



Unilateral Atypic Foramen Ovale in Dried Human Skull: Surgical Importance of a Rare Bone Variation

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Abstract

Foramen ovale (FO) serves as an important landmark for neurosurgeons in the surgical procedures of the trigeminal nerve. FO is the transition point between intracranial and extracranial structures. The information about anatomical variations of foramen ovale have surgical importance in different methods such as percutaneous trigeminal rhizotomy, biopsy of cavernous sinus tumour and anaesthesia of the mandibular nerve. FO variation is quite rare. It is unknown by many researchers and clinicians. It is thought that divided FO variations emerge as a result of the ossification of pterygospinous ligament. Clinicians must know that such variation may occur in surgical operations on skull base.

Keywords: Foramen ovale, variation, sphenoid bone, base of skull, ossification

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Introduction

Foramen ovale (FO) is the important opening that is located on the skull bone and opens the greater wing of the sphenoid bone [1]. FO is close to the high end of the lateral pterygoid plate's posterior margin. It goes through the greater wing of the sphenoid posterior to the foramen rotundum and lateral to the lingula and posterior end of the carotid groove [2,3]. Foramen ovale is considered as an important landmark for the process involving the trigeminal nerve to the brain surgeon. Mandibular nerve, accessor meningeal arteria, emisserial ven and sometimes minor petrosus nerve pass from in this opening [4]. The knowledge of anatomical variation of this bony lamina is very improtant for radiologists, neurosurgeons, maxillofacial and dental surgeons and anesthetists[5]. Also, FO is an important landmark for middle cranial fossa surgery [6]. Lateral pterygoid plate is an important landmark for mandibular anaesthesia and any anomalies in lateral pteryoid plate like bony lamina can confuse anaesthetists and dentists [7].

Case presentation

In routine anatomy laboratory studies, we observed that left foramen ovale (FO) located at the base of the skull was unilaterally split two part by procesus pterygoideus lamina lateralis of sphenoid bone (Figure 1). It was determined that the region of FO was covered by an oblique bony lamina, which seemed to continue with the lateral pterygoid plate. Another popular name of this lamina is pterygoalar bar. The FO is divided by it into two compartments: medial compartment and lateral compartment (Figure 2A and 2B). The lateral compartment, which was larger than the medial compartment, formed a foramen that could be considered a topographic counterpart to the FO proper. The other anatomical structures were normal.

Discussion

FO gives a passage to the mandibular division of the trigeminal nerve, the lesser petrosal nerve, the accessory meningeal branch of the maxillary artery and an emissary vein which connects the cavernous venous sinus to the pterygoid venous plexus [8]. This bony lamina may cause trigeminal neuralgia by compressing mandibular nerve passing in FO [9].

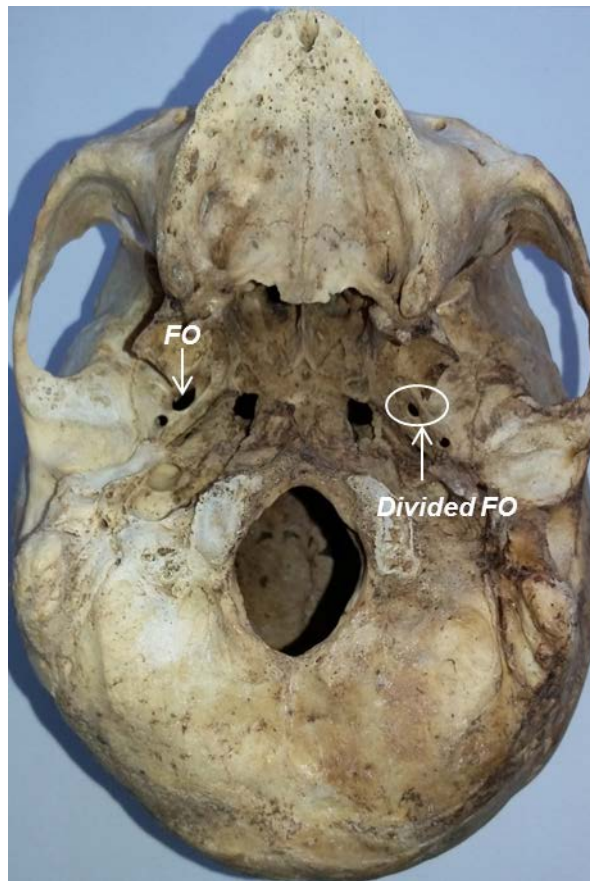


Figure 1: Bottom view of the base of the skull. The FO normal opening on the right side, while the left side is split with bony bar.

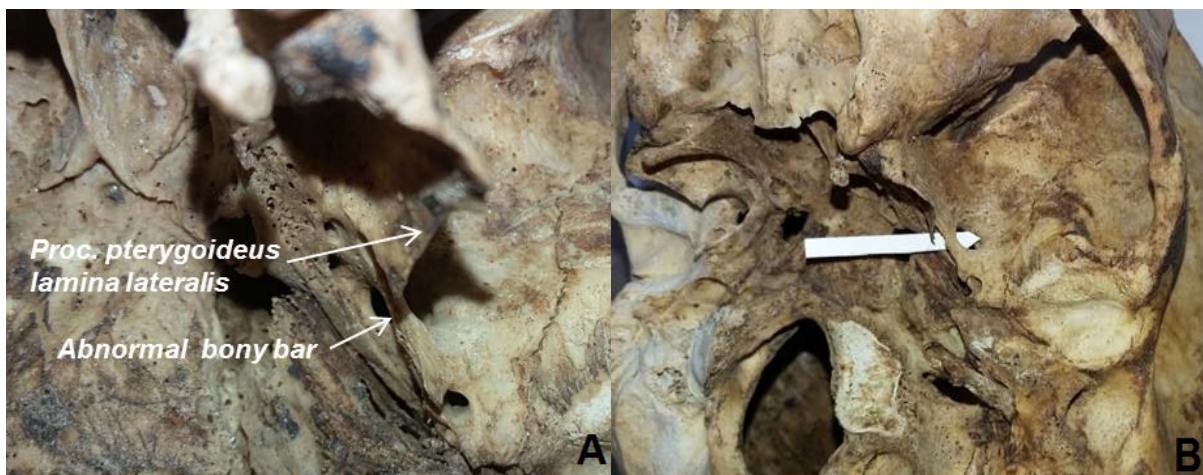


Figure 2A-2B: Close-up view of proc. pterygoideus lamina lateralis of sphenoid bone and abnormal bony bar's.

Trigeminal neuralgia is the most common treating by percutaneous trigeminal rhizotomy done through FO [5,10,11]. So this bony lamina make difficulty to accessing foramen ovale for therapeutic approach [12]. Percutaneous biopsy of cavernous sinus tumours mostly making through the foramen ovale. Biopsy of deep lesions like squamous cell carcinoma, meningioma, Meckel cave's lesions can make easily through FO without open surgical biopsy or craniotomy [13]. Electroencephalographic analysis of seizure making by electrode placed at FO. Foramen ovale electrode is a device to explore human temporo-medial interictal and ictal EEG activity during presurgical evaluation [14]. This bony lamina leads to difficulty by leaving little space while performing the surgical procedures mentioned above [15]. Entrapment of lingual nerve between ossified pterygospinous ligament and medial pterygoid plate can lead to hypoesthesia or anaesthesia and loss of taste in the anterior 2/3 of the tongue, anaesthesia of the lingual gums, and pain related to speech articulation disorders. Dental surgeons should be aware of the possible signs of neurovascular compression in regions where the lingual nerve is distributed [16]. Different authors have reported with different results, though and this difference is probably regional. Incidence of ossified pterygospinous ligament reported by different researchers with different results. Wood found 8% in Hawaiian skulls [17]. Nayak et al. [9] observed 3.84% with incomplete pterygospinous ligament and 5.76% with complete pterygospinous bony bar in Indian skulls. Antonopoulou et al. [18] reported incompletely ossified pterygospinous ligaments in 2.5% and completely ossified pterygospinous bridge bilaterally in 2% of the Greek skulls in CT image. Knowledge of FO variations will help to distinguishing potential abnormal foramen to normal during the computed tomography and magnetic resonance. In addition, demonstrating these variations in terms of anatomical and clinical is important for treatment of trigeminal neuralgia, detection of tumors and ischemia abnormal bone growth causing necrosis [1,2,19]. This variation is considered as pterygospinous ligament ossification that is seen extremely rare [20]. So, this ossification may press to neurovascular structures and reveal difficulties in therapeutic approach to FO [12,21,22].

This report illuminates an infrequent bony variation of FO through which single foramen was divided into two compartments creating an intercommunicating supplementary opening laterally, which is called canalis ovalis [23]. Knowing this variations by clinicians is important in terms of prevent to damage to structure here in invasive procedures and surgical intervention directed to FO.

Conflict of Interests

The authors hereby declare that they have no competing interests.

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