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MORPHOMETRIC STUDY OF ACETABULUM AND ITS CLINICAL SIGNIFICANCE

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ABSTRACT

Background: The hip joint is one of the major weight bearing joints of the body. The head of the femur articulates with the acetabular cavity of the hip bone. In the modern era hip replacement and hip reconstruction surgeries have become much common in the field of orthopedics. Thus it is inevitable for the anatomists and clinicians to note the variations and dimensions of the acetabular cavity and the head of the femur. Hence the present study was carried out with the aim to study the morphometric measurement of acetabulum. **Materials and Methods:** 50 human adult unpaired dry hip bones (27 right and 23 left) of unknown age and sex were collected from the Department of Anatomy of Sree Balaji Medical College and Hospital Chennai. The data of diameter and depth of the acetabulum was taken by digital sliding caliper and statistical analysis was done using Microsoft Excel 2010 and SPSS software version 23. **Results:** In the present study the mean acetabular depth was 23.35 ± 1.34mm and mean acetabular diameter was 47.34 ± 1.86mm. **Discussion:** As total hip replacement is a common surgery performed nowadays, awareness of the average dimensions of the acetabulum is essential as it will help the prosthetists and the surgeon to determine the correct size of the acetabular cup during total hip arthroplasty and to realign the acetabulum back to normal position. The normal acetabular depth is 9mm and less than that is regarded as dysplasia .In our study the measurement of average acetabular depth and average acetabular diameter are in accordance with the study done by Funda Tastekin Aksu et al, but differ from Gaurang parmara et al (Table-1 and Table-2). Maximum and minimum measurements of acetabular depth and diameter, r value, p value, are similar to the study done by previous authors. **Conclusion:** Analysing the morphometric measurements and its variations on human acetabulum is helpful in understanding not only morphological but also medico legal aspects. the present morphometric study may be helpful for orthopedicians and implant manufacturers,

KEYWORD

Acetabulum; Hip joint; Hip replacement; Hip Reconstruction

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Introduction:

The hip joint is one of the major weight bearing joints of the body. It is ball and socket joint. The femoral head articulates with a cup shaped acetabulum. Movements of this joint include flexion, extension, adduction and abduction [2]. Osteoarthritis of hip joint is a common condition. An incongruous joint is more prone to develop degenerative changes than a joint having normal anatomy. It has been estimated that 25-40% of hip osteoarthritis may be caused by acetabular dysplasia. Dysplastic hip also correlates with the acetabular depth. The normal acetabular depth is 9mm and less than that is regarded as dysplasia [3].The knowledge of normal anatomical features and morphometry of the acetabulum is vital to understand the mechanics of hip joint. The acetabular images aid the surgeon to determine the correct size of the acetabular cup during total hip arthroplasty and to realign the acetabulum back to normal position[4]. A bigger roof of the acetabular cup means a good grip of the head of the femur inside the acetabulum and hence a better result of arthroplasty[5].The main problem for acetabular placement will be positioning the acetabular cup implant and acetabular inclination to the correct location according to its acetabular version and the acetabular depth[6].Akas et al[7] described the acetabular dysplasia frequency and normal hip joint morphometry in adult Turkish population. Gursharan singh Dhindsa et al [8] measured the diameter and capacity of acetabulum in Ludhiana,Punjab. Basaloglu et al[9] measured the vertical and transverse diameter of acetabulum in both sexes comparatively. Chauhan et al[10] measured the depth and diameter of acetabulum in both sexes in New delhi . Mukhopadhaya and Barroah e tal[11] also measured the depth and diameter of the acetabulum. Mohammed yusuf [12] did the morphometric study of the acetabulum in Malaysian population.

Materials and Methods: 50 human adult unpaired dry hip bones (27 right and 23 left) of unknown age and sex were collected from the Department of Anatomy of Sree Balaji Medical College and Hospital Chennai. The data of diameter and depth of the acetabulum was taken by digital sliding caliper and statistical analysis was done using Microsoft Excel 2010. Diameter of the acetabulum (AD1)—the distance between the acetabular ridge nearest to the body of ischium and anterior iliac margin intersecting the acetabular ridge was named as acetabular diameter. Depth of the acetabulum(AD2)-- A thin metallic strip was placed across the diameter of the acetabulum . Depth of the acetabulum was measured in millimeters using vernier scale from the centre of the acetabulum to the metallic strip. Measurements could be made as accurate as 1/10 of a millimeter by this scale. Correlation between morphometrical parameters were investigated using Pearson's test.

Morphometric measurement The mean values for the acetabular depth and diameter were 23.35 ± 1.34mm and 47.34 ± 1.86mm respectively (table 1). The maximum and minimum measurements of acetabular diameter were 50.5mm and 42.8mm. The maximum and minimum measurements of acetabular depth were 34.6mm and 21.8mm respectively(table 2).

Table 1: Comparison of Morphometric parameters of the present study with other authors

	Funda Tastekin Aksu et al	Gaurang parmara et al	Present study
Mean Acetabular diameter (AD1)	54.29±3.8mm	42.54 ± 3.6mm	47.34 ± 1.86mm
Mean acetabular depth(AD2)	29.49 ± 4.2mm	19.07 ± 2.47mm	23.35 ± 1.32mm

Table 2: Comparison of Maximum and Minimum morphometric parameters of the present study

	Funda Tastekin Aksu et al		Gaurang Paramara et al		Present study	
	Max.	Mini.	Max.	Mini.	Max.	Mini.
Acetabular depth(AD1)	38.6 mm	22.6 mm	32.13mm	19.07 mm	34.6 mm	21.8 mm
Acetabular diameter (AD2)	65.5 mm	44.8 mm	56.60 mm	42.54 mm	50.5 mm	42.8 mm
r value	0.498	0.437	0.416			
P value	p<0.001	P=0.001	P<0.001			

Positive and significant correlation was found between depth and the diameter of the acetabulum (r= 0.416, p<0.001)

Discussion:

As total hip replacement is a common surgery performed nowadays, awareness of the average dimensions of the acetabulum is essential as it will help the prosthetists and the surgeon to determine the correct size of the acetabular cup during total hip arthroplasty and to realign the acetabulum back to normal position [4]. The main problem for acetabular placement will be positioning the acetabular cup implant and acetabular inclination to the correct location according to its acetabular version and the acetabular depth.Dysplastic hip correlates with the acetabular depth. The normal acetabular depth is 9mm and less than that is regarded as dysplasia .In our study the measurement of average acetabular depth and average acetabular diameter are in accordance with the study done by Funda Tastekin Aksu et al,but differ from Gaurang parmara et al (Table-1 and Table-2). Maximum and minimum measurements of acetabular depth and diameter, r value, p value, are similar to the study done by previous authors.

CONCLUSION

The present study on morphometric measurements of the acetabulum, we would like to add to the previous authors findingS and accentuate the importance of morphological and morphometrical study of acetabulum and we hope that it will benefit the orthopedic surgeons and implants manufacturer.

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