



Morphometric and Morphological Analysis of Foramen Ovale in North Indian Population

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Abstract

Background: *many of neurosurgical procedures need to know knowledge about shape size of foramen ovale for various surgical processes such as blocking of mandibular nerve .*

Objectives: *to determine diameter of foramen ovale along with its shape and accessory bony projection.*

Material and Methods: *The present study was conducted using 100 dried skulls of both unknown sexes. Shape of foramen ovale with any accessory bony projection was measured. All the metric and non metric parameter was measured with Vernier calliper.*

Results: *The mean length of foramen ovale was were 6.8 ± 1.5 mm on right side and 6.55 ± 1.36 mm on left side. Mean width was 3.55 ± 0.76 mm on right side and 4.4 ± 0.81 mm on left side. Most common shape was ovale.*

Conclusion: *Morphometric knowledge will be very useful in neurosurgical procedures such as administration of anesthesia for blocking of mandibular nerve.*

Keywords: *Foramen Ovale, Percutaneous trigeminal rizotomy, Trigeminal neuralgia.*

Introduction

The foramen ovale (FO) is present in the posterior part of greater wing of sphenoid. Sphenoid bone forms mainly the middle cranial fossa. The Foramen ovale is one of two cranial foramina open on the infratemporal surface of the greater wing of sphenoid, the other being the Foramen spinosum. The foramen ovale, irregularly ovale in outline, lies close to the posterior border and posterolateral to the upper end of the posterior margin of the lateral pterygoid plate. The Foramen ovale is posterior and lateral to the foramen

rotundum, anterior and lateral to the Foramen spinosum. Posterior and medial to the foramen is the opening for the carotid canal. Foramen ovale is one of the important openings on the infratemporal surface of the greater wing of the sphenoid bone. Variations in number, size, symmetry leads to vascular compromise. The region of the foramen ovale is found to be covered by an osseous lamina and continuous with the lateral pterygoid plate and thus forms a wall of an apparent canal, which opens on the lateral side of the pterygoid process¹. The FO shows a great

variation in its shape and size throughout the life. The earliest shape was ring shaped which was observed in 7th month fetal life. The average length is about 7.48mm and width is about 3.7mm in adults.² Most common shape of foramen ovale is ovale shape.³ This is one of the important foramina which is situated in the transition zone between extra cranial structures⁴. It is situated posterolateral to the foramen rotundum and anteromedial to the foramen spinosum.^{5,6} Knowing the Knowledge of foramen ovale size and variation can prevent injury to the trigeminal nerve during surgical approaches.

Material and Methods

Study Population: This study conducted on 100 dried, adult human skulls with of unknown age and sex were obtained from Anatomy department of Government Medical College, Kannauj U.P. Two hundred Foramen ovale in 100 skull were examined. The foramen ovale was found in the greater wing of the sphenoid and was confirmed by inserting a probe through each foramen. All the metric parameter was measured with Vernier calliper.

Table 1 Mean Antero-posterior diameter or length of Foramen ovale

Side	Mean	Std. Deviation	Std. Error Mean
Right	6.80	1.50253	.15025
Left	6.55	1.36059	.13606

Mediolateral diameter or width of Foramen ovale

In the present study, we find that the mean length of FO was 3.55 ± 0.76 mm on right side and 4.4 ± 0.81 mm on left side. Showing in table no 2.

Table 2 Distribution of mean width of the foramen ovale

Side	Mean	Std. Deviation	Std. Error Mean
Right	3.5500	.76204	.07620
Left	4.4010	.81730	.08173

Methods

The metric Parameter is:

- 1-Lenth of Foramen ovale (Anteroposterior)
- 2- Width of Foramen ovale (Mediolateral)

The non-metric Parameter is:-

- 1- The different Shapes of the Foramen ovale.
- 2- Presence of accessory bone structure like bony Plate, spine, tubercle, Septa if any.

Inclusion Criteria: Complete unbreakable Skull included half and full both skull.

Exclusion Criteria: Broken Skull

Results

In the present study 100 skulls were observed for foramen ovale on both sides in 100 dried human skulls of unknown age and sex. The skulls were numbered from 1 to 100. The antero-posterior & medio-lateral diameter was measured with the help of vernier calliper.

Antero-posterior diameter or length of Foramen ovale;

In our present study, observed mean length of FO were 6.8 ± 1.5 mm on right side and 6.55 ± 1.36 mm on left side. Showing in table 1.



Fig. 1 showing measurement of foramen ovale

Table 3 Variation in shape of foramen ovale on both sides

Sl. No.	Shape	Skull=100		Foramen= 200	N=100 %
		Right	Left		
1	Oval	58	70	128	64%
2	Almond	26	22	48	24%
3	D shaped	4	2	6	3%
4	Longitudinal	5	2	7	3%
5	Round	2	2	4	2%
6	Irregular	3	4	7	3%

Table 4 Accessory Bony Structure in Foramen O+vale

S.N	Parameter	Skull= 100		Total F.O. n=200	N= 100 %
		Right	Left		
1	No assescory bony structure	42	46	88	44%
2	Bony plate	34	30	64	32%
3	Spine	6	10	16	8%
4	Septa	7	11	18	9%
5	Tubercle	5	9	14	7%



Fig. 2 showing longitudinal shape of Foramen Ovale

Discussion

Knowledge of foramen ovale gives a good vision between neurovascular anatomy and the cranial

morphology. Foramen ovale is used for variation surgical as well as diagnostic procedures. In the present study the Foramen ovale was present in all

100 skulls on both sides.

The antero-posterior & medio-lateral diameter

Mean length of foramen ovale on the right was 6.8 ± 1.5 mm and on the left side was 6.55 ± 1.36 mm. The mean width on right side was 3.55 ± 0.76 mm and 4.4 ± 0.81 mm on left side. Our study finding was similar with Biswabina Ray et al⁷, M.S. Somesh et al⁸, B Ray et al⁹ and Karishma Ravinthar¹⁰ they observed that mean length of foramen ovale was 7.46 ± 1.41 mm on right side and 7.01 ± 1.41 mm on left side, 7.64 ± 1.194 mm, and 7.561 ± 1.123 mm, on the left side, the mean length, and width of the foramen ovale, was 7.46 ± 1.41 mm and 3.21 ± 1.02 mm on right side and 7.01 ± 1.41 mm and 3.29 ± 0.85 mm on left side, the value for right was 6.773 ± 1.652 mm and on the left was 5.744 ± 1.791 mm. Mean width of foramen ovale on the right was 3.56 ± 0.737 mm and on the left was 4.28 ± 0.833 .

Shape of Foramen Ovale

In our current study shape of foramen ovale is oval in 64 % cases while Almond shaped in 24 %, D shaped in 3 %, longitudinal slit in 3% cases, round in 2% and irregular in 3% cases. Study was similar with Berjina Farooq Naqshi et al⁹ Karan Bhagwawan Khairnar¹⁰ and M.s.so MESH et al⁸ Oval 28 (70%) foramen ovale were oval in shape, 7 (18%) were almond shaped, 4 (10%) were round and 1(2%) was slit shaped. 76.55% ovale, 10.5% almond round 7 and 5.95% are irregular shape, (56.70%) Almond (28.65%) Round (10.97%) Irregular (3.65%)

Accessory Bony Structure

A bony plate was present in 32% cases, spine in 8% cases, septa in 9%, tubercle in 7%. No bony accessory structure was seen in 44% cases. Our study was similar with Wadhwa et al.¹¹ in 60 foramen found bony plate in 6, spine in 1 and tubercle in 2 cases.

Conclusion

Present study was conducted on a total of 200 sides in 100 dry adult skulls. Foramen Ovale is normally located in the greater wing of the sphenoid bone, posterior and lateral to the

foramen rotundum and the. Various shapes of the Foramen Ovale observed. There were no statistical differences in length and width of foramen ovale. The Knowledge of variations of foramen ovale will help in distinguishing potentially abnormal foramina from normal during computed tomography and magnetic resonance imaging. The current study tells the variation in diameters of foramen ovale. Morphometric knowledge will be very useful in neurosurgical procedures such as administration of anesthesia for blocking of mandibular nerve. Although the morphometric measurements are statistically insignificant on right and left side, there is asymmetry in the morphometric of right and left foramen ovale. Regional variations in morphometric and morphological analysis of foramen ovale are therefore of clinical significance and useful in neurosurgical procedures like administration of anesthesia involving the mandibular nerve, treatment of trigeminal neuralgia and in cases dealing with tumors of the cavernous sinus.

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