

Anatomy of Malleus – A Human Ear Ossicle

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KEY WORDS Anatomy. Punjabis. Variations.

ABSTRACT The present paper is based on the anatomical study of 60 human ear ossicles-malleus, procured from the temporal bones of the adult cadavers of Punjabis available from Anatomy Department, Govt. Medical College, Patiala (Pb.), India. Each malleus has been studied for gross anatomy, weight and measurements. For gross anatomy, each malleus has been examined pertaining to general shape, head form, neck type, handle, anterior process, lateral process and incudomalleolar joint. In addition to this, each malleus has been studied for its weight and measurements maximum length, maximum head diameter, minimum head diameter, width of neck and length of handle. The results have been compared with other studies.

INTRODUCTION

Human ear consists of three parts – the external ear, which includes projecting part of the ear on the side of head and the canal leading inward; the middle ear, separated from the external ear canal by a membrane but opening into the pharynx through a narrow tube; and the internal ear which both receives sound vibrations transmitted to it through the middle ear and also the balance of the head and body. Middle ear presents three auditory ossicles-malleus (hammer), incus (anvil) and stapes (stirrup). They extend across the cavity from the tympanic membrane to the internal ear.

The round upper end of the malleus is its head. It fits into the concavity of the body of the incus, which lies behind it; both bones lie in epitympanic recess. Below slight neck, the malleus has a short anterior process and a more prominent lateral process that is attached to the inner surface of the drum membrane. The long part of the malleus is the manubrium (handle). The malleus is attached to the ear drum membrane by both the manubrium and the lateral process (Bast and Anson, 1949; Guild, 1936; Mac Naughton-Jones, 1940; Young, 1960 and Hollinshed, 1967). With the increasing interest in middle ear anatomy, knowledge of ear ossicles

and their variations are of considerable importance. With this idea present study has been undertaken to study the anatomy of malleus in Punjabis.

MATERIALS AND METHODS

Human ear ossicle-malleus were procured from the temporal bones of the cadavers from Department of Anatomy, Govt. Medical College, Patiala (India). The cadavers belonged to different parts of the Punjab state and were of Punjabi in origin. The data is based on a sample of 60 malleus ossicles extracted from temporal bones. Observations of the gross anatomical features of the malleus were studied pertaining general shape, head form, neck type, handle, anterior process, lateral process and incudomalleolar joint. Each malleus was studied for its weight and measurements maximum length, maximum and minimum head diameter, width of neck and length of handle. Data on weight and measurements were subjected to statistical computations. Statistical constants like mean, standard deviation, standard errors and range were calculated. Regression equation was calculated and line was drawn between weight of the malleus and its maximum length.

RESULTS

The results are based on the gross anatomical study and anthropometric measurements on 60 malleus ossicles.

I. Gross Anatomy

1. *General Shape*: All the malleoli were hammer shaped.

2. *Head Form*: It was lying in epitympanic recess in all the cases. The shape of the articular surface was oval in 25% cases and elliptical in the remaining malleoli.

3. *Neck Type*: It was only a small piece lying

in between the head and handle of malleolus in all the cases.

4. *Handle*: It was embedded in tympanic membrane and directed backward, downward and medially in position in all the malleoli. Lower end being curving forward and laterally and the tip being flattened laterally in all the malleoli.

5. *Anterior Process*: It was arising from the front part of the neck and extending forward and downward in all the malleoli.

6. *Lateral Process*: It was conical projection arising from the root of handle and lying laterally in all the malleoli.

7. *Incudomalleolar Joint*: It was a saddle shaped joint between the posterior aspect of head of malleus and articular surface of incus. These ossicles were interlocked firmly and were covered with a thin capsular ligament in all the cases.

II. Weight and Measurements

1. *Weight*: In the present sample the weight of malleoli ranges between 18.00 mgm. to 31.60 mgm. With a mean weight of 25.99 mgm. with the standard deviation of ± 3.00 mgm. (Table 1)

2. *Maximum Length*: The maximum length of malleoli varies between 7.20 mm. and 9.60 mm. The mean value of this parameter has been found to be 8.36 mm. with a deviation of ± 1.39 mm. (Table 1).

3. *Maximum Head Diameter*: The maximum diameter of head has been observed on the articular surfaces and mean value has been found to be 2.36 mm. with a very small deviation of ± 0.17 mm. The parameter shows the minimum value of 2.10 mm. and maximum as 2.89 mm (Table 1).

4. *Minimum Head Diameter*: This parameter has been observed to present a mean value of 2.09 mm. with standard deviation of ± 0.28 mm. and ranging between 2.74 mm. to 1.68 mm. (Table 1).

5. *Width of Neck*: Maximum width of the neck has been observed to be 2.16 mm. and minimum 1.31 mm. The mean value is minimum of all the parameters in this series i.e. 1.78 mm. with standard deviation of ± 0.28 m. (Table 1).

6. *Length of Handle*: The mean value of length of handle has been observed to be 4.65 mm. with standard deviation of ± 0.27 mm. Maximum length of the handle has been

Table 1: Human ear ossicle (Malleus) weight and measurements

S.No.	Parameter	Number	Mean	$\pm$ S.D.	$\pm$ S.E.	$\pm$ S.E. of S.D.	Maximum	Minimum
1.	Weight (mgm.)	60	25.99	3.00	0.40	0.28	31.60	18.00
2.	Maximum length (mm.)	60	8.36	1.39	0.18	0.13	9.60	7.20
3.	Maximum head diameter (mm.)	60	2.36	0.17	0.02	0.015	2.89	2.10
4.	Minimum head diameter (mm.)	60	2.09	0.28	0.04	0.03	2.74	1.68
5.	Width of neck (mm.)	60	1.78	0.28	0.04	0.03	2.16	1.31
6.	Length of handle (mm.)	60	4.65	0.27	0.04	0.03	5.21	3.78

Table 2: Human ear ossicle (Malleus) regression between weight and maximum length

Parameter	Regression equation
Weight (X) in mgm.	
Maximum length (Y) in mm.	$Y = 6.56 + 0.07x$

observed to be 5.21 mm. and minimum 3.78 mm. (Table 1).

III. Regression Equation and Line

The relationship between weight and maxi-

Table 3: Comparison of weight and measurements of malleus ossicle

Study	Weight (mgm.)	Maximum length (mm.)	Maximum head diameter (mm.)	Minimum head diameter (mm.)	Width of neck (mm.)	Length of handle (mm.)
Present study	25.99	8.36	2.36	2.09	2.78	4.65
Kaushik (1974)	26.22	8.35	2.54	2.10	1.80	4.63
Value of 't'	0.46	0.05	3.60	0.14	0.29	0.22
Probability	.7>P>.6	P<.99	.001>0>0.0001	.9>P>.8	.8>P>.7	.9>P>.8

imum length has been computed in the form of regression equation (Table 2).

IV. Comparison of Weight and Measurements of Malleus with Other Study

The result of present study has been compared with another study carried out in Punjab by Kaushik (1974). The results have been compared with the help of test of significance - test of normal deviate. Table 3 indicates the comparative results with the value of test of normal deviate and probability. No statistically significant differences could be observed in the two studies pertaining to various parameters except in maximum head diameter (probability, $0.001 > P >$

0.0001).

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