

Study of Shape of Obturator Foramen of Stapes in Gujarat Population

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Abstract

Background: Only few studies have been described on shape of obturator foramen. It provides necessary information for the otologist, anthropologist and prosthetic designers.

Objectives: To identify various shape of the obturator foramen of the stapes and establish common shape in Gujarat population.

Methods: Examination of 60 stapes bone extracted from the human cadaver temporal bone collected from the three medical colleges of Gujarat. Intact stapes bones were count in the study and broken specimen were excluded.

Results: The various stapedia foramen shapes were observed in Gujarat population. The most common shape was Triangle with unequal sides shape in 32 specimens (53.33 %) and second most common was circular shape in 11 specimens (18.33 %). The least common shape was isosceles triangle in 8 specimens (13.33 %).

Keywords: Oval, Circular, Semicircular, Irregular, Double foramen, Kidney shape, absent foramen, isosceles triangle, equilateral triangle.

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Introduction

The shape of obturator foramen is not only helpful for anatomists, but it also contributes developmental anomaly and understand a multitude of other otology problems. The Obturator foramen is bounded by the anterior, posterior crus and foot plate. Various terminology used for obturator foramen are intercrural foramen and stapedia foramen. [1,2]

At 7 to 10 mm stage, the stapedia artery arises from the hyoid artery and passes through the stapes mesenchymal primordium and form the obturator foramen. [3]

The different Shapes of obturator foramen Oval, Circular, Semicircular, Irregular, Double foramen, Kidney shape and absent foramen are observed by various authors. There is scarcity of data on the various shape of the obturator foramen of stapes. The purpose of this study is to describe various shape of the obturator foramen and establish common shape. Detail understanding of the shape of the obturator foramen is essential for the ENT surgeons, anthropologist, and prosthetic makers and for developmental evolution.

Material and method:

The study was conducted at the Anatomy Department, M.P. Shah Govt. Medical College, Jamnagar, Gujarat. The present study was conducted after approval from the institutional ethics committee. Total 60 stapes bone specimens were extracted from the formalin fixed human temporal bone. The different Shapes of obturator foramen are Oval, Circular, Semicircular, Irregular, Double foramen, Kidney shape and absent foramen.^{(4) (5) (6) (7)} in this study triangle is further classified into triangle with unequal border, isosceles triangle, equilateral

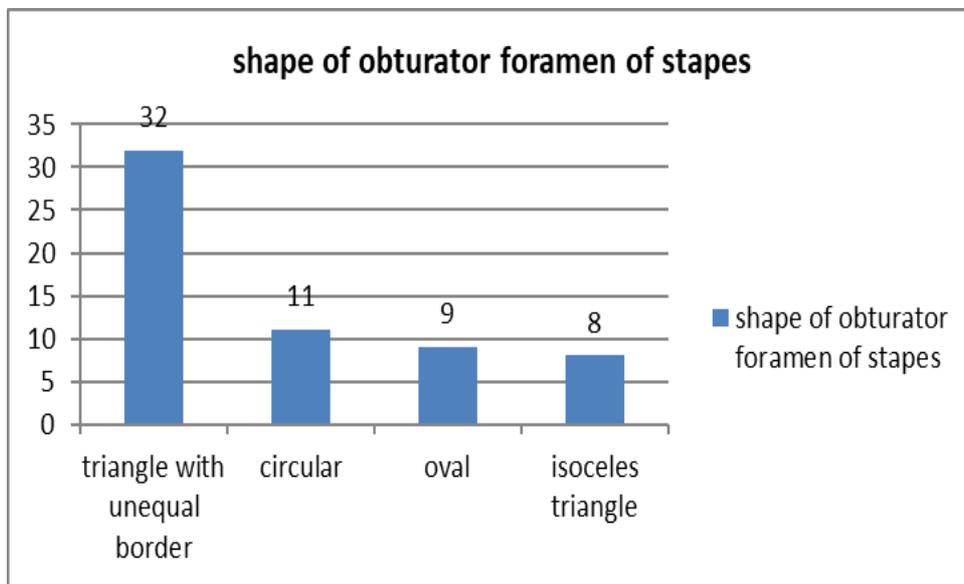
triangle. Magnifying glass was used to observe the different shape.

Inclusion criteria: intact stapes bone

Exclusion criteria: broken stapes bone

Results

As shown in Graph 1, the most common shape was Triangle with unequal sides shape in 32 specimens (53.33 %) and second most common was circular shape in 11 specimens (18.33 %). The least common shape was isosceles triangle in 8 specimens (13.33 %).

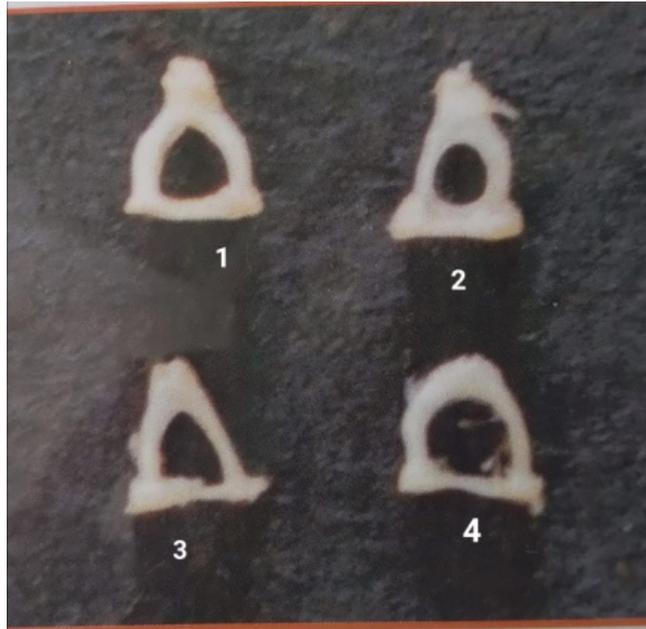


Graph 1: Showing the shape of obturator foramen of stapes and its statistical analysis

The shape of the obturator foramen were observed and tabulated.

Table 1: showing the distribution of shape of obturator foramen of stapes

Sr. No.	Shape of the Obturator Foramen of the Stapes	Observation in Present Study (N=60 Stapes Bone)
1	Triangle With Unequal Border	32 (53.33 %)
2	Isosceles Triangle	8 (13.33 %)
3	Equilateral Triangle	0
4	Oval	9 (15%)
5	Circular	11 (18.33 %)
6	Semicircular	0
7	Irregular	0
8	Double Foramen	0
9	Kidney Shape	0
10	Absent Foramen	0



(photograph showing shape of obturator foramen of stapes.)

1. isosceles; 2. circular; 3. triangle with unequal side; 4. oval shape.

The most common shape of the obturator foramen was triangle with unequal border and second common shape was circular. Other shapes mention in table, Equilateral triangle, Semicircular, Irregular, Double foramen, Kidney shape and absent foramen were not found in study.

Discussion

In present study, 32 had triangles with unequal sides, 11 had circular shapes, 9 had ovals and 8 had isosceles triangle shapes of obturator foramen. The present study in Gujarat population was unequally distributed compared to that reported by Dass R et al. (1966) in Patiala population [4] and Wadhwa S et al. (2005) in New Delhi population. [5] Ritaban Saha et al. observed a triangular shape in highest number of stapes and they also observed no statistical significance between right and left obturator foramen. [6] In general, Wadhwa et al. [7] and Ritaban Saha et al. have broadly described the shape as triangular, while Dass et al. and in the present study, triangle is further classified.

Unur et al. observed circular holes, oval holes, triangular holes, tunnel holes and without hole stapes. (8) In present study

tunnel holes and without holes were not found.

M. Pramila Padmini et al. observed variations of stapes in the neck and the hole or foramen. Circular foramen of stapes with long neck, circular hole with small pointed head, semicircular foramen without neck, oval foramen, with neck, arched foramen with a very long neck, foramen covered with membrane, tunnel shape hole, triangular foramen, deviated head and bony spicule diving the foramen. [9]

Previous animal study shows triangular shape in hamsters [10] oval shape in 2- to 3-month-old Makouei sheep fetuses [11] and very large and triangular shape in mouse. [12]

The delineation of the shape of obturator foramen was strength of the study. Lack of data in the population of Gujarat necessitates further research, despite similar studies being conducted in several region of India. Additionally, research should be done on the foramen's alterations caused by ageing and sex. [13]

The inter-observer error and sample size was limitation of the study.

Table.2 showing comparison of previous data with present study

Sr. No.	Shape of the obturator foramen of the stapes	Dass R et al. (1966) Patiala population (n=165)	Wadhwa S et al. (2005) New Delhi population (n=10)	Ritaban Saha et al. Kolkata, west Bengal (n=52)	Dr Aarushi Jain et al. (Kota, Rajasthan) (n=60)	Present study Gujarat population (n=60)
1	Triangular	-	4	23 (44.2%)	-	-
2	Triangle with unequal border	71 (43.03%)	-	-	-	32 (53.33%)
3	Isosceles triangle	36 (21.42%)	-	-	-	8 (13.33%)
4	Equilateral triangle	24 (14.55%)	-	-	-	-
5	Oval	19 (11.52%)	2	17 (32.7%)	12%	9 (15%)
6	Circular	4 (2.42%)	3	9 (17.3%)	20%	11 (18.33%)
7	Semicircular	-	1	-	-	-
8	Tunnel shaped	-	-	3 (5.8%)	68%	-
9	Irregular	4	-	-	-	-
10	Double foramen	3	-	-	-	-
11	Kidney shape	2	-	-	-	-
12	Absent foramen	2	-	-	-	-

Conclusion:

Triangle with unequal sides shape was common and second most common circular shape of obturator foramen are more common in Gujarat population, so it provides necessary information for the anatomist, otologist, anthropologist and prosthetic designers and anatomy model making. Furthermore, in future vasculature of stapes and shape of obturator foramen and also dimension of stapes in relation with obturator foramen can be studied.

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