion in the temporal bone, which is commonly described as "skin in the wrong place." [1]

Radiological evaluation of the temporal bone is difficult owing to complicated anatomical structure of the middle ear and inner ear. A major advance in imaging of the ear structures has occurred with the development of High-Resolution Computed Tomography (HRCT) [2,3]. Thin section HRCT with modern equipment allows by means of special algorithms, imaging of osseous structures up to a spatial resolution of 0.45 to 0.65mm. HRCT has the advantage of excellent topographic visualization devoid of artifacts from superimposition of structures. Because the various components of the temporal bone are often seen in only one projection it is necessary to obtain scans in both planes of view axial and coronal. One set of conditions in which the indication of preoperative scanning is quite clear is when there are CNS Complications of CSOM. Other reasonable uses of CT scanning include preoperative facial paralysis, vertigo with positive fistula test and when revision mastoidectomy is contemplated in the absence of details of the previous procedure. Its ability to determine the extent of soft

tissue involvement of the antrum, middle ear and especially the posterior tympanic spaces may assist the surgeon in deciding between a canal wall up versus an open procedure [4]. Doubts about sensitivity and specificity, in detecting the extent of underlying pathology and in predicting asymptomatic complications, prevent widespread adoption [5]. Routine CT is not advocated for cholesteatoma diagnosis but may be important in complicated disease (revision cases, intact tympanic membrane, history does not correlate well with physical examination) [6].

There are contradicting views in contemporary literature on the utility of pre-operative radiology in treatment of cholesteatoma e.g. Smyth *et al.* [7] and Dulac *et al.* [8] These two extreme viewpoints motivated us to do a study of correlation between pre-operative HRCT findings and intra operative findings of cholesteatoma.

Material and Method

The proposed study was conducted in the department of Otorhinolaryngology, Mathura Das Mathur Hospital, Dr. S.N Medical College Jodhpur, on patients of chronic suppurative otitis media -attico antral disease admitted between July 2011 to January 2013. All the patients were evaluated by detailed history, clinical and otoscopic examination as per attached Performa. Then preoperative HRCT-temporal bone both in axial and coronal was done. The operative findings were correlated with finding of HRCT temporal bone.

Result

This study was based on 88 patients who were treated for chronic suppurative otitis media-atticoantral disease.

Table 1: General characteristics

Mean age	17.36±6.35 yrs
Male: Female	1.2:1
Side (right: left:both)	33:37:18

Discharge	88(100.00%)
Earache	4(4.5%)
Hearing loss	76(86.4%)
Vertigo	2(2.8%)
Facial weakness	4(4.5%)
Postaural abscess	2(2.8%)
Type of perforation	
Total	12(13.60%)
Subtotal	15(17.10%)
Central	11(12.50%)
Posterosuperior	31(35.20%)
Attic	19(21.60%)

Majority of the patients (56.8%) were in 11-20years age group with male predominance (54.5%) and left ear (37%) was commonly involved. There were 48 males and 40 females in this study producing a male to female ratio of 1.2:1. There is increased incidence of disease in left ear. Commonest presenting complaint was otorrhoea (100%) followed by hearing loss (86.4%). Two (2.8%) patients presented with post-aural abscess and only 2 (2.8%) patient with vertigo. Patients with post aural abscess also complained of earache. Four (4.5%) patients presented with earache and 4 (4.5%) patients with facial weakness. On otoscopic examination of the diseased ear, presence of posterosuperior perforation was the commonest finding. 31(35.2%) patients showed posterosuperior perforation and 15 (17.04%) showed subtotal perforation, while 12(13.6%) patients had total perforation. 19 patients (21.6%) show attic perforation.

Table 2: Correlation of CT scan and operative findings (soft tissue density)

Correlation	CT	Surgery	Cases in Agreement	False +VE	False -VE	Sensitivity	Specificity
Evidence of soft tissue density	88	88	88	0	0	100%	100%

Table 3: Correlation of CT scan and operative findings-Extent of the disease

Finding	CT	Surgery	Cases in agreement (True +ve)	False (+ve)	False (-ve)	True (-ve)	Sensitivity (%)	Specificity (%)
Protympanum	36	28	28	8	0	52	100	86.6
Mesotympanum	48	36	36	12	5	35	87.8	74.4
Post-tympanum	61	52	52	9	0	27	100	75
Epitympanum	80	82	82	0	2	4	97.6	100
Hypotympanum	57	42	42	15	0	31	100	67.3
Antrum	79	79	76	3	3	6	96.2	66.6
Aditus	76	76	73	3	3	9	96	75
Mastoid air cell	70	79	70	0	9	12	88.6	100
Perilabyrinthine cells	42	34	34	8	0	46	100	85.1

CT was highly sensitive for cholesteatoma in protympanum, posterior tympanum, hypotympanum and peri-labyrinthine cells and sensitivity varied from 97.6% to 87.8% for other regions. CT was 100% specific for cholesteatoma in epitympanum and mastoid air cells and specificity varied from 86.6% to 66.6% for other regions.

Table 4: Correlation of CT scan and operative findings

Finding	CT Scan	Surgery	Cases in agreement (True positive)	False (+ve) positive	False (-ve) negative	True negative (-ve)	Sensitivity (%)	Specificity (%)
Ossicular destruction – Malleus Handle	53	59	53	0	6	29	89.8	100
Ossicular destruction – Malleus Head	50	64	50	0	14	24	78.1	100
Ossicular destruction- Incus	59	66	56	3	10	19	84.8	86.3
Facial canal dehiscence	16	23	12	4	11	61	52.1	93.8
LSCC erosion	4	2	2	2	0	84	100	97.6
Mastoid cortex dehiscence	13	17	13	0	4	71	76.4	100
Sinus plate dehiscence	2	2	2	0	0	86	100	100
Dural plate erosion(tegmen)	2	2	2	0	0	86	100	100

Discussion

Luchikhin LA *et al.* (1995) [9] compared temporal bone computed tomography findings with those obtained at operation in 30 patients with chronic otitis media. The comparison demonstrated high informative value of CT examinations which provide exhaustive characteristics of the pathological process important for preparation to and performance of relevant surgery.

Mafee f.Kenji Aimi.*et al* (1986) [10] in the study of chronic otomastoiditis: A conceptual understanding of CT finding , studied the micro dissections of 250 fresh temporal bones and reviewed over 1,000 high-resolution computed tomography (CT) scans of the temporal bones. The pertinent

anatomy is described, and the role of the tympanic diaphragm and isthmus in determining the degree to which middle ear disease may progress is stressed. The appearances on CT scans of chronic otomastoiditis, tympanosclerosis, cholesterol granuloma, attic retraction pocket, and acquired cholesteatoma are reviewed and illustrated.

Kee Hyun Park *et al.* (1988) [11] in the study of high-resolution computed tomography of cholesteatomatous otitis media: significance of preoperative information. They analyzed 51 cases of cholesteatoma by temporal bone CT. Then CT features of each cholesteatoma were compared with the lesion found during

surgery. The cholesteatoma sac is soft tissue lesion and appears in the CT as a soft tissue shadow. Granulation tissue has the same CT attenuation number as the cholesteatoma sac, and thus the involved portion of the epitympanum and mastoid cavity showed similar soft tissue density of the cholesteatoma and granulation tissue. They pointed out that the diagnostic accuracy of preoperative CT in cholesteatoma otitis media was very high. Therefore, CT could help us not only to avoid intraoperative complication, but also to decide the appropriate type of surgery and to choose ossiculoplastic material preoperatively. They concluded, a high degree of correct correlation was noted between CT finding and surgical finding.

Jackler RK *et al.* (1984) [12] conducted a study where forty-two patients with chronic otitis media underwent preoperative CT scanning followed by surgical exploration of the middle ear and mastoid. The CT finding of abnormal soft tissue density associated with bone erosion was highly correlated with the surgical finding of cholesteatoma. By contrast, the total absence of abnormal soft tissue on CT essentially excluded cholesteatoma. They concluded that CT scan has a role in the evaluation of selected patients with chronic otitis media, but must be interpreted cautiously in view of its limitations and numerous pitfalls.

Garber I *et al.* (1994) [13] conducted a retrospective study to compare CT with the operative findings in 44 patients operated on for cholesteatoma. Results showed that while CT can detect abnormalities in the temporal bone, its ability to diagnose cholesteatoma is poor. They concluded that CT should be used selectively in those patients presenting diagnostic dilemmas or when other concomitant pathology (i.e., complications, recurrent disease, etc.) is suspected.

Cook *et al.* (1996) [14] in the study of Hearing result following modified radical versus

canal-up mastoidectomy in the series of 153 tertiary referral cases of chronic suppurative otitis media, demonstrate that MRM properly performed produce no significant change in bone conduction threshold and produces overall hearing results that are comparable with those of ICWM procedure.

Blevins NH, Carter BL. (1988) [15] found that there was no single accepted standard for the use of preoperative imaging in uncomplicated COM. Imaging studies, especially computed tomography (CT), can provide information regarding the nature and extent of disease, which may not be apparent on the basis of clinical findings alone. This information may impact the patient's operative management, especially in complex or revision cases. Each clinician must assess the benefits derived from these studies in his or her own practice.

Conclusion

The present study shows that there was good correlation between HRCT finding and operative finding. It was both sensitive and specific in diagnosing cholesteatoma, disease extension, bony erosion and ossicular destruction. High resolution computed tomography was less sensitive to identify the facial canal dehiscence and stapes suprastructure erosion.

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