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Original Research Article

MORPHOMETRIC STUDY OF THE OCCIPITAL CONDYLE AND ITS SURGICAL IMPORTANCE

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ABSTRACT

Objective: The transcondylar approach is being increasingly used to access lesions ventral to the spinal canal at the level of the foramen magnum can be reached using a ventral or a dorsal approach. Understanding the anatomy of the occipital condyles is important for this approach.The present work is aimed to study occipital condyles morphometrically and its importance in transcondylar approach.

Materials and Methods: The study was performed on 200 occipital condyles of 100 adult human dry skulls of unknown age and sex. The measurements like length, width, height, and the anterior and posterior intercondylar distances were measured.

Results: The length, width and height of the occipital condyle were found to be 21.83, 1=1.07 and 8.25 mm on the right and 22.19, 11.42 and 8.19 mm on the left respectively. The anterior and posterior intercondylar distances were 21.28 and 40.61 mm respectively.

Conclusion: The above said parameters of the occipital condyles and its variations should be taken into consideration during posterior and lateral approaches to the craniovertebral junction by neurosurgeons and orthopaedicians.

KEY WORDS: Occipital condyle, foramen magnum, Surgical Anatomy.

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INTRODUCTION

The posterior part of the human skull is largely formed by the occipital bone. Adjoining the foramen magnum the occipital condyles are present. The superior articular facet of the atlas articulates with the occipital condyles to form the atlanto occipital joint. The occipital condyles are oval in shape and placed in an oblique manner so that its anterior end lies closer to the midline than its posterior end [1]. The occipital condyles represent the cranial portion of the craniocervical junction. Space occupying lesions ventral to the spinal canal at the level of the foramen magnum can be reached using a ventral or a dorsal approach. The difficulties and a high rate of morbidity associated with ventral approaches necessitate a dorsal approach in such conditions. Partial resection of the occipital condyle during transcondylar surgical procedure is an important step for access to the ventral and ventrolateral foramen magnum [2].

As the ventral approach is dangerous and has a high rate of morbidity, the dorsal approach is preferred to reach the space occupying lesion ventral to the spinal cord at the craniovertebral junction [3,4]. The far-lateral transcondylar surgical approaches have been used to reach lesions at the ventrolateral clivus and jugular foramen.[5, 6] Partial resection of the occipital condyle is made during transcondylar surgical approach. The extent of bony removal necessary for optimal exposure is unclear ranging from suboccipital craniectomy to occipital condyle removal. This exposure may be gained through a limited removal or complete removal [6-8].

So the present study will need adequate information about the metric and morphological aspect of occipital condyle. The objective of the present study was to clarify the morphometric data of the occipital condyle and its surgical importance in transcondylar approach.

MATERIALS AND METHODS

The present study was performed on 100 adult human skull of unknown age and sex. All of them were dry and free from deformity and fully ossified.

All the skulls were obtained from Department of Anatomy, Government Medical College.

The equipment's used for the purpose of study were

- Vernier calipers,

- Measuring scale - Digital photography equipment

The following parameters were measured on both right and left sides

1. The length of occipital condyle (measured between the distance from anterior tip of occipital condyle and posterior tip of occipital condyle.)

2. The width of occipital condyle (noted by midpoint of left margin and right margin of occipital condyle.)

3. The height of occipital condyle (noted by midpoint upper and lower lip.)

4. Anterior intercondylar distance (distance between the anterior tips of the right and left occipital condyles)

5. Posterior intercondylar distance (distance between the posterior tips of the right and left occipitalcondyles)

Statistical Analysis: All parameters were measured using a caliper accurate to 0.01 mm for linear measurements. Mean and standard deviation of the parameters were worked out, unpaired t'test was applied.

RESULTS

The results obtained from the present study are shown in Table1. The mean length, width and height of the measured occipital condyle were found to be 21.83mm (right) and 22.19 mm (left) for the length, 11.07 mm (right) and 11.42 mm (left) for the width and 8.25 mm (right) and 8.19 mm (left) for the height. The mean anterior and posterior intercondylar distances were found to be 21.28 mm and 40.61 mm respectively.

There were no significant differences for the measured parameters between the right and left sides.

Table 1: Comparison of Right and Left side of occipital condylar Parameters.

Sr. no.	Parameter	Right		Left		P value	Significance (unpaired't'test)
		Mean	S.D.	Mean	S.D.		
1	Maximum length	21.83	2.99	22.19	3.31	0.2848	Significant
2	Maximum width	11.07	2.41	11.42	2.31	0.0683	Not Significant
3	Maximum height	8.25	1.58	8.19	1.79	0.7035	Not Significant
4	Anterior intercondylar distance	Mean		S.D		<0.0001	Significant
		21.28		3.03			
5	posterior intercondylar distance	Mean		S.D		<0.0001	Significant
		40.61		3.34			

O.C = occipital condyle, Rt = right, Lt = left, AICD= anterior intercondylar distance, PICD=posterior intercondylar distance, S.D = standard deviation

Table 2: Comparison between others studies.

Sr. no.	Parameter		S. Kavitha et al. (2013) [9]	Divya Mahajan et al. (2011) [10]	Mustafa Bozbuga et al. (1999) [11]	Avic.E et al. (2011) [12]	Naderi et al. (2005) [13]	Anil kumar et al. (2014) [14]	Present study
1	Length of O.C	R	21.97	22.61	23.1	23.7	23.6	-	21.83
		L	22.34	22.36	22.9	24	23.2	-	22.19
2	Width of O.C	R	13.05	13.72	11.3	12.2	10.6	-	11.07
		L	13.03	13.96	11.4	12.4	10.6	-	11.42
3	Heigth of O.C	R	-	7.01	-	-	9.2	-	8.25
		L	-	6.95	-	-	9.2	-	8.19
4	AICD		-	-	22.8	-	21	17.63	21.28
5	PICD		-	-	30.2	-	41.6	42.02	40.61

O.C = occipital condyle, Rt = right, Lt = left, AICD= anterior intercondylar distance, PICD=posterior intercondylar distance.

DISCUSSION

Craniovertebral junction lesions are currently approached by lateral approaches. Many varieties of lateral approaches to this region have been reported, including transfacetal approach, the partial transcondylar approach, the complete transcondylar approach, the extreme-lateral transjugular approach and the transtubercular approach. Most of these approaches necessitate resection of the occipital condyle partially or completely, and morphometrical analysis of the occipitalcondyle.

The far lateral transcondylar approach is a complex skull base approach that is used to reach the anterior and anterolateral aspects of the craniocervical junction, the foramen magnum and the brainstem (Nanda *et al*., 2002).

In the present study the mean length of occipital condyles were found to be mean of 21.83±2.99mm on right and 22.19±3.39mm on left sides respectively. This measured length is comparable to what was found by S. Kavitha et al. [9] who reported the length as of occipital condyle to be 21.97 on right and 22.34 on left respectively. Similarly the study carried out by Divya Mahajan et al. [10] who reported the length as of occipital condyle to be 22.61±2.3 on right and 22.36±2.3 on left respectively.

The mean of width of occipital condyle was found to be 11.07±2.41mm on right and 11.42±2.31mm on left sides respectively. This measured width is comparable with the results obtained by Mustafa Bozbuga et al. [11] who reported the width as 11.3mm on right and 11.4mm on left. But differ from the results obtained by Avic. E et al. [12] also reported the width as 12.2±1.2mm on right and 12.4 ±1.5mm respectively on left side.

The height of occipital condyle was found to mean of 8.25±1.58mm on right and 8.19±1.79 mm on left sides respectively. This measured height is approximate to the result obtained by Naderi et al. [13] who reported the height as 9.2±1.4mm on right and 9.2 ± 1.3 mm on left sides respectively.

The anterior and posterior intercondylar distances were found to be 21.28±3.03 mm and 40.61±3.34 mm respectively. These measured distances are comparable to the results obtained by Naderi et al. [13] who reported these distances as 21 and 41.6 mm respectively and away from the results obtained by Anil kumar et al. [14] who reported them as 17.63 and 42.02 mm respectively. This wide difference between the anterior and posterior intercondylar distances leads the occipital condyle to have different anterior and posterior angles. The anteroposterior orientation and narrow intercondylar space would require a more bony removal [15].

CONCLUSION

The occipital condyles are integral part of neck and the base of skull. In the present study an effort was made to measure various parameters related to occipital condyle. These parameters should be taken into consideration during posterior and lateral approaches to the craniovertebral junction by neurosurgeons and orthopaedicians. The insignificant difference

between radiological measurements obtained by various workers and those obtained on dry bones as in the present study strengthens the accepted notion that preoperative radiological evaluation is important for achieving surgical success along with thorough anatomical knowledge and surgical experience.

The above said parameters will be helpful in interpreting the neurological investigative procedures and also in planning surgical interventions involving the skull base.

Conflicts of Interests: None

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