

Morphometric analysis of Foramen ovale

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Abstract

The foramen ovale is a very circular looking hole that is located in the posterior part of the sphenoid bone, structures passing through it mandibular nerve, accessory meningeal artery, lesser petrosal nerve, emissary vein. The foramen ovale differs in shape and size, in present study we have studied about morphometric values of like mean length, width and area. The total 125(250 sides) skulls were used for this study, the result were on left side was 7.98 ± 1.89 mm, the mean width was 5.88 ± 1.01 mm, the mean area was 32.08 ± 9.08 mm and on right side the mean length was 8.14 ± 1.42 mm, the mean width was 5.26 ± 0.93 mm, the area was 31.56 ± 9.82 mm. we also observed some variations in shape of foramen ovale the results were oval was 62.80%, almond shape was 23.20%, round was 11.81% and irregular were 2.19%. The knowledge of foramen ovale very helpful for neurosurgeons.

Key words – Foramen Ovale, Emissary vein, Mandibularnerve.

INTRODUCTION

The foramen ovale is present in sphenoid bone which transmits the mandibular nerve, accessory meningeal artery, emissary vein and the lesser petrosal nerve. The common location of foramen ovale is in the infratemporal surface of greater wing of the sphenoid bone posterior and lateral to the foramen rotundum and lateral to the lingual and posterior end of the carotid groove. Foramen ovale lies close to the upper end of the posterior margin of the lateral pterygoid plate[1]. According to Blaszczyk B et al, the foramen ovale occasionally can be covered by the bony bridges which results from ossification of the ligaments that are stretched between the lateral pterygoid process and sphenoid bone. Sometimes the venous part of foramen ovale may be compartmentalized by a bony spur located anteromedially looking like as double foramen ovale. The foramen ovale important in functional cranial anatomy and neurosurgeries as it enables access to the neurosurgery as it enables access to the trigeminal nerve[2].

In developmental aspects of foramen ovale is situated at the posterior border of greater wing of sphenoid. This sphenoid bone has both intramembranous and endochondral ossification centers and it consists of the body the paired lesser wings and the greater wings. The basisphenoid is derived mainly from presphenoid and postsphenoid centre and the postsphenoid centre is the one which is associated with the development of the greater wing of sphenoid. The first ossification centre appears for alisphenoids and its large portion forms the greater wing of sphenoid by membranous ossification[3]. According to Yanagi S(1987) mandibular nerve becomes surrounded by cartilage to form the foramen ovale. At 22 weeks, the foramen ovale can be seen as discrete ring shaped opening in the area of unossified cartilage that can be well recognized 3 years after birth at the latest. The present study conducted for morphometric analysis of foramen ovale[4].

MATERIALS AND METHODS

125 dry adult human skulls constituted the material for the present study. The skulls belong to the Department of Anatomy, JJM Medical College, Davangere, Karnataka, India. Each was studied for the morphometric analysis of foramen ovale and recorded.

RESULTS

The total 125(250 sides) skulls were used for this study, the results were on left side was 7.98 ± 1.89 mm, the mean width was 5.88 ± 1.01 mm, the mean area was 32.08 ± 9.08 mm and on right side the mean length was 8.14 ± 1.42 mm, the mean width was 5.26 ± 0.93 mm, the area was 31.56 ± 9.82 mm. We also observed some variations in shape of foramen ovale the results were oval was 62.80%, almond shape was 23.20%, round was 11.81% and irregular were 2.19%.

DISCUSSION

The Sphenoid bone is very complex bone and intricate embryological origin, on the infratemporal surface of this bone foramen ovale is present which transmits mandibular nerve, accessory meningeal artery, lesser petrosal nerve, emissary vein. Foramen ovale is used for surgical and diagnostic procedures such as electroencephalographic analysis, microvascular decompression by percutaneous trigeminal rhizotomy and percutaneous biopsy of cavernous sinus tumours[5,6,7]. The technique of CT guided transfacial fine needle aspiration technique through the foramen ovale is used to diagnose squamous cell carcinoma, meningioma and allows biopsy of deep lesions. In the sphenoid bone first ossification centre appears in the great wings of sphenoid bone and the ring shaped formation of the foramen ovale is observed in the 7th foetal month. During development the foramen ovale is located within a membranous bone derived from a medial pterygoid process, the appearance of spine, spur, tubercle, bony plate

surrounding foramen ovale indicates that bony overgrowth during its developmental process, between its first appearance and perfect ring formation and also the various inconstant patterns of grooves and foramen in the vicinity of the foramen ovale can be interpreted as arising from the interplay of various parts of membrane bone and the emissary venous plexus from the middle meningeal veins to the pterygoid plexus [8]. The pterygoalar bar extends as a bony lamina from the root of lateral pterygoid lamina to the greater wing of the sphenoid bone[9]. In rare cases ossification of the pterygospinous ligament may also produce a bony bridge that extends in the vicinity of the foramen ovale[10]. According to study of Krmpotic et al found the accessory foramen ovale that lies in front and medial to the foramen ovale which leads to an oblique canal directed towards the pterygoid fossa. The canal was up to 2.3 mm long and opened near the root of the pterygoid process. An atypical position of the foramen ovale and neighboring osseous structures may influence the anatomical organization of the nerves that run through this opening, thus the main trunk of the mandibular nerve was redirected more laterally and its divisions had to cross the extended lateral pterygoid plate, because of the abnormal course it would be possible for the nerves to become entrapped or compressed between osseous structures and muscles, causing neuralgia. The same author found a great rarity the the oval canal divided into two compartments by extension of the lateral lamina of the pterygoid process. Each of these compartments appeared to transmit part of a mandibular division of the trigeminal nerve[11]. Yanagi(1987) in his study measured the foramen ovale as 3.85mm in the new born and in adults it is about 7.2mm[5]. In study by Reymond et al(2005) the foramen ovale was found to be divided into 2 or 3 compartments in 4.5% of cases[12]. According to Lang J(1984) the mean length of the foramen ovale is about 3.85 mm in the newborn and about 7.2 mm in adults and its width extends from 1.81 mm in the newborn to 3.7 mm in case of adults[13]. The knowledge of foramen oval is very helpful for neurosurgeons.

REFERENCES

1. Williams PL, Bannister LH, Berry MM, Collin P, Dyson M, Dussek JE, Ferguson MWJ. Gray's anatomy. 38th ed. Churchill Livingstone, New York 2000.
2. Błaszczuk B, Kaszuba A, Kochanowski J. Atypical foramina of the base of the skull. *Folia Morphol.* 1980;93:201–209.
3. Lang J: Clinical Anatomy of the Head, Neurocranium, Orbit andCranio-cervical Region, Springer-Verlag, Berlin 1883.
4. Yanagi S: Developmental studies on the foramen rotundum, foramen ovale and foramen spinosum of the human sphenoid bone. *The Hokkaido Journal of Medical Science.* 1987; 62(3): 485-496.
5. Wieser HG, Siegel AM: Analysis of foramen ovale electroderecorded seizures and correlation with outcome following amygdalohippocampectomy. *Epilepsia.* 1991;32: 838-850.
6. Gerber AM: Improved visualization of the foramen ovale for percutaneous approaches to the gasserian ganglion: Technical note. *J Neurosurg.* 1994;80: 156-159.
7. Gusmao S, Oliveira M, Tazinaffo U, Honey CR: Percutaneous trigeminal nerve radiofrequency rhizotomy guided by computerized tomography fluoroscopy: Technical note. *J Neurosurg.* 2003;99: 785–786.
8. James TM, Presley R, Steel FL. The foramen ovale and sphenoidal angle in man. *Anat Embryol (Berl).* 1980;160: 93–104.
9. Skrzat J, Walocha J, Środek R. An anatomical study of the pterygoalar bar and the pterygoalar foramen. *Folia Morphol.* 2005;64: 92–96.
10. Peker T, Karakose M, Anil A, Turgut HB, Gulekon N. The incidence of basal sphenoid bony bridges in dried crania and cadavers: their anthropological and clinical relevance. *Eur J Morphol.* 2002;40: 171–180.
11. Krmpotic, Nemanic J, Vinter J, Hat J, Jalsovec. Mandibular neuralgia due to anatomical variation. *Eur Arch Otorhinolaryngol.* 1999;256: 205–208.
12. Reymond J, Charuta A, Wysocki J: The morphology and morphometry of the foramina of the greater wing of the human sphenoid bone. *Folia Morphologica.* 2005;64(3): 188-193. 2005.
13. Lang J, Maier R, Schafhauser O: Postnatal enlargement of the foramina rotundum, ovale et spinosum and their topographical changes. *Anatomischer Anzeiger* 1984;156 (5): 351-387.