

OSTEOTIC VARIATIONS IN PARACONDYLAR REGION OF ADULT HUMAN SKULLS – INCIDENCE AND CLINICAL SIGNIFICANCE

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ABSTRACT

Aim: In the paracondylar region(lateral to the occipital condyles)there might be morphological variation in the form of an anomalous foramina. This anomalous foramina may represent the course of an emissary vein in absence of posterior condylar canal or an aberrant course.

Material & Method: 82 dry adult skulls (164 sides), of Indian origin and of both the sexes formed the basis for this study. The region anterior, posterior and lateral to the occipital condyles was carefully examined for the presence of foramina. Complete foramina were only considered for this study. The patency was ascertained by passage of a probe through it.

Results: paracondylar foramina was observed in 12.1% specimens ,in 10.9% it was predominantly located on the left side and in 1.2% it was bilateral. No right sided paracondylar foramina was observed. Unilateral left sided Double hypoglossal canal was seen in 4.8% specimens . Posterior condylar canal was present in 9.7% out of which 6.0% were on the left side exclusively and 3.6% bilateral in position.

Conclusion: Misinterpretation may occur as neoplasm or an abnormal lymph node during radiodiagnosis Surgical procedures in this area such as paracondylar approach and far lateral supracondylar approach could be impacted upon by this.

KEYWORDS: Paracondylar Foramina; Double Hypoglossal Canal; Posterior Condylar Canal; Occipital Condyles; Skull.

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INTRODUCTION

On the cranial base anterior to the occipital condyles lies the anterior condylar canal or hypoglossal canal which transmits the hypoglossal nerve, meningeal branch of ascending pharyngeal artery and an emissary vein which connects basilar plexus with internal jugular vein. Occasionally this canal may be septated completely or partially by a spicule of bone. Posterior to the occipital condyles lies the condylar fossa which lodges the superior articular facet of atlas [1] , sometimes in this fossa lie foramina termed as posterior condylar foramina which may be complete or partial and when it is patent it transmits an emissary vein

and nerves. This emissary vein is called as posterior condylar vein which connects the sigmoid sinus with the sub occipital venous plexus[1], it communicates anteriorly with the jugular bulb or vein in the hypoglossal canal, and posteriorly with the vertebral venous plexus which lies in the condylar fossa [2] , while the nerve supply the duramater of the posterior cranial fossa . However, variations may occur in the form of groove or foramina in the paracondylar region (lateral to the occipital condyles) which merit documentation. This morphological diversity formed the basis for this study.

MATERIALS AND METHODS

A total of 82 dry adult skulls (164 sides), of Indian origin and of both the sexes were obtained from the Osteology section of Anatomy Department of LLRM Medical College, Meerut (UP). For the purpose of the study equipments like probe, digital vernier caliper, measuring tape, and digital photography camera were used. Skulls in deteriorated state were discarded. The region anterior, posterior and lateral to the occipital condyles was carefully examined for the presence of foramina. Complete foramina were only considered for this study. The patency was ascertained by passage of a probe through it. The positions of these foramina were also noted in the posterior cranial fossa. Digital vernier caliper was used to measure the transverse diameter of the anomalous foramina.

OBSERVATIONS

Out of the 82 skulls, in 10 skulls anomalous foramina was observed in the region between occipital condyles and jugular foramen, in 9 specimens it was unilaterally situated on the left side and in 1 skull it was situated bilaterally. The transverse diameter of these foramina was in the range of 2-3mm and all of them opened in the posterior cranial fossa, poster lateral to the jugular foramen, in the groove for sigmoid sinus. Unilateral right sided paracondylar foramina was



Fig 1: Bilateral patent paracondylar foramina.

		OSTEOIC VARIANT (n=82)					
		Paracondylar Foramina		Double Hypoglossal Canal		Posterior Condylar Canal	
		Number	Percentage	Number	Percentage	Number	Percentage
		10	-12.10%	4	-4.80%	8	-9.70%
Unilateral	right	-		-		-	
	left	9	-10.90%	4	-4.80%	5	-6.00%
Bilateral		1	-1.20%	-		3	-3.60%

Table 1: Incidence of osteoic variants.

not observed in any of the skull. Double hypoglossal canal was observed in 4 skulls and it was unilaterally located on the left side and the transverse diameter was 4mm. Results are tabulated in table 1.

DISCUSSION

Out of 82 skulls in 10 skulls (12.1%) there were complete anomalous foramina in the region between occipital condyles and jugular foramen ,Tuli et al[3] has reported a much higher incidence (19.4%), amongst these 3 skulls had a patent posterior condylar canal too. Hollinshead [4] has mentioned that the posterior condylar canal opens at the groove for sigmoid sinus, posterolateral to the jugular foramen in the posterior cranial fossa. These anomalous foramina also opened at the same location in posterior cranial fossa. This leads to the speculation that these anomalous foramina might be acting as additional source of drainage of intracranial veins into extracranial veins. In 7 skulls only patent anomalous foramina was observed in the paracondylar region and posterior condylar canal was absent, similar to the study by Manjunath [5] who coined the term paracondylar foramina. Such foramina suggest

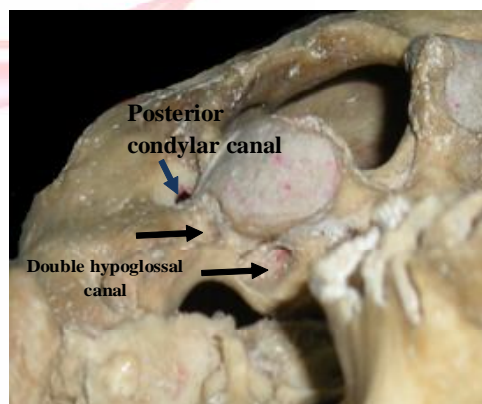


Fig 2: Double hypoglossal canal with Posterior condylar canal.

AUTHOR	PERCENTAGE
De Francisco et al 1990	19.70%
Bhullar et al 1998	28.12%
Wysocki et al 2004	43%
Zaidi et al 2011	12.50%
Jasbir et al 2012	6.00%
Roopali et al 2013	28%
Rao et al 2013	2%
Present study	1.20%

Table 2: Comparison of occurrence of double hypoglossal canal in different studies.

an abnormally placed posterior condylar canal or an abnormal course of the posterior condylar emissary vein. Unilateral paracondylar foramina was present 9 skulls (10.9%), this is consistent with 7.6% of Tuli et al[3]. Bilateral paracondylar foramina was observed in 1 skull (1.2%) (Fig 1), this contradicts the study by Tuli et al (11.8%). In 4 skull (4.8%) double hypoglossal canal was seen which was located on the left side, this variation shows a wide range in context to geographical and racial distribution as evident from the reported cases in available literature (table 2). Normally the hypoglossal canal lies anterior to the occipital condyles, it is directed laterally and forwards from the posterior cranial fossa. It transmits the hypoglossal nerve and meningeal branch of the ascending pharyngeal artery, and an emissary vein which connecting the intracranial basilar plexus with the extracranial internal jugular vein [6]. This canal may be divided partially or completely by a spicule of bone. The hypoglossal nerve emerges as rootlets attached to the anterolateral sulcus of medulla, and then courses laterally behind the vertebral artery in the form of two bundles which perforate the duramater separately opposite the hypoglossal canal in the occipital bone. After traversing the canal they unite and appear as a single bundle. Embryologically, the nerve originates from several segments and in the event of failure of union of the two bundles it may result in the division of canal being into two (Fig 2).

CONCLUSION

Incidence of paracondylar foramina is low yet its knowledge is significant from surgical and radiological point of view. Surgical procedures in this area, such as the paracondylar approach (which is directed through the area lateral to the occipital condyles) and the far lateral supracondylar approach, could be impacted upon by this variation. Such a variation can be misinterpreted in radiodiagnosis [7]. Although there are no clinically reported case but a double hypoglossal canal predisposes the roots of hypoglossal nerve to entrapment in the occipital bone during ossification, and subsequently lead to an alteration in the tongue movement and speech.

Conflicts of Interests: None

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