

Original Research Article

## Study of Neck-Shaft Angle in Adult Dried Femora

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Received: 23/08/2016

Revised: 02/10/2016

Accepted: 05/10/2016

### ABSTRACT

**Background:** The neck-shaft angle of femur is a crucial factor in the biomechanics of gait. Femoral ante version and the neck-shaft angle variations probably are the etiologic factors in various types of femoral neck fractures.

**Aims and Objectives:** To measure the neck-shaft angle of dried femora and to compare with other studies.

**Materials and Methods:** The numbers of femora collected from the department were 60. The neck shaft angle was obtained by drawing the femoral contour on a paper. A point on the centre of maximum diameter of head of femur was marked. Another point was kept on the centre of minimum diameter of the neck. The two lines were joined to form the axis of neck of femur. Two points each on upper and lower ends of the shaft were joined by a line to form the axis of the shaft. These two lines were extended to intersect each other at an angle, the neck shaft angle. This was measured by a protractor.

**Results:** Out of the 60 femora, 33 belonged to right side and remaining 27 were from left. The maximum angle from the study was 140 degrees and the minimum was 112 degrees. The mean value was 126.28 degrees with a standard deviation of 6.556. P value was calculated using chi square and it was not significant statistically.

**Conclusion:** The mean value of neck-shaft angle of femur was 126.28 degrees with a p value not significant statistically. The study can be widened by increasing the number of femora to find any variation.

**Keywords:** Femora, neck-shaft angle, axis of shaft, axis of neck, p value.

### INTRODUCTION

The transition from quadrupedal to bipedal gait was a considerable biomechanical milestone in the evolution of Homo sapiens. [1] The neck of the femur inclines to form an angle with the shaft. This is wide in infancy when the child learns to walk and gradually decreases during growth. The neck-shaft angle also shows gender difference, smaller in females due to wide pelvis. There is a racial difference owing to the morphology of head, neck and shaft of femur.

Normal range of neck-shaft angle varies from 120<sup>0</sup>-145<sup>0</sup> with an average value of 135 degrees. [1] Several studies were conducted on neck-shaft angle [3-6] to determine the variations, clinical correlation, and surgical applications. The present study was done to evaluate the neck-shaft angle and to compare with other studies.

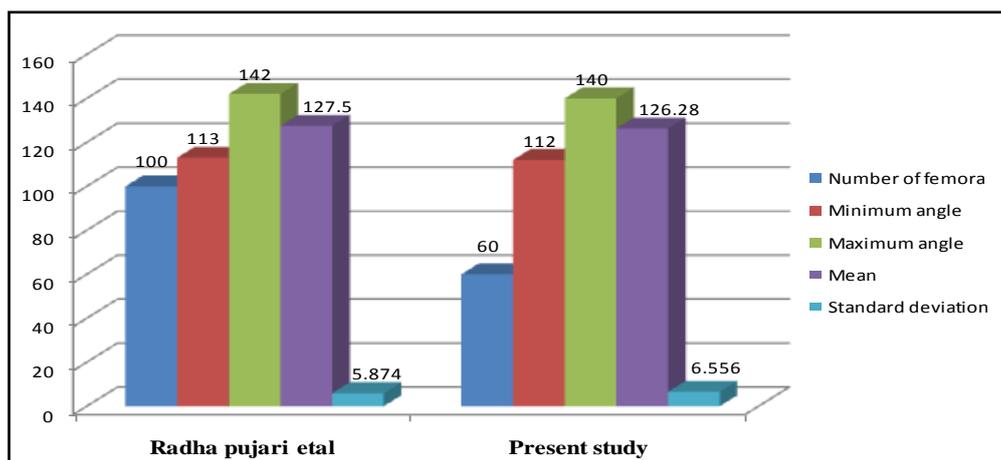
### MATERIALS AND METHODS

60 dried femora from the department of Anatomy were evaluated for the study. 33

were from the right side and 27 femora belonged to left side. Those which are broken and bearing prosthesis were discarded. The contours of femoral head, neck and upper end of the shaft were traced on a paper. The midpoint on the widest diameter of the head was marked. The midpoint on the greatest width of the neck was marked. A line was drawn joining these

two points which was called the axis of neck of femur. Another line was drawn joining a point on the upper end of shaft with greatest width and a point on the tip of greater trochanter. This was called axis of shaft of femur. The inner angle between them at the point of intersection was measured with a protractor.

## RESULTS



Graph 3.1: Compound bar chart comparing the study of neck-shaft angle of femur

60 femora were evaluated of which 33 were from right side and 27 from left side. The maximum neck-shaft angle from the study was 140 degrees while the minimum was 112 degrees. P value was determined using chi square. Chi square (X<sup>2</sup>) was calculated using the formula:

$$x^2 = \frac{(O - E)^2}{E}$$

Where O is the observed value; E is the expected value. X<sup>2</sup> = 0.0116; degree of freedom n=2-1=1, p value =0.9142 which is not significant statistically.



Figure 3.1: Femora from the department of Anatomy

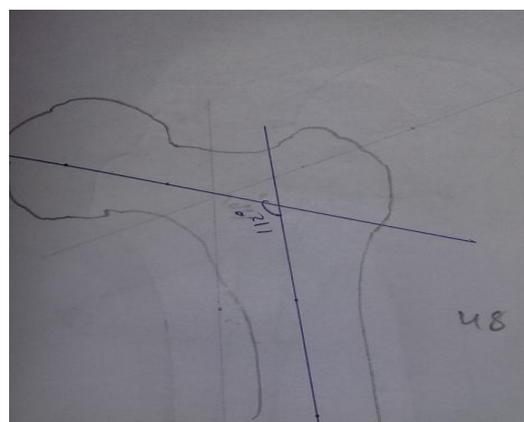


Figure 3.2: maximum and minimum neck-shaft angle

## DISCUSSION

The neck of femur lies at an angle with the shaft- the neck-shaft angle. The angle in the new born is nearly equal to the adult. The average being 126.5° and range being 106°-151° according to Kate [8] (1967). There is a racial and gender difference, smaller in females when compared to males. Several studies [7-10] show the clinical relevance to the variation in the neck-shaft angle.

The present study was done on dried femora of north coastal Andhra Pradesh. The values were compared with the study made by Radha Pujari et al. [2] The values of neck-shaft angles ranged from 112°-140°, whereas they were 113°-140° in other study. [2] The mean value was 126.28° with a standard deviation of 6.556. But the mean value from other study was 127.5° with a standard deviation of 5.874. This shows that there is a variation in the geographic distribution as well. P value was calculated and was not statistically significant.

## CONCLUSION

A study on 60 dried femora determined the neck-shaft angle ranging from 112°-140° with an average of 126.28°. This is compared with other study and p value was determined which was not significant statistically. This may be further evaluated for variation in gender difference.

## REFERENCES

1. Gray's Anatomy, Susan Standring 40<sup>th</sup> ed., Churchill Livingstone, pg-1360, 1390.
2. Radha Pujari, Ravi Shankar G, Naveen N. S, Roopa C. R. "Evaluation of Neck Shaft Angle of Femur on Dry Bones". Journal of Evolution of Medical and Dental Sciences 2015; Vol. 4, Issue 32, April 20; Page: 5518-5522, DOI: 10.14260/jemds/2015/807.
3. Olav Reikeras, Arne Høiseth, Astor Regstad & Erik Fönsteli (1982) Femoral Neck Angles: A Specimen Study with Special Regard to Bilateral Differences, Acta Orthopaedica Scandinavica, 53:5, 775-779, DOI: 10.3109/17453678208992291
4. Shakil Mohamad Khan, Shaik Hussain Saheb. STUDY ON NECK SHAFT ANGLE AND FEMORAL LENGTH OF SOUTH INDIAN FEMURS. Int J Anat Res 2014; 2(4):633- 635. DOI: 10.16965/ijar.2014.512
5. Subhash Gujar, Sanjay Vikani, Jigna Parmar, K V Bondre. A correlation between femoral neck shaft angle to femoral neck length. IJBAR; 2013: 04 (05).
6. S. P. Tuck, D. J. Rawlings, A. C. Scane, I. Pande, G. D. Summers, A. D. Woolf, R.M. Francis. Femoral Neck Shaft Angle in Men with Fragility Fractures. SAGEHindawi Access to Research Journal of Osteoporosis. 2011; Article ID 903726, 7 pages.
7. B. Isaac, Selvakumar Vettivel, Rajendra Prasad, L. Jeyaseelan G. Chandi- Prediction of the femoral neck-shaft angle from the length of the femoral neck. Clin. Anat. 10:318-323, 1997.
8. KATE B.R. 1967-The Angle of femoral neck in Indians-Eastern Anthropologist, Vol.XX.No.1, 54- 60
9. CHRIST LAVELLE 1974-An analysis of human femur-American Journal of Anatomy, 141:3:415-426.
10. AM Fearon, S Stephens, JL Cook, PN Smith, T Neeman, W Cormick, JM Scarvell- The relationship of femoral neck shaft angle and adiposity to greater trochanteric pain syndrome in women-A case control morphology and anthropometric study, Br J Sports Med. 2012 September; 46 (12) : 888 892. doi: 10.1136/bjsports-2011-090744 PMID: PMC3597182.

How to cite this article: Neelima P, Sunder RR, Himabindu A. Study of neck-shaft angle in adult dried femora. Int J Health Sci Res. 2016; 6(11):100-102.

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