MORPHOMETRY OF OCCIPITAL CONDYLES IN CRANIOVERTEBRAL SURGERIES

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ABSTRACT

Introduction: The occipital condyle connects the cranium and the first cervical vertebra at the atlanto occipital joint. It overlaps the foramen magnum. The purpose of this study is to correlate the measurements of occipital condyles and its clinical implications in various surgeries involving transcondylar approach, condylar drilling, cranio-vertebral surgery, accessing lesions in the posterior cranial fossa and clivus, condylectomy, occipital fixation etc.

Materials and Methods: The following study was performed in the Department of Anatomy of Sri Manakula Vinayagar Medical College, Pondicherry using 50 adult unsexed dry human skull bones.

Results: In the present study, the significant P value of the length, the middle and posterior breadth and thickness of occipital condyles as well as the angle of occipital condyle to horizontal plane were 0.001, 0.029, 0.016, 0.009, 0.009 respectively.

Conclusion: The morphometric values of occipital condyles is very crucial for the modified approach to the foramen magnum in cranio-vertebral surgeries.

KEY WORDS: Occipital Condyle, Morphometry, Transcondylar Approach.

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successful outcome of the surgery.

MATERIALS AND METHODS

The following study was performed on 100 occipital condyles from 50 unsexed dry human skulls in the Department of Anatomy of Sri Manakula Vinayagar Medical College, Pondicherry, India.

Exclusion criteria:

Damaged, malformed and foetal skulls were excluded in this study.

The measurements carried out were the length of the condyle, breadth in the anterior, middle and posterior parts of the condyle, thickness of the condyle, intercondylar distance in anterior, middle and posterior parts of the condyle (AID, MID, PID) using vernier calliper, the angle of the occipital condyle to the sagittal plane and the angle of the occipital condyle to the horizontal plane.

RESULTS

The present study was performed on 100 occipital condyles of unsexed dry human skulls. Table 1 represents the mean value of length, breadth and thickness of the occipital condyles. The mean length of the occipital condyle on the left side was 2.39 cm and on the right side 2.49 cm with standard deviation of 0.25, 0.45 respectively and the result was significant. The mean breadth of the occipital condyle at its middle part on the right side was 1.14 cm and on the left side 1.01 cm with the standard deviation of 0.30, 0.29 respectively and the result was significant. The mean breadth of the occipital condyle at its posterior part on the right side was 0.84 cm and on the left side 0.68 cm with the standard deviation of 0.37, 0.23 respectively and the result was significant. The mean thickness of the right occipital condyle was 0.53 cm and on the left side 0.45 cm with the standard deviation of 0.17, 0.13 respectively and the result was significant. The mean angle of occipital condyle to horizontal plane on the left side was found to be 57.64 degree and on the right side, it was 55.33 degree with the standard deviation of 7.54, 10.98 respectively and the result was significant. Table 2 shows the posterior intercondylar distance (PID) which was found to be a maximum of 2.77 cm.

Table 1: Showing the mean, standard deviation and P value.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Mean</th>
<th>SD</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length (cm)</td>
<td>R-2.49</td>
<td>L-2.39</td>
<td>R-0.45</td>
</tr>
<tr>
<td>Breath -Anterior (cm)</td>
<td>R-0.46</td>
<td>L-0.44</td>
<td>R-0.29</td>
</tr>
<tr>
<td>Breath-Posterior (cm)</td>
<td>R-0.84</td>
<td>L-0.68</td>
<td>R-0.37</td>
</tr>
<tr>
<td>Breath-Middle (cm)</td>
<td>R-1.14</td>
<td>L-1.01</td>
<td>R-0.30</td>
</tr>
<tr>
<td>Thickness  (cm)</td>
<td>R-0.53</td>
<td>L-0.45</td>
<td>R-0.17</td>
</tr>
<tr>
<td>Angle of occipital condyle to sagittal plane in degrees</td>
<td>R-30.52</td>
<td>L-29.6</td>
<td>R-5.49</td>
</tr>
<tr>
<td>Angle of occipital condyle to horizontal plane in degrees</td>
<td>R-57.64</td>
<td>L-55.33</td>
<td>R-7.54</td>
</tr>
</tbody>
</table>

*Marked values are significant

Table 2: Showing mean intercondylar distance.

<table>
<thead>
<tr>
<th>Intercondylar distance in cm</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>AID</td>
<td>1.52</td>
</tr>
<tr>
<td>MID</td>
<td>2.02</td>
</tr>
<tr>
<td>PID</td>
<td>2.77</td>
</tr>
</tbody>
</table>
DISCUSSION

The success of craniovertebral surgery depends upon the knowledge of morphometry of occipital condyles in respect to length, breadth, thickness and tilt of the occipital condyles in relation with the axis of foramen magnum. Pathological lesions affecting the structures which are over the clivus and foramen magnum require a safe approach like transcondylar approach. In this study, the mean length of right and left occipital condyles were 2.49 cm and 2.39 cm respectively.

In a study by Bayat et al [1], the mean length of left occipital condyle was 19.28 mm and right occipital condyle was 19.43 mm. These findings were observed lesser than our present study findings. In the studies conducted by Mahajan et al [2], Naderi et al [4], Rathva et al [5], Swetha et al [6], Kavitha et al [7] the observations were similar to our findings. In a study conducted by Anil et al [8], he found that the length of occipital condyle on the right side in case of male was 23.88 cm and in case of female it was 22.6 cm. On the left side in case of male was 24.99 cm and in case of female it was 24.20 cm which were higher than our values. Agnihotri et al [9] observed the length of the occipital condyle ranged from 15.24 to 28.7 mm which were lesser than our findings. In our study, the mean breadth of the occipital condyle at its middle part on the right side was 1.14 cm and on the left side 1.01 cm. This result was significant. The mean breadth of the occipital condyle at its posterior part on the right side was 0.84 cm and on the left side 0.68 cm with the standard deviation of 0.37, 0.23 respectively and the result was significant. Melissa et al [10] identified the width of left occipital condyle as 11.42 mm and on the right side was 11.08 mm which were similar to our findings at the middle part. Naderi et al [4], Kalthur et al [11], Saralaya et al [12] and Mahamutha et al [13] measured the mean thickness as 9.2 mm, 9 mm, 10.2 mm, 9.6 mm respectively which were higher than the findings of the present study which was significant.

The mean AID in the present study was measured as 1.52 cm which was similar to the finding by Bayat et al [1] which was 15.39 mm. The mean MID in the present study was found to be 2.02 cm and PID was measured as 2.77 cm which were lesser than the findings done by Naderi et al [4], Rathva et al [5], Mahamutha et al [13]. In our study the mean angle of occipital condyle to sagittal plane on the right was 30.52 degree and on the left side 29.6 degree but it was not significant. Kizilkanat et al [14] and Hong et al [3] found the angle of occipital condyle to sagittal plane as 31.5 and 33.5 degree respectively. Our finding goes hand in hand with Kizilkanat et al [14], Naderi et al [4]. In the present study the angle of occipital condyle to the horizontal plane was measured on both sides. The mean angle of right occipital condyle to horizontal plane was 57.64 degree and on the left side 55.33 degree which was observed to be significant.

CONCLUSION

Several surgeries involving cranio-vertebral junction is observed to be a complex procedure which demands a preoperative radiological technique to assess the occipital condyles. The resection of occipital condyle would give a better exposure to the area which will avoid damage to the surrounding vital structures. A precise morphometric parameters of occipital condyle will give an easy access for the skull base approach. In the present study, the length, the middle and posterior breadth, thickness of occipital condyles, angle of occipital condyle to horizontal plane were significant. We believe that these findings may enhance the knowledge of the neurosurgeons, radiologists to approach the area for successful outcome of surgery in the south Indian population.

ABBREVIATIONS

AID- Anterior Intercondylar Distance
MID- Middle Intercondylar Distance
PID- Posterior Intercondylar Distance

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Conflicts of Interests: None

REFERENCES


