

# Anatomical Variations of Foramen ovale

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## Abstract:

The Foramen Ovale is found at the posterior part of the greater wing of sphenoid, it is one of the larger holes present in the Skull, through which many nerves pass. The foramen ovale has important clinical significance in neurological procedures. To locate and identify the various osseous structures and different shapes of foramen Ovale in across different skulls. To obtain dry skulls of unknown sex from the Department of Anatomy, Saveetha Dental College and Hospitals and observe the presence of the accessory bony structures such as Tubercles, spine and bony plates and the variants in the shape of foramen ovale. To collect data about the prevalence of these projections and variants in the shape of the foramen ovale .Anatomical knowledge of the variations of foramen ovale is important for neurosurgeons.

**Key Words:** Foramen ovale, variations, bony outgrowths, mandibular nerve

## INTRODUCTION:

The foramen ovale is an important foramen present in the middle cranial fossa. It is seen in the infratemporal surface of greater wing of the sphenoid bone, present lateral to the foramen rotundum. The mandibular nerve, accessory meningeal artery, emissary vein and the lesser petrosal vein pass through the foramen ovale (Ambica Wadhwas, Mamta Sharma and Paramjeet Kaur., 2012). It is one of the important foramina, as it is situated at the transition area between the extracranial and intracranial structures ( Karan Bhagwan Khairnar, Prashant Amanroa Bhusari., 2013). The variations of the foramen ovale involve the presence of bony projections and its shape. These variations may influence the structures passing through the foramen, therefore they have important clinical significance since the mandibular nerve occupies most of the foramen, compression by the bony outgrowths could lead to paresis of the innervated muscles (J. Skrzat, J. Walocha, J. Zawilinski., 2012). The aim of the study is to identify the occurrence of these variations because of its importance in neurosurgeries.

## MATERIALS AND METHODS:

The study was done by taking 30 adult dry skulls of unknown sex from the Department of Anatomy, Saveetha Dental College, Chennai. The greater wing of the sphenoid bone was examined to identify the foramen ovale. First the shape of the foramen ovale was noted, taking into account of oval, almond, round and slit shaped foramen. Then the presence of the bony outgrowth such as spine, bony plate and tubercle was observed. The numbers of bony outgrowths present in the skulls were recorded.

## RESULTS:

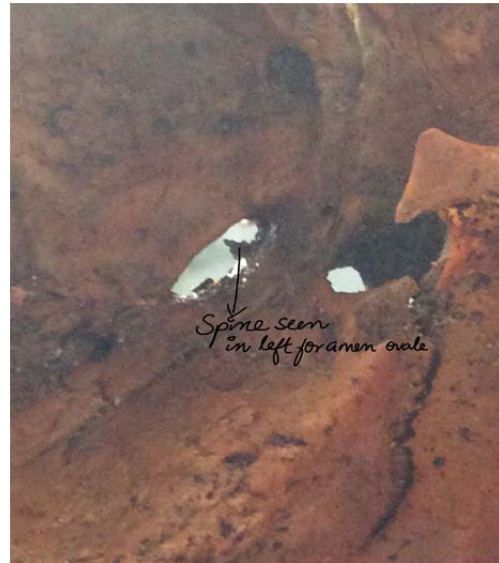
The study was conducted on a total of 60 sides in the 30 dry adult human skulls. On visual inspection of the foramen ovale of the given skulls showed that 48 foramina out of 60 foramina had an oval shaped foramen, 7 foramina showed almond shaped foramen, 4 foramina showed round shaped foramen and 1 foramina showed a slit shaped foramen. Incidences of oval, almond round and slit shaped foramen were 80%, ~12%, ~7% and ~2% respectively. Out of 60 sides in 30 adult skulls, 8 foramina out of 60 foramina showed the presence of a bony spine, 4 foramina showed the presence of a tubercle and 7 foramina showed

the presence of a bony plate. Incidences of Spine, Tubercle and Bony plate were 13%, 6% and 11.6% respectively.

**Table 1: Variations in Appearance of Foramen Ovale**

| Shape  | Right(n=30) | Left(n=30) | Total (n=60) |
|--------|-------------|------------|--------------|
| Oval   | 27          | 21         | 48           |
| Almond | 1           | 6          | 7            |
| Round  | 3           | 1          | 4            |
| Slit   | 0           | 1          | 1            |





**Table 2: Bony outgrowths seen in the Foramen ovale**

| Bony Outgrowths | Right (n=30) | Left (n=30) | Total (n=60) |
|-----------------|--------------|-------------|--------------|
| Spine           | 3            | 5           | 8            |
| Tubercle        | 3            | 1           | 4            |
| Bony Plate      | 4            | 3           | 7            |

**DISCUSSION:**

Developmentally the sphenoid bone has two types of ossification centres which are intramembranous and endochondral ossification centres which give rise to the basisphenoids (body), orbitosphenoids (lesser wings) and alisphenoids (greater wings). During the 7<sup>th</sup> month of the intra uterine life, the foramen ovale is seen as an oval opening in an area of unossified cartilage in the greater wing of sphenoid (Chandra Phillips.X and Arun Kumar S.Bilodi., 2013). The foramen is used in various invasive and diagnostic procedures as it is seen in the transition zone of extracranial and intracranial structures. Foramen ovale electrode technique provides neurophysiological information for amygdalohippocampectomy (Weisler and Siegel 1991). The presence of the bony plate, tubercle and spine is due to the osseous overgrowth during development between its first appearance and the perfect ring formation. However the presences of these structures are rare. But if these osseous structures are seen at the critical sites, they can cause critical problems such as be an obstacle in trigeminal ganglion blockage. The shape of the foramen ovale is also of great importance because of the structures passing through it. If the foramen ovale is slit shaped, it could lead to compression of the mandibular nerve and other structures. Ray et al reported in their study on the anatomical variations of foramen ovale, the presence of spine on the margin of foramen ovale in 3 cases and 2 sides they found a bony spur that divided the foramen into two compartments. Skratz et al. (2006) found that the foramen ovale was covered by an osseous plate that made it seem absent in the skull. In a study by Reymend et al. 2005 reported that the foramen ovale was divided into two or three compartments in 4.5% of the cases.

**CONCLUSION:**

The study is done to understand the different anatomical variations of foramen ovale. The different osseous structures such as the bony spine, plate and tubercles and the variations in shape like round, slit, almond and oval are due to differences in the ossification of the greater wing of the sphenoid bone during the developmental process. The data presented should be taken into account when neurological procedures of the middle cranial fossa are performed. Therefore, it is of clinical importance to medical practitioners in case of trigeminal neuralgia or any other lesions seen in the cranial cavity.

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