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Original Research Paper

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# ANATOMICAL STUDY OF POSTERIOR CONDYLAR CANAL IN ADULT DRY HUMAN SKULL AND ITS CLINICAL IMPORTANCE

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## ABSTRACT

**Background:** The posterior condylar canal is a skull base canal seen during the study of Norma basalis externa. It is located within the condylar fossa posterior to the occipital condyles. The canal transmits an emissary vein connecting sigmoid sinus with the sub occipital venous plexus.

**Objectives:** The aim of our study is to determine the incidence, side predominance, patency and other anatomical variation of posterior condylar canal.

**Materials And Methods:** The present study was conducted in 205 dry human skull obtained from department of Anatomy, N.S.C.B. Medical college Jabalpur (M.P.). Each skull was examined for the presence or absence of the canal, Patency of canal, and any other variations according to standard method.

**Result:** In our study we found that 89% skull posses posterior condylar canal. The incidence of bilateral presence of canal is more (68%) than unilateral (22%). Intrasinus form of posterior condylar canal was 68% and retrosinus form was 26% of total skulls.

**Conclusion:** To conclude that our study provides detailed data about the incidence, side predominance & patency about posterior condylar canal in Mahakoshal Region of central India. Our study gives basic knowledge to the clinicians and surgeons before planning a surgery in the occipital condylar regions.

**KEYWORDS :** Posterior Condylar Canal, Intrasinus , Retrosinus.

## INTRODUCTION:

The Anatomical definition of canal is a tubular passage that connects the one part of body to another part while Foramen is described as simple hole in the bone[1]. For shake of convenience we use both terminology synonyms sly. When we study the most posterior part of norma basalis externa, the most prominent bony landmarks are foramen magnum and occipital condyles. Anterior to occipital condyles the bony canal is known as anterior condylar canal or commonly termed as Hypoglossal canal. Posterior to occipital condyles the bony canal is termed as posterior condylar canal or Condylar canal [2]. We also able to recognize the foramen through posterior cranial fossa (study of skull internally as Norma basalis interna). It is apparent just postero inferior to the jugular foramen and posterior to the hypoglossal canal[3]. The Condylar canal transmits an emissary vein connecting the sigmoid sinus to the sub occipital venous plexus which is one of the content of suboccipital triangle. The condylar emissary vein also drains into the deep cervical and vertebral plexus of veins [4].

The posterior condylar canal has a variable presence and patency. If canal opens into sigmoid sulcus completely by inserting a probe or a steel wire it is termed as intrasinus. But in many cases the patency is not complete then we call as retrosius [5]. The posterior condylar canal may also present itself as a doubled entity[6]. Many canals exist in and around the occipital condyles which are grouped as paracondylar canals[7]. These paracondylar canals when patent transmit emissary veins which can communicate with other veins[7]. The posterior condylar canal also transmits meningeal branches of the occipital artery. Identification of posterior condylar canal and its role as an alternative source of venous drainage from the brain will help to avoid misinterpretation.[8]

Compression of structures passing through the foramen can occur during movements of the atlanto occipital joint because the posterior margin of the atlas fits itself into the condylar fossa when the neck is fully extended. Such pressure on neurovascular structures can result in clinical symptoms [3].

## MATERIALS AND METHODS:

This study was conducted in the Department of Anatomy N.S.C.B. Medical College, Jabalpur (M.P.). The present study consisted of 205 adult human cleaned and dried skull collected from Department of Anatomy N.S.C.B. Medical College, Jabalpur (M.P.). All the selected skulls were serially numbered and photographed. The specific age and sex characteristics of the bones studied are unknown. The study was done to determine the variations in the occurrence of posterior condylar canal with respect to incidence, side predominance and patency and if patent whether intrasinus or retrosinus. [5]

We also examined the other variations of foramen such as presence of multiple foramina, double foramina in each skull. The following parameters were studied:

### Presence Or Absence Of Canal:

All the Skulls were examined vigilantly for the presence of canal. First with naked eye and also with the help of magnifying hand lens we examined both sides of occipital condyles and note down all the variations of condylar canal if present or absent. Whether unilateral or bilateral .We also observed presence of double foramina or tiny multiple foramina around the condylar fossa.

Patency:

By inserting a probe we note down the patency of each condylar canal:

According to patency we divide the canal in to two types:

Intrasinus: The canal was classified as intrasinus type if it opens into sigmoid sulcus. Retrosinus: if it opens behind the sigmoid sulcus.

### Statistical Analysis:

The data obtained was tabulated and analysed using Microsoft excel worksheet.

## RESULTS:

The results were analyzed and tabulated. In our present study 205 skulls were studied. Out of 205 skulls we observed posterior condylar canal in total 183 skulls (bilaterally 114 and unilaterally 55skull) with an incidence of 89%. In 22 skulls we did not found any foramina on both sides. (Table 1). The intrasinus type of canal was observed in total 140 skull (68%) while retrosinus type was in 49 skulls (26%). (Table 2). We also found other anatomical variations in 05 skulls. (Table 3).

**Table: 1 Presence Of Canal**

| Number of Skull Studied | Number of skull | Percentage |
|---|---|---|

| | | |
|---|---|---|
| Bilateral Presence | 114 | 67.4% |
| Right Unilateral | 33 | 19.5% |
| Left Unilateral | 22 | 13.0% |
| Bilateral Absence | 31 | 15.5% |
| Other variations | 05 | 2.5% |
| Total number of Skull = 205 | | |

**Table: 2 Percentages Of Intrasius Type And Retrosinus Type**

| Type | Number of Skull | Intrasinus | Retrosinus |
|---|---|---|---|
| Bilateral | 114 | 72(63.15%) | 22(19.29%) |
| Right Unilateral | 33+20 | 40(75.47%) | 13 (24.52%) |
| Left Unilateral | 22+20 | 28 (66.66%) | 14(33.33%) |

**Table: 3 Variations Observed**

| Variations | Number of Skull |
|---|---|
| Small multiple foramina seen | 02 |
| Accessory foramina seen | 02 |
| Right posterior condylar canal opens into Right Hypoglossal canal | 01 |

## DISCUSSION:

The transcondylar fossa approach is considered to be the first choice for lesions of the vertebral artery or those anterior to the medulla oblongata. It is a good approach for viewing lesions in the middle and lower clivus through the supero-medial direction of the surgical microscope. This approach is now using it for the surgery of VA-PICA aneurysms, glossopharyngeal neuralgia, and tumors around the hypoglossal canal. The most important procedure in this approach is the drilling of only the condylar fossa, and the posterior condylar canal and the emissary vein in the canal both play an important role as anatomical landmarks in differentiating between the jugular tubercle and the occipital condyle from outside. Nowadays a number of microsurgical investigations are done to analyze the microanatomy of posterior condylar canal and the emissary vein using cadaveric specimens, dry skulls, and CT images. Posterior condylar canal and the emissary vein can be useful anatomical landmarks to differentiate the transcondylar fossa approach from the transcondylar approach, thus preventing unnecessary injury of the atlantooccipital joint.[9,10,11,12] .Condylar canal serves to function as a bridge of communication from the intracranial to extracranial space. Variations of the condylar canal are extremely prevalent and can present as either bilateral, unilateral, or completely absent. Anatomical variations of the condylar canal pose as a potential risk to surgeons and radiologist during diagnosis as it could be misinterpreted for a glomus jugular tumor and require surgical intervention when one is not needed.[8]

The condylar canal transmits emissary veins which connect vertebral venous plexus to the sigmoid sinus. During surgical procedures in this region, emissary veins passing through condylar canal can be damaged accidently if present. In cases of achondroplasia and complex cranial synostosis, there may be an obstruction at the Juglar foramen level leading to decreased sigmoid-jugular venous flow and consequently increased venous flow in the posterior condylar vein. Failure to appreciate this fact can lead to fatal complications during surgery.[9,10]

Comparing the present study with past studies: Krause discovered condylar canal was present bilaterally in 21% and unilaterally in 38%.[13] Ginsberg found this channel bilaterally in 55.9% and 17.6% unilaterally.[14] Boyd found this channel 77% unilaterally[15]. Kavitha observed bilateral presence of foramen in about 78% of skull and unilateral in 22% cases.[16] Our present study match more with study done by Kavitha. We also observed bilateral presence of canal in 68% cases and unilateral in 22%. (image 1)

**Image No.1- Bilateral Presence Of Condylar Canal**

Galarza found intrasinusal form 24.6% bilaterally, 17.8% on the right side and 13.5% on the left where as retro sinus form he found 1.2% bilaterally and 1.2% unilaterally on the right side.[17] Goda J found intrasinusal type was in 71.88% of the skulls. Bilateral presence of intrasinus type was noted in 60.94% of the skulls. 12.5% of intrasinusal type was seen on right side and 9.37% was found on left side. Retrosinusal type was found in 8.59% of the skulls. Right sided retrosinusal form was found in 7.8% and left sided was noted in 9.37% of the skulls.[18] In our study we observed intrasinus type of canal on both sides in total 63% of skull while retrosinus in 23% of skulls. Right sided intrasius type was found in75% skull and same side retrosinus was in 25% skull. Left sided intrasius type was found in 66% skull and same side retrosinus was in 33% skull. (image 2)

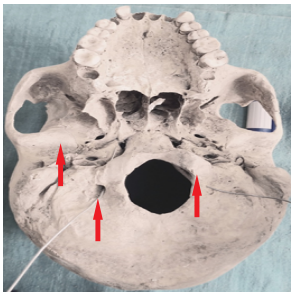

**Image No.2- Intrasinus Type Of Opening On Right Side**

Berge & Bergman found that the posterior condylar canal was doubled in six of the 144 patent foramina (4%). [6] our present study also found some anatomical variations in 05 skulls out of 205. (2.7%). (image 3)

**Image No.3- Right Posterior Condylar Canal Open Into Right Hypoglossal Canal (Presence Of Anatomical Variation)**

## CONCLUSION:

The results on the posterior condylar canal incidence, side predominance and patency are more consistent with previous study done by Kavitha et al. So our present study will serve as a bench mark as it pertains to Indian ethnicity and thorough knowledge of the surgical anatomy of this region and its reported variations should be disseminated to surgeons who perform difficult and complicated surgical procedure.

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