



## Study of Variant Anatomy of Foramen Ovale and Foramen Spinosum in Human Skulls

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### ABSTRACT

Background: Middle cranial fossa contains foramen ovale and foramen spinosum. Foramen spinosum is situated postero-lateral to foramen ovale. These two foramina are important regarding various diagnostic and therapeutic analysis like EEG analysis. Aims and Objectives: To study the variations in shape, bony growth and divisions of foramen ovale and foramen spinosum in available dried human skulls. Materials and Methods: Fifty adult human skulls from JIMSH and KPCMCH were examined for both morphologic and morphometric parameters by digital photographs and slide caliper. Result: We found oval, almond, elliptical and slit shaped foramen ovale. Maximum variation was oval shape followed by almond, elliptical and slit like. Conclusion: Considering the variant shapes and different dimensions of foramen ovale, this study is helpful in the field of radiology and neurosurgery.

**Keywords:** Variation, Skull, Foramen ovale, Foramen spinosum

### I. INTRODUCTION

Middle cranial fossa contains foramen ovale and foramen spinosum. In the greater wing of sphenoid, behind the foramen rotundum, foramen ovale is situated which transmits the mandibular nerve. Foramen spinosum is situated postero-lateral to foramen ovale and transmits middle meningeal artery and veins.<sup>1</sup>Foramen ovale variation affect the surgical intervention of trigeminal neuralgia.<sup>2</sup>To diagnose cavernous sinus tumours, aspiration

biopsy is done through foramen ovale.<sup>3</sup>Knowledge of variant anatomy of foramen spinosum help in surgical approaches to middle cranial fossa.<sup>4</sup>The foramen ovale is used for different surgical and diagnostic procedures.<sup>5,6</sup>It is also used for electroencephalographic analysis of the seizure & percutaneous trigeminal rhizotomy for treatment of trigeminal neuralgia.<sup>7</sup> The administration of anaesthesia via mandibular nerve can be done after a thorough knowledge of the morphometry of the foramen ovale.<sup>8</sup> The percutaneous biopsy of the cavernous sinus can be done through foramen ovale.<sup>9</sup>

### AIMS AND OBJECTIVES:

To study the variations in shape, bony growth and divisions of foramen ovale and foramen spinosum in available dried human skulls.

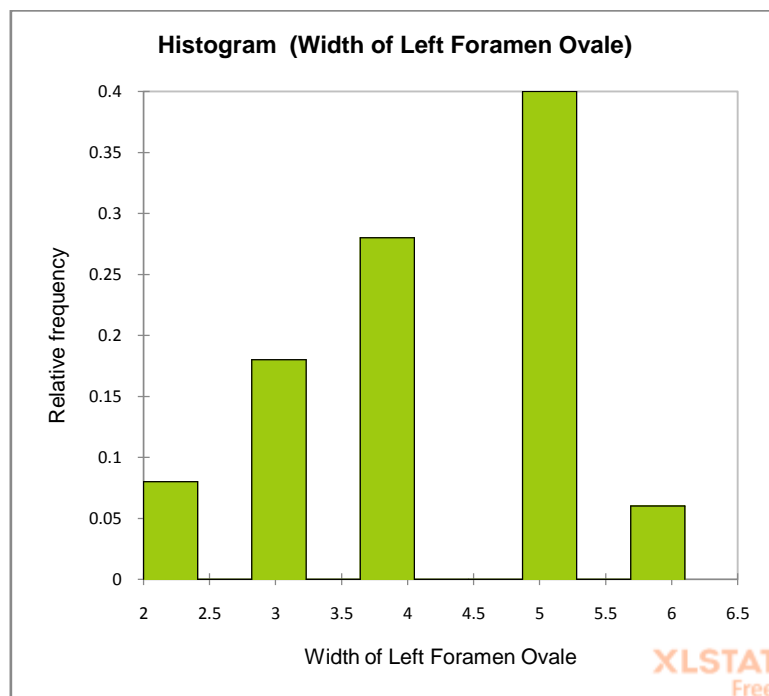
### II. MATERIALS AND METHODS

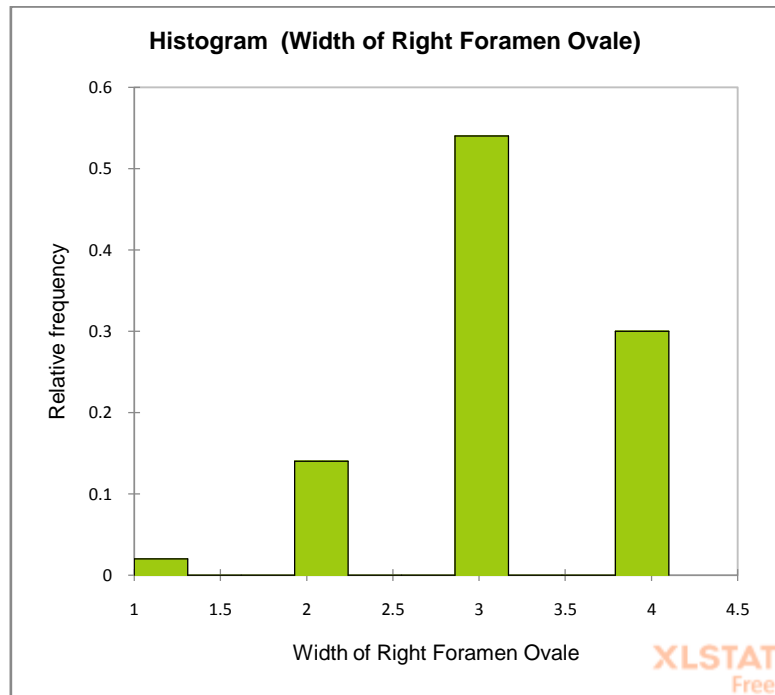
The study was conducted in the department of Anatomy, JIMSH and KPCMCH, Kolkata, India on 50 dry adult human skulls of unknown sex having 100 intact greater wings of sphenoid. Sample size was calculated by predefined power. Different skulls were taken from different human cadavers. Shapes of the foramina were observed and length as well as width were measured by slide caliper. Photographs were taken by using digital camera. All the data were compiled and tabulated and statistical analysis were done by using SPSS software.



### III. RESULTS

	Length of Foramen Ovale (mm)		Width of Foramen Ovale (mm)	
	Right	Left	Right	Left
Number of Observations	50	50	50	50
Minimum	9.0	9.0	1.0	2.0
Maximum	10.5	10.5	4.0	6.0
Mean	9.628	10.008	3.12	4.18
Standard Deviation	0.524	0.412	0.718	1.063
p-value	0.001		<0.0001	
Confidence interval (Right-Left)	(-0.599, -0.161)		(-1.425,-0.695)	











First figure is showing almond shaped foramen ovale and second figure is showing elliptical foramen ovale whereas third figure is showing slit like foramen ovale in marked arrow.

Also irregular shaped FS in the third figure. In the fourth figure the FS is situated medial to spine of sphenoid.



**IV. DISCUSSION:**

Regarding the variation of shape of foramen ovale, we found 66% oval, 17% almond, 16% elliptical and 1% slit like FO. Roma Patel et al (2014) found similar 1% slit like FO in their study whereas Poornima et al (2015) found 2% slit like FO.<sup>10,11</sup>

In the present study, the length of right FO ranged from 9-10.5mm with mean±SD as 9.628±0.524. The length of left FO also ranged from 9-10.5mm with mean±SD of 10.008±0.412. The mean Rt length and Lt length of the present study coincide with values of previous studies. Raval, Binita et al (2015) in their study on 150 dry adult skulls stated that the mean value of length of Rt side was 7.53±1.75mm and the mean value of length on Lt side was 7.41±1.53mm.<sup>12</sup>

In our study, range of width of left side FO is greater than right side FO; similar finding was in the study done by Ashwini et al (2017).<sup>13</sup>

In the present study, the position of FS was observed anteromedial in 99% of skulls. FS was seen medial to spine of sphenoid in 1% of skulls. Jeyanthi Krishnamurthy et al (2013) analyzed 50 dry human skulls and stated that FS was anteromedial to spine of sphenoid (96%) and lateral to spine of sphenoid was 4%.<sup>14</sup> The position of FS is important for approaching the base of the skull.

In our study, we found irregular shape of FS in 1% case which is comparable with the study of Jeyanthi et al (2013)<sup>14</sup> who reported that out of 50 skulls the shape of FS was irregular in 2% cases.

**COMPARISON OF SHAPES OF FORAMEN OVALE:**

Sno	AUTHORS	Oval (%)	Almond (%)	Elliptical (%)	Slit like (%)
1	Present study	66	17	16	1
2	Anju et al (2013)	54.29	35.71	8.57	1.43
3	Roma Patel et al (2014)	59.5	12	27.5	1
4	Poornima et al (2015)	60	25	13	2

**V. CONCLUSION:**

Several morphometric study were done on foramen ovale and spinosum on dried human skulls at different parts of world. The results varied in the previous studies especially with the location of the study. But similar study in this eastern part of India is less to find out the variant spectrum of size and shape of foramen ovale and foramen spinosum.

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