

MORPHOLOGICAL AND MORPHOMETRIC STUDY OF MALLEUS IN SOUTH INDIAN POPULATION

K. Radha.

Associate Professor, Department of Anatomy, Vinayaka Missions Medical College, Karaikal, Pondicherry, India.

ABSTRACT

Background: Knowledge of morphology and morphometric parameters of malleus will be helpful in reconstructive surgeries of middle ear. This study aims to analyse the morphological variations and morphometric values of malleus in south Indian population through cadaveric dissection.

Materials and Methods: This study is performed on 25 dry malleus, both right and left which were obtained from human cadavers.

Result: The total length of malleus was in the range of 6.7 mm to 7.94 mm, mean length of manubrium was 4.2 mm and that of the head and neck was 3.5 mm.

Conclusion: The details of morphological variations and morphometry of the malleus can be useful for prosthetic surgical reconstructions of middle ear.

KEY WORDS: Malleus, Morphometry, Morphological variations, Manubrium.

Address for Correspondence: K. Radha, Associate Professor, Department of Anatomy, Vinayaka Missions Medical College, Karaikal, Pondicherry, India. **E-Mail:** ajjuradha@gmail.com

Access this Article online

Quick Response code



DOI: 10.16965/ijar.2016.212

Web site: International Journal of Anatomy and Research
ISSN 2321-4287
www.ijmhr.org/ijar.htm

Received: 22 Apr 2016

Accepted: 12 May 2016

Peer Review: 22 Apr 2016

Published (O): 31 May 2016

Revised: None

Published (P): 31 May 2016

INTRODUCTION

The malleus is the largest ear ossicles and derives its name from resemblance to mallet meaning hammer. It has head, handle and the neck, which is a constriction between head and handle. The anterior and lateral processes arise just below the neck. The head articulates with the body of incus, at the saddle type of synovial articulation called incudomalleolar joint. The neck gives attachment to tensor tympani muscle [1].

Malleus is unique to mammals and evolved from a lower jaw bone in basal amniotes called the articular, which still forms part of the jaw joint [2].

The cartilaginous precursor of the malleus

originates as part of the dorsal end of Meckel's cartilage. With the exception of its anterior process, the malleus ossifies from a single endochondral center which appears near the future neck of the bone in the fourth month in utero. The anterior process ossifies separately in dense connective tissue and joins the rest of the bone at about the sixth month of fetal life [3].

The present study aims in finding morphology and morphometric variation, pertaining to malleus from small sample of cadavers of south Indian origin.

MATERIALS AND METHODS

This study is performed on 25 malleus, both right

and left which were taken from cadavers of both sexes, obtained from dissection hall, Raja Muthiah Medical College, Chidambaram and Vinayaka Missions Medical College, Karaikal, India.

The ossicles have been obtained from tympanic cavity after opening tegmen tympani, which is the roof of middle ear. The measurements were estimated with a digital vernier callipers which has an accuracy of 0.01 mm. Morphological variations of the individual malleus bones – if any were noted.

The parameters of the malleus studied:

1. Total length of malleus: Maximal distance between the top of the head and the end of the handle(Manubrium).
2. Length of manubrium: Distance from the end of the lateral process to the end of manubrium
3. Length of head and neck: Maximal distance between the top of the head and the end of the lateral process.

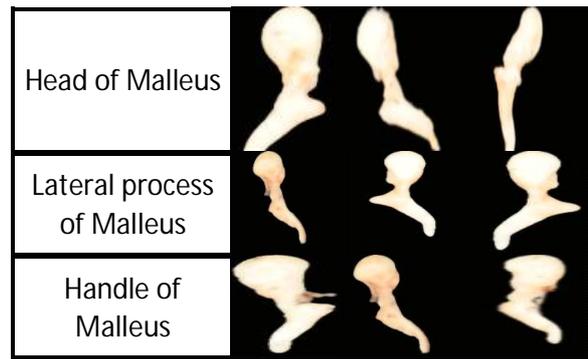
Fig. 1: Method of removing Malleus.



Fig. 2: Method of measuring Malleus



Fig. 3: Morphological variations of various parts of Malleus.



RESULTS

Length of Malleus ranged from 6.7 mm to 7.94 mm. Mean length of manubrium was 4.2mm. Mean length of head and neck was 3.5 mm.

Table 1: Parameters of Malleus.

Parameters of Malleus	Mean value (In mm)
Total length	7.4
Length of manubrium	4.2
Length of head and neck	3.4

DISCUSSION

Ossicles play an important role in hearing. Malleus potentiates sound energy by providing 1.3 time mechanical advantage due to lever ratio. Morphometric analysis of ear ossicles have been the subject of interest since mid fifteenth century [4].

In the study done by Ajay kumar et al showed the maximum length of malleus ranged from 6.4mm to 9.1mm[5]. Study by Vijayachandra et al showed the height of malleus were in the range of 6.94 mm to 7.78 mm[6]. Some authors have studied the morphometry irrespective of sides e.g. Arensburg et al. from Israel took ossicles of either left or right side in an individual and not from both sides. They studied malleus in different races of different era. They reported malleus length 7.7, 8.1, and 7.8 mm and manubrium length of 4.5, 4.6, and 4.4 mm in three races[4]. Ramirez has studied 23 sets of malleus and reported their length to be 8.18 mm [7].

Harneja et al in their study found that the malleus length was 7.15 mm and manubrium length was 4.22 mm [8]. Our findings were correlating with these studies.

The knowledge of variations of these ossicles and its morphometric data will help the otologist during reconstructive surgery and provide necessary information for the prosthesis designer [9]. The morphometric analysis of malleus may help in understanding various middle ear pathologies. It may aid the otorhinolaryngologists in ossicular replacement surgeries. There are many conditions like cholesteatoma and otitis media an inflammation of the middle ear leading to ossicular degradation that require surgical reconstruction of the ossicular chain [10]. The goal of ossicular reconstruction is the restoration of conductive hearing [11].

CONCLUSION

An otologic surgeon must choose his prosthesis based on the best chance of successful hearing restoration and the lowest chance of complications. The data relating to malleus may help in improving number of prosthetic designs. The knowledge of morphometry of ear ossicles is helpful in making of implantable devices which in turn helpful in patient with hearing problem.

Conflicts of Interests: None

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How to cite this article:

K. Radha. MORPHOLOGICAL AND MORPHOMETRIC STUDY OF MALLEUS IN SOUTH INDIAN POPULATION. Int J Anat Res 2016;4(2):2342-2344. DOI: 10.16965/ijar.2016.212