



MORPHOMETRIC STUDY OF NECK OF ADULT FEMUR.

Anatomy

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ABSTRACT

Introduction: Skeleton plays a significant role in various sciences like medicine, forensic sciences, anthropology etc. and also in estimation of sex, age, race and stature of an individual. The knowledge about different diameters of head and neck of femur is essential in orthopaedic surgery in prosthesis and nail application, for radiological practice in identifying pathology of bone and also for determining age.

Method: The present study was conducted on 80 dry femur bones of unknown age and sex, which were obtained from Department of Anatomy, GMC Jammu. Circumference of femoral neck, length of femoral neck, vertical diameter of femoral neck, and transverse diameter of femoral neck were measured.

Result: Mean circumference of neck of right and left femur bones is 10.29 (SD 0.81) cms with a range of 8-12 cms and 10.17 (SD 0.69) cms with a range of 8.5-12 cms respectively. Mean femoral neck length of right and left sided bones is 3.19 (SD 0.32) cms with a range of 2.5-4.5 cms and 3.24 (SD 0.28) cms with a range of 3-4 cms respectively. Mean neck vertical diameter of right and left femur bones is 30.76 (SD 2.75) mm with a range of 24.2-35.9 mm and 30.57 (SD 3.26) mm with a range of 22.3-36.8 mm respectively. Mean neck transverse diameter of right and left femur bones is 24.62 (SD 2.41) mm with a range of 17.6-29 mm and 24.60 (SD 2.54) mm with a range of 19.3-29 mm respectively

Conclusion: the knowledge of the present study will be very useful for designing implants used for surgical correction of femoral neck fracture; for radiological practice in identifying pathology of bone, determining age and in reconstruction surgeries. It could hence be stated that this study will prove to be useful along the broad spectrum of medical science such as anatomy, radiology, orthopedics and forensic medicine.

KEYWORDS

Femur, Fracture Of Neck.

INTRODUCTION:

Skeleton Plays A Significant Role In Various Sciences Like Medicine, Forensic Sciences, Anthropology Etc. And Also In Estimation Of Sex, Age, Race And Stature Of An Individual. It Is Commonly Accepted That The Examination And Statistical Analysis Of Femoral Anthropometry Among Different Populations Reveals A Great Amount Of Variation Due To The Fact That The Femoral Anthropometry Measurements From Different Countries Are Likely To Be Affected By Racial Variations In Diet, Heredity, Climate And Other Geographical Factors Related To Life Style¹. As The Femur Is Composed Of Hard Tissue, They Are The Best Preserved Part Of Skeleton After Death And In Many Times They Are The Only Available Parts For Forensic Examination². Predicted Hip Fracture From Geometric Measurements Of Femur And They Inferred That Longer Neck Of Femur Is Associated With Increased Risk Of Femur Neck And Trochanteric Fractures³. Dislocation Of The Hip Joint And Fracture Neck Femur Is Very Common In Clinical Practice. The Knowledge About Different Diameters Of Head And Neck Of Femur Is Essential In Orthopaedic Surgery In Prosthesis And Nail Application, For Radiological Practice In Identifying Pathology Of Bone And Also For Determining Age⁴. It Has Been Radiographically Suggested That Hip Axis And Length Of Femur Neck Are Becoming Longer As Years Pass By And These Changes Can Increase The Risk Of Fracture⁵.

MATERIAL AND METHOD: The Present Study Was Conducted On 80 Dry Femur Bones Of Unknown Age And Sex, Which Were Obtained From Department Of Anatomy, Gmc Jammu. The Bones Selected For The Study Were 42 Of Right Side And 38 Of Left Side And They Were Properly Labelled.

INCLUSION CRITERIAS

The Femur Bones For The Study Fulfilled The Following Criteria:

1. The Bones Were Dry And Macerated.
2. They Were Complete In All Respects So As To Give Correct Morphometry.
3. They Were Thoroughly Cleaned.

INSTRUMENTS REQUIRED:

1. Stainless Steel Sliding Vernier Caliper To Measure Breadths And

Diameters.

2. Measuring Tape For Measuring Curved Distances.
3. Cotton Thread For Measuring Circumferences.

Method: Following Parameters Were Recorded.

Circumference Of Femoral Neck: It Was Measured By Winding The Flexible Tape Around The Circumference Of Neck Of Femur. (fig M)



Fig. M: CIRCUMFERENCE OF FEMORAL NECK

Length of femoral neck: It was measured as a distance between the inferior margin of the femoral head and the intertrochanteric line with the help of measuring tape.

Vertical diameter of femoral neck: It was measured using Vernier Caliper as minimum diameter of the neck of the femur at the supero-inferior direction. (Fig O)

Transverse diameter of femoral neck: It was measured with the help of Vernier Caliper as minimum diameter of the neck of the femur at antero-posterior direction. (Fig P)



FIG. O: VERTICAL DIAMETER OF FEMORAL NECK



FIG. P: TRANSVERSE DIAMETER OF FEMORAL NECK

RESULT:**a) Circumference of femoral neck:****TABLE 1: Statistical measurement of circumference of neck of right, left and total femur bones**

Femur bones	No.	Circumference of femoral neck	
		Mean + SD(cms)	Range + (cms)
Right	42	10.29 ± 0.81	8-12
Left	38	10.17 ± 0.69	8.5-12
Total	80	10.24 ± 0.75	8-12

Table 1: shows the mean circumference of femoral neck of right, left and total bones. Mean circumference of neck of right and left femur bones is 10.29 (SD 0.81) cms with a range of 8-12 cms and 10.17(SD 0.69) cms with a range of 8.5-12 cms respectively. Mean circumference of neck of total femur bones is 10.24 (SD 0.75) cms with a range of 8-12 cms. Mean value of right femur bones is slightly more than left femur bones.

b) Length of femoral neck:**Table 2:Statistical measurement of length of neck of right, left and total femur bones**

Femur bones	No.	Length of femoral neck	
		MeanSD(cms)	Range(cms)
Right	42	3.190.32	2.5-4.5
Left	38	3.240.28	3-4
Total	80	3.220.31	2.5-4.5

Table 2: shows the mean length of femoral neck of right, left and total bones. Mean femoral neck length of right and left sided bones is 3.19 (SD 0.32) cms with a range of 2.5-4.5 cms and 3.24 (SD 0.28) cms with a range of 3-4 cms respectively. Mean length of neck of total femur bones is 3.22 (SD 0.31) cms with a range of 2.5-4.5 cms. Mean value of left femur bones is slightly more than right femur bones.

c) Vertical diameter of femoral neck:**Table 3: Statistical measurement of vertical diameter of neck of right, left and total femur bones**

Femur bones	No.	Vertical diameter of femoral neck	
		MeanSD(mm)	Range(mm)
Right	42	30.762.75	24.2-35.9
Left	38	30.573.26	22.3-36.8
Total	80	30.672.98	22.3-36.8

Table 3: shows the mean vertical diameter of neck of right, left and total bones. Mean neck vertical diameter of right and left femur bones is 30.76 (SD 2.75) mm with a range of 24.2-35.9 mm and 30.57(SD 3.26) mm with a range of 22.3-36.8 mm respectively. Mean vertical diameter of neck of total femur bones is 30.67 (SD 2.98) mm with a range of 22.3-36.8 mm. Mean value of right femur bones is slightly more than left femur bones.

d) Transverse diameter of femoral neck:**Table 4: Statistical measurement of transverse diameter of neck of right, left and total femur bones**

Femur bones	No.	Transverse diameter of femoral neck	
		MeanSD(mm)	Range(mm)
Right	42	24.622.41	17.6-29
Left	38	24.602.54	19.3-29
Total	80	24.612.46	17.6-29

Table 4: shows the mean transverse diameter of neck of right, left and total bones. Mean neck transverse diameter of right and left femur bones is 24.62 (SD 2.41) mm with a range of 17.6-29 mm and 24.60 (SD 2.54) mm with a range of 19.3-29 mm respectively. Mean transverse diameter of neck of total femur bones is 24.61 (SD 2.46) mm with a range of 17.6-29 mm. Mean value of right femur bones is slightly more than left femur bones.

DISCUSSION:

In the past, several quantitative anatomical studies of adult femora have been carried out in different countries. The present study has been undertaken on a series of 80 femur bones (42 right, 38 left) obtained from the Department of Anatomy, Government Medical College, Jammu.

Circumference of femoral head: Circumference of femoral head is most successful parameter in sex determination in certain population.

The mean values of circumference of femoral head on right and left sided femur bones were 13.86 1.08 and 13.71 1.13 cm respectively. Osorio H et al⁶, 2012 measured the circumference of femoral head 13.39 and 13.68 right and left respectively, found its value slightly higher than the present study. The result of study conducted by Silva VJ et al⁷, 2003 found 14.49 on right side and 14.17 on left side which matches the result of our study.

Length of femoral neck: The knowledge of femoral neck length can act as a parameter of hip fracture risk. The mean values of length of femoral neck of right and left side in present study were 3.19 0.32 cm and 3.24 0.28 cm respectively. Khan SM & Saheb SH⁸, 2014 worked on the same parameter and found mean length 3.61 on right side and 3.64 on left side, so their results were found to be closer to the present study. Ozandac S et al⁹, 2015 unraveled lower value which were 2.22 on right side and 2.25 on left side.

Vertical diameter of femoral neck: Superio-inferior femoral neck diameter is practical to use for sex identification. The mean values of neck vertical diameter on right and left sided femur bones were 30.76 2.75 mm and 30.57 3.26 mm respectively. Results of present study are in accordance with those of Ziylan T & Murshid KA¹⁰, 2002.

Transverse diameter of femoral neck: The anatomical knowledge of dimensions of femoral neck is very essential in anthropological, for sex determination in medico-legal practice as well as to radiologists, rheumatologists and for orthopedic surgeons for diagnosis and planning of treatment. The mean transverse diameter of neck of femur was found to be 24.62 2.41 on right side and 24.60 2.54 on left side. The values of present study were less than the values obtained in a study done by Ziylan T & Murshid KA¹⁰, 2002 which were 26.3 on right side and 25.5 on left sides.

CONCLUSION: The morphometric landmarks of neck 80 adult femur were evaluated. The various parameters of neck of femur were measured. The measurements were statistically analysed and result was presented. These metric parameters were compared with those available in the literature and their clinical implications were discussed. The results of the present study shows that the dimensions of neck of femur is different as compared to other authors. The present study will be very useful for designing implants used for surgical correction of femoral neck fracture; for radiological practice in identifying pathology of bone, determining age and in reconstruction surgeries. It could hence be stated that this study will prove to be useful along the broad spectrum of medical science such as anatomy, radiology, orthopedics and forensic medicine.

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