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ORIGINAL ARTICLE

Investigating the Role of Imaging Modalities, Such as Computed Tomography (CT) or Magnetic Resonance Imaging (MRI), in the Diagnosis and Management of Temporal Bone Disorders

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ABSTRACT

Aim and Objective: The aim of the study was to assess the role of tomography (CT) or magnetic resonance imaging (MRI), in the diagnosis and management of temporal bone disorders.

Materials and Method: The current prospective study was conducted at the Department of ENT from April 2022 to September 2022 after approval from the institutional review board. A total of 60 patients were included in the study selected through the purposive sampling technique. The age of the participants was up to 75 years. Informed consent was obtained from each patient. All the data was collected from the lab reports and the results of the CT scan and MRI done for each individual and then analyzed by using the latest version of SPSS 24.

Results: A total of 60 participants were selected on the basis of their symptoms which include both males and females. 28.33 % of them were from 21-30 years of age and 25 % of them were 31-40 years of age. 41-50 years of age were 15 %. 37 (61.66 %) of them were male and 23 (38.33 %) were female participants. overall, 13.33 % of them had fractured the temporal bone, The most common of them had mastoiditis 31.66 %, 21.66 % had cholesteatoma and 3.33 % of them had otitis externa. 5 % had meningioma. 9 (45 %) had meningitis, 15 % had brain abscesses, and 25 % of them had carotid canal irregularity.

Conclusion: The current study concluded that both CT scans and MRIs have a vital role in accurately diagnosing the various types of temporal bone disorders like mastoiditis, cholesteatoma, bone fractures, and congenital malformations which helps us to treat and manage the patients according to their etiology. Therefore, CT scans and MRIs have a key role in investigating and managing patients properly.

Keywords: Cholesteatoma, mastoiditis, temporal bone disorder, CT scan, MR

INTRODUCTION

The capability of imaging the human CNS non-invasively has drastically transformed the diagnostics strategy for the disorders affecting the brain. Various imaging techniques can be used to investigate temporal bone disorders comprising simple imaging studies, CT- scans and MRI are presently used as the most commonly used procedures which have virtually superseded the additional modalities[1]. Traditional radiology has been useful for temporal bone diagnosis. The three-dimensional temporal bone is flattened into one plane, while the ensuing superimposition causes thicker tissues to hide less thicker ones. Bone along with air space anatomy as well as diseases are two areas where computed tomography (CT) really shines[2]. CT exams have essentially supplanted polysomnography due to they have proven to be more precise in diagnosing numerous soft tissue anomalies and considerably less susceptible to artifacts, especially due to the CT images delivering a lesser amount of radiation into the lenses of the globe. Contrast in images as well as depth resolution are also improved when using CT[3]. Since MRI allows for different tissue structures that cannot be observable with conventional techniques, it has widened the variety of diseases that can be analyzed precisely. Blood vessel-related diseases that affect the temporal bone may additionally be evaluated with great success using MRI[4]. Plain radiography, angiography, computed tomography, multi-directional tomography as well as magnetic resonance (MRI) imaging are different types of imaging used to assess temporal bone. Temporal bone can be studied with a conventional X-ray at a low cost, although this procedure often gives false results[5]. In order to illustrate the numerous disorders discussed in this article, the authors employ CT scans and MRI scans, two of the most popular imaging techniques now accessible. Radiologists need to understand not just when each modality is most useful, but also its limitations[6]. Imaging modalities like CT and MRI can reliably foretell whether or not a patient will have a healthy inner ear structure, making them useful for selecting candidates for implantation[7]. MRI is preferable for assessing delicate tissue structure as well as lesions of the vascular system, whereas HRCT is more suited for analyzing air gaps as well as cortical bones. This suggests that there may be situations where HRCT and MRI can work together for the best outcome[8]. Therefore, the aim of the study was to assess the role of tomography (CT) or magnetic resonance imaging (MRI), in the diagnosis and management of temporal bone disorders in various patients in order to treat them properly.

Aim and Objective: The aim of the study was to assess the role of tomography (CT) or magnetic resonance imaging (MRI), in the diagnosis and management of temporal bone disorders.

MATERIALS AND METHOD

The current prospective study was conducted at the Department of ENT from April 2022 to September 2022 after approval from the institutional review board. A total of 60 patients were included in the study selected through the purposive sampling technique. The age of the participants was up to 75 years. Both males and females were included in the study. The participants who had symptoms like deafness, ear pain, and discharge as well as fever were included in the study. Those who have autoimmune diseases and chronic diseases like cardiac diseases and known cases of malignancies were excluded from the study. Informed consent was obtained from each patient. All the data was collected from the lab reports and the results of the CT scan and MRI done for each individual and then analyzed by using the latest version of SPSS 24.

RESULTS

A total of 60 participants were selected on the basis of their symptoms which include both males and females. 28.33 % of them were from 21-30 years of age and 25 % of them were 31-40 years of age. 41-50 years of age were 15 %. 37 (61.66 %) of the were male and 23 (38.33 %) were female participants as shown in table no 1.

Table 1: age and gender of the participants

Age (years)	Number	Percentage
0-10	3	5 %
11-20	5	8.33 %
21-30	17	28.33 %
31-40	15	25 %
41-50	9	15 %
51-60	7	11.66 %
61-70	3	5 %
71-80	1	1.66 %
Gender		
Male	37	61.66 %
Female	23	38.33 %

Table no 2 summarizes the results of the CT scan and MRI, overall, 13.33 % of them had fractured the temporal bone of which 5 % were transverse and 5 % were complex fractures. The most common of them had mastoiditis 31.66 %, 21.66 % had cholesteatoma and 3.33 % of them had otitis externa. 5 % had meningioma, 1.66 % had squamous cell carcinoma, and 3.33 % of the participants had metastasis. While 1.66 % of them had congenital ossicular malformations and 3.33 % anomalous facial nerves, Additionally, 3 (5 %) of them had normal findings. Table 3 indicates that out of 17 cases of mastoiditis 9 (47.36 %) had acute and 6 (31.57 %) of them had chronic mastoiditis. Table 4 shows the complications among the individuals in which 9 (45 %) had meningitis, 15 % had brain abscess, and 25 % of them had carotid canal irregularity.

Table 2: Diseases in accordance to the causes

Cause	Number of cases		Percentage
Fracture	Longitudinal	2	3.33 %
	Transverse	3	5 %
	Complex	3	5 %
Infection	Mastoiditis	19	31.66 %
	Cholesteatoma	13	21.66 %
	Otitis externa	2	3.33 %
	Granulation	1	1.66 %
Neoplastic	Squamous cell cancer	1	1.66 %
	Meningioma	3	5 %
	Metastasis	2	3.33 %
	EAC osteoma	1	1.66 %
	Glomus tumor	1	1.66 %
Congenital	Ossicular malformation	1	1.66 %
	Facial nerve (anomalous)	2	3.33 %
	Microtia with EAC atresia	1	1.66 %
Normal		3	5 %

Table 3: Type of Mastoiditis

Type	Number	Percentage
Acute	9	47.36 %
Coalescent	4	21.05 %
Chronic	6	31.57 %

Table 4: Complications

Complications	Number	Percentage
Meningitis	9	45 %
Brain abscess	3	15 %
Hydrocephalus	1	5 %
Carotid canal irregularity	5	25 %
Total	18	100 %

DISCUSSION

High-quality computed tomography (CT) and MRI offer an accurate representation of the anatomical landmarks included inside the temporal bone surface as well as it introduces an entirely new facet into the process of evaluating the temporal bone by making it possible to see the soft tissue components contained inside and subsequent with the temporal bone. A study conducted by Sharma VK et al reported that because of their excellent image quality, CT scans and MRIs are able to clearly distinguish between minute changes and tiny components in the temporal bone, which has become a significant development in the definition of pathology prior surgical investigation in cholesteatoma sufferers[9]. In the current study there 13.33 % of them had fractured the temporal bone of which 5 % were transverse and 5 % were complex fractures. The most common of them had mastoiditis 31.66 %, 21.66 % had cholesteatoma and 3.33 % of them had otitis externa. 5 % had meningioma, 1.66 % had squamous cell carcinoma, and 3.33 % of the participants had metastasis. A similar study conducted by Dubey R et al reported that 20 individuals who suffered fractures in their temporal bones due to trauma underwent evaluation; 5 had longitudinal fractures, 9 had transverse fractures, as well as 6 had complex fractures. 7 patients had been determined to have a neoplastic origin. 30 individuals with cholesteatoma were examined; 13 had erosions of the ossicular, 7 had tegmen tympani erosion, and 8, 5 of the individuals had facial nerve presence, furthermore, lateral squamous had cell carcinoma respectively[10]. In the present study, 3 (5 %) of them had normal findings. Table 3 indicates that out of 17 cases of mastoiditis 9 (47.36 %) had acute and 6 (31.57 %) of them had chronic mastoiditis. Table 4 shows the complications among the individuals in which 9 (45 %) had meningitis, 15 % had brain abscess, and 25 % of them had carotid canal irregularity. In another comparable study by Vivek R et al recurrent meningitis caused 34.68 % of the total consequence, persistent meningitis was 48.10 %, as well as coalescent meningitis, constituted 17.22 %. There was a total of 56.52% cases of cholesteatoma, 38.13% cases of mastoiditis, and 4.35% cases of granulation. Forty percent (40 %) had a transverse fracture, forty percent had an anomalous fracture, and twenty percent had a complicated fracture[11]. In 7%, 3%, 5%, and 2% of patients, correspondingly, acoustic neuroma, metastasis, Glomus tympanicum, or meningioma were found. Ossicular abnormalities and microtia accompanied by ear atresia both accounted for 2% of birth defects. Eleven percent of diseases and seventeen percent of trauma individuals involved the facial canal. The sensitivity as well as the specificity of HRCT varied across causes, with an accuracy of 7.1% alongside a precision of 100.0% for inherited issues, 58.3% and 31.25 % for diseases, 17.9% and 87.5% for malignant lesions, along with 16.7% along with that 81.25% for trauma, respectively. The capacity of HRCT to give thorough images of bone plus soft tissue tissues leads us to reach the conclusion that it is a valuable technique for diagnosing temporal bone disease. Helps doctors spot and treat cancerous growths, infections, and birth defects[12]. 5 % of the individuals had mastoiditis, whereas 1.7 % each had meningitis and brain abscess, 15 % had cholesteatoma, moreover, 13 % of individuals had ossicular erosion[13]. Existence of cholesteatoma. Forty percent and thirty-six percent of patients, respectively, were found to have a cholesteatoma that included both pars flaccid as well as pars tensa. Cholesteatoma of the pars tens has been reported in 24% of individuals[14].

CONCLUSION

The current study concluded that both CT scans and MRIs have a vital role in accurately diagnosing the various types of temporal bone disorders like mastoiditis, cholesteatoma, bone fractures, and congenital malformations which helps us to treat and manage the patients according to their etiology. Therefore, CT scans and MRIs have key role to investigate and manage the patients properly.

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