Bilateral atypical foramina ovalia formation due to the presence of pterygoalar bar: a rare osseous variation

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Abstract

Introduction
Foramen ovale of the sphenoid bone serves as an important landmark for neurosurgeons in the procedures involving the trigeminal nerve. Shape and size of the Foramen ovale is subject to vary as similar to other foramina. But, the Foramen ovale which is divided into two compartments is a rare variation. We report here a case of bilateral atypical foramina ovalia which is divided into medial and lateral compartments by an oblique bony lamina—the pterygoalar bar.

Case report
The medial compartment is regarded as a topographic counterpart to the Foramen ovale proper. The lateral compartment is regarded as canalis ovalis.

Conclusion
The altered osseous morphology of this basicranial region may affect the course of the neurovascular structures which pass through the Foramen ovale. As a result, clinical symptoms could occur such as paraesthesiae of the cheek and neuralgia resulting from compression of the mandibular nerve or its branches.

Introduction
The foramen ovale (FO) is an oval osseous aperture situated in the infratemporal surface of the greater wing of the sphenoid bone, close to the upper end of the posterior margin of the lateral pterygoid plate. It is located medial to foramen spinosum and lateral to foramen lacerum. It transmits the mandibular nerve, lesser petrosal nerve, accessory meningeal artery and occasionally, emissary veins. Clinically, FO serves as an important milestone for neurosurgeons during diagnostic procedures involving electroencephalographic analysis, microvascular decompression by percutaneous trigeminal rhizotomy and percutaneous operation of cavernous sinus tumours¹⁻³. Topographic location of FO helps in the process of access to the trigeminal nerve as in administration of anaesthesia targeting the mandibular nerve. Topographic position of the FO in relation to the adjacent bony landmarks provides a useful tool in diagnostic procedures. Presence of atypical foramina ovalia leads to atypical morphometry, which may hinder these approaches and often leads to serious clinical complications.

Therefore, exact localisation of FO by means of its morphometry is important for the clinicians and surgeons operating this region. Thus, prior knowledge of such variation is obligatory before handling these procedures. This article reports a case of bilateral atypical foramina ovalia formation due to the presence of pterygoalar bar.

Case report
During routine osteology demonstration for undergraduate medical students, we noted bilateral atypical foramina ovalia in a dry adult human skull of South Indian origin. The region of FO was found to be covered by an oblique bony lamina, apparently continuing with the lateral pterygoid plate. This lamina, popularly known as pterygoalar bar, divided the FO into medial and lateral compartments (Figure 1). The medial compartment being larger than the lateral constituted a foramen which could be regarded as a topographic counterpart to the FO proper. Its lumen was in the plane of the basicranium. It was nearly perpendicular to the lateral compartment, which is often termed as canalis ovalis. The canalis ovalis was found to communicate with the middle cranial fossa.

Discussion
FO with different shapes such as round shape, almond shape and slit variety in addition to variant bony growth from the margins like spine, tubercle and incomplete bony plate protruding from its margin have been reported by Nirupama and Anju⁴. Rarely, an oblique bony lamina referred as pterygoalar bar covering the FO dividing the foramen into medial and lateral compartments has been reported. In such cases, the lateral compartment is referred to as oval canal or canalis ovalis⁵. In the present case, the medial compartment was much larger than the lateral compartment and regarded as FO proper. The division of the FO into two compartments, on both the sides as observed here, is extremely rare.

The incidence of division of FO into compartments was reported to be 4.5%⁶. Krmpotic et al. have reported a unilateral variation in which the FO was divided into two compartments by an extension of bony lamina protruding from the pterygoid process. In this case, the author has observed that the mandibular nerve was passing through the oblique bone lamina between the lateral pterygoid plate and the lateral compartment of the FO.


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after birth becomes a prominent and definitive foramen. Abnormal bony overgrowth during its developmental process is often evidenced by the appearance of tubercle, bony spur and bony plate surrounding the FO, and also there may be occasional presence of an accessory foramen beside the ovale, probably due to the interaction of different parts of the membrane bone and the emissary venous plexus from the middle meningeal vein to the pterygoid venous plexus. Atypical FO may be encountered occasionally with or without any clinical manifestations. Narrow size of FO is one of the clinical scenarios of Paget’s disease or osteopetrosis.

The variant form of FO may alter the anatomical organisation of the nerves which are transmitted through the foramen. This frequently results in the lateral displacement of the mandibular nerve, resulting in the entrapment of its branches between the bony structure and the neighbouring muscles which might lead to neuralgia. A fine-needle aspiration technique through the FO is commonly done to diagnose squamous cell carcinoma and meningioma and also for biopsy of deep lesions in this region. Apart from this, in a procedure known as TN radiofrequency ablation which is performed under the guidance of X-ray imaging, puncture of FO is reported to be totally successful.

Abnormal morphology or topography of the FO can result in hindrance of such procedures as it may result in paresthesiae of the inner aspect of the cheek, ischemia, trigeminal neuralgia, necrosis and paralysis of structures supplied or innervated by the contents passing through the FO.

**Conclusion**

This report throws light on a rare bony variation of FO, whereby the single foramen was divided into two compartments creating an intercommunicating additional opening through both the compartments by the pterygoalar bar. The black arrows indicate the lateral compartment of the foramen ovale (canalis ovalis) and white arrows indicate its medial compartment.

**Figure 1:** Basicranium of a skull showing the bilateral atypical foramina ovalia (probed) due to the presence of pterygoalar bar. The black arrows indicate the lateral compartment of the foramen ovale (canalis ovalis) and white arrows indicate its medial compartment.
latterly, known as canalis ovalis. Thus, knowledge of such a type of variation is obligatory for a clinician before performing critical surgical or invasive procedures targeting FO, to avoid possible complications resulting from the damage of structures passing through it.

**Abbreviations list**

FO, foramen ovale.

**References**