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CORRELATION OF NECK SHAFT ANGLE OF FEMUR WITH SEX- A RADIOGRAPHIC STUDY

Anatomy

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ABSTRACT

The hip joint is one of the largest and most stable joints in the body. The neck shaft angulation create a weak spot at the upper end of femur. The angulation constitutes important feature of adaptation that helps in the process of evolution of erect posture in bipeds. it was described as greater in males than females, or no sexual difference at all. Aim of the present study is to find out the correlation between Neck shaft angle of femur in relation with Gender/sex in Northern Rajasthan population. Subjects were selected from O.P.D Of Radiodiagnosis department, NIMS Medical college and Hospital, Jaipur, Rajasthan. Total number of subjects will be 100, among them 50 were male and 50 were female. Instrument for (Radiological) measurement of N.S.A is Radiant dicom viewer. Total population Right side mean neck shaft angle was higher than left side, but statistically not significant. Mean neck shaft angle in male subjects of the right side was higher while in females mean neck shaft angle of left side was more. The neck shaft angle is less in female than in the males due to the increased breadth of the lesser pelvis & greater obliquity of the femur

KEYWORDS

Neck Shaft Angle, Radiant Discom Viewer, Femur.

INTRODUCTION

The hip joint is one of the largest and most stable joints in the body. It is a multi- axial ball and socket joint that has maximum stability because of the deep insertion of the head of the femur into the acetabulum. To mechanically accommodate this postural change, the head and neck of femur undergo angulation and rotation locomotion from the very beginning. The neck shaft angulation creates a weak spot at the upper end of femur. Nevertheless the angulations constitutes important feature of adaptation that helps in the process of evolution of erect posture in bipeds. It was found to be different in different races and at different ages. The findings pertaining to sex were inconsistent. However it was described as greater in males than females or no sexual difference at all.

NECK SHAFT ANGLE: The neck-shaft angle is defined as the angle formed by the neck axis and long axis of the shaft of femur. It is also named as neck-shaft angle (N.S.A), angle of neck of femur, angle of inclination, collodiaphyseal angle or cervicodiaphyscal angle.

Fig.1   (α : Neck shaft angle) In above radiograph:

Axis A-B :   Axis of femoral neck
Axis C-D :   Axis of shaft of femur
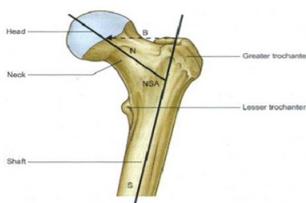**α :**   Neck shaft angle

Fig.4   : The neck shaft angle between the long axis of the shaft and axis of the femoral neck

Normal neck-shaft angle varies from 120˚-140˚.A decrease in the normal neck-shaft angle is known as coxa-vara, while if the angle is more than 140° it is known as coxa-valga. Awareness of the anatomic differences between genders for acetabulum anteversion angle and neck shaft angle may reduce the relatively higher incidence of dislocations in females and may lead to different implant designs for male and female patients.

NEED FOR THE STUDY- There is paucity of literature pertaining to effects of improperly sized implants on patient outcome. Present study will help to analyze the proximal femoral geometry in Indian population. The data obtained can be useful in the designing of appropriate implants.

AIMS AND OBJECTIVES- Aim of the present study is to find out the correlation between Neck shaft angle of femur in relation with Gender/sex in Northern Rajasthan population.

MATERIALS AND METHOD-
1. SOURCEOF DATA- The present study was observational descriptive study with radiographic data collection where subjects will be selected from O.P.D Of Radio diagnosis department, NIMS Medical college and

Hospital, Jaipur, Rajasthan.
Total number of subjects will be 100
a) Male- 50
(b) Female-50

Including both right and left sides of femur.
A) Inclusion Criteria: All individuals between 20 to 80 years of Age who would be under going pelvic digital x-rays. Anteroposterior view with Radiologically normal x-rays were included in the study (having both right and left side femur) Age,sex and other data noted down by general interview by Radiologist.

B) Exclusion Criteria: The diseases which could modulate the outcome of the study, digital Radiographs of patients with osteoarthritis, (Injury of the study part of limb, Metabolic bone diseases, Malignancy, Renalfailure, Coxarthrosis).

C) MATERIALS USED:
1.   100 x-ray images A.P view of pelvis showing both (Rt. and Lt) N.S.A of femur.
2.   Protractor
3.   Instrument for (Radiological) measurement of N.S.A : Radiant dicom viewer

STATISTICALANALYSIS (a) Formula for calculation of mean is :

$$Mean\ (\bar{X}) = \frac{Total\ or\ sum\ of\ the\ observation}{Number\ of\ observation}\ or\ (\bar{X}) = \frac{\sum X}{n}$$

(b) Standard deviation: Defined as "Root- means- square- Deviation".

$$SD = \frac{\sum(X - \bar{X})^2}{n - 1}$$

(c) Coefficient Variation

$$Coefficient\ variation\ (Cv):\ \frac{100 \times SD\%}{Mean}$$

Methodology- Pelvic radiograms were taken with 15-30 degrees of internal rotation of the hips in the supine position. The beam centered on the symphysis pubis with a film-focus distance of 100 cm. 15 inch×12 inch films were used in this study.

Meuserment of neck shaft angle: By Radiant dicom viewer:

Radiant dicom viewer:

Introduction of Radiant Dicom viewer:
- To display the images inside the Web browser, DICOM Java viewer with the following features can display any kind of DICOM image including indexed or true color images obtained in Ultrasounds or Nuclear Medicine.
- The viewer allows to change the window level of MR and CT true 12 or 16 bits depth grayscale images. Other image manipulations like zooming or rotations will also be available. The viewer allows to short the images in different stacks according to the sequences they belong. Those stacks can be synchronized and visualized altogether for comparison purpose.
- The synchronization can be set according to the slide position or can be user defined.
- This system is almost as fast as other PACS systems (Picture Archiving and Communication Systems :). For hospital departments outside the radiology department, like the intensive care unit.

PROCEDURE: First we have to install the medical software (radiant dicom viewer)in our system from internet.
- Then we have to export all the x-ray images (our samples) as dicom images in file folder of radiant dicom viewer.
- Then we have to open an image and angle was measured. The long axis of femoral shaft (drawn from the centre of the shaft) and the axis of the neck (drawn from the midpoint of the head of the femur towards the base of the neck)were drawn. Dicom viewer automatically read the angle.
- Three readings were taken and an average was recorded. This was done for both right and left sides

Observation table- 1comparison of neck shaft angle in total population

| Parameter	Side	N	mean	Std. Deviation	P Value
NSA	right	100	130.22°	6.26	>0.05
	left	100	129.81°	6.87	

Sidewise Comparison in Total Population
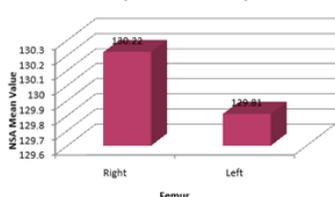
The table shows that the mean NSA of right side in total population was 130.22 degree while mean NSA on left side was calculated as 129.81 degree. On comparing by unpaired 't' Test this difference b/w the two sides was found to be statistically nonsignificant. (N.S.A : Neck shaft angle).

Table 2: sidewise comparison of N.S.A in Male population

Parameter	Side	N	Mean	Std. Deviation	P Value
NSA	Right	50	130.76°	7.13	>0.05
	Left	50	129.44°	7.74	

Sidewise Comparison in Male Population
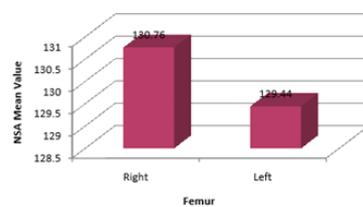
The above table shows the mean value of NSA in male population on right side 130.76 degree while mean value of NSA on left side was calculated 129.44 degree, On comparing by unpaired 't' test this difference b/w the two side was found to be statistically nosignificant.

(N. S. A: Neck shaft angle)

Table no. 3 Sidewise comparison of N.S.A. of female population

Parameter	side	N	mean	Standered deviation	P value
NSA	right	50	129.68°	5.20	>0.05
	left	50	130.18°	5.86	

The above table shows that mean N.S.A. of the right side in female population was 129.68° while mean N.S.A. of the left side in female population was 130.18°,On comparing by unpaired 't' test this difference b/w the two side was found to be statistically nonsignificant.

Sidewise Comparison in Female Population
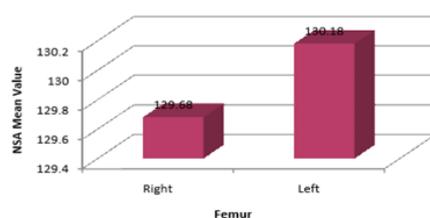
Summary and conclusion
The femoral N.S.A has been studied by several authors and most authors agreed that there is considerable individual variation & wide standard deviation in this angle. In the present study 100 radiographs 50 male 50 female were studied to find out the correlation of neck shaft angle with Gender, so we consider both right and left side for different age groups.

Mean neck shaft angle analyzed by using radiant dicom viewer.

Table no 1(graph no. 1): The neck shaft angle in total population of the right side ranged from (108°-145°) with a mean 130.22° and of the left side the mean neck shaft angle ranged from (115°-147.3°)with a mean 129.81°. On comparing by unpaired't' test this difference b/w the two sides was found to be statistically nonsignificant. (p value › 0.05)

Table no 2 (graph no.2); The neck shaft angle in male population of the right side ranged from (113°-144°)with a mean 130.76° and of the left left side the neck shaft angle ranged from (115°-147.3°) with a mean 129.44°. On comparing by unpaired't' test this difference b/w the two side was found to be statistically nonsignificant. (p value › 0.05)

Table no 3 (graph no.3); The neck shaft angle in female population of the right side ranged from (108°-145°)with a mean 129.68° and of the left left side the neck shaft angle ranged from (115.3°-140.2°) with a mean 130.18°. On comparing by unpaired 't' test this difference b/w the two sides was found to be statistically nonsignificant.(p value › 0.05).

Year	Author	Region	Male	Female
1980	Hoaglund	Hong-Kong	135°	134°
2001	Massaki Maruyama	Japan	125.6°	126.1°
2018	Present study	Northern Rajasthan	130.18°	129.68°

The neck shaft angle is less in female than in the males due to the increased breadth of the lesser pelvis & greater obliquity of the femur(Gray's anatomy).

Total population Right side mean neck shaft angle was higher than left side, but statistically not significant. Mean neck shaft angle in male subjects of the right side was higher while in females mean neck shaft angle of left side was more.

There was Low –ve correlation (-0.0156) between right side femoral mean N.S.A and Age and   Low +ve correlation (0.026.) between left side femoral mean N.S.A and Age. Right side correlation coefficient : (-0.0156) , Left side correlation coefficient : (0.026)

On comparing by unpaired't' test the difference between both methods (N.S.A measurement on plane paper and by dicom viewer) The mean N.S.A. of right side femur was found to be

statistically significant while the mean N.S.A of left side femur was found to be statistically nonsignificant. Clinicians must be familiar with normal neck-shaft angle for better comprehension of clinical and pathological states of hip joint. The neck-shaft angle, neck length and other parameters are important to design the prosthesis for hip replacement. The neck-shaft angle is helpful in forensic identification of individuals.

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