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Variations of parietal foramen in dried adult human skulls

Gaining Gangmei[1], *Huidrom Sushila Devi[2], Thonthon Daimei[1], Elizabeth Remei[1], Joyce Tunglut[1]

[1]*Department of Anatomy, J.N. Institute of Medical Sciences, Porompat, Imphal- 795005, Manipur, India.*
[2]*Department of Anatomy, Regional Institute of Medical Sciences, Lamphelpat, Imphal- 795004, Manipur, India.*
*Corresponding author: *Dr. Huidrom Sushila Devi*

***Abstract**: Variations in the emissary foramina of the skull are not uncommon and such variations are important both clinically and anthropologically. These cranial variants may or may not be associated with other congenital anomalies. Defect in the ossification of the parietal bones is an important cause responsible for the variations of the parietal foramen such as accessory parietal foramen, enlarged parietal foramen, parietal fissure and obeliac bones. Therefore, the objectives of the present study were to study the prevalence, number and position of parietal foramen in dried adult human skulls and to compare the findings with that of other research workers. A total of 48 skulls (96 parietal bones) were used in the present study, out of which parietal foramen was found in 74 parietal bones (77.08%) and absent in 22 bones (22.9%). The foramen was found bilaterally in 30 skulls (62.5%), unilaterally in 14 skulls (29.2%) and absent bilaterally in 4 skulls (8.3%). The foramen was mostly found at the junction between the middle 1/3 and posterior 1/3 of the parietal bones near the sagittal suture, except in two where it was found more anteriorly in the middle 1/3 of the parietal bones. These findings of variations in the prevalence, number and position of the parietal foramen can be an important addition to various research works as well as to any clinician/ surgeon dealing in the area to avoid complications.*

***Keywords:** Variations, emissary foramen, parietal foramen, ossification, sagittal suture.*

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I. Introduction

Cranial emissary foramina are of great clinical significance in determining the spread of infection from extra-cranial foci to intra-cranial venous sinuses. Some of these foramina are relatively constant, while others may be absent. [1] Therefore, anatomical variations of the cranial emissary foramina have been of great interest among various research workers.

The parietal foramina are usually small, oval or rounded openings located one on either side of the sagittal suture in the posterior part of the parietal bones. They are usually located at the junction between the middle one-third and posterior one-third of the parietal bones. Part of the sagittal suture between the two parietal foramina is given the name 'obelion' because of its resemblance to the Greek symbol 'obelos' (%). The two dots represent the two parietal foramina, while the line between the two dots represents the sagittal suture. [2, 3, 4]

The parietal foramen may be present or absent and when present, it transmits an emissary vein which connects the superior sagittal sinus with the veins of the scalp and sometimes it also transmits a small meningeal branch from the occipital artery. [5] Apart from transmitting these vessels, other function(s) of the parietal foramen is not known and is still under investigation. [6] However, there is an important relationship between the emissary foramina and the diploic veins of the skull, especially in the spread of infection from the exterior to the interior of the skull. Emissary foramina are less common in lower animals than in man, which may be altogether absent in some animal species. [7]

II. Materials And Methods

The present study was carried out in 48 dried adult human skulls (96 parietal bones) in the Department of Anatomy, J.N. Institute of Medical Sciences, Porompat, Imphal. 43 skulls were collected from the Department of Anatomy, J.N. Institute of Medical Sciences, Porompat, Imphal and 5 from the Department of Anatomy, Regional Institute of Medical Sciences, Lamphelpat, Imphal. The skulls were observed on both sides i.e. both the parietal bones for the presence or absence of parietal foramen. When present, the actual number and position of the parietal foramen were noted. However, age and sex of the skulls were not determined and too small foramina with size less than 1mm were not considered in the present study. In the present study, a parietal bone having more than one parietal foramen was counted as having double foramina, triple foramina, etc.

III. Results And Observations

Altogether 96 parietal bones were used in the present study. Out of the total parietal bones studied, parietal foramen was found in 74 (77.08%) and absent in 22 (22.9%). The foramen was mostly found at the junction between the middle1/3 and posterior 1/3 of the parietal bone near the sagittal suture, while in two parietal bones, it was found more anteriorly in the middle third of the bone. The foramen was found bilaterally in 30 skulls (62.5%), unilaterally in 14 skulls (29.2%) and absent bilaterally in 4 skulls (8.3%, Fig.6). In most of the skulls with bilateral parietal foramina, a single foramen was found one on each side of the sagittal suture (Fig.1) except in one skull where double foramina were found on the right side and a single foramen was found on the left side (Fig.2). And in those skulls with unilateral foramen, a single foramen was found on the right side in 5 skulls (Fig.3) and on the left side in 7 skulls (Fig.4), however in one skull, double foramina were found on the right side and absent on the left side and yet in another bone, triple foramina were found on the right side and absent on the left side (Fig.5). The findings were then discussed and compared with the findings of other previous workers so as to come to a significant conclusion.

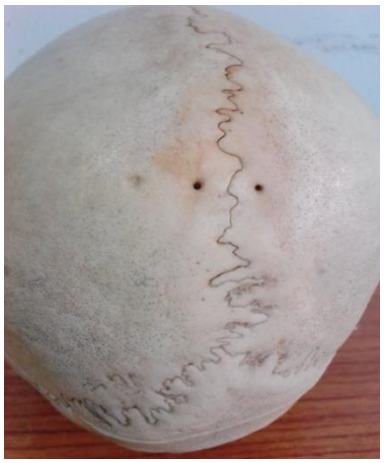

Fig.1: A single parietal foramen on each side of sagittal suture.

Fig.2: Double foramina on the right side and a single foramen on left side.

Fig.3: A single foramen on the right side and absent on the left side.

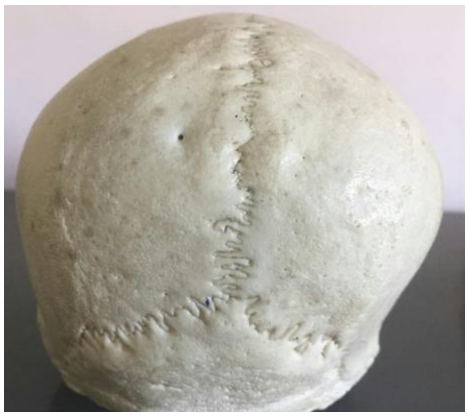

Fig.4: A single foramen on the left side and absent on the right side.

Fig.5: Triple foramina on the right side and absent on the left side.

Fig.6: Bilateral absence of parietal foramen.

Table 1: Variants of parietal foramen in the 48 skulls (96 parietal bones) in the present study-

		Absent foramen	Single parietal foramen	Double parietal foramina	Triple parietal foramina
Bilateral		4	29	_	_
Unilateral	Right	11	34	2	1
	Left	11	37	_	_
	Total	22	71	2	1

Values are given in number, not in percentage.

IV. Discussion

The 2 parietal bones form most of the roof and sides of the skull. Each parietal bone is irregularly quadrilateral in shape having 2 surfaces and 4 borders. Each is ossified from 2 centres located near the parietal eminence at about the seventh week of intrauterine life. The 2 centres eventually unite and the process of ossification gradually radiates towards the margins. [1] Delayed or prolonged ossification of the posterior one-third of the parietal bone in the region of the obelion results in a v-shaped notch or slit, sometimes known as the subsagittal suture of Pozzi, [8] pars obelica, sagitttal or third fontanelle. This fontanelle is present in about 50-80% and usually closes during the first two years of life. [9] Variations in the closure of the third fontanelle are responsible for the formation of accessory parietal foramina, enlarged parietal foramen, parietal fissure and obeliac bones. [10] Boyd also mentioned that the abnormally enlarged parietal foramina are probably due to a defect in the ossification of the parietal bones and not associated with an enlarged emissary vein.[7] However, there is a strong possibility of genetic predisposition and association with other congenital anomalies. Therefore, radiological imaging is a must before any corrective intervention to rule out any accompanying congenital anomaly. [11]

The parietal foramen usually occurs bilaterally, but it may be only unilateral in some cases and sometimes it may be absent. [12] Out of the 96 parietal bones evaluated in the present study, parietal foramen was found in 74 parietal bones (77.08%). This result is similar with the findings of other researchers showing the incidence of parietal foramen in 50-80% among the various population groups. [5, 7, 13, 14] However, in the study done by Mann et al [10], the incidence of parietal foramen was little bit high, found in 85% of the cases and Pereira GAM et al [15] reported still higher incidence of parietal foramen, being found in 100% of the bones studied. In the present study, the parietal foramen was found bilaterally in 30 skulls (62.5%), unilaterally in 14 skulls (29.2%) and absent bilaterally in 4 skulls (8.3%). Boyd [7] reported the presence of parietal foramen in about 60% of the cases. Unilateral presence was found to be more on the left side than on the right in the present study, however Boyd observed more on the right side (20.7%) than on the left side (15.2%).

Apart from variations in the frequency of the parietal foramen, there are also various studies showing differences in the number, location, shape and size of the parietal foramen. The number of parietal foramen varies from absence to multiple (double, triple, quadruple etc) and Murlimanju et al [5] reported a maximum of 3 parietal foramina in their study, which is similar to the finding of the present study. Boyd [7] reported presence of a median parietal foramen over the sagittal foramen in about 5.9% of cases, so also Murlimanju et al [5] observed median foramen in 3.4% of the cases. However, none of the skull bones showed median foramen in the present study.

The average size of the parietal foramen ranges from 1.8- 2.0 mm, [13, 14] however Boyd [7] reported it to be about 0.5mm or less, and size of 1.5mm or more is rare, found in only 7% of cases. He reported no age or sex difference in his study, though he stated that there is a marked contrast between the Australian and other races in the distribution and size of the emissary foramina including the parietal foramen. However, Wysocki [13] observed that the average size of parietal foramen in Polish females was twice as that of the male counterparts. The parietal foramen is also described to vary in shape in different literatures by different authors- circular/ rounded, oval, slit-like or irregular in shape measuring several millimetres/ centimeters in diameter. [10, 15, 16] However, the various morphometric parameters of the parietal foramen were not analysed in the present study, this being a great limitation of the present study.

Table 2: Comparison of the prevalence/ frequency of parietal foramen as observed by different workers (in %)-

Worker	Absent foramen	Unilateral parietal foramen	Bilateral parietal foramen
Boyd	39.6%	40.5%	19.9%
Murlimanju et al	12.1%	32.7%	55.2%
Yoshioka et al	40%	20%	40%
Present study	8.3%	29.2%	62.5%

V. Conclusion

Variations of the cranial emissary foramina may sometimes be associated with other congenital anomalies, therefore a thorough investigation should be done prior to any corrective intervention to rule out any accompanying congenital anomaly. Keeping in view the various differences in frequency, number, location, size and shape of the parietal foramen and also the structures passing through it, a thorough anatomical knowledge about the parietal foramen and its variations is a must for every clinician/surgeon dealing in the area to avoid complications.

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References

[1]. Standring S. Head and neck. In: Standring S, Borley NR, Collins P, Crossman AR, Gatzoulis MA, Healey JC, et al, editors. Gray's anatomy: the anatomical basis of clinical practice. 40th ed. London: Churchill Livingstone; 2008. P. 423-97.
[2]. Currarino G. Normal variants and congenital anomalies in the region of the obelion. AJR Am J Roentgenol 1976; 127(3): 487-94.
[3]. Freire AR, Rossi AC, De Oliveira VC, Prado FB, Caria PHF, Botacin PR. Emissary foramens of the skull: anatomical characteristics and its relations with clinical neurosurgery. Int J Morphol 2013; 31(1): 287-92.
[4]. Jamieson EB. Dixon's manual of human osteology. 2nd ed. London: Humphrey Milford; 1937.
[5]. Murlimanju BV, Saralaya VV, Somesh MS, Prabhu LV, Krishmurthy A, Chettiar GK, et al. Morphology and topography of the parietal emissary foramina in South Indians: an anatomical study. Anat Cell Biol 2015; 48: 292-8.
[6]. Wu YQ, Badano JL, McCaskill C, Vogel H, Potocki L, Shaffer LG. Haploinsufficiency of ALX4 as a potential cause of parietal foramina in the 11p11.2 contiguous gene-deletion syndrome. Am J Hum Genet 2000; 67: 1327-32.
[7]. Boyd GI. The emissary foramina of the cranium in man and the anthropoids. J Anat 1930; 65(1): 108-21.
[8]. Breathnach AS. Frazer's anatomy of the human skeleton. 6th ed. London: J&A Churchill Ltd; 1965.
[9]. Scheuer L, Black SM. The juvenile skeleton. Amsterdam: Elsevier Academic Press; 2004.
[10]. Mann RW, Manabe J, Byrd JE. Relationship of the parietal foramen and complexity of the human sagittal suture. Int J Morphol 2009; 27: 553-64.
[11]. Griessenauer CJ, Veith P, Mortazavi MM, Stewart C, Grochowsky A, Loukas M, et al. Enlarged parietal foramina: a review of genetics, prognosis, radiology and treatment. Childs Nerv Syst 2013; 29: 543-7.
[12]. Sicher H, DuBrul EL. Oral anatomy. 6th ed. Rio de Janeiro: Guanabara Koogan; 1977.
[13]. Wysocki J, Reymond J, Skarzynski H, Wroobel B. The size of selected human skull foramina in relation to skull capacity. Folia Morphol (Warsz) 2006; 65: 301-8.
[14]. Yoshioka N, Rhoton AL Jr, Abe H. Scalp to meningeal arterial anastomosis in the parietal foramen. Neurosurgery 2006; 58: ONS123-6.
[15]. Pereira GAM, Lopes PTC, Santos AMPV, Pozzobon A. Study of landmarks in dried skulls in a Brazil population. J Morphol Sci 2013; 30(2): 94-7.
[16]. O'Rahilly R, Twohig MJ. Foramina parietalia permagna. Am J Roentgenol Radium Ther Nucl Med 1952;67: 551-61.

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