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Original Article

Morphology and Morphometry of Acetabulum

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ABSTRACT

Environment play an important role in the development of human beings. It was thought that the change in the environment might have lead to some kind of change in parameters of the bony component of the hip joint, as well as acetabulum. Anterior acetabular ridges , Diameter of the acetabulum and depth of acetabulum are important in the surgical treatment of acetabular fractures and total hip arthroplasty also understanding the rarity of primary osteoarthritis. This study is value to the forensic experts, orthopaedicians and prosthetics as it gives the dimensions of acetabulum. Objective of this study is to determine the relationship between acetabular depth and its diameter. The study was conducted in the department of the anatomy, Government medical college Bhavnagar in Gujarat. 100 Dry Hip bone of adult human being was taken and data of diameter and depth of acetabulum taken by digital sliding vernier caliper and sensitive compass. Correlation between morphometrical parameter where analyzed using Pearson's test <1 was the significant level.Regarding the anterior acetabular ridge shape majority was curved (61%), Straight (20%), and Irregular (19%). Mean value for acetabular depth and diameter were $26.16 + 7.69\text{mm}$ and $49.23 + 7.91$. This data is helpful in hip arthroplasty, treatment of hip joint fractures, diagnosis of congenital hip dysplasia also in forensic medicine, orthopadician.

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1. Introduction

Acetabulum is a hemispherical cavity on the medial part of the hip joint[1].The diameter and depth of Acetabulum is valuable for surgical treatment of Acetabulum like Total hip arthroplasty.[12,13] Parameter of acetabular diameter and depth helps in determining the gender (Ref. Murphy studied on prehistorically New Zealand Polynesian hip bone). Various bony components, Acetabulum and its parameters not only help the radiologists but will also be of immense importance to the orthopedicians and prosthetists. Any deviation of this parameter from normal have strong correlation with the development of various kind of pathology related to Acetabulum[10]. The purpose the present study was to assess the accuracy of the discriminate functions equation for acetabular diameter [11]. The morphologous study of acetabulum is vital in clinical application, particularly in planning before acetabular surgery and for determining the dysplasia of hip^[12].

2. Material and Method

This study was conducted in the Department of Anatomy, Government Medical College Bhavnagar. 100 Dry hip bones adult human beings were taken and depth and diameter of Acetabulum were taken by digital sliding vernier caliper. Correlation between parameters were analysed using Pearson's correlation test, <1 was the significant level.

1. Diameter of the acetabulum- The distance between the acetabular ridge nearest to the ischial tuberosity to anterior iliac margin intersecting the acetabular ridge.
2. Depth of the acetabulum- A thin metallic strip was placed across the diameter of acetabulum. Depth of the acetabulum was measured in millimeters using digital sliding vernier caliper.

Measurement could made as accurate as 1/10 of a millimeter by this test and we evaluated the anterior acetabular ridge shape morphologically and classified them as follows. (curved, straight & irregular).

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3. Results

Regarding the anterior acetabular ridge shape, mainly the shape is curved 61%, straight 21% and irregular 19%. The mean value for acetabular depth and diameter in that acetabulum having curved ridge is 26.00 + 2.47mm. The mean value for acetabular depth having straight ridge is 26.56 + 2.89 mm. The mean value for the acetabular depth having irregular ridge is 56.25 + 1.72mm respectively.

The maximum and minimum measurements of acetabular diameter were 56.60mm to 42.54mm. The maximum and minimum measurements of acetabular depth were 32.13mm to 19.07 respectively. Positive and significant correlation was found between the depth and the diameter of acetabulum ($r = 0.437$ $p = 0.001$).

Parameter of the bony acetabulum is very essential, as it will help in understanding of some acetabulum related pathology. Awareness of the average dimensions of the acetabulum will help in detection of disputed person by forensic expert. As total hip replacement is a common surgery performed nowadays knowledge of the dimensions of the acetabulum and parameters will assist the prosthetists to construct the suitable prostheses. [10]

Table 1 : Depth Of Acetabulum (n=100)

Type	CURVED	IRREGULAR	STRAIGHT
Number	61	19	20
Range of depth of acetabulum	19.07-32.13	23.33-29.59	19.07-30.31
Average of depth of acetabulum In mm	26	26.25	26.56
SD	2.47	1.72	2.89

Table 2 : Diameter Of Acetabulum (n=100)

Type	CURVED	IRREGULAR	STRAIGHT
Number	61	19	20
Range of Diameter of Acetabulum In mm	42.59-55.97	42.35-56.60	42.82-55.59
Average of Diameter of Acetabulum In mm	49.07	49.18	49.79
Sd	3.6	4.05	3.85

Figure 1 : Measurement of Diameter of Acetabulum



Figure 2 : Measurement of Depth of Acetabulum.



4. Discussion

Clinically it is very important to know the morphology of anterior acetabular ridge during total hip arthroplasty, treatment of hip joint fractures and in diagnosing congenital hip dysplasia.

Our results differ from fundu TASTEKIN AKSU, particularly, the high incidence of straight ridge in our study may be due to ethnical origins. In Previous study of fundu TASTEKIN AKSU, the average depth of acetabulum was 29.49 + 4.2mm where as in our study, the average depth of acetabulum is 19.07 + 2.47.(13)

Previous study of fundu TASTEKIN AKSU, the average diameter of acetabulum is 54.29+ 3.8 mm where as our study, the average diameter of acetabulum 42.54+ 3.6.(13)

Aktas et al. performed a radiological study to determine the normal hip joint morphometry and acetabular dysplasia rete in Turkish adults. They measured the acetabular depth in various age groups and found depths between 10.00 and 11.1 mm. In addition they reported that the morphometry of the hip joint displayed ethnical differences(7)

Han et al. conducted a radiological study and presented the radiological parameters for acetabular dysplasia diagnosis. They measured the acetabular depth radiologically and found that depth differ which decreases by aging (average AD 2 10.9+2.7 mm in women and 11.5+2.6 mm in men)(6). AD 1 measurements were in the present because it was assessed in dry bone (29.49+ 4.2 mm).

Our study showed a significant correlation between diameter and depth. This information can be beneficial for the early diagnosis of acetabular dysplasia.

5. Conclusion

In the Study of the depth of acetabulum with acetabulum diameter, Most common anterior acetabular ridge shape is curved 61%, straight 20% & irregular 19%. This information may be helpful during the hip arthroplasty, treatment of hip joint fracture and in diagnosis of congenital hip displacement. This study also helps in forensic medicine science and prosthetists.

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