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Original Research Article

Morphometric Study of Proximal End of Femur in Telangana Region

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Abstract

Background: The femur is the longest, strongest and heaviest bone of human body. It has upper end, lower end and an intervening shaft. Upper end consists of head, neck, greater trochanter and lesser trochanter. Head of the femur articulates with the acetabulum of hip bone to form hip joint. The morphometric analysis of proximal end of femur is immense importance in designing prosthesis and implants of appropriate size for total hip replacement.

Methods: The present observational study was conducted on 100 (47 Right & 53 Left) dry femurs of unknown sex in the department of Anatomy, Osmania medical college, Hyderabad, Telangana. The study has taken prior approval from Institutional Ethical Committee. Fully ossified, dried, femur bones of unknown sex were included in our study. Broken & deformed femur bones were excluded from the study.

Results: In the present study the mean length of femur (FL) was 419.60 ± 24.32mm, 420.52 ± 26.76mm on right and left side respectively. The mean transverse diameter (TD) of Femoral head was 42.84 ± 3.95 mm and 42.93±3.98 mm on right and left side respectively. The mean neck shaft angle (NSA) of Femur was 132.60 ± 7.03 and 137.80 ± 9.06 on right and left side respectively.

Conclusion: The knowledge of morphometry of proximal end of femur will be useful in anthropological and Medico-legal practice, as well as to orthopedecians for diagnosis and treatment of disease related to hip & femur.

Keywords: Length, Transverse diameter, Neck shaft angle, Femur

Introduction

The femur is the longest, strongest and heaviest bone of human body. It measures about 45cm in length. It has upper end, lower end and an intervening shaft. Upper end consists of head, neck, greater trochanter and lesser trochanter. Head of the femur articulates with the acetabulum of hip bone to form hip joint [1]. The morphometric analysis of proximal end of femur is immense importance in designing prosthesis and implants of appropriate size for total hip replacement [1]. The neck of femur is 5cm long, connects the head with the shaft at an average angle of 125º. It facilitates movements at the hip joint and also act as a lever for the muscles acting

around the hip joint. If the NSA is >135 º is known as coxa valga, if it is <120 º is called coxa vara [2]. As human grows the NS Angle is significantly decreases because of the changes in body portion and adaptation of hip joint to vertical posture [3]. Grossly mutilated skeletal remains are a big challenge for forensic pathologists and physical anthropologists in the identification of the deceased. The application of osteometry is most important in medico-legal investigation for estimating the height, age at the time of death, sex, race, ancestry, ethnicity, stature; body weight and body build [3]. The Knowledge of variations in the parameters of dry femur will help the orthopedicians and also assist prosthetists to design a suitable prosthesis for restoration of normal neck-shaft angle [4]. It is expected that in our country the incidence of hip fractures has increased in the last 20 years and around 64 thousand hip fracture cases will be seen annually in 2040 [5].

Aims & Objectives: To study morphometric characteristics of proximal end of femur like length, transverse diameter of femoral head and neck shaft angle. To compare their values on right & left side. To compare their values with similar studies

Materials & Methods

The present observational study was conducted on 100 (47 Right & 53 Left) dry femurs of unknown sex in the department of Anatomy, Osmania medical college, Hyderabad, Telangana, India. The study has taken prior approval from Institutional Ethical Committee.

Inclusion criteria: Fully ossified, dried, femur bones of unknown sex were included in our study.

Exclusion criteria: Broken & deformed femur bones were excluded from the study

Methodology: Various morphometric parameters of Femur (both Rt& Lt sides) like length of femur, transverse diameter of femoral head, NS Angle were measured with the help of osteometric board, digital Vernier callipers, and goniometer as follows Maximum Length of femur: Distance from the highest point of the head to the lowest point of medial condyle measured using osteometric board (Figure-1

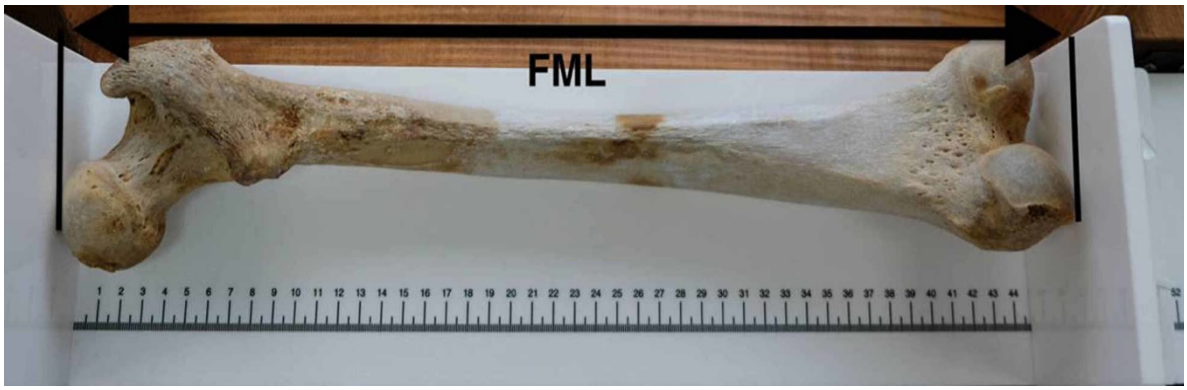

Figure 1: Measurement of femur using osteometric board

Transverse Diameter of femoral head: Maximum transverse diameter of head of femur measured with the help of digital Vernier callipers (Figure-2).

Figure 2: Measurement of transverse diameter of femoral head

Neck shaft Angle: The angle between the axis of femoral shaft and the axis of femoral neck. Measured as the line joining the two centre points on anterior surface of neck and the line joining two centre points on anterior surface of shaft with the help of goniometer (Figure-3)

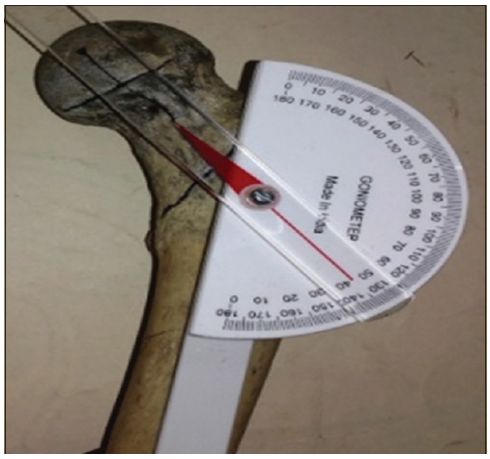

Figure 3: Measurement of Neck shaft angle of femur

Statistical analysis: The collected data was compiled & analysed statistically using Microsoft excel SPSS 21.0

Results

The present study was conducted on 100 (47 Right & 53 Left) dry femur bones in the department of anatomy, Osmania medical college, Hyderabad, Telangana. In the present study the mean length of femur (FL) was 419.60±24.32mm, 420.52±26.76mm on right and left side respectively. The mean transverse diameter (TD) of Femoral head was 42.84±3.95 mm and 42.93±3.98 mm on right and left side respectively. The mean neck shaft angle (NSA) of Femur was 132.60±7.03 and 137.80 ± 9.06 on right and left side respectively. The mean length & NS Angle, transverse diameter (TD) of femoral head of left femurs were more as compared to right femurs. The transverse diameter of Rt& Lt femur shows statistical significance but no significant statistical differences in length and NS angles of right & left femurs [Table/Figure-4].

Table 1: Showing various parameters of right and left femur bones

	Right femur	Left femur	P-value
Maximum length	419.60±24.32	420.52±26.76	0.941
TD of Femoral head	42.84±3.95	42.93±3.98	0.008
Neck shaft angle	132.60±7.03	137.80.±9.06	0.012

Discussion

On an average 80,000 hip replacements are done annually worldwide. Regional differences were observed in the stature of human beings, so prosthesis should be designed according to specific population. Any mismatch between femoral bone & stem results in micro motion which can lead to pain, osteolysis and aseptic loosening [4]. In the present study the length of Rt femur was 41.96±2.43 and left femur was 42.03±2.67 and these results were compared to various study results as shown in table/ figure no-5. The present study results are closely related to the findings of the study done by Pooja D et al [6].

Table-2: Showing length of right and left femur bones in various studies.

S. No	Author & Year	Sample size	Length in cm		P-value
			Right	Left	
1	Rajeev Mukhia et al., 2019 [1]	75 (35+40)	42.70±3.09	41.30±2.54	0.31
2	Shaik Hussain et al., 2016 [3]	592 (281+311)	44.71±2.89	44.379±2.87	-
3	Minakshi Verma et al.,2017 [6]	91 (47+44)	42.94±2.769	42.70±3.016	0.703
4	Vinay G et al., 2020 [7]	180 (90+90)	42.95±3.29	43.33±2.72	0.079
5	Pooja D et al.,2020 [8]	76 (38+38)	41.252±2.115	42.08±2.178	0.09
6	Present study 2022	100 (48+52)	41.96±2.432	42.03±2.67	0.094

The fractures of proximal end of femur are quite common. Internal fixations with implants for these fractures are important for rehabilitation and early mobilization of patients [7]. In the present study the transverse femoral head diameter of Rt femur was 42.84±3.95 and Lt femur was 42.13±3.98 and these results were compared to various study results as shown in table/ figure no-6. The present study results are closely related to the findings of the study done by Pooja D et al [8].

Table-3: Showing transverse femoral head diameter of right and left femur bones in various studies

S. No	Author & Year	Sample size (Rt & Lt)	Femoral head transverse diameter		P-value
			Right	Left	
1	Rajeev Mukhia et al., 2019 [1]	75 (35+40)	13.10±0.88	13.00±0.92	0.17
2	Durga P et al., 2019 [4]	100(50+50)	42.23±3.3	42.43±4.2	-
3	Minakshi Verma et al., 2017 [6]	91 (47+44)	42.51±3.729	42.11±4.530	0.564
4	Vinay G et al., 2020 [7]	180(90+90)	40.6±3.6	41.1±3.3	0.58
5	Pooja D et al.,2020 [8]	76(38+38)	40.39±3.213	41.38±2.717	0.14
6	Present study 2022	100(48+52)	42.84±3.95	42.93±3.98	0.008

NS Angle of femur has a direct relationship with the lifestyle. It was more in population with sedentary lifestyle. This infers the developmental plasticity of NSA with respect to changing habitual blood vessels during development [2]. The NSA is an important factor particularly in operations involving the dynamic hip screw, dynamic condylar screw [7]. In our study the average NSA of Rt femur was 132.60±7.03 and left femur was 137.80±9.06. Present study results were compared to various study results as shown in table/ figure no-7. Findings of the present study are similar to observations of the study done by Pooja D et al [8].

Table -4: Showing neck shaft angle of right and left femur bones in various studies.

S. No	Author & Year	Sample size	Neck-shaft angle		P-value
			Right	Left	
1	Rajeev Mukhia et al., 2019 [1]	75 (35+40)	122.90±7.71	131.30±5.17	0.03
2	Shaik Hussain et al., 2016 [3]	592 (281+311)	136.9±4.41	136.7±4.49	-
3	Durga P et al., 2019 [4]	100 (50+50)	116.84±8.07	118.52±8.9	-
4	Minakshi Verma et al.,2017 [6]	91 (47+44)	127.57±4.661	130.3±3.875	0.003
5	Vinay G et al., 2020 [7]	180 (90+90)	119.92±6.27	120.3±5.26	0.138
6	Pooja D et al.,2020 [8]	76 (38+38)	137.52±4.753	133.23±5.758	0.013
7	Present study 2022	100 (48+52)	132.60±7.03	137.80±9.06	0.012

Study Limitation: Sample size was limited & concentrated on morphometric parameters of upper end of femur. Study was done on dry bones. Right & Left bones are not from same individual. Gender, age could not be taken into account. It will be beneficial to conduct similar studies with larger sample size.

Conclusion

The morphometric details of upper end of femur will help in surgical interventions of proximal femur and arthroplasty procedures. It enlightens the bio mechanical engineer to prepare implant design according to measurements of the local population. The knowledge of morphometry of proximal end of femur will be useful in anthropological and Medico-legal practice, as well as to orthopedecians for diagnosis and treatment of disease related to hip & femur.

References

1. Mukhia R, Poudel P. Morphometric Study of Proximal end of Femur of Nepalese People. Nepal Journal of Medical Sciences.2019; 4(1):9-14
2. Sajan Skaria, Manoj Kulkarni, Hetal Vaishnani. Morphometric Study of Proximal Femur and its Applications in Prosthesis Designing: A Cross-sectional Study from Western India. Journal of Clinical and Diagnostic Research. 2022; 16(5): AC01-AC04
3. Ravi G.O, Shaik Hussain Saheb, Abraham Ratna Joseph N. A Morphometric Study of Femur and its Clinical Importance. Int J Intg Med Sci. 2016; 3(7):341-44.
4. Durga. P, K. R. Dakshayani. A morphometric study of upper end of femur and its implications in hemiarthroplasty. Int J Anat Res 2019; 7(1.1): 6045-49.
5. A Tokpınar, S Yılmaz, R K Tokpınar, Ş Ateş, M E Kandur, Me Nisari. Morphometric Examination of the Proximal Femur in the Hip Joint. Experimental and Applied Medical Science.2020; 1(3): 82 – 88
6. Minakshi Verma, Sheetal Joshi, Anita Tuli, Shashi Raheja, Priyanka Jain, Priyanka Srivastava et al. Morphometry of Proximal Femur in Indian Population. Journal of Clinical and Diagnostic Research. 2017; 11(2):AC01-AC04.
7. Vinay G, Naveen kumar B, Kalpana Thondapu. Morphometric study of proximal end of femur in Telangana population. Int J Anat Res 2020; 8(1.1):7247-50.
8. Pooja Dawani, Jasbir Kaur, Davinder Singh. Morphometry of Proximal Femur in North Indian Population and Its Clinical Correlation. JMSCR.2020; 8(7): 329-334.