

**MORPHOMETRIC ANALYSIS OF OCCIPITAL CONDYLE IN HUMAN  
ADULT DRY SOUTH INDIAN SKULLS**

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**ABSTRACT**

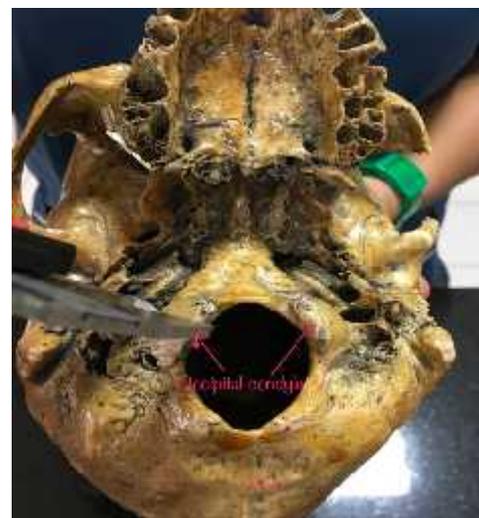
The aim of the study is to measure the morphological features and dimensions of occipital condyle in human adult dry South Indian skulls. To examine the anatomy of right and left occipital condyle and measure the various dimensions. The occipital condyles are undersurface protuberances of the occipital bone in vertebrates, which function in articulation with the superior facets of the atlas vertebra. The human occipital condyle is the unique bony structure connecting the cranium and the vertebral column. The progress in neuroimaging techniques has increased interest for aggressive craniovertebral surgery. Study of occipital condyle will be useful to the neurosurgeons during their surgery.

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**INTRODUCTION**

The occipital condyles are undersurface protuberances of the occipital bone in vertebrates, which function in articulation with the superior facets of the atlas vertebra.<sup>(1)</sup> 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 (2). A condylar fossa is situated just posterior to the occipital condyle and can contain a posterior condylar canal for an emissary vein from the sigmoid sinus. Laterally, the occipital bone connects with the petrous part of the temporal bone anteriorly and the mastoid process posteriorly (7). Occipital condyles are important element to maintain the head vertically. It is necessary for the stability of the craniovertebral junction. The superior articular facet of the atlas articulates with the occipital condyles to form the atlanto occipital joint. (3). Asymmetrical facets may be responsible for altered kinematics in the atlanto-occipital joint (11). The human occipital condyle (OC) is unique bony structure connecting the cranium and the vertebral column.<sup>(5)</sup> It is the only articulation between the occipital bone and the atlas hence an important part of the cranio-vertebral junction. The integrity of occipital condyles is of vital importance for the stability of the cranio-vertebral junction (6). Craniovertebral bony abnormalities have been recorded for many years in morphological and clinicoradiological studies. Anomalies of Craniovertebral junction are of interest not only to an anatomist, but also to the clinicians because many of these deformities produce clinical symptoms. (8).

Partial resection of the occipital condyle, as made during transcondylar surgical approaches, has been an important step for access to the ventral and ventrolateral foramen magnum. The interest for transcondylar approach requires information regarding the morphometric aspects of the occipital condyle and structures around it.<sup>(9)</sup> There are many kinds of pathological processes that involve the craniovertebral junction. These lesions include intradural tumors such as meningiomas, neurinomas or vascular lesions such as aneurysms and arteriovenous malformations of the vertebral artery and vertebrobasilar junction, extradural tumors.<sup>(10)</sup> The occipital condyle are anterolateral to the foramen magnum and participate in the articulation of skull with the cervical vertebral column.<sup>(12)</sup>



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Occipital condyle screws serve as an alternative fixation point in occipital cervical fusion. Their replacement requires a thorough understanding of the anatomy of the occipital condyles and associated structures<sup>(13)</sup>

**MATERIALS AND METHODOLOGY**

The morphometric analysis study was performed on 30 dried South Indian skulls of unknown age and sex in Department of Anatomy, Saveetha Dental College, Poonamalle, Chennai -77. All these measurements were taken using digital vernier calipers. (Least count 0.01 mm). In order not to cause interobserver and intraobserver errors, the measurement of each particular parameter was performed by a different researcher and using the predetermined methodology. Skulls that were damaged or those with deformities, which may influence measurements, were excluded from the study and only intact skulls in good condition were studied.

**The metric study**

The measured parameters are:

1. Length of Occipital condyle: Maximum anteroposterior distance between anterior and posterior tips of Occipital condyle.
2. Width of Occipital condyle: Maximum transverse distance between medial and lateral border of Occipital condyle.
3. Height of Occipital condyle: Maximum vertical distance between upper and lower border of medial margin of Occipital condyle.
4. Anterior Intercondylar Distance (AICD): Distance between anterior tips of right and left Occipital condyle.
5. Posterior Intercondylar Distance (PICD): Distance between posterior tips of right and left Occipital condyle.
6. Shape of the Occipital condyle: The shape and morphological variations of occipital condyle are important in neurological interpretation.

**RESULTS**

The following parameters were measured on both the right and left sides.

**Table 1** showing the various measured parameters of occipital condyles

Measurement parameter	Side	Mean	Median	S.D	Range
Length of O.C	Right	21.55	20.63	2.88	18 - 28
	Left	22.64	22.62	3.1	17 - 28
Width of O.C	Right	11.65	12.67	4.51	8 - 14
	Left	12.34	11.32	4.92	10 - 18
Height of O.C	Right	7.57	7.65	0.76	6 - 8
	Left	7.64	7.55	0.805	6 - 9
Anterior I.D		19.73	19.8	2.67	18 - 22
Posterior I.D		40.27	40.26	2.75	38 - 42

**Table 2** showing the frequency of different shapes of occipital condyles

Types	Number	Percentage
Oval	4	13.33
Kidney like	14	46.6
Ring form	3	10
Triangular	9	30

A total of thirty (30) human adult dry South Indian skulls were studied. The statistical analysis was carried out and the results have been tabulated. The length, width, height of occipital condyle, anterior inter condylar distance, posterior inter condylar distance and the shape of occipital condyles were calculated and the results were analysed.

The shapes of the occipital condyle are varied and have shown to be oval, kidney like, ring form and triangular. This analysis were taken on the general basics for both right and left and results have been concluded. 14 kidney shaped, 9 triangular, 4 oval and 3 ring form.

**DISCUSSION**

In the present study, the mean length of human occipital condyle was recorded to be 21.55mm in the right and 22.64mm in the left. This measured length is comparable to what was found by Archana.K.Tale<sup>(2)</sup> who reported the mean length to be 21.83mm in the right and 22.19mm in the left. But the results in the present study were away from the measured length found by Ajay Rathva<sup>(3)</sup> who reported a higher value of 23.5mm in the right and 23.1mm in the left side of occipital condyle.

The mean width of the human occipital condyle in the present study was found to be 11.65mm in the right and 12.34mm in the left. This measured value is almost comparable to results concluded by Sandeep Saluja<sup>(7)</sup> which was reported to be 12.98mm in the right and 12.97mm in the left. But the results given by SaitNaderi<sup>(9)</sup> was reported to be value of 10.6mm on the right and left side of occipital condyle.

In the present study, the mean height of the occipital condyle was recorded to be 7.57mm in the right and 7.64mm in the left. This result is much lower than the results concluded by M.MahamuthaAffshana<sup>(1)</sup> and Sandeep Saluja<sup>(7)</sup> who reported 9.64mm (right) , 9.5mm (left) and 9.32mm (right), 9.12mm (left) respectively.

The anterior intercondylar distance and the posterior intercondylar distance have recorded to be 19.73mm and 40.27mm respectively in the present study. But the results reported by other authors have varied results. Anil Kumar<sup>(6)</sup> concluded 17.63mm and 42.02mm and Sanjuktha Sahoo<sup>(8)</sup> reported 20.31mm and 41.17mm for the anterior and posterior intercondylar distance.

**CONCLUSION**

The study of base of skull is very important because significant structures pass through it. It can be concluded that careful radiological analysis of occipital condyle is required before craniovertebral junction surgery is done to prevent complications like hemorrhage, atlantooccipital instability and injury to major structures. There are several developmental variations in the region of the craniocervical junction, many of which can resemble deformities. Some variations are minor anatomic abnormalities but they can cause severe diagnostic problems in the important structures. These anomalies may be asymptomatic initially but may later clinically manifest. A reliable and exact radiological diagnosis requires knowledge of the morphologic features of the variations and the appearance of their characteristic features in the common radiologic procedures. The major limitation of this study is the lack of knowledge regarding the age and gender of the subjects whose condyles were studied.

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