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# Role of Hrct Temporal Bone In Ear Pathologies

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***Abstract***
***Background And Objectives:*** *HRCT, a modification of routine CT, provides a direct visual window into thetemporal bone providing minute structural details. Purpose of the present is to evaluate thenormal variations, pathological processes (infections, tumours and congenital anomalies)and their extent involving the temporal bone.*
***Methods:*** *A prospective study of 50 cases in patients with signs and symptoms of temporalbone pathology was done from February 2016 to October 2017. Patients were scanned inboth the coronal and axial planes with thin 2mm sections using ultra high algorithmobtaining both contrast and nonenhanced images. Results were tabulated usingpercentages.*
***Results:*** *Of 50 cases examined, we had 46 cases of ear infection out of which 22 cases were cholesteatoma, 20 cases of mastoiditis and 4 cases were malignant externa otitis, 3 cases of tumor and 1 traumatic case.*
***Interpretation And Conclusion:*** *HRCT is a revolutionary imaging modality that helps in evaluating the distributionfeatures, localization and assessing the extent of various pathologies affecting thetemporal bone.*
***Keywords:*** *Neuroma, Acoustic; Cholesteatoma middle ear; Otitis media with suppuration; Mastoiditis; Temporal bone; Ear neoplasms.*

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## I. Introduction

The ability to image the human central nervous system non-invasively has completely changed the diagnostic approach to pathology of the brain.Many imaging modalities are available for the evaluation of the temporal bone pathologies including plain radiographs, angiography, air and non-ionic contrast cisternography, computed tomography (CT) and magnetic resonance imaging (MRI). However, CT and MRI are currently themost widely used techniques andhave largely replaced the other modalities.

Convetional radiography has been of value in screening the entire temporalbone. It produces a composite single plane image of a tridimensional temporal bone resulting in superimposition where larger and denser structures obscure smaller and less denser ones. CT scanning excels in the evaluation of bone and air space anatomy and disorders.[2] Because CT scans are more accurate in identifying many soft tissue abnormalities and are much less prone to artifacts, they have largely replaced polytomography; there is also less radiation to the lens of the globe with CT scans than with polytomography. CT has the advantage of producing images with higher contrast and a better spatial resolution.[3]MRI has expanded the range of pathology that can be accurately evaluated because it can image many soft tissue entities not visible by other techniques. MRI studies can also be extremely useful in the evaluation of blood vessel related disorders of the temporal bone.[4]Angiography is still the "gold standard" for vascular evaluation, and interventional angiography can be used in treatment of vascular lesions of the temporal bone. Each technique has its own advantages and disadvantages and often more than one examination is necessary for a complete temporal bone evaluation. HRCT, a modification of routine CT provides a direct visual window into the temporal bone providing hitherto unavailable minute structural details. The purpose of the study is primarily to understand the capability of HRCT in diagnosis and detection of pathologies of the temporal bone [3] Aims and objective of this purpose is to study the different pathologies where temporal bone is involved and its complications.

## II. Methods And Materials

This study evaluating the efficacy of CT in the diagnosis of temporal bone pathologies was done on 50 cases. This study was conducted during the period between February 2016 to October 2017 in the Department of Radio diagnosis, SreeBalaji Medical College & Hospital, Chennai.

**2.1 Source Of Data:**
The main sources of data for this study are patients from the teaching hospital attached to SreeBalaji Medical College & Hospital.

**2.2 Selection Of Patients:**
Patients who were clinically suspected of having symptoms related to the temporal bone were referred and subjected to HRCT of the temporal bone.

**2.3 Inclusion Criteria:**
Patients who are clinically suspected of having symptoms related to temporal bone.
History of ear discharge, trauma to head, history of facial palsy, tinnitus, vertigo, hearing loss and history of increased intracranial tension with history of war discharge.

**2.4 Exclusion Criteria:**
Patients with electric devices at the skull base, such as cochlear implants, and history of previous surgery

**2.5 Equipment Used:**
Hitachi ECLOS 8 Slice machine

HRCT was done using thin section, high-resolution and bone algorithm technique. Sections in both axial and coronal planes were obtained. Coronal imaging was done by neck extension and prone position and axial imaging done in supine and neutral position of the neck. Iodine Based contrast used mainly in the neoplastic pathologies. Final imaging diagnosis correlated with histopathological confirmation or follow-up and treatment response.

## III. Observations And Results

HRCT scan was performed in 50 patients who presented with history, symptoms, and signs of the temporal bone pathologies. The results are enumerated in Tables 1-11.

**Table 1:** Distribution of Disease

| **Diseases** | **No. of Patients** | **Percentage** |
|---|---|---|
| Infections | **46** | **92.0** |
| Tumours | **3** | **6.0** |
| Traumatic | **1** | **2.0** |

**Table 2:** Sex Distribution

| **Sex** | **No. of Patients** | **Percentage** |
|---|---|---|
| Male | 30 | 60.0 |
| Female | 20 | 40.0 |

**Table 3**: Clinical Features

| **Clinical features** | **No. of Patients** | **Perc** |
|---|---|---|
| Hearing loss | 14 | 35.0 |
| Ear discharge | 29 | 72.5 |
| Facial nerve weakness | 2 | 5.75 |
| Head ache | 23 | 57.5 |
| Ear pain | 21 | 52.5 |
| Tinnitus | 5 | 12.5 |
| Cerebellar signs | 4 | 10.0 |
| Diplopia | 3 | 7.5 |

**Table 4:** Age and sex distribution of infection.

| Age in years | Male | Female |
|---|---|---|
| 0-10 | 3 | 2 |
| 11-20 | 10 | 4 |
| 21-30 | 9 | 7 |
| 31-40 | 4 | 4 |
| 41-50 | 2 | 1 |
| 51-60 | 2 | 1 |
| 61-70 | 0 | 1 |

**Table 5:** Age Distribution

| Age (in years) | No. of Patients | Percentage |
|---|---|---|
| 0-10 | 5 | 10.0 |
| 11-20 | 14 | 28.0 |
| 21-30 | 16 | 32.0 |
| 31-40 | 8 | 16.0 |
| 41-50 | 3 | 6.0 |
| 51-60 | 3 | 6.0 |
| 61-70 | 1 | 2.0 |

**Table 6:** Distribution of Infection

| Distribution of Infection | No. of Patients | Percent |
|---|---|---|
| External malignant otitis | 4 | 16.0 |
| Cholesteatoma | 22 | 44.0 |
| Mastoiditis | 20 | 40.0 |

**Table 7:** Comparison between CT and operative finding in infections

| **CT appearance of patients** | **No. of patients** | **No. of patients with operative findings** |
|---|---|---|
| Opacification of external | 2 | 2 |
| Cholesteatoma | 22 | 18 |
| Opacification of mastoid | 16 | 15 |
| Ossicular erosion | 14 | 14 |
| Intra cranial extension | 5 | 5 |

**Table 8**: Sex distribution of tumours

| **Sex** | **No. of Patients** | **Percentage** |
|---|---|---|
| Male | 2 | 66.6 |
| Female | 1 | 33.3 |

**Table 9**: Age incidence of tumours

| **Age (in years)** | **No. of Patients** | **Percentage** |
|---|---|---|
| 0-10 | 0 | 0 |
| 11-20 | 1 | 33.3 |
| 21-30 | 1 | 33.3 |
| 31-40 | 0 | 0 |
| 41-50 | 1 | 33.3 |
| 51-60 | 0 | 0 |
| 61-70 | 0 | 0 |

**Table 10:** Distribution of Neoplasm

| **Distribution of Neoplasm** | **No. of Patients** | **P** |
|---|---|---|
| Acoustic neuroma | 2 | 67 |
| Metastasis | 1 | 33 |

**Table 11:** Age incidence of acoustic neuroma

| **Age (years)** | **No. of Cases** | **Percentage** |
|---|---|---|
| 0 – 29 | 1 | 50 |
| 30 – 59 | 1 | 50 |

## IV. Discussion

The varied temporal bone pathologies including congenital, inflammatory, traumatic, and neoplastic conditions were evaluated by HRCT. The lack of specificity in clinical examination and the imprecise result of conventional radiography renders CT as the modality of choice in the evaluation of temporal bone pathology. In this study, 50 patients were evaluated for their various symptoms in ear pathologies and temporal bone. The gender ratio in this study was 2:1 (male:female) (Table 2). A maximum number of patients presented with the chief complaints of ear discharge (72%), headache (57%), otorrhea (52%) followed by hearing problem or deafness (35%) (Table 3). Other chief complaints were otalgia, vertigo, tinnitus, ataxia, and fascial nerve palsy. Patients with intracranial complications had fever, vomiting in addition to above complaints

## V. Infection

Patient with infection form the largest proportion of cases studied (Table 1). The age range was from 0 months to 70 years, the youngest one was 2 years old, oldest one was 55 years. 46 cases were studied and out of

which mastoiditis were 20, 22 cholesteatoma and 4 malignant otitis externa (Table 6). Study by GAS Lloyd et al (1980)[5] in 30 patients with CT showed infection as the 3rd most common cause of temporal bone lesion. This variation could be due to the increasing number of complications associated with the infections because of the late presentation of the disease in our study, which could be attributed to the low socio economic strata, and illiteracy of the patients.In current study maximum cases are seen in the 2ND decade. 32.5 % of the cases in this were in the age group of 11-20. Mean age was 19.92, which is in accordance by Gupta et al (1998)[50].
Out of 17 patients in the present study 14 belonged to low socio economic groups. This is accordance with studies and a well-acknowledged fact. Poor nutrition and poor hygiene coupled with illiteracy perhaps plays a major role as most patients were found to be illiterate and ignorant about ear disease. Most patients sought medical advice very late.The common presenting symptoms were otorrhea and otalgia. The discharge was scanty, foul smelling and purulent. Most patients presented with chronic ear discharge.

Increase ear discharge, persistent ear ache, fever, post auricular swelling and facial weakness heralded complications of cholesteatoma. The presence of vomiting, headache, drowsiness and altered sensorium indicated to more sinister threat of a lurking intracranial complications. Bilateral cholesteatoma are rare.Cholesteatoma in children and adolescent is said to be more aggressive. This is validated by the high incidence of complication in the first three decades of life and further substantiated by the fact that very extensive disease at the time surgery is more frequent in children than in adults and also by higher rates of recurrence inchildren.5 patients were studied for postoperative assessments[15]

**5.1Limitations Of The Use Of CT In Evaluation Of Chronic Middle Ear Disease:**

CT scans of chronically draining ears demonstrated abnormal soft tissue densities in the middle ear or mastoid. However, if this soft tissue mass was not associated with bone erosion, it was not possible to discern whether or not cholesteatoma was present. Infrequently the soft tissue masses were proved to be granulation tissue or mucosal hypertrophy. Of greater predictive value in the diagnosis of cholesteatoma was the presence of abnormal soft tissue densities with bonyerosion.
Tympanic membrane thickening and perforations were difficult to assess on HRCT and better seen on otoscopy.

**5.2neoplasm:**

They constitute 7.5 % of our study, which is not correlated with the study of GAS Lloyd et al (1980)[5], which claimed neoplasms to be the most frequent lesions.
Age group of these patients in our series varied from 5years to 45 years with male preponderance.

**5.3 Acoustic Neuroma:**

Out of 3 neoplastic lesions (7.5 %) that were scanned 2 were diagnosed as acoustic neuromas. Right CP angle predominance was noted in our study. All cases were hypodense to isodense to the surrounding brain with dense enhancement on contrast administration and depicted internal auditory canal erosion. Taylor S(1982)[7], in his study had reported bony erosion on CT in upto 87% of the cases. This difference can be because we encountered all large size acoustic neuromas. Acoustic neuroma was the most common internal auditory canal and / or CP angle lesion in a study by P Wolf (1987)[9] and GAS Lloyd (1980)[5].

**5.4 Metastasis**

According to Hugh D Curtin(1995)[10] metastases to petrous apexis common from carcinoma breast, kidney and lung and variety of other rare tumours have been reported to involve the apex. The appearance is variable depending on the site of the primary lesion. Some metastases are very cellular, infiltrating tumours and some may be less invasive and remodel the bone.

**5.5 Trauma.[4,11]**

One patient of 50 cases encountered was 16yr old boy who feel from motorbike with trauma to head with bleeding from ear. Temporal bone fractures were classified into two main categories, longitudinal and transverse on the basis of the fracture plane relative to the long axis of the petrous bone or may be complex with mixed features of both longitudinal and transverse fractures[15].The classically described longitudinal fracture runs parallel to the long axis of the petrous bone.Longitudinal fractures typically traverse the middle ear cavity, with frequent disruption of the ossicles and resultant conductive hearing loss[18]The classically described transverse fracture runs perpendicular to the long axis of the petrous bone.

There are two subtypes of transverse fractures: medial and lateral relative to the arcuate eminence.Both subtypes frequently result in SNHL.[4]

### 5.6 Complications[11]

Hemotympanum,disruption of the ossicles and ossicular chain, facial nerve injury, perilymphatic fistula, vertigo,cerebrospinal fluidleak, meningitis and acquired cholesteatoma.

## VI. Conclusion

HRCT scan of temporal bone depicts complex bony details and associated soft tissue pathologies accurately. Due to various limitations of clinical examination and radiography, it is not possible to differentiate various pathologies affecting the temporal bone and study their extent[12]. HRCT temporal bone overcome with all these limitations and its single most important imaging tool to evaluate various congenital, inflammatory, traumatic, and neoplastic pathologies of the temporal bone. Now HRCT temporal bone is standard imaging modality for pre-operative evaluation and management of various pathologies of the temporal bone[19].

## Reference


[1]. Virapongse C, Rothman slg, Kier EL, Sarwar M. computed tomographic anatomy of the temporal bone. AJR 1982; 139:739-749.
[2]. Swartz, J.D., High-Resolution computed tomography of the middle ear and mastoid part I: Normal radio-anatomy including normal variations. Radiology 1983; 148: 449.
[3]. Shaffar KA, Haughton VM, Wilson CR., High-Resolution computed tomography of the temporal bone. Radiology 1980;134:409-414.
[4]. Interactive Web-based Learning Module on CT of the Temporal Bone Anatomy and Pathology .Grace S. Phillips, MD • Sung E. LoGerfo, MD • Michael L. Richardson, MD • Yoshimi Anzai, MD**.** Radiographics 2012; 32: E85–E105.
[5]. Lloyds GAS, Phelps PD and Du Boulay GH. High resolution computerized tomography of the petrous bone. Brit. J. Radiology 1980; 53:631.
[6]. Paparella MM, Kim CS. Mastoidectomy: Larangoscope 1977: 87:1977-88.
[7]. Taylor S. The petrous temporal bone (including the cerebello-pontine angle tumours). Radiol Cling north Am 1982; 20:67-86.
[8]. Gupta Vineet, Gupta Abhay, Sevarajan K. Chronic Suppurative Otitis Media Aerobic Micro biological study. Ind J Otol 1998; 4: 79-82. Paparella MM, Kim CS. Mastoidectomy: Larangoscope 1977: 87:1977-88.
[9]. Allan P Wolff, Michael A Mikhael Evanston IL and Ivan S Clric. Current concepts in neuroradiological diagnosis of acoustic neuromas. J Laryngoscope 1987 April; 97:471-476.
[10]. Hugh D Curtin and Peter M Som. The petrous apex. Otolaryngologic Clinics of North America 1995 June; 28: (3):473-495.
[11]. Domsma H, DeGroot JAM et al. CT of cochlear otosclerosis. Radiol Clin North Am 198437-44.
[12]. Lloyd TV, Van Aman M, Johnson JC. Aberrant jugular bulb presenting as middle ear mass. Radiology 1979;131:139-141.
[13]. Stern J, Goldenberg M. Jugular diverticula in medial petrous bone. AJR 1980; 134:959-961.
[14]. Turski P. High-resolution CT of the petrous bone: direct VS reformatted images.AJNR 1982; 3:391.
[15]. Zonneveld FW, Van Waes PFGM, et al. Direct multiplanar computed tomography of petrous bone. Radiographic 1983; 3:400-449.
[16]. Phelps P.D., Lloyds GAS. Glomus Tympanicum tumors: demonstration by high- Resolution CT. Clin Otolayngol 1983;8:15-20.
[17]. 17. Curtin HD. Radiologic approach to paragangliomas of the temporal bone.Radiology 1984; 150: 837.
[18]. Gurher HD, Jeusen JE, Barues L Jr, May M. Ossifying Hemangiomas of the Temporal Bone: Evaluation with CT. Radiology 1987; 164:831-835.
[19]. Swartz JD et al. Fenestral otosclerosis: Significance of pre-operative CT evaluation. Radiology 1984; 151:703-707.