Original Article

Osteometric Dimension of Stapes

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ABSTRACT

Background: In the present study an attempt is made to study the morphometric analysis of ear ossicles to compare and evaluate the various morphometric parameters for designing the prosthesis used by Otologist in people of Gujarat.

Aim: To study normal values of stapes this helps in making of stapes prostheses for otologists.

Material and Method: Present study was carried out on 60 stapes in anatomy department at 3 medical colleges namely Shri M.P. Shah Govt. Medical College, Jamnagar, Govt. Medical College, Bhavnagar and P.D.U Medical College, Rajkot. The present study was conducted after approval from the institutional ethics committee.

Results: the mean total height of stapes was 3.33 ± 0.25 mm, ranging from a minimum of 2.86mm to maximum of 3.9mm. The mean length of footplate of stapes was 2.78 ± 0.15 mm, ranging from a minimum of 2.41mm to maximum of 3.11mm. The mean width of footplate of stapes was 1.34 ± 0.13 mm, ranging from a minimum of 1.05 mm to maximum of 1.73 mm.

Conclusion: The results of parameters of the ear ossicles are very helpful in making ear ossicles prosthesis in ossicular chain pathology in Guajarati population. Variation in the dimension of the ear ossicles might be due to racial difference or regional population difference in India. Variation in the dimension of ear ossicles might be due to various types of instruments used for measurement; methods used for measurement of ossicles or inter observer error by other workers.

Key word: stapes, height, length, width

INTRODUCTION

Hearing loss is second leading cause for years lived with disability. As per who estimates in India, there are approximately 63 million people, who are suffering from significant auditory impairment; this places the estimated prevalence at 6.3% in Indian population [1]. The most common middle ear pathology causing ossicular chain discontinuity is chronic suppurative otitis media resulting in either ossicular necrosis, erosion, dislocation or fixation due to single or combined defect of inflammation, ischemia, trauma, adhesions, granulation tissue, tympanosclerosis or cholesteatoma [2]. At the present time, the two most widely used materials are titanium and hydroxyapatite [3].

In the present study an attempt is made to study the morphometric analysis of ear ossicles to compare and evaluate the various morphometric parameters for designing the prosthesis used by Otologist in people of Gujarat.

MATERIAL AND METHOD

Present study was carried out on 60 stapes in anatomy department at three medical colleges namely Shri M.P. Shah Govt. Medical College, Jamnagar, Govt. Medical College, Bhavnagar and P.D.U Medical College, Rajkot. The present study was conducted after approval from the institutional ethics committee.

Measurements were taken with digital vernier caliper. All the measurements were taken by the same

investigator. Each reading was taken thrice and the mean of all the three was taken to rule out any inadvertent error.
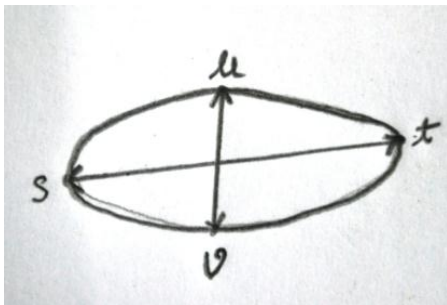
Total height of stapes (Photograph 1: g-h): maximal distance between the top of the head and the basis stapedis [4].

Photograph 1: showing Stapes height
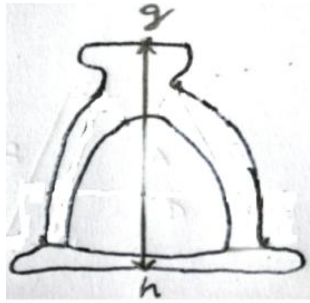
Length of the footplate of stapes (Photograph 2: s-t): maximal length of the long axis of basis stapedis [4].

Photograph 2: showing Stapes footplate length and width

Width of the footplate of stapes (Photograph 2: u-v): maximal width of the basis stapedis [4].

RESULTS

Table 1 showing that the mean total height of stapes was 3.33 ± 0.25 mm, ranging from a minimum of 2.86 mm to maximum of 3.9 mm. The mean length of footplate of stapes was 2.78 ± 0.15 mm, ranging from a minimum of 2.41mm to maximum of 3.11mm. The mean width of footplate of stapes was 1.34 ± 0.13 mm, ranging from a minimum of 1.05 mm to maximum of 1.73 mm.

Table 1: Showing mean, max (maximum), min (minimum) and SD (standard deviation) values of Height of stapes, Length and width of footplate of stapes

Statistics	Mean (mm)	Max (mm)	Min (mm)	SD (mm)
Height of stapes	3.33	3.90	2.86	0.25
Length of footplate	2.78	3.11	2.41	0.15
Width of footplate	1.34	1.73	1.05	0.13

DISCUSSION

Total height of stapes (mm):

In present study (2013), the mean total height of stapes (3.33 mm) was almost similar with reported by Dass R et al (1966) (3.29 mm), Wadhwa S et al (2005) (3.41 mm) and it was higher than reported by Harneja NK and Chaturvedi RP (1973) (3.12 mm), Arsenburg et al (1981) (3.2 mm) and Unur E et al (2002) (3.22 mm) [4-8].

Length of the footplate of stapes (mm):

The mean length of footplate of stapes (2.78mm) was higher than reported by Farhani RM and Nooranipour M (2008) (2.298 mm) and Unur E et al (2002) (2.57mm) [4,10]. It was almost similar with Dass R et al (1966) (2.79 mm), Harneja NK and Chaturvedi RP (1973) (2.68 mm) and Arsenburg et al (1981) (2.8 mm) and lower than reported by Wadhwa S et al (2005) (2.97 mm) [6-9].

Width of the footplate of stapes (mm):

The mean width of footplate of stapes was 1.34 mm which was almost similar with reported by Dass R et al (1966) (1.43 mm), Harneja NK and Chaturvedi RP (1973) (1.26 mm), Arsenburg et al (1981) (1.3mm) and Unur E et al (2002) (1.29 mm) [4,6,7,9].

Table 2: Showing the comparison of total height of stapes of present study with the finding of the other workers

Researcher	Study population	Sample size	Min (mm)	Max (mm)	Mean (mm)	SD (mm)
Dass R et al (1966) [5]	Patiala	165	2.80	3.93	3.29	-
Harneja NK and chaturvedi RP (1973) [6]	Rajasthan	48	2.50	3.50	3.12	0.21
Arsenburg et al (1981) [7]	India	19	2.89	3.72	3.20	0.21
Unur E et al (2002) [4]	Turkey	40	-	-	3.22	0.31
Wadhwa S et al (2005) [8]	New Delhi, India	10	3.06	3.71	3.41	0.20
Present study (2013)	Gujarat	60	2.86	3.90	3.33	0.25

Table 3: Showing the comparison of length of footplate of stapes of present study with the finding of the other workers

Researcher	Study population	Sample size	Min (mm)	Max (mm)	Mean (mm)	SD (mm)
Dass R et al (1966) [9]	Patiala	165	2.29	3.30	2.79	_
Harneja NK and Chaturvedi RP (1973) [6]	Rajasthan	48	1.75	3.25	2.68	0.27
Arsenburg et al (1981) [7]	India	18	2.49	3.05	2.8	0.15
Unur E et al (2002) [4]	Turkey	40	_	_	2.57	0.33
Wadhwa S et al (2005) [8]	New Delhi, India	10	2.64	3.56	2.97	0.31
Farhani RM and Nooranipour M (2008) [10]	Middle east	12	1.928	3.050	2.298	0.433
Present study(2013)	Gujarat	60	2.41	3.11	2.78	0.15

Table 4: Showing the comparison of Width of footplate of stapes of present study with the finding of the other workers

Researcher	Study population	Sample size	Min (mm)	Max (mm)	Mean (mm)	SD (mm)
Dass R et al (1966) [9]	Patiala	165	0.42	1.94	1.43	_
Harneja NK and Chaturvedi RP (1973) [6]	Rajasthan	48	1.10	1.50	1.26	0.08
Arsenburg et al (1981)[7]	India	18	1.23	1.45	1.3	0.07
Unur E et al (2002) [4]	turkey	40	_	_	1.29	0.22
Present study (2013)	Gujarat	60	1.05	1.73	1.34	0.13

CONCLUSION

The total height of stapes was 3.33 mm. The length of footplate of stapes was 2.78 mm. The width of footplate of stapes was 1.34 mm. The results of parameters of the ear ossicles are very helpful in making ear ossicles prosthesis in ossicular chain pathology in Guajarati population. Variation in the dimension of the ear ossicles might be due to racial difference or regional population difference in India. Variation in the dimension of ear ossicles might be due to various types of instruments used for measurement; methods used for measurement of ossicles or inter observer error by other workers.

REFERENCES

1. Kishor J; National Health Programs of India: National Policies and Legislations Related To Health; Chapter-27, National Programme For The

Prevention And Control Ofdeafness; 10th Edition; New Delhi, India; Century Publication; 2012; p. 542.

2. Kandakure V, Thakur G, Thote A, Kausar A, Gilada A, and Survase R, Behaviour of Ossicular Grafts in Otitis Media, IOSR- Journal of Dental and Medical Sciences 2012; 1(3): 32-6.

3. Miller PR, Gittard SD, Adunka O, Pillsbury HC, Lee YS, and Narayan RJ; Total Ossicular Replacement Prostheses: Materials and Designs.; Nano LIFE; 2010; 1(1): 121-31.

4. Unur E, Ulger H, and Ekinci N; Morphometrical and Morphological Variation of Middle Ear Ossicles in the Newborn; Erciyes Medical Journal; 2002; 24(2): 57-63.

5. Dass R, Grewal BS and Thapar SP; Human Stapes and Its Variations -I General Features; J Laryngol Otol; 1966; 80(1): 11-25.

6. Harneja NK, Chaturvedi RP; A Study of the Human Ear Ossicles. Indian J Otol.; 1973; 25: 154-60.

7. Arsensburg B, Harrell M, Nathan H; The Human Middle Ear Ossicles: Morphometry and Taxonomic Implications; J Hum Evol; 1981; 10: 199-205.

8. Wadhwa S, Kaul JM and Agarwal AK; Morphometric Study of Stapes and Its Clinical Implication; J Anat Soc India; 2005; 54(2):1-9.

9. Dass R, Grewal BS and Thapar SP; Human Stapes and Its Variations -II Footplate; J Laryngol Otol.; 1966; 80(1): 471-9.

10. Farhani RM and Nooranipour M; Anatomy and Anthropometry of Human Stapes; American Journal of Otolaryngology- Head and Neck and Surgery; 2008; 29:42-4.

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