

CASE STUDY OF TEMPORAL BONE LESIONS USING HIGH RESOLUTION COMPUTED TOMOGRAPHY (HRCT)



Radiology

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ABSTRACT

HRCT, a modification of routine CT, provides a direct visual window into the temporal bone providing minute structural details. Purpose of the present study is to evaluate the normal variations, pathological processes (infections, tumours and congenital anomalies) and their extent involving the temporal bone.

INTRODUCTION

Temporal bone is the most complex bone in the human body. It houses many vital structures, including the cochlear and vestibular endorgans, the facial nerve, the carotid artery and the jugular vein. Diseases of middle and inner ear can result in hearing loss which remains a significant health problem in terms of prevalence, economics and sequel. Clinical and otoscopic examination can determine lesions of external ear and some middle ear lesions. However further imaging is required to know the extent of disease, inner ear involvement, and intracranial extension and to decide appropriate medical and surgical management.

Many imaging modalities are available for the evaluation of the temporal bone. 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. 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. High resolution CT (HRCT) images are obtained with thin sections [1-2mm] and special bony algorithm for high details.

The advent of High resolution computed tomography (HRCT) scanning in the 1980s has revolutionized diagnostic imaging of the temporal bone. HRCT, a modification of routine CT, provides a direct visual window into the temporal bone providing hitherto unavailable minute structural details. HRCT scanning excels in the evaluation of bone and air space anatomy and disorders of temporal bone.

The purpose of the present study is primarily to understand the capability of HRCT in diagnosis and detection of pathologies of the temporal bone.

AIMS AND OBJECTIVES

To assess the normal variations in the structure of temporal bone.
To characterize the middle and inner ear lesions.

To study the extent of middle ear infections and their complications.
To evaluate temporal bone neoplasms and stage them.

To study the diagnostic efficacy in correlation with histological / surgical findings.

METHODOLOGY

This study evaluating the efficacy of HRCT in the diagnosis of temporal bone pathologies was done on 40 cases which was conducted during the period between September 2014 to September 2016 in the Department of Radio Diagnosis. All the HRCT

scans were performed at our institute on SIEMENS SOMATOM SENSATION CT scan.

Selection of Patients:

Inclusion criteria:

Patients who were clinically suspected of having symptoms related to the temporal bone were referred and subjected to HRCT of the temporal bone.

Exclusion criteria:

Patients with cochlear implants and trauma were excluded from the study.

OBSERVATION AND RESULTS

Total number of patients included in the study were 40

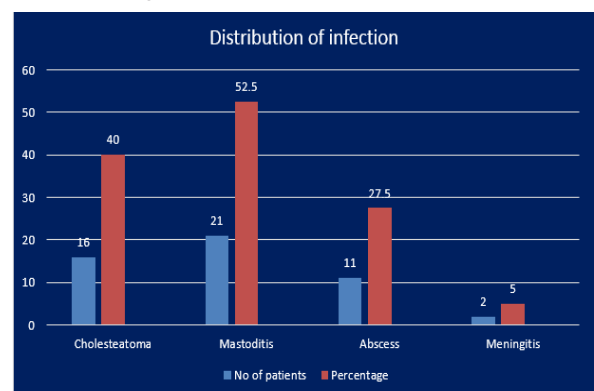
Distribution of Disease

Diseases	No. of Patients	Percentage
Infections	35	87.5%
Tumours	5	12.5%
Total	40	100%

Sex Distribution

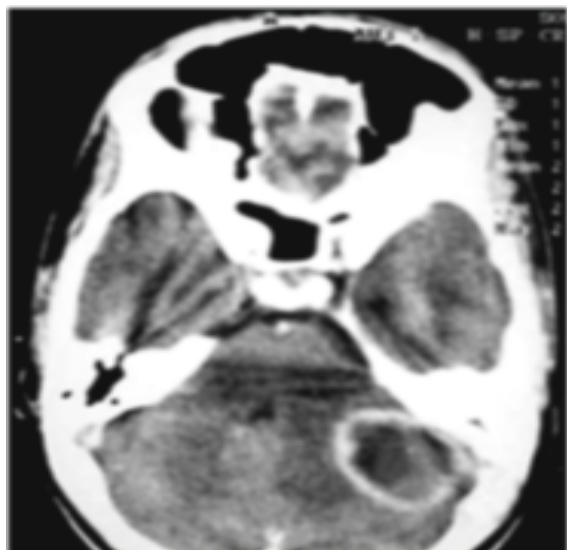
SEX	No. of Patients	Percentage
MALE	26	65%
FEMALE	14	35%

Graph showing distribution of infection



HOLESTEATOMA WITH CEREBELLAR ABSCESS:

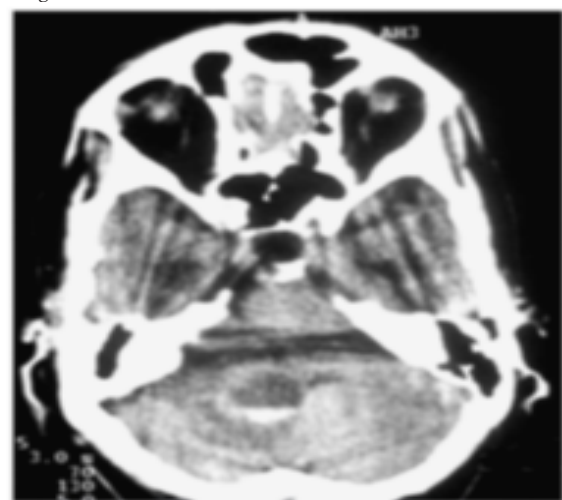
Female Patient with history of headache, fever, vomiting, vertigo, ear discharge and otalgia shows:



CECT Shows Left Cerebellar Abscess as a Complication of Cholesteatoma.

ACOUSTIC NEUROMA

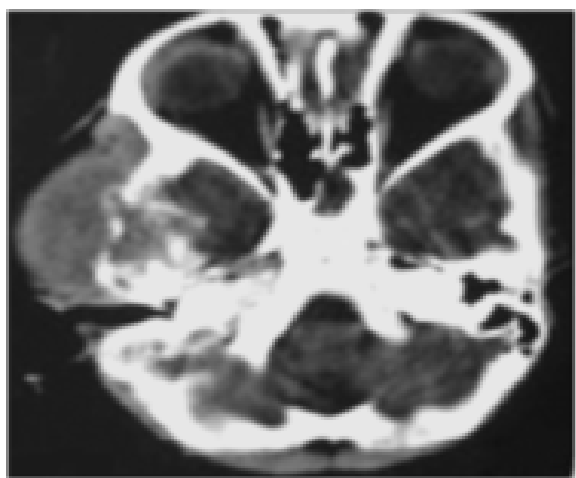
Female Patient with history of headache, vomiting and deviation of angle of mouth on CECT shows:



Plain CT shows hypodense mass with haemorrhage within it.

EWINGS SARCOMA

Male patient with history of swelling over mastoid shows:



Soft tissue window shows a heterogeneous mass involving the right temporal bone with destruction of squamous, petrous and mastoid part of Temporal bone

DISCUSSION

High resolution computed tomography has completely replaced conventional multidirectional tomography in the evaluation of the temporal bone. Unprecedented detail is now available for evaluation of both middle ear and inner ear structures, however assessment of pathologies of temporal bone is difficult owing to its complicated anatomical structure.

It identifies the hidden areas of the temporal bone. It also lays down an anatomical roadmap for the surgeon preoperatively.

This study is undertaken to establish the efficacy of CT in the diagnosis of inflammatory pathologies of temporal bone. It has an 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. The HRCT temporal bone gives valuable information for evaluation of congenital anomalies, inflammatory diseases, otosclerosis, tumors and cerebellopontine angle lesions, post-operative mastoid cavities, anatomical variants as well as temporal bone trauma.

Our study group comprised of 26 males and 14 females. The age group of the subjects ranged from 7 years to 70 years. Of the 40 temporal bone HRCT studies done by us, 35 cases were having infections of the temporal bone, with few of them showing multiple infections. Of these, 16 had cholesteatoma, 21 had mastoiditis, 11 had abscess and 2 had meningitis. Of the 5 HRCT temporal bone scans having tumors, 3 were of acoustic neuroma and 1 case was Ewing's sarcoma and other case was Rhabdomyosarcoma in the temporal bone. The acoustic neuroma was seen in HRCT as hypodense to slightly hyperdense cerebellopontine angle mass showing contrast enhancement with erosion of porous acousticus.

In this study, the youngest patient was 7 years and the oldest was 70 years. Maximum patients were in the age group 21 to 30 yrs (40%) which is similar to findings by Datta et al (2014). and Gerami et al (2009).

Similarly in a prospective study carried out on 50 patients by CL Thukral (2015), the age of patients ranged from 3 months to 65 years. Mean age of patients was 27.95 ± 16.85 years. Thus, most of the studies targeted to study temporal bone pathologies or normal variations have reported the mean age of patients between 25 to 30 years.

In the present study, majority of cases were males ($n=26$; 65%). Male to female ratio of study population was 1.86:1. Poursadegh et al (2000) reported a low male to female ratio of 1.39:1. Gerami et al (2009), Shankwar A et al (2016) and Vlastarakos et al (2012) studies, had a highly skewed male to female ratio.

In the present study, the most common symptom is ear discharge (82.5%), followed by headache (50%) and fever (45%). Hearing loss (35%) and otalgia (33%) are also presenting symptoms. In a study by CL Thukral (2015), 96% of patients had active discharge, followed by hearing loss (58%) and pain in ear (62%).

The most common presenting symptom was otorrhea (100%) followed by hearing loss (40%) and otalgia (33%) in a study by Amit Shankwar et al (2016). These findings were similar to our study.

In the study, Middle ear is most commonly involved. In the series of Goma et al (2013), chronic ear discharge with hearing loss was the main clinical presentation (60.7%). This probably indicates that the patients come to hospital relatively late and are reluctant for initial treatment.

Majority of cases (n=30; 75%) had unilateral involvement. Incidence of bilateral involvement was 10%. Laterality of presentation has been reported variedly in literature. In CL Thukral's study³(2015), majority of cases (n=38;76%) had unilateral involvement.

In a study by Gomaa et al⁷ (2013), the bilateral incidence was only 3.57%. In the present study, HRCT was able to provide excellent views of the mastoid air cells, antrum and aditus ad antrum in either coronal or axial planes similar to previous studies.

Mastoiditis was seen in 21 (52.5%) cases followed by Cholesteatoma (n=16, 40%). CL Thukral's study³(2015) showed mastoiditis in 38 (76%) cases. Chole et al⁸(2005), reported that mastoiditis is a common finding in cases with suspected temporal bone pathology and CSOM. Chronic mastoiditis followed by ossicular erosion are the common presentations on CT in the study by Jyothi AC et al⁹(2016).

According to Mafee et al¹⁰(1983), the hallmark of cholesteatoma on HRCT is a soft tissue mass in attic and mastoid antrum associated with smooth bony expansion, scalloping of mastoid, erosion of lateral wall of attic (scutum) and erosion of ossicles. Our study also showed the same findings of cholesteatoma on HRCT. Intracranial complications of abscess and meningitis were seen in 28% and 5% respectively in the present study and all these complications were also detected intraoperatively. Thus HRCT diagnosed all intracranial complications correctly giving it high sensitivity and specificity i.e. 100%. Previous studies also revealed the same.

Tumors:

Tumors were the second most common lesion in our study. They constitute 12.5 % of our study which is not correlated with the study of Lloyd et al¹¹ (1980) which claimed neoplasms to be the most frequent lesions.

Age group of these patients in our series varied from 9 years to 45 years with female preponderance. Of 5 cases, females were 3 and males were 2. In the study by Shankhwar A et al⁵(2016), tumors are the second most common lesion with number of cases 7 of 40 (17.5%). Peak age incidence of tumors in this study is from 51-60 yr.

In our study, HRCT diagnosed tumors as 3 cases of Acoustic neuroma, 1 Ewing's sarcoma and 1 Rhabdomyosarcoma. Similar findings were seen in Shankhwar et al⁵ (2016) study which showed 4 cases of Acoustic neuroma, 1 Glomus tympanicum and 1 Metastasis.

SUMMARY

Most common lesion in our study was infection. There was male preponderance in our study.

In case of infections common presenting symptoms were otorrhea, otalgia, hearing loss and headache.

Most common tumour was acoustic neuroma. Peak age was third to sixth decade. Female > male.

A rare case of primary Ewing's sarcoma of the temporal bone is also seen in our study.

There is excellent correlation between CT and operative findings of cholesteatoma.

HRCT is ideal for evaluation of Temporal Bone lesions.

CONCLUSION

HRCT outweighs the conventional modalities of investigations and provides higher spatial resolution and better soft tissue contrast. Middle ear disease is a common clinical entity. HRCT plays a crucial role in diagnosis and assessing the disease extent, helping to decide appropriate management.

HRCT is far advantageous in assessing the complications of infection.

It lays down an anatomical roadmap for the surgeon preoperatively. HRCT predicts certain normal variants of surgical significance preoperatively.

It identifies the hidden areas of the middle-ear, namely the posterior recesses. Careful analysis of the soft tissue on HRCT is crucial in achieving the right diagnosis.

REFERENCES

1. Datta G, Mohan C, Mahajan M, Mendiratta V. Correlation of preoperative HRCT findings with surgical findings in Unsafe CSOM. IOSR Journal of Dental and Medical Sciences (IOSR-JDMS) 2014;13(1):120-25.
2. Gerami H, Naghavi E, Wahabi-Moghadam M, Forghanparast K, Akbar MH; Comparison of preoperative computerized tomography scan imaging of temporal bone with intra-operative findings in patients undergoing mastoidectomy. Saudi Med J, 2009;30:104-8.
3. Thukral CL, Singh A, Singh S, Sood AS, Singh K. Role of High Resolution Computed Tomography in Evaluation of Pathologies of Temporal Bone. J Clin Diagn Res. 2015; 9(9):TC07-TC10.
4. Poursadegh M, Hashemi G, Jalali M. Evaluation of Anatomical Variations of vestibular aqueduct dimensions in temporal bone CT scan. MJIRI. 2000;14(3):199-202
5. Shankhwar A, Dixit Y, Shukla P, Nagar A. High Resolution Computed Tomography Evaluation of Temporal Bone Lesions. Sch. J. App. Med. Sci., July 2016; 4(7B):2447-2449.
6. Vlastarakos PV, Kiprouli C, Pappas S, Xenelis J, Maragoudakis P, Troupis G, Nikolopoulos TP; CT scan versus surgery: how reliable is the preoperative radiological assessment in patients with chronic otitis media?. European Archives of Oto-rhino-laryngology, 2012; 269(1):81-6.
7. Gomaa MA, Abdel Karim ARA, Abdel Ghany HS, Elhiny AA, Sadek AA. Evaluation of Temporal Bone Cholesteatoma and the Correlation Between High Resolution Computed Tomography and Surgical Finding. Clin Med Insights Ear Nose Throat. 2013;6:21-28.
8. Chole RA, Sudhoff H. Otolaryngology head and neck surgery. In: Chronic otitis media, mastoiditis and petrositis. 4th edn, (Ed) Cummings CW, Fredrison MJ, Harker L. Mobsy: Philadelphia, USA: 2005; 2988-3008.
9. Jyothi AC, Shrikrishna BH. Role of high resolution computed tomography in the evaluation of temporal bone lesions: our experience. Int J Otorhinolaryngol Head Neck Surg. 2016;2(3):135-13.
10. Mafee MF, Kumar A, Yannias DA. CT of the middle ear and evaluation of other soft-tissue masses. Radiology 1983; 148: 465-470.
11. Lloyd GA, Phelps PD, Du Boulay GH. High-resolution computerized tomography of the petrous bone. Br J Radiol. 1980;53(631):631-41.