

STUDY OF EMISSARY SPHENOIDAL FORAMEN AND ITS CLINICAL IMPLICATIONS

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ABSTRACT: BACKGROUND: The emissary sphenoidal foramen is a small foramen located anteromedial to foramen ovale and lateral to foramen rotundum and opens below lateral to scaphoid fossa. It transmits an emissary vein through which the cavernous venous sinus and pterygoid venous plexus communicate. According to Soames emissary sphenoidal foramen exists in 40% of skulls. **AIMS:** The aim of the present study was to identify the percentage of emissary sphenoidal foramen and to analyze its clinical importance. **MATERIAL AND METHODS:** 180 dry adult human skulls were studied which were available from the Department of Anatomy at Mysore Medical College (Mysore), J. S. S. Medical College(Mysore), Farooqia Dental College (Mysore) and J. J. M. Medical College (Davangere). **RESULTS:** The emissary sphenoidal foramen was present in 90 skulls out of 180 skulls studied. Out of the 90(50%) skulls, emissary sphenoidal foramen was present bilaterally in 42(23.3%) skulls and in the remaining 48(26.67%) skulls it was unilateral, 18 (10%) skulls showing on right side and 30(16.67%) skulls showing on left side. **CONCLUSION:** Anatomic variations of the emissary sphenoidal foramen could be explained due developmental reasons. The detailed anatomical knowledge is required in clinical situations necessitating the surgery at the skull base where various nerves and vessels pass through various foramina.

KEYWORDS: Emissary sphenoidal foramen, Emissary veins, Thrombosis, Cavernous sinus.

INTRODUCTION: The skull has numerous foramina through which neurovascular structures course. Emissary sphenoidal foramen is a small foramen located anteromedial to the foramen ovale and lateral to foramen rotundum and vidian canal.⁽¹⁾ This foramen is also known as foramen of Vesalius. It opens between foramen ovale and scaphoid fossa inferiorly. When present, it contains an emissary vein linking the pterygoid venous plexus in the infratemporal fossa with the cavernous sinus in the middle cranial fossa forming a communicating channel between face and cavernous sinus. According to Soames, it exists on one side or both sides in 40% of the skulls.⁽²⁾ Emissary veins are valve less and pass through the foramina to communicate intracranial with extra cranial veins.⁽³⁾ Since the literature review gives few reports, the present study was done to establish the incidence of the emissary sphenoidal foramen.

MATERIALS & METHODS: 180 dry adult human skulls were available from the Department of Anatomy at Mysore Medical College (Mysore), J. S. S. Medical College (Mysore), Farooqia Dental College (Mysore) and J. J. M. Medical College (Davangere). The emissary sphenoidal foramen was identified in the skulls. Its presence was noted both unilaterally, (right side and left side) and bilaterally in the skulls.

RESULTS: The emissary sphenoidal foramen was identified in 90 skulls i.e. 50% of the 180 skulls studied. Among the 90 skulls which showed the foramen, in 42 skulls it was present bilaterally on both right and left side, the incidence being 23.3%. In the 48 skulls, i.e. 26.6% foramen was unilateral, 18 skulls with 10% incidence showed foramen on right side only and 30 skulls with 16.6% incidence showed foramen on left side only. The emissary sphenoidal foramen was totally absent in 50% (90) of the skulls. The total numbers of sides (right and left) studied were 360. The foramen was identified in 132 sides. The foramen was seen in 16.67% on right side (60) and on left side in 20% (72) of 360 sides.

DISCUSSION: The emissary sphenoidal foramen is an inconstant foramen which is situated in the posterior part of the greater wing of the sphenoid. The emissary veins are valve less and pass through the foramina to communicate intracranial with extra cranial veins. Thereby they maintain equilibrium of intracranial venous pressure.⁽⁴⁾

Wood-Jones reports that the foramen ovale is an important venous outlet in humans. The veins tend to find their exit predominantly through the anterior and medial portion of the foramen ovale and the disposition of the mandibular nerve being behind; give the typical oval shape to the foramen. Occasionally the venous anterior portion of the foramen ovale is constricted and elongated, or venous portion of the foramen ovale may tend to become subdivided from the nervous portion due to the in-growing spicules of bone which may cut the foramen ovale into two parts, the anterior of which may be regarded as the foramen of Vesalius or emissary sphenoidal foramen.

In some cases foramen of Vesalius lie 2 to 3 mm anteromedial to foramen ovale and this is regarded as the maximum degree of sub division of foramen ovale.⁽⁵⁾ Hence the emissary sphenoidal foramen is an expression of the differentiation of cranial venous outlets that is characteristic of humans and does not occur in any other primate.⁽⁵⁾

Ossification of the skull base progresses in an orderly pattern from posterior to anterior, i.e. from occipital, post sphenoid, presphenoid to ethmoid. The sphenoid bone consists of the body (formed by the presphenoid and post sphenoid centers, with a contribution from the medial crus of the orbit sphenoid), the paired lesser wings (orbitosphenoids) and the greater wings (alisphenoids).⁽⁶⁾ The larger part of the greater wing of the sphenoid is formed in membrane. It is shown that the emissary sphenoidal foramen represents the site of fusion between this membrane bone and more medial, cartilaginous bone, ala temporalis.⁽⁷⁾

Various inconstant patterns of grooves and foramina in the vicinity of the foramen ovale can be interpreted as arising from the interplay of the various parts of the membrane bone and the emissary venous plexus from the middle meningeal veins to the pterygoid plexus.⁽⁷⁾ Thus the various holes and foramina of the skull base are created around preexisting structures.⁽⁶⁾

In the present study the foramen exists in 50 % of the skulls, shows slight increase incidence. Raymond⁽⁸⁾ reports lower incidence of 17% of the foramen whereas Bergman⁽⁹⁾ reports higher incidence of 59%. Present study reports unilateral (26.67%) more compared to bilateral (23.3%) occurrence which can be compared with Rossi⁽¹⁰⁾ (unilateral 26.25%, bilateral 13.75%), Shinohara⁽¹¹⁾ (unilateral 18.25%, bilateral 15.5%) and Boyd⁽¹²⁾ (unilateral 21.8%, bilateral 14.7%), whereas Ozer⁽¹³⁾ (unilateral 25.5%, bilateral 9.3%) reports marked increase in unilateral

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foramen. In the study by Gupta⁽¹⁾ (unilateral 20%, bilateral 22.85%), Kodama⁽¹⁴⁾ (unilateral 5.5%, bilateral-16.3%) and Bergman⁽⁹⁾ (unilateral 24%, bilateral 35%) bilateral incidences are reported more.

In the present study, the incidence of emissary sphenoidal foramen on the left side was (16.67%) more than right side (10%). Similar reports were observed in the studies done by Boyd⁽¹²⁾ (left - 11.2%, right - 10.6%), Kale⁽¹⁵⁾ (left-10.37%, right - 9.51%), Shinohara⁽¹¹⁾ (left -10.5%, right-7.75%), and Ozer⁽¹³⁾ (left - 15.1%, right -10.4%). Rossi reports increased right side incidence 15.62% compared to left side 11.25 %.⁽¹⁰⁾

The clinical importance lies in the fact that the emissary veins coursing through the foramen of Vesalius may convey the infected thrombus from the exterior to the interior of the cranial cavity.⁽⁴⁾ Thrombophlebitis or septic thrombosis may occur through dissemination by contiguity through per phlebitis or by septic embolism. The septic thrombosis is caused by supportive processes at the orbit, paranasal sinuses or the upper half of face level, such as boils, sinusitis or otitis and rarely dental infection. More commonly infection spreads to the contra lateral cavernous sinus through the circular sinus.⁽¹⁶⁾

Trigeminal neuralgia is characterized by paroxysms of shock pain, which presents for short duration and is recurrent, in the somatosensory distribution of one or more branches of the trigeminal nerve. The treatment of trigeminal neuralgia is by trans-ovale approach rhizotomy associated with fluoroscopy to guide a needle puncture to the trigeminal impression. One important aspect of this treatment is the foramen ovale penetration. When reaching the foramen ovale, the needle is placed at the third branch of the trigeminal nerve.

The needle may erroneously penetrate the sphenoidal emissary foramen, with the consequent puncture of the cavernous sinus. Sweet (1968) reported the needle penetration at the sphenoidal emissary foramen in 09 cases, in 08 there were no adverse consequences, but in 1 case there was a temporal lobe hemorrhage.⁽¹⁶⁾

Studies by Rossi et al and Shinohara et al demonstrated that the average distance between these two foramina was short. Sindou et al, (1987), reported error of needle puncture to the trigeminal impression in 10 cases of 200: 2 at the carotid canal, 1 at the jugular foramen and 7 at the sphenoidal emissary foramen.^(10,11,16)

Lang reported that a small nerve (nervulus sphenoidalis lateralis) may pass through the foramen into cavernous sinus. In 20 % of cases the foramen may transmit accessory meningeal artery.⁽¹⁾ Though the foramen is not always present, its identification is important because of its relation with surrounding structures and for various procedures performed at the region.

CONCLUSION: The emissary sphenoidal foramen which is not constant is significant not only for anatomical studies, but also for neurosurgical approaches at the base of the skull due to its variability in its incidence and its clinical implications.

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AUTHORS	TOTAL INCIDENCE %	BILATERAL %	UNILATERAL %	RIGHT %	LEFT %
Reymond J	17	-	-	-	-
Bergman	59	35	24	-	-
Gupta N	42.85	22.85	20	-	-
Kodama	21.8	16.3	5.5	-	-
Boyd	36.5	14.7	21.8	10.6	11.2
Kale A	45	25.1	19.9	9.51	10.37
Rossi AC	40	13.75	26.25	15.62	11.25
Shinohara	33.75	15.5	18.25	7.75	10.5
Ozer	34.8	9.3	25.5	10.4	15.1
Present study	50	23.3	26.67	10	16.67

Table No 1: To show the incidence of the emissary sphenoidal foramen by various authors

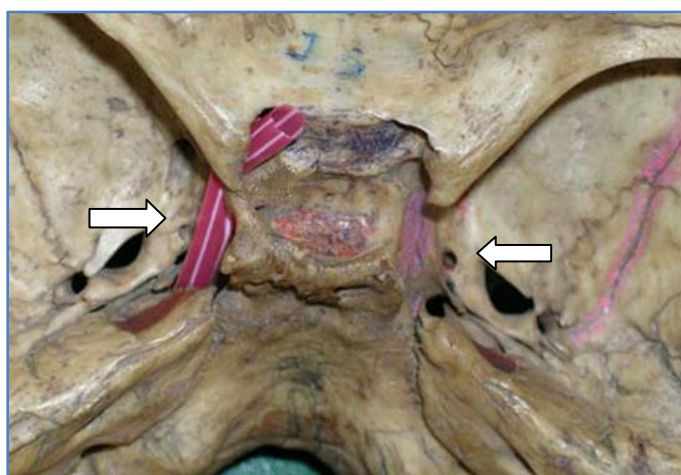


Fig. 1: White arrows pointing emissary sphenoidal foramen bilaterally

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