

Original Article

Morphometric Study of the Dry Femur in South Gujarat Population

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ABSTRACT

Introduction: Femur is the longest and strongest bone of the body located within thigh extending from hip to knee. In upright posture, it transmits the body weight from hip to knee. Like other long bones femur also possess superior and inferior extremities and intervening shaft. Statistical analysis of widespread studies about femoral geometry reveals variations in different parameters among different population. Significant differences prevail across gender, age, race and other factors. Today the world face the epidemy of proximal femoral fractures due to increasing road traffic accidents, osteoporotic femur in old age, avascular necrosis of femoral head etc. Proximal femur fractures accounts for large proportion of hospitalization among trauma cases. Surgical intervention using various implants is not infrequent mode of treatment in these cases.

Aim and Objective: Knowledge of various bony components of upper end of femur has become important for orthopaedicians and prosthetists. So present study is aimed to determine regional pattern about certain metrics in different parameters of femur.

Method: With approval from ethical committee, the study was conducted on 200 dried macerated specimens of adult human femora available at anatomy department government medical college, Surat. Different parameters studied.

Results: Different parameters of femur like Vertical diameter of head of femur, Vertical diameter of neck of femur at superiorinferior directions, Transverse diameter of the neck of femur at antero posterior directions, Neckshaft angle, Circumference of neck, Maximum length on osteometric board between head of the femur to medial condyle, Trochanteric length between greater trochanter to lateral condyle, Bicondylar width studied and compared with different studies. The present study can deliver excellent performance and excellent literature for the orthopaedicians and prosthetists. It also help to find out regional variations in the parameter measured.

Key words: Femur, morphometric study, south gujarat population

INTRODUCTION

Femur is the longest and strongest bone of the body located within thigh extending from hip to knee. In upright posture, it transmits the body weight from hip to knee. Like other long bones femur also possess superior and inferior extremities and intervening shaft. The superior extremity presents head, neck, greater & lesser trochanters. The spherical head is meant to articulate with acetabulum of hip bone to form hip joint. The femoral neck connects head with the body and directed upwards, medially and forwards. Two trochanters are chiefly meant to provide muscular attachments. The femoral shaft is directed medially and downwards forming an angle with neck known as neck-shaft angle. This angle exhibits variations depending on age, gender and other factors. The inferior extremity of femur exhibits expanded condyles which contribute in formation of hip joint.

Statistical analysis of widespread studies about femoral geometry reveals variations in different parameters among different population. Significant differences prevail across gender, age, race and other factors.

Today the world face the epidemy of proximal femoral fractures due to increasing road traffic accidents, osteoporotic femur in old age, avascular necrosis of femoral head etc. Proximal femur fractures accounts for large proportion

of hospitalization among trauma cases. Surgical intervention using various implants is not infrequent mode of treatment in these cases.

Nowadays use of prosthesis in the treatment of proximal femur fractures is increased. Due to variations in metrics of various parameters of femur prosthesis with perfect fitting is difficult to achieve. Knowledge of various bony components of upper end of femur has become important for orthopaedicians and prosthetists. So present study is aimed to determine regional pattern about certain metrics in different parameters of femur.

METHOD

With approval from ethical committee, the study was conducted on 200 dried macerated specimens of adult human femora available at anatomy department government medical college, Surat. The bones show visible abnormalities excluded for the study. The instruments used for study were an osteometric board, venire calipers, goniometer, steel measuring scale, marking pen, cotton thread.

Each bone was numbered serially with a marking pen to help in identification. Their side was also determined. In the study following parameters studied

1. Vertical diameter of head of femur

2. Vertical diameter of neck of femur at superioinferior directions
3. Transverse diameter of the neck of femur at antero posterior directions
4. Neck shaft angle
5. Circumference of neck
6. Maximum length on osteometric board between head of the femur to medial condyle
7. Trochanteric length between greater trochanter to lateral condyle
8. Bicondylar width

RESULTS

The present study was conducted on 200 femora collected from department of anatomy government medical college, Surat. Out of them 107 was of left sided and remaining 93 was of right sided. The results of the different parameters are shown in the table 1.

As we can see from above table that there is no significant difference in left and right sided femora.

Table 1: Different parameters of study on right and left side

Parameters	Left side	Right Side
Vertical Diameter of head of femur	4.13cm	4.12cm
Vertical diameter of neck of femur at superioinferior directions	2.96cm	2.96cm
Transverse diameter of the neck of femur at antero posterior directions	2.43cm	2.43cm
Neck shaft angle	128.13°	128.12°
Circumference of neck	8.84cm	8.84cm
Maximum length on osteometric board between head of the femur to medial condyle	42.56cm	42.54cm
Trochanteric length between greater trochanter to lateral condyle	40.56cm	40.53cm
Bicondylar width	6.19cm	6.19cm

DISCUSSION

The angle of the femur neck is reducing with aging. In our study we aimed at the comparative analysis between right and left femur neck angle. Our study demonstrates values are slight higher on left side. The study done by silva et al (2002)¹ in adult brazillions show similar results. The study done by Isaac et al(1997)² in infants and they found similar value in infants. Study done by Reikeras et al(1985)³, Miller et al(1993)⁴ shows similar results as compared to our study.

Comparing the length of femur we found 42.54 cm on right side and 42.56cm on left side. The results when compared with study done by Ferriario et al(1998)⁵ it shows a bit lower than our results. The Hoaglund and Low et al(1980)⁶ found the value among Caucasians a mean of the 45.1cm in male and 43.7 cm in female.

Our study find the maximum length of femur was found to be on an average 2 cm more than the trochanteric length. The average femoral length is 42.55cm compared to 40.55cm trochanteric length. Our data is similar with the data of Leelavaty N et al(2000)⁷ study.

The vertical diameter of femoral head in our study on right side is 4.12cm and on left side 4.13cm. The tanez et al (2002)⁸ observed that vertical diameter of the right femoral head which was significantly greater than those of corresponding left femur. Issac et al(2002)² study results are similar to our result.

In our study vertical diameter of neck on both sides equal i.e. 2.96cm. We found that the femoral neck length progressively increases with vertical diameter get decreased. So the neck become longer and narrower.. this increased the risk of fracture. Our results were supported by the study done by Reid et al(1994)⁹, O'Neill et al(1996)¹⁰.

CONCLUSION

Today the world is facing an epidemic of proximal femur fractures, and these numbers probably will continue to rise

due to the tiny number of elderly people. Our study emphasized the importance of the femoral geometry data of the south Gujarati population. The present study can deliver excellent performance and excellent literature for the orthopaedicians and prosthetists. It also help to find out regional variations in the parameter measured.

REFERENCE

1. Da Silva, V.J.; Oda J.T. & Sant,Ana, D.M.G. (2003)- Anatomical aspects of the proximal femur of the Brazilians. *Int. J. Morphol.* 21(4): 303-308
2. Issac, B ; Vettivel, S ; Prasad, R ; Jeyaseelan, L & Chandi, G. Prediction of the femoral neck shaft from the length of the femoral neck. *Clinical anatomy*, 10:318-23, 1997
3. Reikeras, O. ; Hoiseth, A. & Reigstad, A. (1985)- Evaluation of the dunlop/rippstein method for determination of femoral neck angles. *Acta Radiologica Diagnosis*, 26:177-9.
4. Miller, F. ; Merlo, M.; Liang, Y.; Kapcha, P.; Jamison, J. Q. Harcke, T. (1993)- Femoral version and neck shaft angle. *J. of pediatric orthopaedics*, 13:382-88.
5. Ferrario, V.F. ; Sforza, C. ; Randelli, Mini-Jr, A. & pizzini, G. (1998)- Femoral asymmetry in healthy adult; elliptic fourier analysis using computerized tomographic scout view. *Int J. Anat. Embryo.*, 103(2);95-105.
6. Hoagland, F.T. & Low, W.D. Anatomy of femoral neck and head with comparative data from Caucasian and Hong Kong Chinese. *Clinical orthopaedics and related research*, 152;10-6.
7. Leelavathy N, Rajangam S, Janakiraman S. Thomas IM. Sexing of femora. *J. of Anat. Soc. India* 49(1):17-20; 2000.
8. Taner Ziyilan, Khalil Awadh Murshid (2002). An analysis of Antolian Human Femur Anthropometry, *Turk J. Med. Sci.* 32,231-235.
9. Reid, I.R.; Chin, K.; Evans, M.G. & Jones, J.G. Relation between increase in length of hip axis in older women between 1950s and 1990s and increase in age specific rates of Hip fracture. *BMJ*, 309; 20-7.
10. O' NEILL, t. w. ; Grazio, s. ; Spector, T.D. & Solman, A.J. (1996) ; Geometric measurements of the proximal in UK women ; Secular increase between the late 1950s and early 1990s. *Osteoporosis Int.* 6 : 136-40.