

ORIGINAL RESEARCH

A retrospective study of anatomical variations of temporal bones on HRCT

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Received Date: 12 September, 2024

Accepted Date: 14 October, 2024

ABSTRACT

The temporal bone is one of the most intricate and complicated structures in the human body, a 3-dimensional knowledge of its anatomy, is of utmost importance in understanding its pathophysiology, and helps in diagnosing and managing most of the otologic conditions, involving these bones. The present-day surgeon is blessed with an investigation and tool like HRCT which not only aids in understanding the anatomy of the vital structures but also cautions the surgeons in case of variations in its anatomy, which is critical during any surgical intervention. **Objective:** This study is mainly aimed at learning the minute anatomical details of the temporal bone using the HRCT, with special emphasis on its anatomical variations. **Materials and methods:** It is a retrospective study, all the patients who underwent HRCT in BMCRI were included in the study group. **Conclusion:** High resolution computed tomography of the temporal bone is a boon of the present century, use of this investigation as a routine in the pre operative work up of all ear cases, is still debated, but using this investigation is left to the discretion of the operating surgeon.

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INTRODUCTION

This study is mainly aimed at young ENT surgeons with keen interest in Otolaryngology. The basic book on Otolaryngology starts by stating "The complexity of nature's machinations is exemplified in the development of the ear, both in phylogenetic and ontogenetic terms"^[1]. The temporal bone is one of the most intricate and complicated structures in the human body. The anatomy of the two temporal bones are similar, a 3-dimensional knowledge of its anatomy is of utmost importance in understanding the pathophysiology of the diseases affecting this bone.

HRCT not only helps in clinical correlation of the disease affecting this bone but also helps in understanding the anatomy of critical structures and its variations, which aids the operating surgeon, to plan one's surgery better and be prepared to manage some untoward occurrences.

AIMS AND OBJECTIVES

To study the anatomy of the temporal bone and its variations on HRCT.

MATERIALS AND METHODS

It is a retrospective study.

The anatomical variations of temporal bone on HRCT was studied using axial and coronal view.

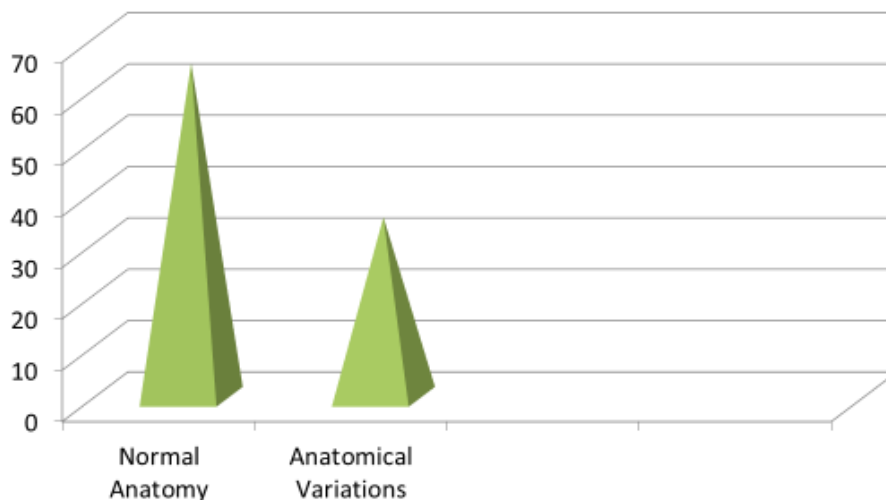
Inclusion Criteria

The HRCT of all the temporal bones that was done in BMCRI in the year 2019 to 2020 was studied for its anatomical variation.

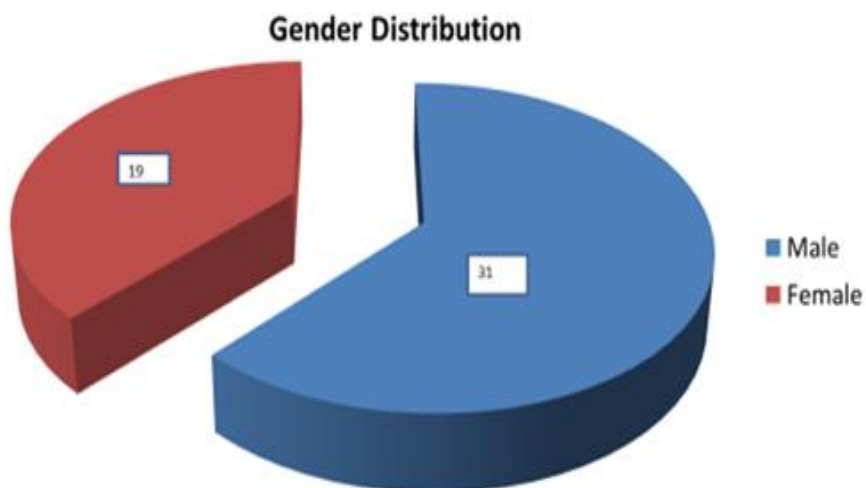
Exclusion Criteria

All those patients who had history of ear surgery were excluded from the study

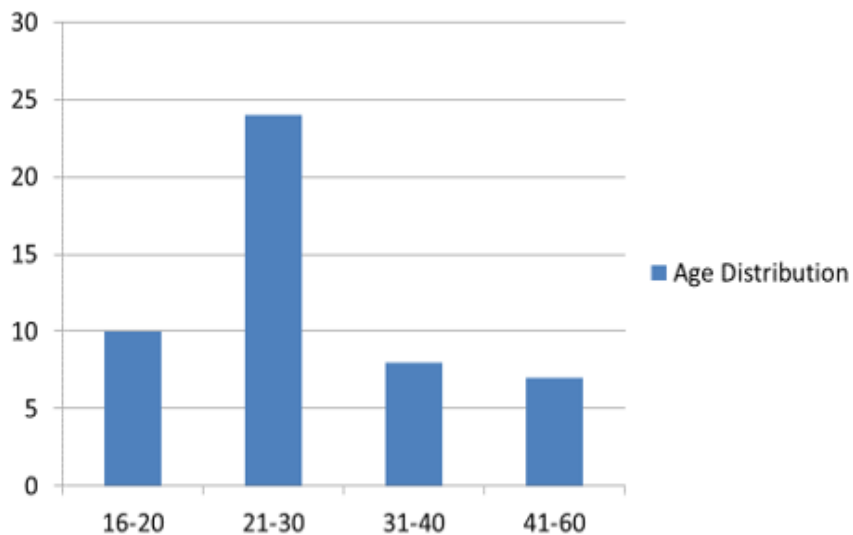
RESULTS



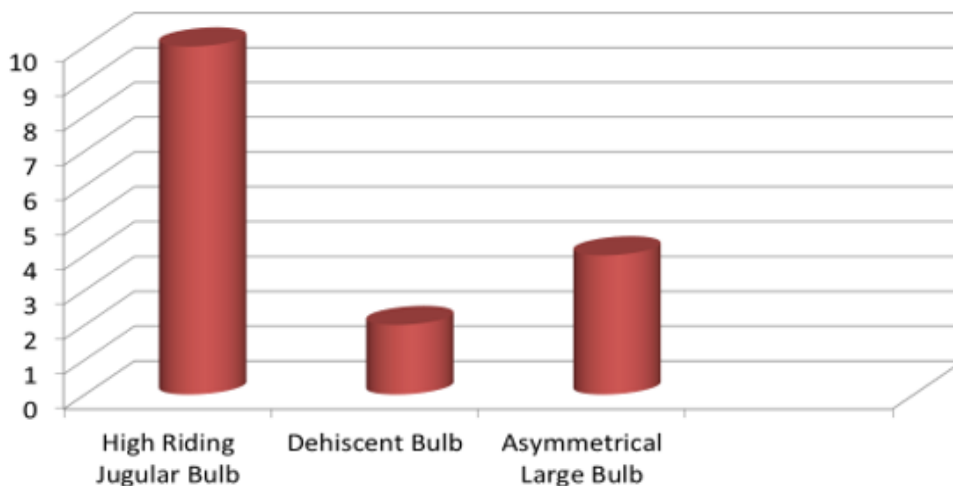
Out of 100 HRCTs that were studied, normal anatomy was observed in 67 bones and anatomical variations in anatomy was observed in 33 bones.



Out of the 50 HRCTs, 31 HRCTs was that of males and 19 HRCT were that of females.



A maximum of 24 pts underwent HRCT in the age group of 20 to 30 years and 7 pts underwent HRCT in the 4th to 6th decade, which was the least in the study group.

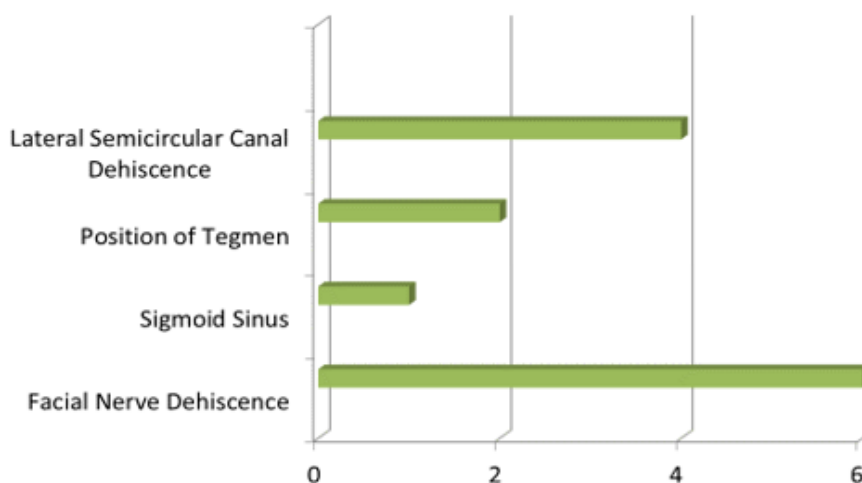


3 types of variations in Jugular bulb were noticed in 16 temporal bones

1. High jugular bulb was seen in 10 temporal bones
2. Dehiscent bulb seen in 2 temporal bones
3. Asymmetrically large bulb is seen in 4 temporal bones



Fig.1 – Left temporal bone with high jugular bulb



Lateral semi-circular canal dehiscence was noted in 4 temporal bones.

Low lying tegmen was seen in 2 temporal bones.

Anteposed sigmoid sinus noted in one temporal bone.

Facial nerve dehiscence was seen particularly in the tympanic segment of the facial nerve in 6 temporal bones.



Fig. 2: low lying dura

DISCUSSION

High-resolution computed tomography (HRCT) of the temporal bone has commonly been used in the evaluation of the chronic suppurative otitis media because of its high sensitivity in the presence of soft tissue disease, bony erosion and anatomical variations^[2].

The CT scan is the standard imaging technique for the temporal bone but its exact role in the pre operative assessment of patients with chronic otitis media is controversial. Some studies declared that it should be used selectively in the pre operative preparation only if complications of the disease is suspected in squamosal type of CSOM^[3].

Our study mainly aims at studying about anatomical variations in jugular bulb, anteriorly located sigmoid sinus, facial nerve dehiscence, lateral semi-circular dehiscence, low lying dura, which are some of the areas encountered during surgery, the knowledge of which could avert major complications.

High resolution CT scan should be a routine examination prior to middle ear and mastoid surgery.

The frequency of a high jugular bulb varies between 6% and 34% from over the floor of the middle ear up to over the basal turn of the cochlea. In a study done by Koesling et. al. the percentage of high jugular bulb was 6%, where as in our study the incidence of high jugular bulb is 10% and 16% showed other variations of the jugular bulb^[4].

The facial nerve is the 7th cranial nerve. It contains the motor, sensory, and parasympathetic (secretomotor) nerve fibres which provide innervation to many areas of the head and neck region. The facial nerve traverses through the temporal bone and is at a risk of being injured during surgery. As noted

by Wiet^[5] operative facial paralysis is the second most common reason for malpractice in ear surgery today in many common otologic approaches. As we mentioned before, the frequency of FND varies from 0.5% to 74% in the literature^[6]. In our study it was detected in 6 ears (6%). Preoperative CT scan may be helpful in the evaluation of detailed anatomy of the temporal bone and decreases the possibility of surgical complications^[7,8].

Inappropriate intervention before certain diagnosis may lead to disastrous, life-threatening consequences. Thus, it is imperative to recognize these anomalies before any surgical intervention.

CONCLUSION

High-resolution computed tomography of the temporal bone gives a precise window for evaluation of temporal bone involvement in various pathological conditions. From the doctor's perspective, in this era of evidence based medicine where the doctors need to be extra cautious for every step they take in treating the patient, there is no harm in using HRCT as a routine pre operative investigation in every patient who is subjected to an ear surgery.

This study is conducted in a medical college, where the initial steps of every case is performed by the post graduate students, there is no better way of orienting the young surgeons to the anatomy of the temporal bone than a pre operative HRCT.

From the patient's point of view, the cost of an HRCT temporal bone is around 1200 rupees, due to availability of ipax software in the hospital, the cost of the investigation comes down if one doesn't ask for a CT film. The cost is quite reasonable keeping in mind the complications that can be averted by knowing the

intricate details of the disease and anatomy before the surgery. The radiation exposure per CT scan is 12.7cGy which is far below the lethal dose of 3-5 Gy. Hence, HRCT is a good radiological tool that can be put to good use for better surgical outcomes.

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