Research Paper

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Role of High Resolution Computed Tomography In Evaluation of Pathologies of The Temporal Bone

MEDICAL SCIENCE

KEYWORDS : HIGH RESOLUTION COMPUTED TOMOGRAPHY, TEMPORAL BONE, CHOLESTEATOMA.

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ABSTRACT

AIM: To assess the role of High Resolution Computer Tomography as the prime modality in the diagnosis and characterization of lesions of the temporal bone.

METHODOLOGY: Patients presenting with symptoms and clinical features suggestive of lesion involving temporal bone were included in the study.

RESULTS: High Resolution Computed Tomography was highly sensitive and specific in evaluating lesions like mastoiditis, cholesteatoma, paragangliomas, cerebello pontine tumours. CONCLUSION: High Resolution Computed Tomography is the imaging modality of choice in evaluation of the temporal bone which is a relatively inaccessible area of the human anatomy. It also dictates proper and adequate medical treatment or timely surgery that can prevent further serious complications.

INTRODUCTION:

A major advance in diagnostic imaging has occurred with the introduction of High Resolution Computed Tomography which have made it possible to obtain high quality images with exquisite demonstration of most normal temporal bone structures and numerous pathological processes.

Because high resolution computed tomography can assess this area with unprecedented accuracy, it has allowed better understanding of the etiology, pathology, the disease course earlier detection of complications and treatment modality which has considerably reduced the morbidity and mortality pertaining to lesions of this region.

METHODOLOGY:

A total of 50 patients were studied. Age group varied from 3 to 70 years. Data for the study were collected from patients attended/referred to the Department of Radio-Diagnosis, PBM Hospital, Bikaner (RAJ.) Patients were selected on the basis of their symptoms and clinical findings suggestive of a lesion involving the temporal bone such as otalgia, otorrhoea and sensorineuronal deafness, pulsatile tinnitus, vertigo and giddiness. All the HRCT scans were performed at our institute using Phillips Brilliance MDCT scanner with Phillips windows workstation and software.

The images are acquired in a single imaging plane using a multi-slice detector scanner. The patient is lying on his/her back and the gantry of the scanner is not tilted. We use the following imaging parameters:

- 120 kV
- 250 mAs
- Collimation 0.625 mm
- Scan time 1.0 s

After acquiring the raw dataset images are reconstructed in axial and coronal plane with a slice thickness of 1 mm and by using an ultra high resolution reconstruction mode. Intravenous contrast was used as and when required.

The features evaluated were site, size, characterization, involvement of adjacent structures, vascular involvement.

RESULTS:

Table No.1 Age Sex Distribution :

AGE	Male		Female		TOTAL	
	No.	%	No.	%	No.	%
0-10	1	3.33	2	10.00	3	6.00
11-20	8	26.67	11	55.00	19	38.00
21-30	14	46.67	1	5.00	15	30.00
31-40	2	6.67	5	25.00	7	14.00
41-50	4	13.33	0	0.00	4	8.00
51-60	0	0.00	1	5.00	1	2.00
61-70	1	3.33	0	0.00	1	2.00
TOTAL	30	100.00	20	100.00	50	100.00

Mean age: 25.88

Commonest age group: 11-30 years .

No of males: 30 (60%)

No of females: 20(40%)

Table No. 2 Various Lesions Of Temporal Bone:

Lesions	No. of Patients	%
Infection	44	88.00
Neoplasm	4	8.00
Congenital	2	4.00
TOTAL	50	100.00

Among all the diseases, infection was the most common pathology seen (88%) followed by neoplastic pathologies(8%).

Table No. 3 Various Infections:

Infection	No of Patients	%
Malignant Otitis Externa	1	2.27
Mastoiditis	19	43.18
Cholesteatoma	24	54.55
TOTAL	44	100.00

Among the infectious group most common pathology was cholesteatoma (54.55%) followed by mastoiditis (43.18%).

Table No. 4 Bony Erosion In Cholesteatoma:

Bony Erosion	No. of cases	%
Scutum	17	70.83
Korner's Septum	15	62.50
Sinus Plate	4	16.67
Tegmen Tympani	5	20.83
Superior And Posterior Meatal Wall	5	20.83
Facial Canal	3	12.50
Lateral Semicircular Canal	3	12.50
Ossicular	21	87.50

Erosion of scutum and Korner's septum was found in 70.83% cases and 62.50% cases respectively.

Table No. 5 Complications Of Cholesteatoma:

Extra Cranial Complications			Intra Cranial Complications		
Type	No. of cases	%	Type	No. of cases	%
Mastoid Abscess	4	16.67	Meningitis	2	8.33
Facial Nerve Palsy	3	12.50	Extra Dural Abscess	1	4.17
Labyrinthine Fistula	3	12.50			
Total	10	41.67	Total	3	12.50

Complication were seen in 54.17% cases. Out of them extra cranial complication seen in 41.67% cases and intra cranial complication seen in 3 cases 12.50% cases.

Table No 6 Neoplasm Of Temporal Bone :

Neoplasm	No. of Cases
Acoustic Neuroma	3
Rhabdomyosarcoma	1

DISCUSSION

Infection:

Patients with infection form the largest proportion of cases studied. The age range was from 6 years to 70 years, 44 cases were studied and out of which mastoiditis were 19, cholesteatoma 24 (all are acquired type) and 1 was malignant otitis externa.

CHOLESTEATOMA[1]: It is a sack of stratified squamous epithelium filled with exfoliated keratin that is trapped and growing within the tympanic cavity or other pneumatised areas of the petrous bone or more simply "skin in the wrong place" The term cholesteatoma is a misnomer as it is not a tumor and doesn't always contain cholesterol. There are two types of cholesteatoma congenital (2%) and acquired (98%).[2]

CONGENITAL: Cholesteatoma found behind an intact tympanic membrane in a patient with no H/o otitis media is congenital cholesteatoma. It occurs at five sites in the temporal bone the petrous apex, mastoid, middle ear, middle ear and mastoid and External Auditory canal. **ACQUIRED:** These lesions arise from either pars tensa or pars flaccida. It is more invasive in children.[3] Cholesteatomas can produce many complications as bone erosion, ossicular erosions, meningitis, cerebral and cerebellar abscess, sinus thrombosis.[4]

Gaurano et al[7]stated that signs indicating cholesteatoma in the attic include erosion or destruction of scutum and widening of the aditus and antrum with loss of the "Figure 8" appearance.

Erosion of scutum was seen in 70.83% of cases followed by erosion of Korner's septum 62.50% in present study. Similar observation was made by Maffee et al (1988)[8] which stated blurring and blunting of normally sharp tip of scutum is the earliest sign of attico antral disease.

In our study most commonly eroded ossicle was only incus (12 cases) followed by only malleus (8 cases), this correlates with study of Gomaa et al[9], who found that the incus was the most commonly eroded ossicle , found in 88.2% of patients, followed by malleus, found in 67.9%.

The present study revealed that erosion of lateral semicircular canal seen in 12.50% cases out of 24 cases of cholesteatoma. Similar results were found by Thukral et al[10].

In our study we diagnosed 3 cases (12.50%) of facial canal erosion, out of 24 cases of cholesteatoma.

Gaurano et al[7] stated that preoperative demonstration of facial nerve canal involvement was often difficult not only because of the small size of the facial nerve canal but also due to its oblique orientation and the presence of developmental dehiscence, particularly when abutted by the soft tissue.

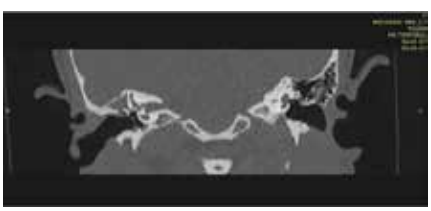
In this study extracranial complication was present in 41.67% of cases and intracranial complication was present in 12.50% out of 24 cases of cholesteatoma.

Kangsanarak et al[11] reported extracranial complication in 59%, intracranial complication in 25% and both in 18% of cases.

In our study most common intracranial complication was meningitis seen in 2 cases (8.33%) out of 24 cases of cholesteatoma. Similar observation were made by Samuel et al[12].

In this study mastoid abscess (16.67 %) was the commonest extracranial complication. These results were very much similar to those observations by Osama et al (2000)[13].

Figure 1.Right Ear Cholesteatoma : Coronal high resolution CT image (bone window) of temporal bone showing nondependent soft tissue mass mainly in epitympanic part of right ear causing blunting and erosion of scutum with partial erosion of middle ear ossicles



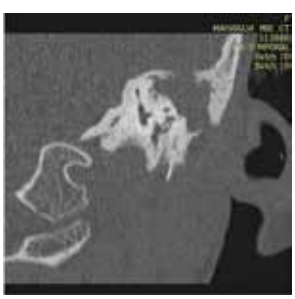


Figure 2.Left Ear Cholesteatoma : Coronal high resolution CT image (bone window) of temporal bone showing large cholesteatoma of left ear causing erosion of scutum,ossicles and tegmen tympani

In our study, out of 44 cases of infection 19 cases were of mastoiditis (43.18%) Chole et al[14], reported that mastoiditis is a common finding in cases with suspected temporal bone pathology and CSOM.

There were 3 cases of acute mastoiditis (15.79%), 2 cases of coalescent mastoiditis (10.53%) and 14 cases of chronic mastoiditis (73.68%) out of 19 cases of mastoiditis in our study.

Figure 3.Left Mastoiditis : Axial high resolution CT image (bone window) of temporal bone showing soft tissue density with fluid levels seen in left mastoid air cell

Neoplasm:

BENIGN NEOPLASMS: Acoustic neuromas comprise about 80% of all Cerebello Pontine angle masses.[5] They arise at the junc-

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tion of neuroglial and Schwann cell sheaths commonly near the porus acuticus. Bilateral lesions are pathognomonic of Neurofibromatosis II. Neuromas at the Cerebello - Pontine angle and petrous temporal region can also arise from V, VII, IX Nerves etc.

Meningiomas arise from the meninges covering the posterior petrous bone and may subsequently invade the temporal bone.The Internal auditory canal is usually not affected. They may produce hyperostosis of the adjacent temporal bone.

Glomus tumors or Paragangliomas are slow growing purplish red vascular tumors that are of mesenchymal or neuroectodermal origin. They arise from chemoreceptor cells that accompany arnold's or Jacobson's Nerve and found in the middle ear or upper portion of jugular bulb or in both regions when they are called Glomus tympanicum, Glomus jugulare and Glomujugulotympanicum respectively.[6]

MALIGNANT LESIONS: PRIMARY MALIGNANCIES: Cancer of the ear arising in the external auditory meatus, middle ear cleft or in a mastoid cavity is a rare disease. Squamous cell carcinoma is the commonest but basal cell carcinoma, Adeno carcinoma and adenoid cystic carcinoma, lymphoma, melanoma can occur as well.

METASTASIS: Metastasis to the temporal bone can be by direct extension or haematogenous extension.

They constitute 8 % of our study.Age group of these patients in our series varied from 3years to 42 years with male preponderance.

1) Acoustic neuroma:
Out of 4 neoplastic lesions (8%) that were scanned 3 were diagnosed as acoustic neuromas. Left CP angle predominance was noted in our study. Acoustic neuroma was the most common internal auditory canal and/or CP angle lesion in a study by P Wolf (1987)[5] .

2) Rhabdomyosarcoma:
Out of 4 cases of neoplasm there was 1 case of Rhabdomyosarcoma in a 3 year old male child in left temporal bone in our study.

Rhabdomyosarcoma is a rare and aggressive malignant soft tissues tumour. More than 60% of the cases occur in children less than 10 years of age.[15] Embryonal rhabdomyosarcoma should be considered in a child presenting with a polyp in the external auditory meatus with recent onset of facial nerve palsy. Extensive destruction of the petrous bone may be revealed in the CT scan.[16]

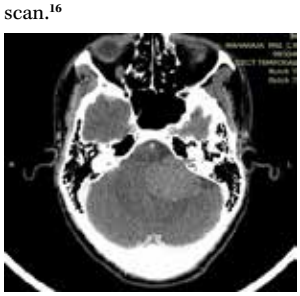

Figure 4.Acoustic Neuroma : Axial CECT TEMPORAL image (soft tissue window) showing enhancing extra axial mass involving left CP angle

Congenital deformity:
In the present study, 2 cases were diagnosed as congenital anomaly on HRCT. Nager et al.[17] stated that atresia of the external auditory canal may be an isolated anomaly. This was consistent with our study where all 2 patients had isolated congenital aural atresia on HRCT and the rest of the middle and inner ear structures were normal. According to Eavey et al[18], the most frequently encountered developmental anomaly of the external ear was microtia, also consistent with our study where 1 out of the 2 patients with congenital aural atresia had associated microtia.

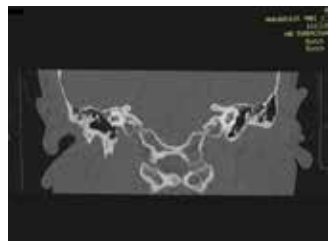

Figure 5.Atresia Of Left External Auditory Canal With Microtia : Coronal high resolution CT image (bone window) of temporal bone showing complete atresia of bony and cartilaginous part of left external auditory canal with deformed pinna

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