Original Research Article

HRCT as a prime modality in the evaluation of pathogenesis of temporal bone

Rajesh Jasti[1], EswaraSai Prasad Yachamaneni[2*], Prathyusha Velam[3], Devi Mounika Bevara[4]

[1]Assistant professor, [2]Assistant professor, [3,4]Post Graduate Student, Department of Radiology, ASRAM (Alluri Sitaramaraju Academy of Medical Sciences) Hospital, Eluru,West Godavari, Andhra Pradesh, INDIA,
Email: eswarprasad006@gmail.com

Abstract

Background: HRCT is a revolutionary imaging modality that helps in evaluating the distribution features, localization and assessing the extent of various pathologies affecting the temporal bone. **Objective:** HRCT, a modification of routine CT, provides a direct visual window into the temporal bone providing minute structural details. Purpose of the present is to evaluate the normal variations, pathological processes (infections, tumours, congenital anomalies), trauma and their extent involving the temporal bone. **Materials and Methods**: A prospective study of 40 cases in patients with signs and symptoms of temporal bone pathology was carried over a period of one year from June 2018 to July 2019 in the Department of Radio-diagnosis, Alluri Sitaramaraju Academy of Medical Sciences, Eluru. Patients were scanned in both the coronal and axial planes with thin 2mm sections using ultra high algorithm obtaining both contrast and nonenhanced images. All the HRCT scans in the study were performed using 32 slice CT scanner (GE Revolution Act).
Key Words: Acoustic Neuroma; Cholesteatoma middle ear; Otitis media with suppuration; Mastoidits; Temporal bone; Ear neoplasms.

[*]**Address for Correspondence:**
Dr. EswaraSai Prasad Yachamaneni, Assistant Professor, Department of Radiology, ASRAM Hospital, West Godavari, Andhra Pradesh, INDIA 534005.
Email: eswarprasad006@gmail.com
Received Date: 02/10/2019 Revised Date: 09/11/2019 Accepted Date: 14/12/2019
DOI: https://doi.org/10.26611/10131423

Access this article online	
Quick Response Code:	Website: www.medpulse.in
	Accessed Date: 01 May 2020

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). CT and MRI are currently the most widely used techniques and have largely replaced the other modalities [1].Conventional radiography has been of value in screening the entire temporal bone. 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

How to cite this article: Rajesh Jasti, EswaraSai Prasad Yachamaneni, Prathyusha Velam, Devi Mounika Bevara. HRCT as a prime modality in the evaluation of pathogenesis of temporal bone. *MedPulse International Journal of Radiology.* May 2020; 14(2): 36-39. http://www.medpulse.in/Radio%20Diagnosis/

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.

MATERIALS AND METHODS

A prospective study of 40 cases in patients with signs and symptoms of temporal bone pathology was carried over a period of one year from June 2018 to July 2019 in the Department of Radio-diagnosis , Alluri Sitaramaraju Academy of Medical Sciences, Eluru.

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. Patients were scanned in both the coronal and axial planes with thin 2mm sections using ultra high algorithm obtaining both contrast and nonenhanced images. All the HRCT scans in the study were performed using 32 slice CT scanner (GE Revolution Act).

Inclusion criteria:

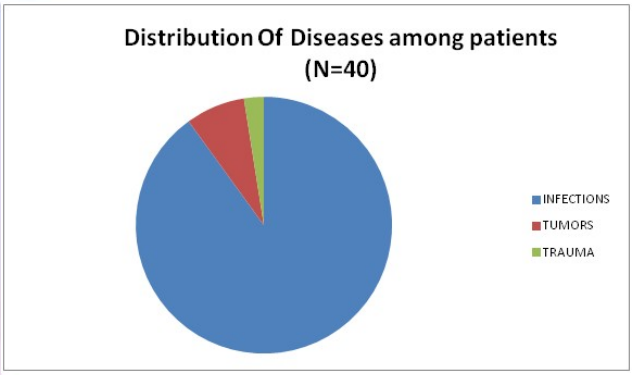
1. Patients who are clinically suspected of having symptoms related to temporal bone.
2. History of ear discharge
3. History of trauma to head
4. History of facial palsy
5. History of tinnitus, vertigo, hearing loss
6. History of increased intracranial tension with history of ear discharge

Exclusion criteria:

Patients with electric devices at the skull base, such as cochlear implants, and history of previous surgery.

RESULTS

Forty patients with symptoms related to temporal bone were evaluated with HRCT Temporal bone scan during the study period. Patients of all age groups and both sexes were included. Out of 40 patients, 36 patients (90 %) had infection, 3(7.5%) patients had tumors and 1(2.5%) had trauma. Among 40 patients 24 were males and 16 were females. Out of the 36 patients with infection, 20(55.5%) cases had mastoiditis, 15(41.6%) cases had cholesteatoma and 1(2.9%) case had external malignant otitis. Among them 21were males and 15 were females. In our study it was found that the left ear was involved in 17 cases, Right ear in 15 cases and both ears in 4 cases. Tumours are the second most common lesion in our study. Number of cases are 3.Among them 2(67%) were males and 1(33%) is female with peak age incidence of tumours ranging from 20-50 years. In our study out 3 cases 2 had Acoustic neuroma and 1 had metastasis. These patients chiefly presented with deafness, tinnitus, ear discharge or with 7th nerve palsy. After plain CT scan a contrast enhanced scan was performed. Soft tissue windows were used to show soft tissue enhancement. Out of 40 cases 1 patient had history of fall from bike and had right ear bleed. HRCT showed transverse fracture in right petrous bone.



Graph 1: Distribution Of Diseases among patients (N=40)

Table 1: Distribution of Infection among patients N=40

Distribution of Infection	No. of Patients	Percentage
External malignant otitis	1	2.9
Cholesteatoma	15	41.6
Mastoiditis	20	55.5

DISCUSSION

Computed Tomography is acquiring an increasingly important role in the radiographic assessment of temporal bone. Radiographic assessment of temporal bone is difficult owing to complicated anatomical structure of middle and inner ear.

This study is undertaken to develop a systemic method for evaluation of temporal bone as there are a variety of other imaging modalities. The lowest radiation dose to the lens, visualization of small bony structures, technical factors, case of patient positioning, interpretation of the images and economical factors were all considered. HRCT has the advantage of excellent topographic visualization, devoid of artifacts from superimposition of structures. It helps in accurate assessment of pathology prior to surgical exploration regarding location, extent and complication of the disease.

Infection

Patient with infection form the largest proportion of cases studied. The age range was from 0 months to 70 years, the youngest one was 2 years old, oldest one was 55 years. 36 cases were studied and out of which mastoiditis were 20, cholesteatoma 15 and 1 was malignant otitis externa. 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. The male to female sex distribution in the present study is 2 : 1. Out of 17 patients in the present study 14 belonged to low socio economic groups. 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 otorhhea 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 auricualr 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.

Neoplasm

They constitute 7.5 % of our study. Age group of these patients in our series varied from 5years to 45 years with male preponderance.

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 isodence to the surrounding brain with dense enhancement on contrast administration and depicted internal auditory canal erosion [5].

Metastatsis

Metastases to petrous apex is 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.

Trauma

One patient of 40 cases encountered was 16 year 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.

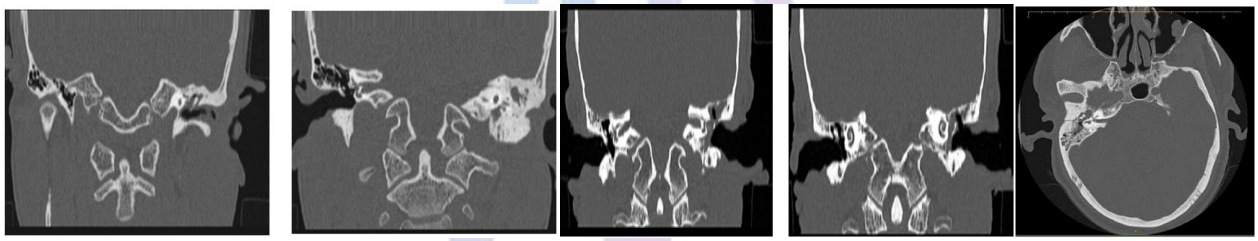


Image 1 Image 2 Image 3 Image 4 Image 5

Image 1 and 2: 17 year male presenting with sclerosis of left mastoid air cells along with soft tissue density areas in middle ear cavity without erosion of ossicles – CSOM; **Images 3 and 4:** Blunting of scutum on left side along with erosion of ossicles along with soft tissue density areas in middle ear and in mastoid cavities suggesting of cholesteatoma. Also noted thinning of tegmen tympany on left side; **Image 5:** Longitudinal fracture involving the petrous part of the right temporal bone extending to the mastoids and middle ear cavity with erosion of ossicles

CONCLUSION

HRCT outweighs the conventional modalities of investigations and provides higher spatial resolution and better soft tissue contrast. For the assessment of middle-ear infections, a close clinical correlation is essential to evaluate the nature of middle-ear soft tissue masses as cholesteatoma is mimicked by many other middle-ear pathologies. In these cases, HRCT is far advantageous in assessing the complications of infection. It lay down an anatomical roadmap for the surgeon preoperatively and can predict certain normal variants of surgical significance preoperatively. It can identify the hidden areas of the middle-ear, namely the posterior recesses. CT scan plays an important role in commenting the extent of surgery, and the general overall condition of the postoperative temporal bone including the internal auditory canal. The residual/recurrent disease can also be assessed. Status of the inner ear can be established. The facial nerve anatomy can be clearly depicted. The relationship of the facial nerve to any surgical change or cholesteatoma tissue can be studied. The status of the ear ossicles or prosthesis employed by the surgeon can be seen. A neoplastic disease of the middle ear is best staged with HRCT. HRCT is not diagnostic of the pathological condition, hence the nature of the neoplastic process needs to be evaluated by a post-contrast scan. It can precisely define intratympanic, mastoid, jugular wall, infralabyrinthine and petrous apical involvement as well as posterior, middle and infratemporal fossa extension. HRCT provides essential information for planning the surgical approach.

REFERENCES

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 •MichaelL.Richardson,MD•YoshimiAnzai,MD.Radiographics2012;32:E85–E105.

Source of Support: None Declared
Conflict of Interest: None Declared