

A Study on the Neck Shaft Angle of Femur in-100 Macerated Bones

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ABSTRACT

Neck of the femur is a mystery in terms of its position, blood supply, direction and function. It doesn't lie in the same plane like that of the femoral shaft and its condyle. The neck sustains an angle with the shaft and lies anterior to it in the coronal plane- referred conventionally as femoral ante version. In rare occasion neck lies posterior to the shaft calls as femoral retroversion.

Exclusive of any deformity or fracture are studied with 100 cadaveric adult femurs with the help of Martins Diopetrograph. The angle between the long axis of the neck and the long axis of the shaft were evaluated. Various workers of the country have evaluated this aspect and globally the literatures covering the subject are plenty and the prosthesis commonly used for hemi and total hip arthroplasty are foreign manufactured. Considering the neck shaft angle, when used in our population it presents some pitfall like restriction of squatting position, chronic hip Pain etc. Hopefully this study will throw some light and guidelines for the manufacturer of prosthesis in this century keeping these facts in mind.

Keywords: Martins Diopetrograph, Neck shaft angle, Osteometric Board, Coxa Vera, Coxa Valga

INTRODUCTION

With modernization of medical science, we update ourselves medical profession with the latest. We come to the world under the brim of pelvis and go out of the world through the fracture neck of femur. Neck of femur is a mystery in terms of its position, function, direction and blood supply. Fractures of upper end of the femur are common in any individuals between adult to old age. Fracture of neck of femur is still more common; understanding the angle (angle of inclination) of the femur helps the mechanics of the

hip joint. The angle of inclination between the long axis of the femoral neck and the femoral shaft varies with age sex and development of the femur. It may also change with any pathological process like weakness coxa valga, Coxa vara causes a mild shortening of the lower limb and limits passive abduction of the hip. On the neck of the femur. When the angle¹ of inclination is decreased, the condition is Coxa vara. When it is increased it is the angle² widest at birth and diminishes gradually until the adult condition is reached. It is less in females than in males owing to the increased breadth of the lesser pelvis and greater obliquity of the shaft of the femur. The reason of faulty angle due to racial and geographical distribution has also to be borne in mind.

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AIMS AND OBJECTIVE

· To identify the variability in the neck shaft angle of the femur in Northern region of Karnataka.

MATERIALS & METHOD

The study of the neck shaft of femur started with the following material collection.

100 femora were collected from the Department of Anatomy, Shri B. M. Patil Medical College Bijapur and surrounding places from January 2004 to 2005.

Osteometric Board from the Department of Forensic Medicine, Shri. B.M. Patil Medical College, Bijapur. Calipers, Scale, Sketch pen, Protractor, Lead pencil etc,

Martin's Diopetrograph instrument of the department of Anthropology, Karnataka University, Dharawad.

According to Parson's table of mathematical sexing of the femur, 100 femora were separated into male and females. With the help of the calipers, Osteometric board and scale.

The following five measurements required for the sexing of femur were taken.

- 1) The vertical diameter of the head – It is the measurement from the highest point on the superior aspect or deepest point on the inferior aspect of the head. In the living condition this measurement while the more by three mm due to the presence of cartilage.
- 2) The popliteal length – It is measured from the apex of the popliteal surface to the centre of the intercondylar line.
- 3) The Bicondrylar width – it is taken parallel to the Infracondylar plane.
- 4) The trochanteric oblique length – it is the vertical distance from the top of the greater trochanter of the Infracondylar line.
- 5) The oblique length of femur – it is the distance from the highest point of the head to the Infracondylar plane.

Inclusion Criteria

Bones are selected which are having proper head, neck and trochanter.

Exclusion Criteria:

Bones with following conditions were excluded from the study.

- 1) Deformed bones – Deformed upper or lower end of the femur
- 2) Malunion Bones

OBSERVATION AND RESULTS

The neck shaft angle of the femur was measured in 100 femora. Among these (50) belongs to right side and (50) belongs to left side of the body. Among 50 right side bones 38 were belonging to male and 12 to female and on left side 35 belong to male and 15 to female. The minimum angle recorded was 107° and maximum angle recorded was 147° and In case of female bones the angle was more than males. The differences of angles between male and female bones were not significant.

Table No1. The angle of 50 Femur Right Side

Bone No	Angles in	Bone No	Angles in
	Degrees		Degrees
1	122	26	131
2	124	27	117
3	133	28	125
4	116.5	29	130
5	114.5	30	113
6	135	31	110
7	121	32	132
8	125	33	114
9	120	34	130
10	123	35	115
11	128	36	120
12	113	37	116
13	124	38	129
14	110	39	125
15	123	40	128
16	130	41	124
17	122	42	124
18	126.5	43	114
19	121	44	122
20	118.5	45	134
21	123	46	115
22	122	47	114
23	121	48	120
24	124.5	49	122
25	120	50	142

Mean = \bar{X} = 122.53

STD = = 6.85

Coefficient Variation = CV = $\frac{STD}{\bar{X}} \times 100 = 5.59\%$

Conclusion : - Variation in Neck shaft angle of the femur is 5.59%

TableNo2. The angle of 50 Femur Left Side

Bone No	Angles in Degrees	Bone No	Angles in Degrees
1	118	26	119
2	123	27	130
3	130	28	107
4	128	29	124
5	125	30	134
6	128	31	126
7	121	32	130
8	131	33	129
9	130	34	130
10	143	35	125
11	128	36	135
12	120	37	125
13	124	38	124
14	132	39	144
15	120	40	130
16	129	41	132
17	133	42	130
18	119	43	115
19	123	44	131
20	118.5	45	117
21	125	46	112
22	117	47	127
23	118	48	147
24	127	49	118
25	139	50	133

Mean = \bar{X} = 126.48

STD = = 7.18

Coefficient Variation = $CV = \frac{STD}{\bar{X}} \times 100 = 6.17\%$

conclusion : - Variation in Neck shaft angle of the femur is 6.17%

Table 3. Random and sex wise mean values of Neck shaft angle of femora

Specimens	No. of Bones	Min (Degrees)	Max (Degrees)	Avg. (Degree)
Random	100	107	147	124.495
Males	73	107	146	123.32
Females	27	118	147	128.18

DISCUSSION

Studies on neck shaft angle of femur showed variations with regard to age, sex and race in Northern region of Karnataka. The neck shaft angle of femur in early fetal life was highest³. The angle varies from 160° in the child to 125° in the adult (Callender) and is widest at birth and diminishes steadily until the adult condition is reached. The present work is chiefly concerned with neck shaft angle in random, males, females and also in comparative study. Sitaram Rao⁴ (1957) measured angles taken at random it was 132° to

205° the average neck shaft angle was found to be 127.7°. Similarly by Grossberg⁵ (1924) the angle found out to be in males 123.9° and females 127.1°. Greater degree of the angle in south Indians 135° – 205° may possibly be due to their habit of squatting when compared to Europeans 125°. The angle was found to be larger in south Indians and Western Indians being 129.6° to 133.1° highest 151° at Madura (Kate 1947) According to studies done by Kate⁶ (1976) the angles were lowest in Faros an and highest in Andaman femur average 125.6° and 134°. In 1980 L Henriksson⁷ presented an analysis that represents a new general principle using computer technique which revealed that the angle diminished with the age from 137° at three year to 131° at six year. Hartly & charpy⁸ observed that the angle was similar in degree in both the sexes i.e. 127°. According to present study of the neck shaft angles, at random were found to be ranging from 107° to 147° the average angle being 124.495°.

CONCLUSION

- 1) The neck shaft angle of the femur was measured in 100 femora of Northern region of Karnataka, the average angle being 124.495°.
- 2) The neck angle of the femur is larger in females than in males. This is 128.18° and 123.32° respectively.
- 3) The difference between the angles of both sexes is 4.86° and it is of no use in determining the sex of the individuals.

Conflict of Interest: The authors wish to state that they have no conflict of interest that might improperly influence this work. This study was unfunded.

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