



MORPHOLOGICAL AND MORPHOMETRIC STUDY OF HYPOGLOSSAL CANAL AND ITS CLINICAL IMPORTANCE

Anatomy

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ABSTRACT

INTRODUCTION: The skull is the most modified part of the axial skeleton. It's a skeletal complex adapted to protect the brain, special senses and cranial nerves. A study of skull and its foramina provides information about the evolutionary history of man. The hypoglossal canal is a permanent element of human skull. [2] The hypoglossal canal is situated above the occipital condyle at its junction of anterior one third and posterior two third and lies a little above and anterolateral to foramina magnum. It is also known as anterior condylar canal. It transmits hypoglossal nerve, meningeal branch of ascending pharyngeal artery and an emissary vein from the basilar plexus internally and to the internal jugular vein externally. The hypoglossal canal transmits the nerve that supplies the motor innervations to the tongue. Studies on morphometry of hypoglossal canal and its variation are important clinically considering pathological symptoms like fracture of the occipital bone, intracranial and extra cranial neoplasm and congenital defects. It will be useful for anthropologists, surgeons and radiologists. **AIM AND OBJECTIVE:** To do the morphometric study of hypoglossal canal because knowledge regarding various parameters of hypoglossal canal are helpful to neurosurgeons during various surgeries, Radiologists and Anatomists. To prevent injuries to important structures during cranial surgeries. **MATERIALS AND METHODS:** This study was done on 24 skulls in Department of Anatomy of Osmania medical college, Koti, Hyderabad. The skulls with visible trauma, pathology and fractures were excluded from study. During this study the parameters of Hypoglossal canal which were measured are anteroposterior diameter and transverse diameter from both exocranial aspects and endocranial aspects, presence and absence of double hypoglossal canal, distance of hypoglossal canal from occipital condyle. The distances were measured and photographed. The results were analysed and compared to previous studies. **RESULT:** In the present study, bilateral double hypoglossal canal was found in 12% and unilateral in 29% of 24 dry skulls. Anteroposterior diameter and transverse diameter from exocranial aspect of right side is 0.7×0.6 (in cm) of left side is 0.7×0.5 (in cm). Anteroposterior diameter and transverse diameter from endocranial aspect of right side is 0.74×0.53 (in cm) of left side is 0.72×0.51 (in cm). The distance of hypoglossal canal from occipital condyle from right side is 0.65 ± 0.12 , left side is 0.63 ± 0.12 (in cm). **CONCLUSION:** Detailed morphometric analysis of hypoglossal canal will help in planning of surgical intervention of skull base in safer and easier ways. Double hypoglossal canal is important clinically, it may trap the hypoglossal nerve during ossification of occipital bone and useful for Neurosurgeons and radiologists and anthropologists

KEYWORDS

HYPOGLOSSAL CANAL, ANTERIOPOSTERIOR AND TRANSVERSE DIAMETER, EXOCRANIAL, ENDOCRANIAL, OCCIPITAL CONDYLE.

INTRODUCTION :

The skull is the most modified part of the axial skeleton. It's a skeletal complex adapted to protect the brain, special senses and cranial nerves. The hypoglossal canal is a permanent element of human skull. [2] The hypoglossal canal is situated above the occipital condyle at its junction of anterior one third and posterior two third and lies a little above and anterolateral to foramina magnum. It is also known as anterior condylar canal. It transmits hypoglossal nerve, meningeal branch of ascending pharyngeal artery and an emissary vein from the basilar plexus internally and to the internal jugular vein externally. The venous plexus is a dominant component of this canal. [2] Sometimes it is divided by a spicule of bone leading to variant as double hypoglossal canal. A few cranial variants have been a subject of study by many pioneering workers. Many such variants have been observed on a racial basis also by Berry and Berry. [5] This was of considerable ethnic but lesser forensic interest. Berry made a special study of non metric variants including double hypoglossal canal. [5] The present study is undertaken to study the anteroposterior and transverse diameter from both exocranial and endocranial aspect.

MATERIAL AND METHODS:

This study was done on 24 skulls in Department of Anatomy of Osmania medical college, Koti, Hyderabad. The skulls with visible trauma, pathology and fractures were excluded from study. During this study the parameters of Hypoglossal canal which were measured are anteroposterior diameter and transverse diameter from both exocranial aspects and endocranial aspects, presence and absence of double hypoglossal canal, distance of hypoglossal canal from occipital condyle. The distances were measured and photographed. The results were analysed and compared to previous studies.

RESULT:

In the present study, bilateral double hypoglossal canal was found in

12% and unilateral in 29% of 24 dry skulls. Anteroposterior diameter and transverse diameter from exocranial aspect of right side is 0.7×0.6 (in cm) of left side is 0.7×0.5 (in cm). Anteroposterior diameter and transverse diameter from endocranial aspect of right side is 0.74×0.53 (in cm) of left side is 0.72×0.51 (in cm). The distance of hypoglossal canal from occipital condyle from right side is 0.65 ± 0.12 , left side is 0.63 ± 0.12 (in cm).

DISCUSSION:

Adequate anatomical knowledge of hypoglossal canal and its related bony, neural, and vascular structures is essential for surgery of lesions involving skull base area. Hypoglossal canal is related superiorly to jugular tubercle, superolaterally to jugular foramen, laterally to sigmoid sinus & inferiorly to occipital condyle. [7]. The morphometric study of hypoglossal canal will be helpful for the planning of surgical intervention around the base of skull during surgical procedures such as transcondylar, supracondylar & lateral suboccipital approaches [8]. It is important for the surgeon to anticipate the depth of HC when drilling into OC during surgical procedures [9].

In the present study, bilateral double hypoglossal canal was found in 12% and unilateral in 29% of 24 dry skulls. Zaidi SHH et al [3] studied 40 adult dry skulls of North Indian population and found that the incidence of double hypoglossal canal was 12.5%. They reported bilateral double hypoglossal canal in only 5% cases and unilateral in 7.5% cases. Wysocki J et al [10] found double hypoglossal canal in 43% of human skulls. Karur et al [11] studied 100 adult dry skulls of North Indian population and found that the incidence of double hypoglossal canal was 10.5%. Jacob M et al [12] studied 60 skull bones of South Indian population and reported double hypoglossal canal only in 12 skulls. In 20% of cases 4 were bilateral and 8 were unilateral. Bhuller et al [13] observed that the hypoglossal canal was divided into

two canals by a small bony spicule in 28.12% of cases, Osunwoke EA et al [14] studied 79 dry skulls of Nigerian origin and reported that the incidence of double hypoglossal canal was 25.31% cases. Various studies compared with present study.

In the present study, anteroposterior and transverse diameter from exocranial aspect is 7.2x6 mm on right side and 7.3x5.7 mm on left side. The anteroposterior and transverse diameter from endocranial is 7.4x5.3mm on right side and 7.2x5.1 mm on left side. The study done by Kizilkanat ED et al [17] on adult Turkish skulls reported that the mean intracranial & extracranial diameter of HC were 6.5 and 6.6mm respectively. Berge JK et al [18] showed a intracranial & extracranial diameter were 4.66 & 5.51 mm respectively. The distance of canal from occipital condyle on right side is 6.5 mm and on left side is 6.3mm.

TABLE 1: ANTEROPOSTERIOR DIAMETER X TRANSVERSE DIAMETER (in cm) FROM EXOCRANIAL ASPECT.

S.no	NAME OF THE STUDY	AP DIAMETER X TRANSVERSE DIAMETER (in cm)	
		RIGHT	LEFT
1.	Berge JK et al [8]	0.55 X 0.42	-
2.	Berlin A et al [9]	0.90 X 0.50	-
3.	Sharma N [10]	0.53 X 0.43	0.54 X 0.43
4.	Nikumbh	0.61 X 0.52	0.64 X 0.52
5.	Present study	0.72x0.6	0.73x0.57

TABLE 2: EXOCRANIAL ANTEROPOSTERIOR AND TRANSVERSE DIAMETER

S.NO	PARAMETER	AP DIAMETER		TRANSVERSE DIAMETER	
		RIGHT	LEFT	RIGHT	LEFT
1.	MEAN	0.7	0.73	0.6	0.5
2.	STANDARD DEVIATION	0.07	0.06	0.09	0.09

TABLE 3: DISTANCE OF CANAL FROM OCCIPITAL CONDYLE

S.NO	PARAMETER	RIGHT	LEFT
1.	MEAN	0.65	0.63
2.	STANDARD DEVIATION	0.125	0.127

TABLE 4: ENDOCRANIAL ANTEROPOSTERIOR AND TRANSVERSE DIAMETER

S.NO	PARAMETER	ANTEROPOSTERIOR DIAMETER	TRANSVERSE DIAMETER		
		RIGHT	LEFT	RIGHT	LEFT
-1.	MEAN	0.74	0.72	0.53	0.51
2.	STANDARD DEVIATION	0.07	0.09	0.07	0.08

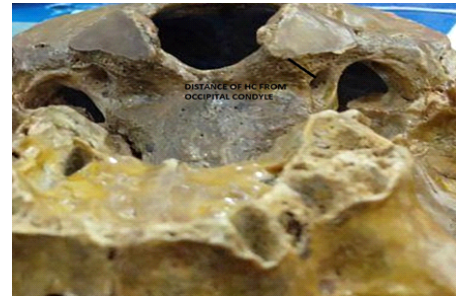


FIG: 5

CONCLUSION:

knowledge about the dimensions of hypoglossal canal is very essential for neurosurgeons and radiologists for the planning of the surgeries around the posterior cranial fossa which will be helpful in reducing the mortality and morbidity during surgical intervention. The introduction of microsurgical techniques has necessitated the study of the microstructure for better understanding of anatomy and its variations and planning surg

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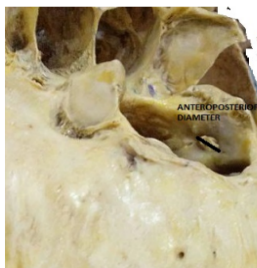


FIG 1

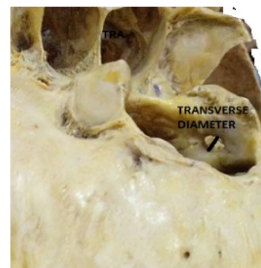


FIG 2

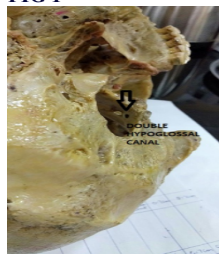


FIG : 3

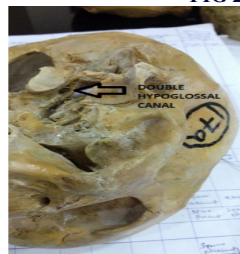


FIG 4