

ORIGINAL ARTICLE

Posterior Condylar Foramen: A Study on Dried Adult Pakistani Skulls

ALIYA ZAHID, MUHAMMAD WAJAHAT KHAN, BRISHNA KHAN

¹Associate Professor Anatomy, Allama Iqbal Medical College, Lahore, ²4th yr MBBS Student, Central Park Medical College, Lahore, ³3rd yr MBBS student, Shalamar Medical and Dental College, Lahore.

For Correspondence: Dr Aliya Zahid, Associate Professor Anatomy, AIMC, Lahore. 27, A1 Johar Town Lahore. 03334219025 draliyaimtiaz@gmail.com

ABSTRACT

Posterior condylar foramen is among the largest emissary foramina of the human skull. It opens in the floor of a condylar fossa situated behind the occipital condyles of occipital bone on base of skull on either side of foramen magnum

Type of study: Descriptive cross sectional study

Objectives: To study the incidence and morphology of posterior condylar foramen in dried skulls of cadavers of Pakistani population.

Materials and Method: This study was carried out in Anatomy departments of Khawaja Muhammad Safdar Medical College Sialkot and Allama Iqbal Medical College Lahore. For this purpose, 78 adult skulls (156 sides) were included irrespective of age and sex. They were closely observed for presence of posterior condylar foramina. Their patency was checked by a probe and their intracranial openings were also noted

Results: It was observed that out of 78 skulls, 26(33.3%) showed unilateral posterior condylar foramen (9 on left side and 17 on right side), 48 (61.6%) skulls had bilateral posterior condylar foramina and 4 (5.1%) skulls had no posterior condylar foramen. Out of 9 left sided posterior condylar foramina, 4 are patent and rest are not patent. On right side, 13 are patent and only 4 are blind. It was also observed that out of total 72 patent posterior condylar foramina, 44 (61%) (had openings in sigmoid sinus sulcus in posterior cranial fossa (intrasinus type) and 28 (39%) had retrosinus openings (posterior to sigmoid sinus sulcus).

Conclusion: Knowledge of anatomical variations of the posterior condylar foramina are clinically important as they are one of the significant anatomical landmarks for surgical approaches through foramen magnum and during surgical resection of tumours or other space occupying lesions from the cranial base. Since no such data about posterior condylar foramina is available in Pakistani population, this study may be of crucial importance to neurosurgeons, radiologists and anatomists.

Key words: Posterior condylar foramen, Pakistani population, dried skulls

INTRODUCTION

Posterior condylar foramen is one of the largest emissary foramen of the posterior cranial fossa. It opens in the condyloid fossa of the lateral parts of occipital bone behind the occipital condyle at the base of skull. Also termed as condylar canal it is present posterior to the hypoglossal canal and posteroinferior to the jugular foramen¹. This foramen can be either unilateral or bilateral and may or may not be patent. The patency depends upon the emissary vein that passes through it. The emissary vein passing through it is called as the posterior condylar vein. The posterior condylar vein connects the veins present in the suboccipital triangle with that of the sigmoid sinus². The posterior condylar vein courses between the superior bulb of the internal jugular vein and deep

cervical vein. It also communicates with the horizontal portion of the vertebral artery venous plexus³.

Emissary veins are thought to be the output veins of the neurocranium and drain venous blood from cephalic region. These veins are valveless and allow the blood flow in both directions. In normal condition, blood flow through these veins is slow but in cases of increased intracranial pressure, the emissary veins play crucial role in drainage of blood^{4,5}. Posterior condylar foramen may transmits occipital emissary veins connecting sigmoid sinus and suboccipital venous plexus⁶. Condylar canal may be described as permanent venous emissary channel, with a prevalence of up to 100%⁷. Apart from veins, posterior condylar canal also transmits meningeal branches of the

occipital artery and the nerves, which supply the dura mater of the posterior cranial fossa⁸.

The condylar canal is the source of venous circulation during the embryonic period and provides connection between endovenous and exocranial systems. At approximately 3rd month of development, the mastoid and anterior and posterior condylar emissary veins are easily discernible⁹. Subsequently, the venous system atrophies from fetal to neonatal circulation. This atrophy which is accompanied by venous closure of the bony canal, however, persists for at least 70% of the adult skulls unilaterally¹⁰.

Posterior condylar vein, is one of the major posterior fossa emissary veins of clinical importance. Recognition of posterior condylar canal helps to avoid misinterpretation in imaging investigations of tumors in the jugular area, enlarged lymph nodes and abnormal blood vessels. So the knowledge of this anatomical variant may be of crucial importance for radiologists to avoid misinterpretation of radiographs, neurosurgeons during surgery of the cranial base and anatomists for its variations.

MATERIALS AND METHODS

This study was carried out in Anatomy departments of Allama Iqbal Medical College

Lahore and Khawaja Muhammad Safdar Medical College Sialkot. For this purpose, 78 adult skulls (156 sides) were included irrespective of age and sex. The skulls were closely observed for the presence of posterior condylar foramina. Their patency was checked by passing a probe through these foramina. Their openings in the posterior cranial fossa were also noted.

RESULTS

It was observed that out of 78 skulls, 48 (61.6%) skulls had bilateral posterior condylar foramina, 26 (33.3%) showed unilateral posterior condylar foramen (9 on left side and 17 on right side) and in 4 skulls (5.1%) posterior condylar foramen were not found on any side. Out of 9 left sided posterior condylar foramina, 4 are patent and rest are blind and showed no opening in posterior cranial fossa. On right side, 13 foramina are patent and only 4 are blind. It was also observed that out of total 72 patent posterior condylar foramina, 44 (61%) had openings in sigmoid sinus sulcus in posterior cranial fossa (intrasinus type) and 28 (39%) had retrosinus openings (posterior to sigmoid sinus sulcus).

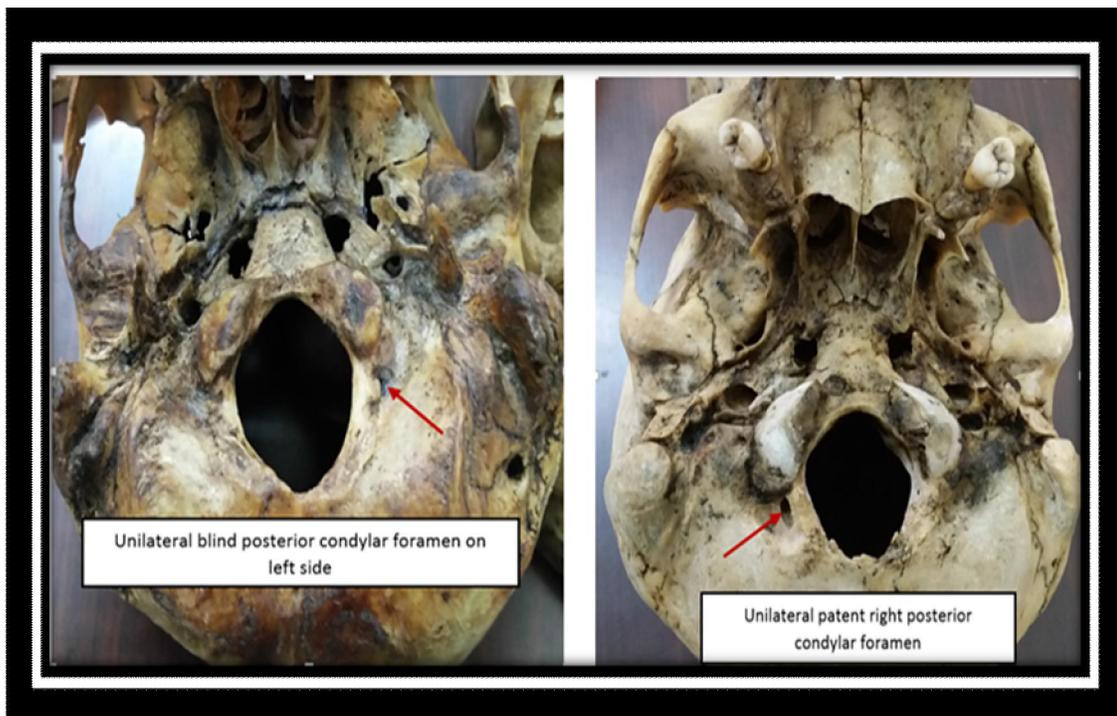


Fig. 1: Unilateral posterior condylar foramina

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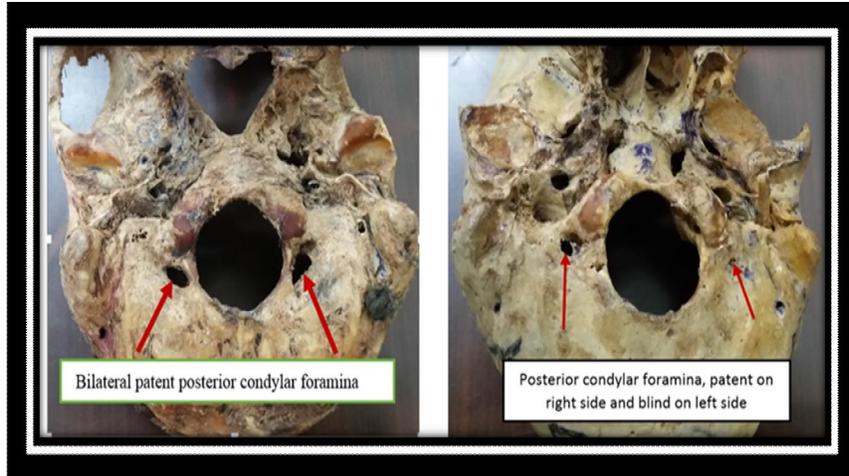


Fig. 2: Bilateral posterior condylar foramina



Fig. 3: Posterior condylar foramen absent on both sides

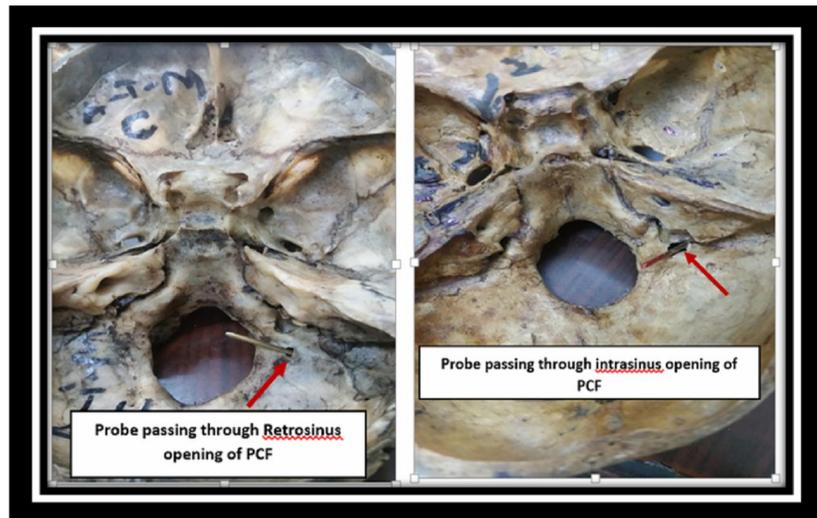


Fig. 4: Two types of openings of PCF in posterior cranial fossa

Table 1: Showing incidence of posterior condylar foramen in dried skulls of Pakistani adults

Incidence of Posterior condylar Foramina (PCF) in dried skulls of Pakistani adults			
Total Skulls (78) (156 sides)	Unilateral PCF		Bilateral PCF
	26 skulls (33.3%)		
	Right side	Left side	48 skulls (61.6%) (97 Sides)
	17	9	One skull showed double PCF right side
			4 skulls (5.1%) (8 sides)

DISCUSSION

The posterior condylar foramen is a communication between the jugular foramen and the condylar fossa, situated just posterior to the occipital condyles on either side of the foramen magnum. The posterior condylar vein exits the skull through this foramen¹¹. Present study is conducted to find out the incidence of posterior condylar foramina in Pakistani population (Table 1). In present study, their patency and intracranial openings were also noted and compared to the different studies in the world (Table 2).

In a study, posterior condylar canals were identified in 36 of 50 sides in dry bones¹². Similarly PCF were shown in 75.5% of skulls in another study¹³ and absent in 33 sides (33%)¹⁴. In another study, posterior condylar foramen was absent unilaterally in 27% of specimens and bilaterally in 17% of the skulls so the posterior condylar canal may not be used as a constant landmark¹⁵. It was observed in a study that posterior condylar canal was present in 9.7% out of which 6.0% were on the left side exclusively and 3.6% bilateral in position¹⁶. It was found in a study that the posterior condylar canal was doubled in six of the 144

patent foramina (4%) and tripled in one case¹⁷. In a study, the posterior condylar canal (PCC) was doubled on the right side and there was only one on the left side¹⁸.

The posterior condylar canal was classified as intrasinus type if it opens into sigmoid sulcus and retrosinus type if it opens behind the sigmoid sulcus. In present study 61% of patent PCF had openings in sigmoid sinus sulcus in posterior cranial fossa (intrasinus type) and 39% had retrosinus openings (posterior to sigmoid sinus sulcus). In a study, intrasinus was the most prevalent form present bilaterally in 60.94% of the skulls. It was shown that there were 12.5% cases of intrasinus type on the right side and 9.37% on the left. In 7.81% skulls retrosinus form was found on right side and 9.37% on the left¹⁹. In another study, it was in a study of posterior condylar foramina that intrasinus form was present in 24.6% bilaterally, 17.8% on the right side and 13.5% on the left where as retrosinus form was found 1.2% bilaterally and 1.2% unilaterally on the right side²⁰.

Table 2: Showing incidence of PCF in different studies

	Author/year	Absent PCF (%)	Unilateral PCF (%)	Bilateral PCF (%)
1	Krause W ¹ /1988	-	38%	21%
2	Ginsberg LE ¹¹ /1994	26.5%	17.6%	55.9%
3	Muthukumar N ²¹ et al /2005	-	40%	-
4	Tanoue S ¹⁴ et al /2010	33.3%	-	-
5	Avci E et al ¹⁵ / 2011	17%	27%	66%
6	Chauhan K et al ¹⁶ / 2013	-	6%	3.6%
7	Kavitah S & Anand A ⁸ /2013	5.76%	21.1%	78.9%
8	Goda J et al ¹⁹ /2013	9.38%	20.31%	70.31%
9	Kothandaraman U et al ² /2015	74%	10%	16%
10	Present study/2015	5.1%	33.3%	61.6%

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