Measurement of Femoral Neck-shaft angles in Indian population.

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Abstract:

Background : Femoral neck-shaft angle is an important parameter considering the biomechanics of the hip joint. The normal femoral neck-shaft angle is in the range of 125-135 degrees. **Objectives:** The objective of present study was to find out the average measurement of femoral neck-shaft angle in Indian population. **Study design:** Retrospective observational study. **Result:** The result of the present study is that the femoral neck-shaft angle was 136.8 degrees (122.2 degrees-141.1 degrees), right femur was 137.1 degrees, left femur was 136.7 degrees **Conclusion:** The femoral neck-shaft angle of Indian population is not significantly different as compared to that given in literature. Also there is no significant difference in the neck-shaft angle of left compared to the right femur.

Key words: Femur, Neck-shaft angle

Introduction:

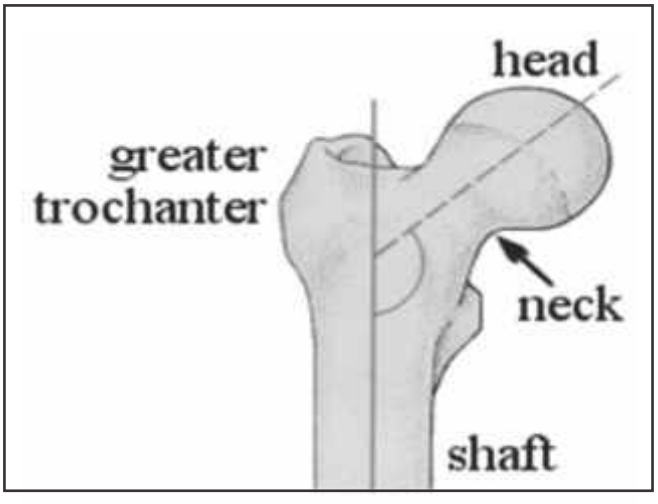

Fig 1: Femoral Neck-shaft angle [1]

Femoral neck shaft angle is the angle subtended between the shaft axis (solid line) and the neck axis(dashed line) of the femur.[1]

The neck of femur is about 5 cm in length and it subtends an angle of 135 degrees by connecting the head to the shaft allowing the limb to swing clear of the pelvis.[2]

Femoral neck-shaft angles, also known as caput-collum-diaphyseal angle (CCD), have been measured in past studies to understand how much variation exists within the human population.[3] However, no studies could be found to have assessed the variation in this angle in Indian population.

A study conducted by Tillman and Tondury found that Femoral neck-shaft angle starts out at about 150 degrees at fetal life, decreases gradually to 125 degrees by the time the person becomes skeletally mature.[4]

The knowledge on neck-shaft angle helps us to better understand the biomechanics of the hip joint and also helps us to better treat pathology of hip and femur.

Objectives: The objective of the present study was to evaluate the range of normal angles of femora in the Indian population, their age and sex difference.

Materials and Methods:

The present study was conducted in the department of Orthopaedics, PDVVPF's Medical College and Hospital, Ahmednagar from January 2014 to December 2015(2 years).

A total of 2000 X-rays of both males and females were considered for the study. X-ray of all ages of pelvis with both hips were studied and no exclusions were made based on age.

The study was started with the following equipment/material :

-Fully functional Windows computer

- Pre-installed InstaPACS software

-Electronic measuring tools.

Inclusion criteria :

-X-ray of the Pelvis with both hip in antero-posterior view of a subject native to India.

-X-ray of the Hip joint in antero-posterior view of a subject native to India.

-X-ray of hip joint in antero-posterior view taken in post-op period.

Exclusion criteria:

-X-ray where the limb is in undue/excess external

rotation evidenced by greater prominence of the lesser trochanter.

-Over-exposed or blurred x-rays.

Procedure :

After the X-ray meets the inclusion and exclusion criteria, the x-ray was critically evaluated using the InstaPACS software by marking the axis of shaft and axis of neck. The axis of neck was drawn by taking two points at the centre of the head and other at the end of the midpoint of the narrowest part of the neck. Then the two points were joined, thus forming a line to represent the axis of the neck. The axis of the shaft was marked by taking two mid-points, one at the upper end of shaft and other at the lower end of shaft, the two points were joined and the same line was extended at the upper end to cut the first line. This angle was measured using electronic measuring guides and the angle was noted down.

Fig 2: X-ray of Pelvis with both Hips in antero-posterior view of a 57 year old Indian female patient

Figure 3: X-ray of the Pelvis with both hips in anter0-posterior view with proximal femoral fracture on the right side

Figure 4: Xray of the pelvis with both hips in antero - posterior view operated with Dynamic Hip screw with barrel plate on the right side

Figure 5: X-ray of the Left Hip joint taken in antero-posterior view of a 45 year old male Indian patient

Results:

- The study comprised of 2000 X-rays
- The mean age of patient was 52.2 years with the youngest being 7 years and eldest being 87 years of age.
- There were 1218 females and 782 males.
- 456 of the 2000 patients had undergone prior operative intervention, out of which 409 had implants in situ.
- The mean femoral neck-shaft angle was 136.8 degrees(122.2 degrees- 141.1 degrees)
- The mean femoral neck-shaft angle for left side was 136.7 degrees while that for the right side was 137.1 degrees

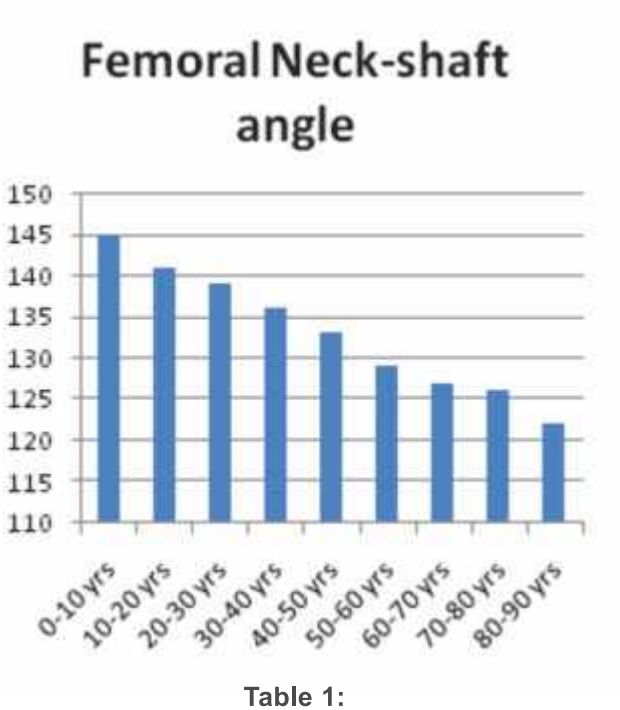

Table 1:
Relation between Femoral neck - shaft angle and Age

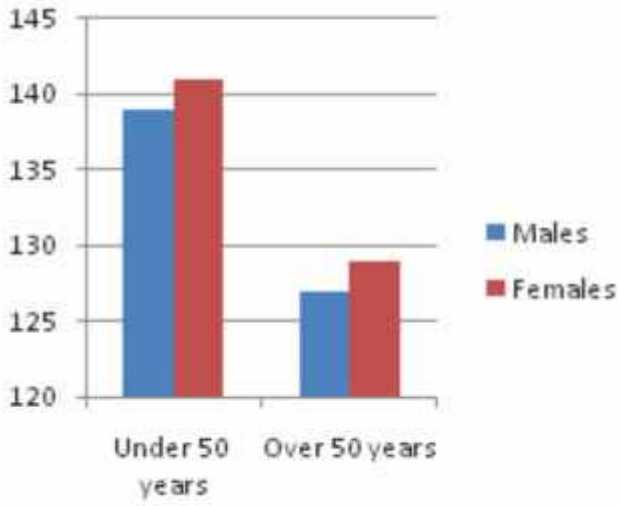

Table 2: Relation between Femoral neck-shaft angle and Gender in two broad age groups

Discussion : The value of correct knowledge of the neck-shaft angle among Indian population is immense. Such information guides the operating surgeon in the O.R as to which prosthesis to select while performing a proximal femoral nailing or dynamic hip screw with barrel plate in fixation of Inter-trochanteric fractures of the femur.

It is also useful in evaluating post-operative x-ray- whether the fixation is anatomical or in varus and

thereby guide post-op rehabilitation and outcome. With no previous data available to quantify the neck-shaft angle, this study attempted to fill a blind-spot of information when it comes to dealing with the Indian population

Conclusion : In the present study, the mean femoral neck-shaft angle was 136.8 degrees. The study does not find any significant difference in the neck-shaft angle of Indian population compared to literature.

This being a study focused purely on the X-ray, there is no bias. The study was conducted using standard computer software, thereby negating any inter-observer variability.

This being a retrospective study, limits the scope of study. The study evaluated 2000 X-rays which is not true representative sample of the entire Indian population. Also, the study did not identify inter-racial or inter-regional variabilities that could have a significant difference in measurement, thus warranting need for further studies.

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Conflicts of Interest : None

The topic for research was approved by Institutional Ethics Committe of PDVVPF's Medical College and Hospital, Ahmednagar.

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