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RESEARCH ARTICLE

A STUDY OF MEASUREMENT OF ACETABULAR INCLINATION ANGLE RADIOLOGICALLY IN NORTHERN INDIAN POPULATION OF JAMMU REGION.

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Abstract

The acetabulum is a cup-shaped socket of the hipbone that derives its name from its resemblance to a shallow Roman vinegar cup. In clinical medicine, measurements of the acetabulum are crucial in diagnosis, monitoring patient recovery, determining stability of the hip joint and in assessment of acetabular dysplasia. The decision for operative treatment is often based on different radiographic measurements and scores for which normal values are defined. Therefore orthopaedic surgeons often use combinations of measurements when assessing acetabular parameter. A number of authors have also shown that geometrical measurements of acetabulum differ with respect to age, sex, and race and even within regions. The size, shape and depth of the acetabulum are variable as reported by Govsa F *et al.*, Therefore, the knowledge of various parameters of acetabulum would be helpful in performing surgical procedures such as acetabular reconstruction and planning reorientation procedures using spikes and screws for fixation.

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Introduction:-

The acetabulum is a cup-shaped socket of the hipbone that derives its name from its resemblance to a shallow Roman vinegar cup.

The acetabular angle of Sharp (SA) was introduced in 1961 which measures the acetabular inclination (**Sharp, 1961**). This study from 200 normal hip joints found that the normal value for acetabular angle was within range 33-38°, angles within range 39-42° were the upper limit of normality and above 47° was considered as hip with congenital subluxation. The SA value in this study averages 41.79° for male and 42.92° for female. This SA value in this study is higher than Singaporean population which has the average SA 39.46° (**Umer et al., 2006**). The acetabular angle of Sharp is valuable especially for acetabulum cup inclination during Total Hip Arthroplasty (THA) to reduce malpositioning, incidence of dislocation and acetabular cup failure (**Stem et al., 2006**).

Materials And Methods:-

The study was conducted in Government Medical College Jammu from October 2016 to November 2017 on the pelvic radiographs of 300 patients. All age groups of the patients who had undergone for pelvic x-ray AP view

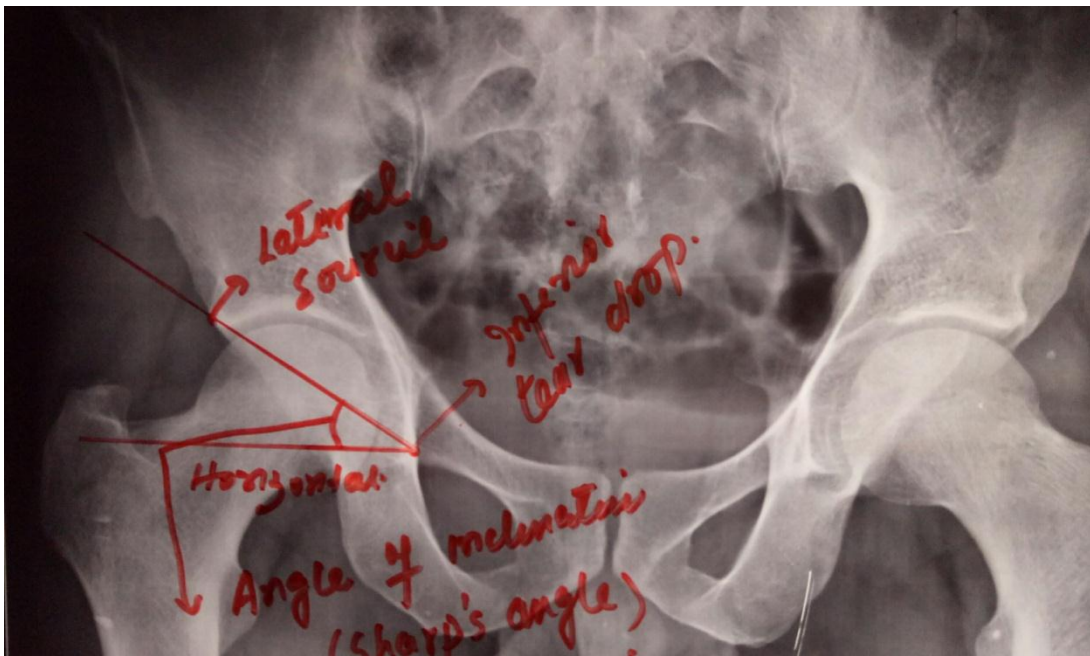
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routinely for their clinical indication with radiologically normal xrays were included in the study. These pelvic radiographs were obtained using the standardised protocol: in 15-30 degrees of internal rotation of the hips in the supine position with a film-focus distance of 100 cm and the beam centered on the symphysis pubis. The magnification power of x ray machine was kept 54%. The values were calculated by multiplying by factor 1.85.

The observations and measurements were made with regards to acetabular inclination angle . All other data like age, sex, presenting complaints were being collected from available records at the Medical records department. This collected data was tabulated and analysed. Appropriate stastical technique was applied and help of statistician was sought to find out prevalence and significance of any apparent association based on type of data available. Data was distributed normally with the help of statistician of our medical college for comparison of genders.

Acetabular inclination angle:-

The Sharps angle provides an estimation of overall acetabular inclination and is formed by connecting a horizontal line from the distal teardrop and oblique line to the superolateral acetabular rim. Steepening of the inclination angle is seen in patients with developmental dysplasia of the hip. The acetabular angle using Hilgenreiner's line should be less than 28° at birth. The angle should become progressively shallower with age, and should measure less than 22° at and beyond 1 year of age. In adults the normal range is 33° to 38°. Angles above 47° are seen in patients with acetabular dysplasia. A measurement between 39° and 46° is indeterminate.



Inclusion Criteria:-

All age groups who had gone to get an x-ray of pelvis for any clinical indication on routine basis in OPD/EMERGENCY/WARD in the Department of Orthopaedics of Govt. Medical College Jammu were included in the study.

Exclusion Criteria:-

Radiographs of patients with osteoarthritis, metabolic diseases, hip fractures and pathological (metastatic) hip fracture were excluded from the study .

Statistical analysis:-

Appropriate stastical technique was applied to find out prevalence and significance of any apparent association based on type of data available.

Observations:-

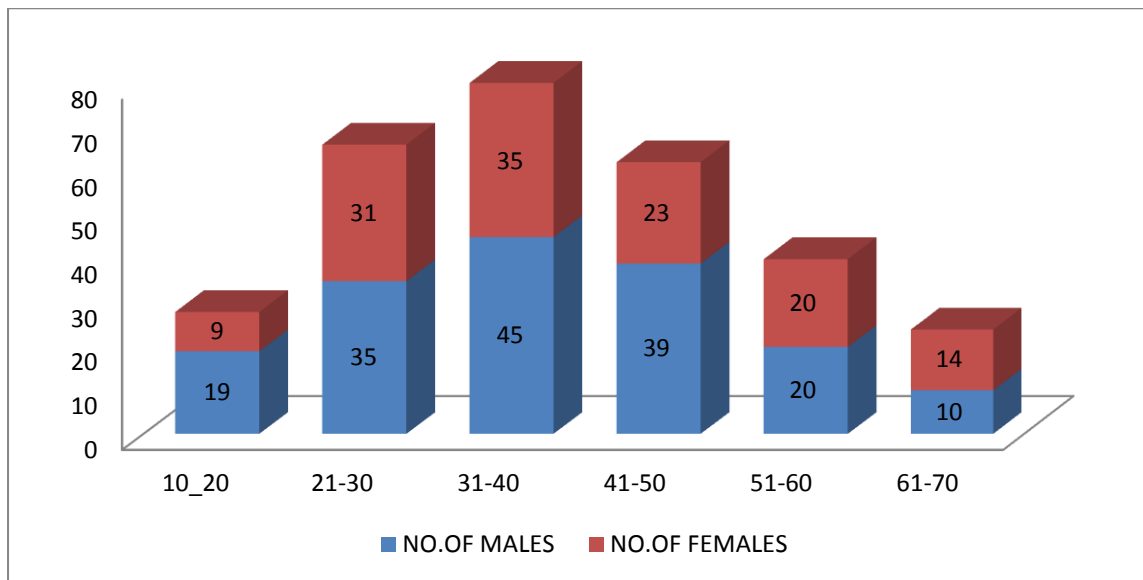
The following observations were made in this study. We included 300 radiographs of pelvis in this study. 168 belonged to males and 132 were females.

Total number of males and females

sex	No. of x rays
MALE	168
FEMALE	132

Age Wise Distribution:-

AGE GROUP	NO.OF MALES	NO.OF FEMALES	TOTAL
10-20	19	09	28
21-30	35	31	66
31-40	45	35	80
41-50	39	23	62
51-60	20	20	40
61-70	10	14	24
	168	132	300



Observation Of Acetabular Inclination Angle (Sharp's Angle):-

Age group(years)	Male(in degrees)	Female(in degrees)
10-20	39.05(38-41)	38.67(37-40)
21-30	39.22(37-41)	39.35(37-41)
31-40	39.20(37-41)	39.20(37-41)
41-50	39.05(36-40)	39.34(38-40)
51-60	38.90(38-40)	39.35(38-41)
61-70	39.07(38-41)	39.07(38-40)
Average	39.14 (36-41)	39.23 (37-41)

Distribution according to acetabular inclination Angle:-

	N	MEAN	SD
MALE	168	39.14	0.11
FEMALE	132	39.23	0.26

N=no of observations. Sd=standard deviation

The acetabular inclination angle in males was 39.14 ± 0.11 degrees (36-41). The acetabular inclination angle in females was 39.23 ± 0.26 degrees (37-41). The difference in the acetabular inclination angle of males and females was found to be statistically significant (p value is <0.0006).

Discussion:-

The acetabular angle was first described by Sharp. Acetabular angle is frequently used to determine the presence of dysplasia, values of $>43^\circ$ are considered dysplastic. Stulberg and Harris reported a mean acetabular angle of 32.2° in white males and 32.1° in white females respectively. Nakamura *et al.* reported a mean of 38° and a standard deviation of 3.6° in the Japanese population. From India, Saikia *et al* found a mean acetabular angle of 39.2° (range = 30° - 50° ; SD 4.9°) and Sengodan *et al* found it to be 35.5 . In our study the mean acetabular angle in males was 39.14 (36-41) and in females was 39.23 (37-41). We found the acetabular angle in our population was similar to Northeastern Indian population, and studies from Asia as depicted in table, however the angle was more as compared to southern Indian population. This might be due to the reason that Northeastern Indian population is racially more closer to central Asians than to South Indians.

STUDY	ETHNICITY	ACETABULAR ANGLE
Stulberg and Harris	White	32.2^0 males/ 21.1^0 females
Nakamura	Asian	38^0
Han	Asian	37^0
Umer	Asian	37.8^0
Saikia	India (NorthEast)	39.2^0
Sengodan	Indian (South)	35.2^0
Present Study	India (North)	39.18^0

Summary And Conclusion:-

This study concludes that there are no significant differences in acetabular inclination angle among north Indian population compared to ethnically similar populations. Significant differences exist between Indian and European and African anthropometry. Within Indian population also, the anthropometric parameters vary from region to region, hence this study may be useful for designing the total hip prosthesis among the Indian population. Awareness of the average dimensions of the acetabulum and femoral head will assist prosthetists in designing a suitable prosthesis according to the need of a particular individual.

However our study was small with only 300 persons. A large multicentric study is needed to confirm our results

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