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Morphometric and Morphology Study of Acetabulum of Human Hip Bone in Central Indian Population

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Abstract--Introduction: Hip bone is the form of the union of 3 bone ilium, ischium & pubis. The acetabulum is the part of hip bone it is usually a deep cup shape or house shoes shape. Acetabulum having a deep cavity like structure present in the lateral aspect of the hip bone. Acetabulum is divided into two parts articular and non-articular, non-articular part of this fossa is covered by a pad of fat this fat. this surface is articulate with head of the femur and it form most stable joint know as hip joint, this is the most stable joint in our body. Materials and Methods: The study was conducted in the Department of Anatomy.in R.K.D.F Meidical College & Hospital Bhopal M.P 200 human hip bones of both sexes were used. Following parameter were taken Shape of acetabulum – Curved, angular, irregular straight. The transverse diameter of the acetabulum- The maximum distance between the anterior and posterior ends of the acetabular cavity. The vertical diameter of the acetabulum -The greatest dimension between the Upper and Lower Margins of the Acetabular Cavity Total diameter of the acetabulum – The transverse diameter of the acetabulum+ The vertical diameter of the acetabulum /2 Depth of the acetabulum- the maximum vertical distance from the deepest point in the acetabular cavity to the horizontal plane touching the margins of the acetabular cavity. Observation: we found the most common shape of acetabulum was curved which was 50% and rest angular straight or irregular 30%, 5 %, 15% as follow, the mean transverse diameter of the acetabulum left side 48.4 mm and on right side it is 48.6 mm, found the mean total Diameter of the acetabulum left side 49.26 and right 49.36 mm, we found that the mean depth of acetabulum right side 25.36 and left side was 25.46. Conclusion: Knowledge of the dimension of the acetabulum will help the biomedical engineers to for the suitable construction of prostheses. Such type of study tells an

average dimension of acetabular with is also very useful for the orthopedic surgery for the reconstruction of acetabulum.

Keywords---Hip bone, Acetabulum Total Hip Arthroplasty, Acetabulum.

Introduction

Hip bone is the form of the union of 3 bone ilium, ischium & pubis. The acetabulum is the part of hip bone it is usually a deep cup shape or house shoes shape. Acetabulum having a deep cavity like structure present in the lateral aspect of the hip bone. Acetabulum is divided into two parts articular and non-articular, non-articular part of this fossa is covered by a pad of fat this fat. this surface is articulate with head of the femur and it form most stable joint know as hip joint, this is the most stable joint in our body. Acetabular having a notch and this notch is called acetabular notch¹. This is major weight bearing joint of the body.² Development of normal acetabular cavity is essential for proper bio-mechanism of hip joint. Cavity starts developing from 4th to 6th week of Intra-uterine life. During 7th week of gestation pre-cartilaginous pattern is seen and entire acetabulum is fully formed at 8th week of fetus.³

The anthropometric study of the acetabulum aids radiologists in diagnosing congenital hip orthopaedicians and dysplasia, for planning for an acetabular surgery, during hip arthroplasty and in the treatment of hip fractures. This study would also be beneficial in understanding the pathophysiology of the hip pathologies such as femoroacetabular impingement and preparing prosthesis of desirable sizes.⁴

The present study becomes all the more vital as acetabular dimensions show regional variations and the study is crucial to provide valuable parameters in the Indian population which would exterminate the catastrophic consequences of prosthetic loosening or dislocation. ⁵ The Present study was conducted on 200 dry adult hip bones of unknown sex and age collected from Department of Anatomy R.K.D.F Medical College& Hospital Bhopal M.P

Material

Instruments -

Vernier Caliper

Divider

Scale

Marker Pen -Black

Exclusion criteria

1. Broken bone
2. Broken acetabular
3. Incomplete ossified bone
4. Bone with muscle

Inclusion Criteria

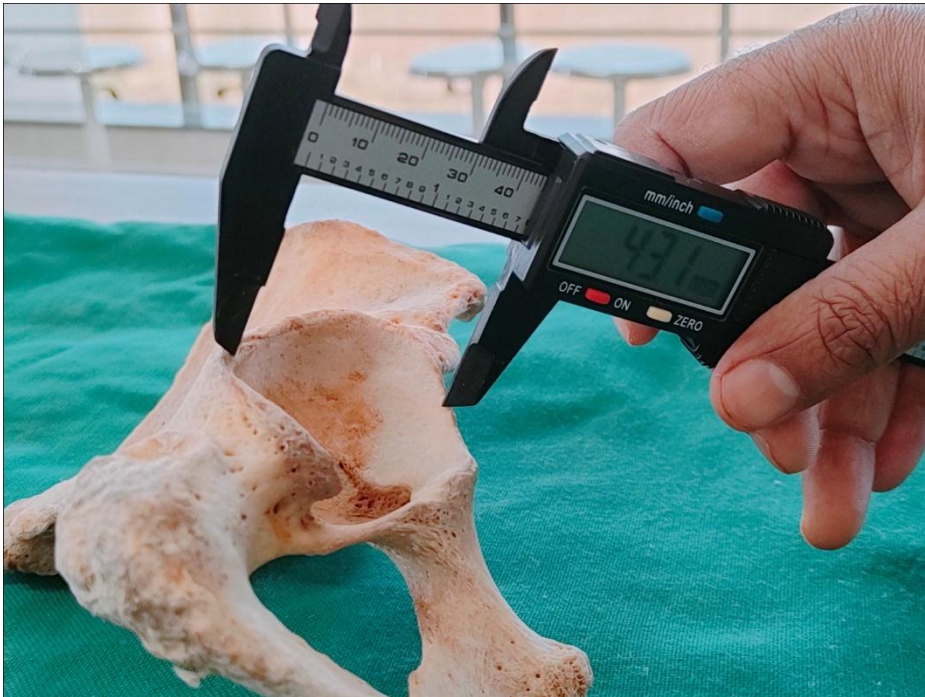
1. Unbroken bone

2. Unbroken acetabular
3. Complete ossified bone
4. Complete finished bone removed from muscle

Method

Following parameter were taken

1. **Shape of acetabulum** – Curved, angular, irregular straight.
2. **The transverse diameter of the acetabulum**- The maximum distance between the anterior and posterior ends of the acetabular cavity.
3. **The vertical diameter of the acetabulum** -The greatest dimension between the Upper and Lower Margins of the Acetabular Cavity
4. **Total diameter of the acetabulum** – The transverse diameter of the acetabulum+ The vertical diameter of the acetabulum / 2
5. **Depth of the acetabulum**- the maximum vertical distance from the deepest point in the acetabular cavity to the horizontal plane touching the margins of the acetabular cavity.





Result

In our current study we found the most common shape of acetabulum was curved. The comparison of acetabulum shaped were given in the table no.1

Table 1
Showing varies shape of acetabular and its percentage

S.N	Shape	Total No	Left	Right
1	Curved	100 (50%)	60	40
2	Angular	60 (30%)	30	30
3	Straight	10 (5%)	6	4
4	Irregular	30 (15%)	20	10

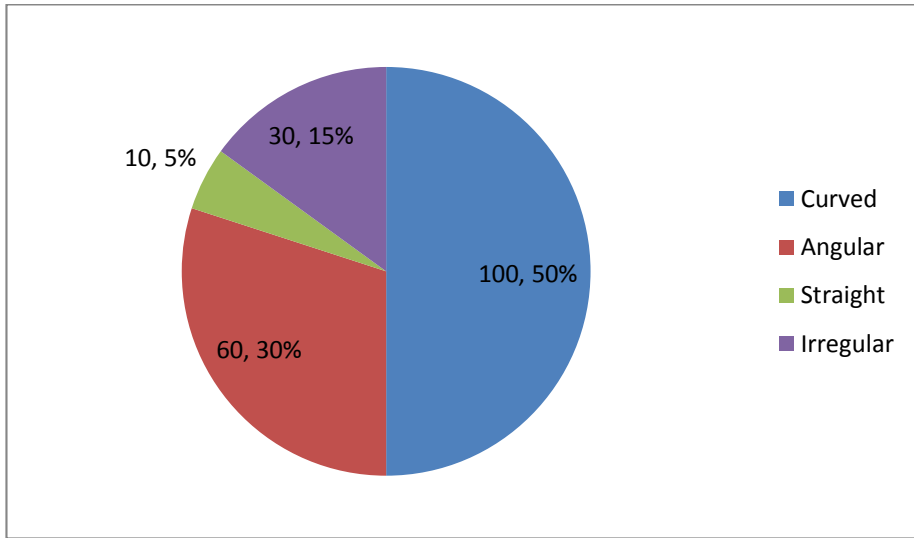


Figure 1. showing the varies shape of acetabular

In our current study we found the mean transverse diameter of the acetabulum left side 48.4 mm and on right side it is 48.6 mm as shown in the table no 2

Table 2
Showing the mean transverse diameter of the acetabulum

Total No	Side	Mean	Std. Deviation	Std. Error Mean
100	Left	48.48	2.79	.39
100	Right	48.62	2.79	.39

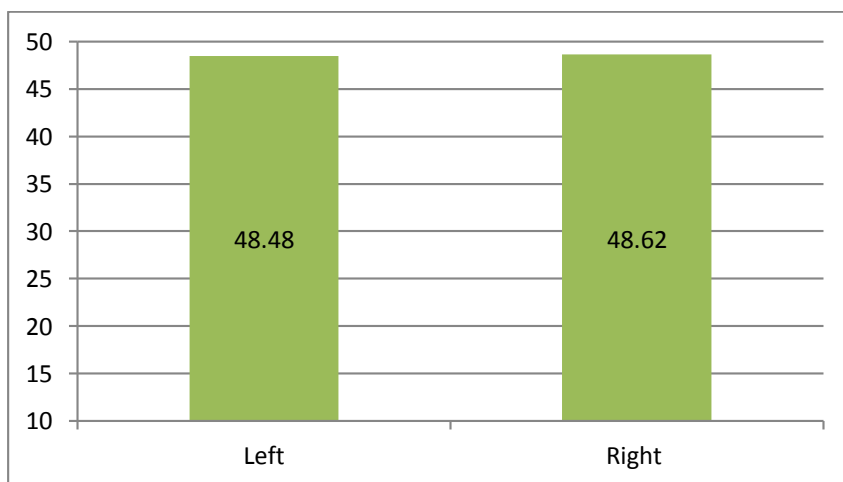


Figure 2. Showing the mean transverse diameter of the acetabulum left and right side

In our current study we observed the vertical diameter of the acetabulum left side 50.24 mm and 49.90 on right side. Show in table no 3

Table 3
Showing the mean vertical diameter of the acetabulum

Total No	Side	Mean	Std. Deviation	Std. Error Mean
100	Right	49.90	2.13	.30
100	Left	50.24	1.78	.25

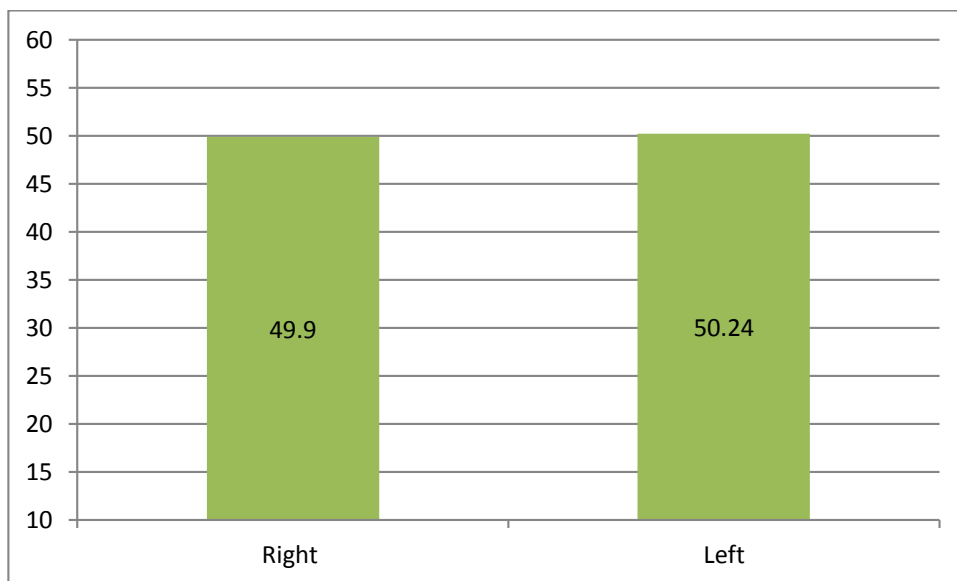


Figure 3. showing the mean transverse diameter of the acetabulum left and right side

In our current study we observed the total Diameter of the acetabulum (The transverse diameter of the acetabulum+ The vertical diameter of the acetabulum /2) left side 49.26 and right 49.36 mm. show in table no 4

Table 4
Showing the mean total Diameter of the acetabulum

Total No	Side	Mean
100	Right	49.26
100	Left	49.36

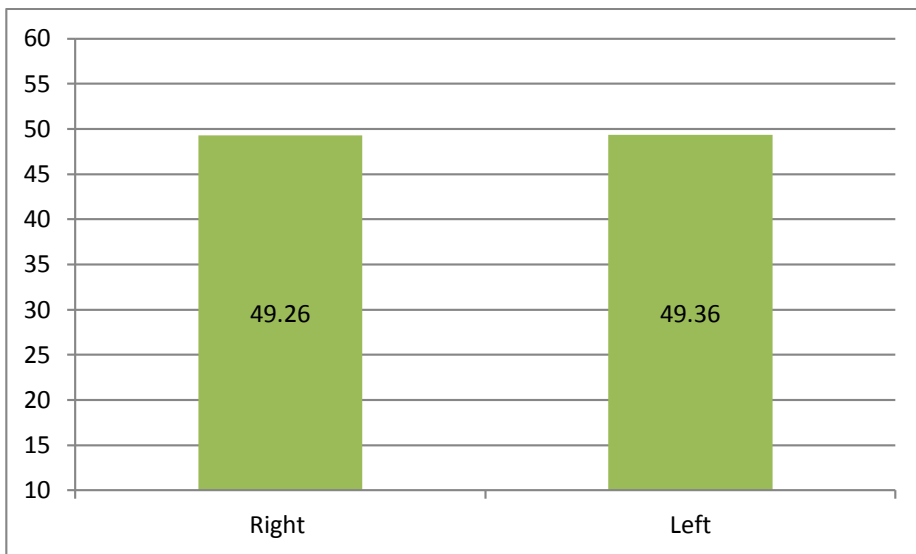


Figure 4. Showing the mean total Diameter of the acetabulum left and right side

In our current study we found the mean depth of acetabulum right side 25.36 and left side was 25.46 as describe in the table no 5.

Table 5
Showing mean depth of acetabulum

Total No	Side	Mean	Std. Deviation	Std. Error Mean
100	Right	25.36	2.48	.35
100	Left	25.46	3.39	.48

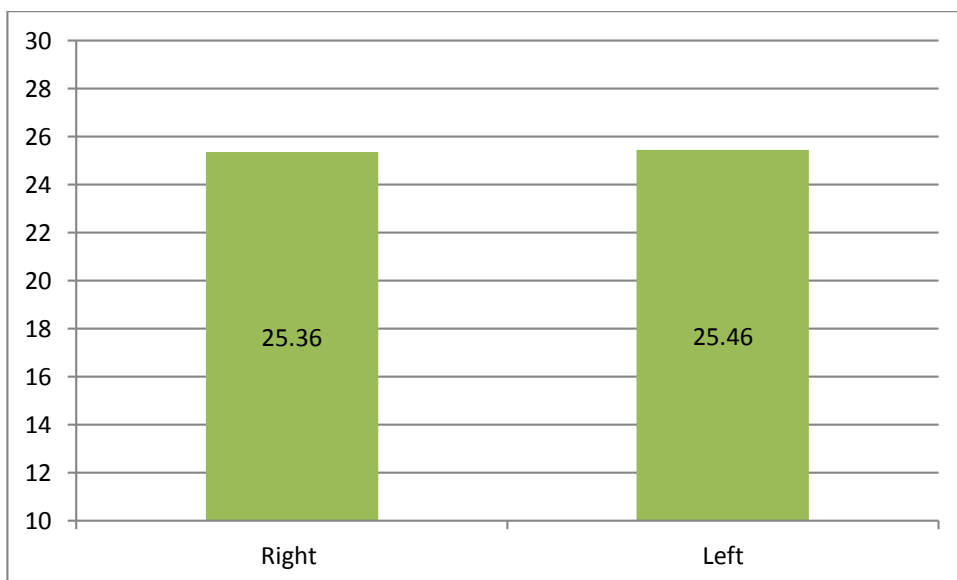


Figure 5. Showing the mean depth of the acetabulum left and right side

Discussion

In our current observation we found the most common shape of acetabulum was curved which was 50% and rest angular straight or irregular 30%, 5 %, 15% as follow while comparing our study with Maruyama et al⁶ there curved which was 60.5% and rest angular straight or irregular 25.5%, 4.5 %, 4.5% which was similar with our study. Another study of Ina Bahl⁷ observation was curved which was 14.1% and rest angular straight or irregular 26.2%, 5.5 %, 27.4% which is similar with our finding. Vyasa et al⁸ there curved which was 37.5% and rest angular straight or irregular 12.5%, 18.4, % 31.6% which was not similar with our study.

In our current study we found the mean transverse diameter of the acetabulum left side 48.4 mm and on right side it is 48.6 mm which was similar with Ina Bahl⁶ observation they observed 47.2 mm whose min to max was follow as 53.1-40.3 mm whose finding was similar with our finding. Another study of K Yugesh⁹ et al they observed the mean transvers diameter of acetabulum was 48.66 mm which was supporting to our finding. In our current study we found the mean total Diameter of the acetabulum left side 49.26 and right 49.36 mm while comparing our study with the Ina Bahl⁷ they observed the mean total diameter of the acetabulum was 48.6 which was similar with our finding.

In our current study we found that the mean depth of acetabulum right side 25.36 and left side was 25.46 as while comparing our finding with Ina Bahl⁷ they observed the mean depth of acetabulum was 27.1right and 27.0 on left side which finding was similar with our finding. Another study of K Yugesh⁹ et al in his study they observed the mean depth of acetabulum of left side was 29.9 on right side and on left side it was 29.7 mm which was near about or finding.

Conclusion

Knowledge of the dimension of the acetabulum will help the biomedical engineers to for the suitable construction of prostheses. Such type of study tells an average dimension of acetabular with is also very useful for the orthopedic surgery for the reconstruction of acetabulum. These study also help in the anthropological study where we can compare dimension of acetabular from one region to another for knowing the geographical factor affecting in dimesions.

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