



## The Morphometric Study Of Antero-Posterior And Transverse parameter Of Foramen Ovale In Dry Skulls

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### Abstract

**Introduction:** The present study was conducted to know the variations of Antero-posterior and transverse parameters of foramen ovale in dry skull. The foramen ovale is important opening of middle cranial cavity located in the infratemporal surface of greater wings of the sphenoid bone. Its posterior is close to the upper end of the posterior margin of the lateral pterygoid plate and anterior of foramen spinosum. The foramen ovale is oval in shape but variations are also present and it is used in different diagnostic and therapeutic procedure by neurosurgeon. Various study shown abnormal morphological changes. Sometimes they are covered by ossified ligament extending between lateral pterygoid process and sphenoid bone.

**Objectives:** To study of Antero-posterior and transverse diameters of foramen ovale in human skull and to find the variations for clinical significance.

**Material and Methods:** The present study conducted on 100 dry skull. The skulls were collected from SMSR and NIIMS. The AP and transverse parameter were measured. The measurement has been taken by Vernier Caliper.

**Result:** The result showing the range of AP diameter in left and right side are remarkable variable but Transverse diameter is about equal in both side.

**Conclusion:** The present study showing the significant findings of P-value of antero-posterior diameter in right and left side of foramen ovale in 100 dry skull.

**Keywords:** Foramen Ovale, AP and Transverse Diameters

### Introduction

Foramen ovale is passage or foramina located in the posterior part of greater wings of sphenoid bone forms the middle cranial fossa. The middle cranial fossa of skull containing numerous foramina and fissures, important nerves and vessels passes through it. Foramen ovale is important foramen and surrounded by foramen rotundum anteriorly and foramen spinosum posteriorly and opens into the roof of infratemporal fossa. It is largest foramen in middle cranial fossa and transmits mandibular division of

trigeminal nerve along with accessory meningeal branch of maxillary artery, lesser petrosal nerve and emissary vein connecting the pterygoid venous plexus in the infratemporal fossa to the cavernous sinus<sup>1</sup>.

Various authors reported the incidence in the anomaly of foramen ovale varies in different region of the world. It has been hypothesized that entrapment of mandibular nerve when it cross

foramen ovale is a primary cause of trigeminal neuralgia and accounts for the higher incidence of trigeminal nerve on the right side<sup>2</sup>.

The foramen ovale connects the pterygoid plexus to the cavernous sinus through the emissary veins<sup>3</sup>. Similar to other foramina, the foramen ovale differs in shape and size throughout the natural life. Regarding the development aspects of Foramen Ovale, it is situated at the posterior border of greater wings of sphenoid. This sphenoid bone has both intramembranous and endochondral ossification centres and it consists of the body called as basisphenoid, the paired lesser wings called as orbitosphenoid<sup>4</sup>.

Regarding the developmental aspects of foramen ovale, it is situated at the posterior border of greater wing of sphenoid. This sphenoid bone has both intramembranous and endochondral ossification centres and it consists of the body (basisphenoid), the paired lesser wings (orbitosphenoids), A Morphometric Study of Foramen Ovale and the greater wings (alisphenoids)<sup>5</sup>.

The earliest perfect ring shaped foramina of the foramen ovale was observed in the 7<sup>th</sup> foetal month

and the latest in 3<sup>rd</sup> years of the birth in the study using over 350 skulls<sup>6</sup>.

Hence the present study is to determine the antero-posterior and transverse parameters of the foramen ovale and to get significant importance of variations of parameters of foramen ovale.

#### **Aim and Objectives:-**

1. To Morphometric study of foramen ovale.
2. To measure the Antero-posterior of Foramen ovale.
3. To measure the Transverse diameter of Foramen ovale.

**Material and Methods:-** The Present study conducted on 100 dry Skull. The Skull were collected from NIIMS & SMSR, Greater Noida. The Antero-posterior and Transverse parameters were measured. The measurement has been taken by Digital Vernier Calliper. The measurement were noted in millimeters. The mean and standard deviation of AP and transverse diameters calculated. The maximum and minimum values of right and left sides of FO were recorded.

**Fig no-1 Foramen ovale**



**Fig no-2 TransverseDiameter**



**Fig no-3 AP Diameter**



**Result:-**The study was conducted on 100 dry skulls including 200 foramen ovale in both sides. The skulls were collected from Noida International Institute Medical Sciences & School of Medical Sciences & Research, Greater Noida. The measurement has been taken extracranially from the base of the skull. The antero-posterior and transverse measurements are the important parameters in this study. The method used is R-software.

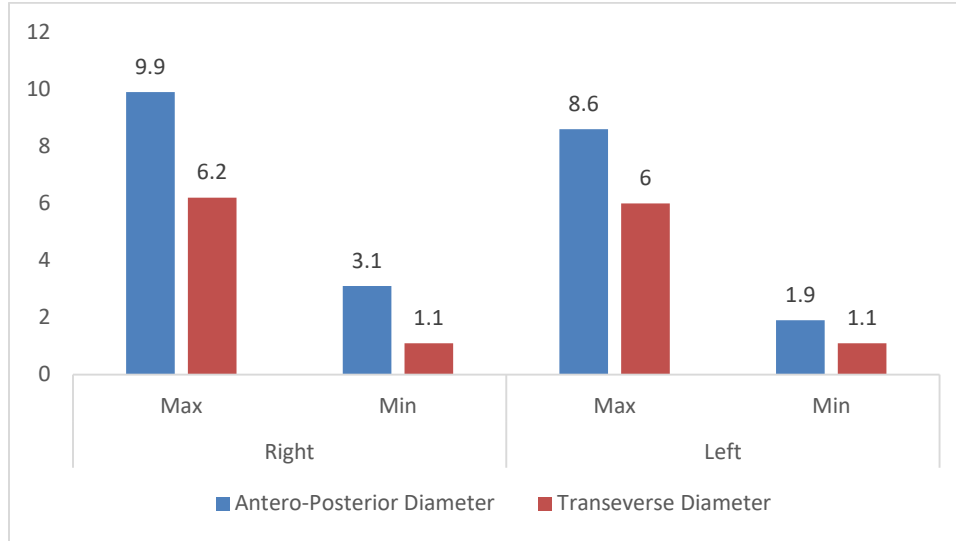
The following are the findings of the study-

The antero-posterior measurement is noted as maximum 9.9 mm and minimum 3.1 mm on the right side and maximum 8.6 mm and minimum 1.9 mm on the left side. The transverse diameters are maximum 6.2 mm and minimum 1.1 mm on the right side and maximum 6.0 mm and minimum 1.1 mm on the left side. Table no-1 and Fig no-4.

**Table no-1 showing AP & Transverse diameters of Foramen Ovale.**

Parameters	Right		Left	
	Max	Min	Max	Min
Antero-Posterior Diameter	9.9	3.1	8.6	1.9
Transverse Diameter	6.2	1.1	6	1.1

Fig no-4



When we calculated the results of the study and their standard value and mean value, we found the significant differences between right and left side of FO. The values are – Anteroposterior diameters, mean values are 5.58 in right side and 5.41 in left side. the SD values are 1.47 in right side and 1.27 in left side. Transverse diameters showing SD values are 2.5 in right side and 2.69 in left side, and Mean values are 0.9 in right side and 0.98 in left side. Table no-2 and Fig no-5

Table no-2 showing Mean and SD of AP & Transverse diameters of FO.

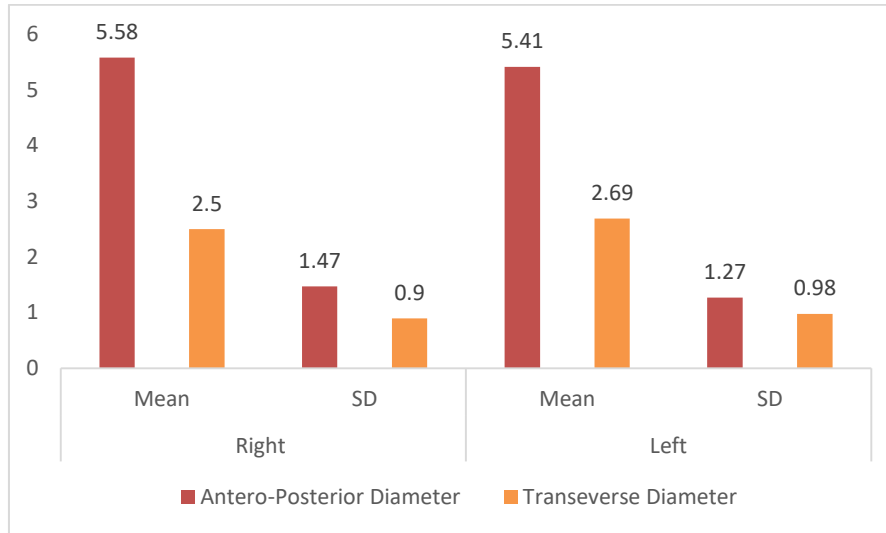
Parameters	Right		Left	
	Mean	SD	Mean	SD
Antero-Posterior Diameter	5.58	1.47	5.41	1.27
Transverse Diameter	2.5	0.9	2.69	0.98

The main observation of present study is the antero posterior diameter of right and left sides of FO have the significant differences

As -Covariance between right and left side of FO =1.272974 and P- value test - <2.2-16 Square covariance = 0.45663.

P value is much more less than 0.5000 (standard value)

Figure No.- 5



**Discussion-** Foramen ovale has significant role in various surgical and diagnostic procedures. The present study of FO is important foramen used for various surgical and diagnostic purpose. The result of study shows that the size of foramen ovale are different in right and left sides in cranial fossa of skull. The transverse diameter of right and left side are almost same in data of 100 dry skull but the P-value and coverage differences of antero-posterior diameter shows markable differences in right and left sides of skull. Similar study done by Biswabina rayet al (2005), they studied on 35 dried human skull and reported that AP diameter on Rt side were 7.46 and 1.41 mm<sup>7</sup>.

According to Yadav, Y et al (2022) study showed the mean length of FO is  $7.82 \pm 1.29$  mm in right and  $7.67 \pm 0.99$  mm in left<sup>8</sup>. Magi Murugun et al. were observed from their study that mean value of Left side of foramen ovale are 8.5 mm and 1.3 mm and in right side are 8.9 mm and 1.6 mm<sup>4</sup>. The similar results are agreement with study conducted by Krishna Ravinthar et al. are the maximum and minimum lengths of right and side of FO is 6.773 and 1.652 and left sides of FO are 5.744 mm and 1.791 mm<sup>9</sup>. Osunwoke E. A et al (2010) in their Study of 87 dry skull of southern Nigerian population reported that antero posterior diameter of FO were 7.98 maximum and minimum 0.10 mm in right side and max 6.89 mm and minimum 0.09 mm on left side<sup>10</sup>. According to SR Daimi et al. ranges of anteroposterior diameter of the right and left FO were

8.5-4.5 mm and 10-3 mm, respectively. The mean length of the right FO was 6.60 mm while that of the left FO was 6.26 mm. The ranges of transverse diameter (width) of both right and left foramen were 2.5-6 mm and 2-5 mm, respectively. The mean transverse diameter of the right FO was 3.70 mm and that of left was 3.34 mm. Bony spur in FO was seen in 6.66% of cases<sup>11</sup>. Jyothi G.L. Asharani, S.K et al. The mean anterior posterior diameter (length) of foramen ovale on the right side is  $8.4 \pm 1.562$  and on the left was  $8.5 \pm 1.323$ . Mean transverse diameters (width) of foramen ovale on right was  $4.5 \pm 0.783$  and on the left was  $4.1 \pm 0.561$ <sup>12</sup>.

Priyanka Katara, et al. they found that the mean antero-posterior diameters (APD) of the right and left foramen ovale were 7.98 mm and 7.14 mm. The mean transverse diameters (TD) of the right and left foramen ovale were 4.24 mm and 3.78 mm respectively<sup>13</sup>. Zahra., H. B., Mahjabeen., M. et al. In their study they observed the mean length of foramen ovale on the right side was  $7.04 \pm 1.08$  mm &  $7.18 \pm 1.14$  mm on the left side<sup>14</sup>. Mumal., N. M. Kaweri., D. et al. The mean length of FO was 5.9 mm on right side and 5.8 mm on left side. Though right foramen ovale was longer than left but no significant difference was observed between the two sides ( $p > 0.05$ )<sup>15</sup>. Manavalan., M. S., Shruthy., K. M. et al The mean length of foramen ovale found to be 7.57 mm on the right side and 7.39 mm on the left side. The mean width of foramen ovale observed to be

4.28 mm on the right side and 4.57 mm on the left side<sup>16</sup>.

**Conclusion**– the present study showing the significant findings of P-value of antero-posterior diameter in right and left side of foramen ovale in 100 dry skull. The foramen ovale is an important foramina in middle cranial fossa so the proper study of foramen ovals always use full in neuro surgeries and some diagnostic procedure. This is important knowledge and help in case of treatment of trigeminal neuralgia. For the anatomical field this information will guide for further research in field of Foramen Ovale.

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