

STUDY OF INCIDENCE, LATERALITY AND PATENCY OF THE POSTERIOR CONDYLAR CANAL IN 100 DRY HUMAN SKULLS

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ABSTRACT

Background: The posterior condylar foramina are the largest of the emissary foramina's present in the human skull. The posterior condylar canal transmits the posterior condylar emissary vein and it acts as a route for venous circulation between extracranial venous system and intracranial venous sinuses. It also acts as a channel for spread of infection. Due to its varied clinical implications and to get a better knowledge about the canal this study was taken up.

Objectives: To determine the variations in the occurrence of posterior condylar canal with respect to incidence, laterality, patency and if patent whether intrasinus or retrosinus.

Materials and methods: An observational study was carried out on 100 dry human skulls obtained from the department of anatomy, Kempegowda Institute Of Medical Sciences, Bangalore, India. The posterior condylar canal was observed and noted. The patency was ascertained by passing a probe and care was taken to note whether the canal opened intrasinus or retrosinus.

Result: The posterior condylar canal was found to be present in 90% of the skulls. The incidence of bilateral presence was more than the unilateral presence. 82.22% of the canals were patent with the intrasinus type being the most prevalent.

Conclusion: The knowledge of the posterior condylar canal and its variations is important for the radiologist, neurosurgeons, ENT surgeons operating in this area.

KEYWORDS: Posterior condylar canal, Emissary vein, Venous sinuses, Retrosinus, Intrasinus.

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INTRODUCTION

Emissary foraminas are apertures present in the crania that transmit emissary veins which connect the extracranial venous system with the intracranial venous sinuses. The posterior condylar foramina is the largest of the emissary foraminas present in the human skull [1]. The

foramina opens into the posterior condylar canal which is present in a depression immediately posterior to the occipital condyle. It transmits the posterior condylar emissary veins which connects the sigmoid sinus with the suboccipital venous plexus [2]. It also transmits the meningeal branch of occipital artery [3]. The

emissary veins act as an alternative pathway for venous drainage during conditions of venous obstruction and may also act as channel for spread of infection to intracranial venous sinuses [4,5]. An enlarged posterior condylar emissary vein may be one of the causes for pulsatile tinnitus [6]. Anatomical variations of posterior condylar emissary veins and the canal therefore has clinical significance. Hence the present study has been taken up to determine the anatomical variations of the posterior condylar canal.

MATERIALS AND METHODS

An observational study was carried out on 100 dry human skulls obtained from the Department Of Anatomy, Kempegowda Institute Of Medical Sciences, Bangalore, India. The study was done to determine the variations in the occurrence of posterior condylar canal with respect to incidence, laterality and patency and if patent whether intrasinus or retrosinus.

The posterior condylar canal was observed and the patency was noted by passing a probe through the canal. Care was taken to note whether the canal opened intrasinus (if opened into sigmoid sulcus) or retrosinus (if opened behind sigmoid sulcus). Photograph of each skull was taken using a digital camera. The data thus obtained was tabulated and analysed using Microsoft excel worksheet.

RESULTS

Results of the present study has been shown in table 1.

Table 1: Results obtained from the study.

Incidence	Presence of foramina- 90 (90%)	Absence of foramen- 10 (10%)
Laterality	Bilateral- 62 (68.8%)	Unilateral- 28 (31.1%) Right sided -14(50%) Left sided - 14 (50%)
Patency	Present- 74 (82.22%)	Absent- 26 (28.88%)
Intrasinus	Bilateral- 26 (39.39%)	Unilateral- 40 (60.60%) Right sided- 20 (50%) Left sided- 20 (50%)
Retrosinus	Bilateral- 4 (66.66%)	Unilateral- 2 (33.33%) Right sided- 1 (16.66%) Left sided- 1 (16.66%)

Fig.1: Bilateral absence of foramen.



Fig.2: Bilateral presence of foramen.



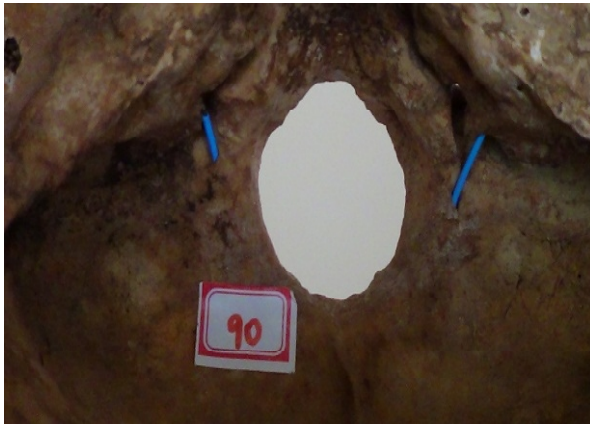
Fig. 3: Unilateral foramen- left



Fig. 5: Patency of foramen- external



Fig. 6: Patency of foramen - Left intrasinus, Right retrosinus



DISCUSSION

During embryonic period the posterior condylar canal acts as an important route for venous circulation connecting intracranial venous sinuses with extracranial venous system [7]. With gradual change from foetal to neonatal circulation this venous system atrophies leading to the closure of the venous bone tunnel [8]. Failure of closure will lead to persistence of the posterior condylar canal in adult skulls.

The posterior condylar canal was identified in 73.5% of the skulls and 81% of CT images in the study by Ginsberg [9]. It was found in 76.9% of the skulls in the study by Boyd [1]. Boryslawski [10] found the presence of the foramen to be in approximately 90% of the Polish skulls. The incidence of the foramen in the study by Jatin Goda and Kavitha et al was 90.6% and 94.2% respectively [5,11]. In the present study the incidence of posterior condylar canal in South Indian skulls was found to be 90%. The present study correlates with the study done by Boryslawski, Jatin Goda and Kavitha et al. A knowledge of high incidence of the foramen should be kept in mind by the operating surgeons while performing a lateral transcondylar approach. As this approach involves extensive dissection of the paracondylar region and this may cause serious injuries to the neurovascular structures present [12].

The presence of unilateral foramen was found in 20.3% of the skulls by Boyd [1], 17.6% of the skulls by Ginsberg [9], 30.8% of the skulls by Galarza [8] and 21.1% of the skull by Kavitha [11]. In the present study unilateral presence of the foramen was noted in 31.1% of the skulls,

fig.3, 4. In the presence of unilateral foramen more orientation was seen on the right side than the left side in the study by Boyd (right-16.5%, left-13.8%) [1] and also in the study by Galarza (right-17.8%, left-13.5%) [8]. In the study by Kavitha left sided foramen (61.3%) was noted more often than right sided foramen (38.7%) [11]. Unilateral posterior condylar canal was evenly distributed between left and right side in the study by Ginsberg [9]. The findings of Ginsberg is similar to the findings obtained in the present study wherein unilateral canal is equally present on both right and left side with a percentage of 50 each.

Ginsberg [9] found the foramen to be bilaterally present in 55.9% of the skulls, Boyd [1] found the foramen bilaterally in 46.6%, Kavita [11] in 78.9% and Galarza [8] in 30.8% of the skulls. In the present study bilateral presence of the foramen was found in 68.88% of the skulls, fig.2. In the present study preponderance towards bilateral foramen is seen when compared to unilateral foramen. In movements occurring at the atlanto occipital joint the superior articular facet of the atlas accommodates itself in the fossa through which posterior condylar canal passes [2]. Under such conditions there is risk of impingement of structures passing through the canal.

Kavitha [11] found patent foramen in 62.58% of the skulls and it was more on the right side (69.5%) than the left side (30.4%). In the present study patent foramen was found in 82.22% of the skulls. Right sided patency was seen in 70.27% and left sided patency in 71.62% of the skulls.

When the canal was patent intrasinus type was found in 71.88% of the skulls in the study by Goda J [5]. Bilateral presence of intrasinus type was noted in 60.94% of the skulls. 12.5% of intrasinus type was seen on right side and 9.37% was found on left side. Retrosinus type was found in 8.59% of the skulls. Right sided retrosinus form was found in 7.8% and left sided was noted in 9.37% of the skulls. In the study by Galarza [8] intrasinus form was found bilaterally in 24.6%. It was found in 17.8% of the skulls on right side and 13.5% of the skulls on left side. Retrosinus form was found bilaterally in 1.2% of the skulls. Right sided

unilateral presence was found in 1.2% of the skulls. In the present study intrasinus type was the most prevalent. It was found in 89% of the skulls. Bilateral presence was seen in 39.39% and unilateral presence was noted in 60.60% of the skulls. Retrosinus type was seen in 8.10% of the skulls. Bilateral presence was noted in 66.66% and unilateral presence in 33.33%. In the presence of unilateral foramen both intrasinus and retrosinus was found to be evenly distributed between right and left side. In 1 specimen right sided intrasinus and left sided retrosinus was noted. In another specimen right sided retrosinus and left sided intrasinus was noted, fig.6. The retrosinus canal was found to be tortuous. Hence potential misinterpretation of this canal may occur during different imaging techniques [8]. Hence a thorough anatomical knowledge of the posterior condylar canal is essential prior to performing interventions in this area so as to avoid grave post surgical complications.

CONCLUSION

Variations in the posterior condylar canal may be associated with variations in posterior condylar emissary vein, which may be wrongly considered as pathological. Hence the anatomical knowledge of the posterior condylar canal and its variations is important for the neurosurgeons, ENT surgeons, radiologist and anthropologists.

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Conflicts of Interests: None

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