International Journal of Current Advanced Research
ISSN: O: 2319-6475, ISSN: P: 2319-6505, Impact Factor: 6.614
Available Online at www.journalijcar.org
Volume 10; Issue 08 (C); August 2021; Page No.25035-25037
DOI: http://dx.doi.org/10.24327/ijcar.2021.12559.4994

Research Article

ANTHROPOMETRIC STUDY OF PROXIMAL END OF FEMUR AND ITS CLINICAL IMPLICATIONS

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A R T I C L E I N F O

Article History:
Received 6th May, 2021
Received in revised form 15th June, 2021
Accepted 12th July, 2021
Published online 28th August, 2021

Key words:
Femoral head diameter, Femoral neck thickness, Horizontal off set, Hip prosthesis.

A B S T R A C T

Introduction: The femur also called the thigh bone is an example of long bone and is the longest bone of the human body. A number of factors affect the proximal end of the femur these include intracapsular fracture of neck of femur, rheumatoid arthritis, osteonecrosis, trauma and bone tumors leading to hip joint failure. It is thus very essential to select proper femur implant so that postoperative complications donotarise. Therefore the knowledge of Anthropometry of the proximal end of femur is useful for designing orthropedic implants and hip prosthesis.

Material and methods: In present study 62 dry femurs (32 right and 30 left) of human cadavers without any gross pathology were obtained from the Department of Anatomy SKIMS Medical college Bemina, Srinagar. Femoral head diameter, Femoral neck thickness and Horizontal offset were measured using Digital caliper in mm.

Results and observations: In the present study we observed that there was a significant variation of various parameters of proximal end of femur between right and left side. The data collected is summarized in the table.

Conclusion: The knowledge of Anthropometry of proximal end of femur is useful for designing orthopedic implants and hip prosthesis. It will also helps us to avoid geometric mismatch of implant.

INTRODUCTION

The femur also called the thigh bone is an example of long bone and is the longest bone of the body. It consists of 3 parts-upper end, shaft and lower end. The upper end consists of the head, neck, greater &lesser trochanter. Head forms about 2/3rd of a sphere and articulates with the acetabulum of the hip bone to form the hip joint. Just below and behind the centre of the head is small pit called fovea is present which provides attachment to ligamentum teres femoris. Neck connects the head with the shaft and is about 3.5cm long. It has 2 borders-upper border & lower border,2 surfaces –anterior &posterior surfaces. Anterior surface of neck meets shaft at the intertrochanteric crest.

The head of femur is mainly supplied by retinacular arteries and partly by a branch of obturator artery. In intracapsular fracture of neck of femur these get injured, leading to avascular necrosis of head. Other conditions affecting the proximal end of femur include rheumatoid arthritis, osteonecrosis, trauma and bone tumors leading to hip joint failure & the most common method of treating hip joint failure is Total hip arthroplasty.

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In case of improper selection of femur implant postoperative complications arise which include discomfort, improper load distribution& aseptic loosening. Hence the knowledge of Anthropometry of the femur is useful for designing orthropedic implants& hip prosthesis in order to match the dimensions of the implant closely with those of femur.

MATERIAL AND METHODS

62 dry femur bones of human cadavers without any gross deformity were obtained from Department of Anatomy SKIMS-Medical College Bemina, Srinagar and were utilized for this study. Out of 62 dry femur bones 32 were of right side &30 were of left side. The parameters of the femur measured were

Vertical head diameter,
Horizontal head diameter,
Femoral neck thickness and
Horizontal offset.

These parameters were measured using Digital caliper in mm

Vertical diameter of head of femur is measured between 2 extreme points along craniocaudal plane.
Transverse diameter of head of femur is measured between 2 extreme points along transverse plane.

Femoral head diameter was taken as mean of vertical diameter and transverse diameter.

Horizontal offset of femur is taken as the horizontal distance from the centre of femoral head to axis of shaft of femur.

Femoral neck thickness is measured in antero posterior axis

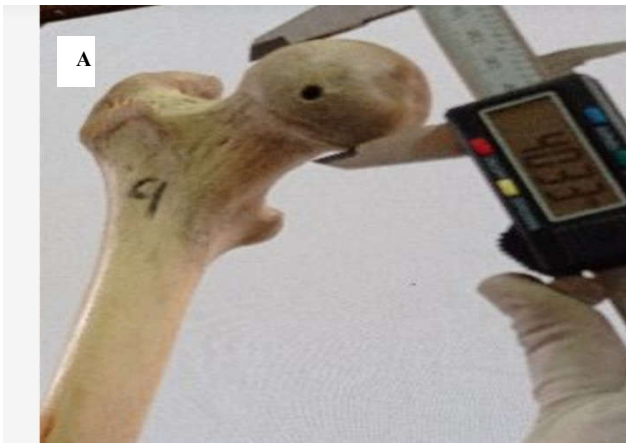

Fig 1 Femoral head diameter measured by digital caliper. A Cranio-caudal plane B. Transverse plane

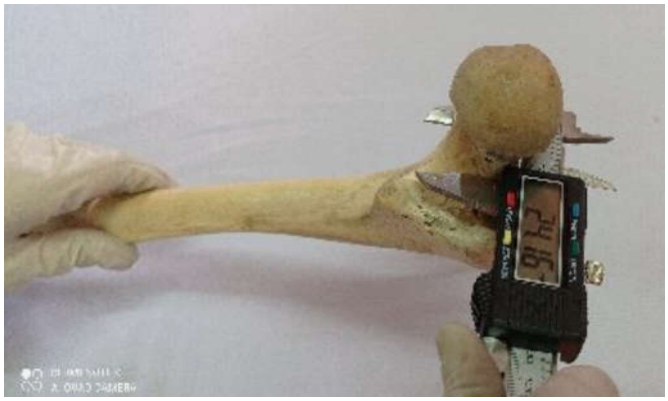

Fig 2 Femoral Neck thickness measured Anteroposteriorly by digital caliper

Fig 3 Femoral Horizontal offset measured by digital caliper

RESULTS AND DISCUSSION

The Measured parameters of both sides are Summarized in the table given below

Parameters	Side	Number of bones(N)	Mean	Range	Standard deviation	Total bones(62)	P-value
Femoral head diameter(mm)	Right	32	40.52	35.12-46.39	1.99	41.07±1.95	0.281
	Left	30	41.62	36.34-46.83	1.92		
Femoral neck thickness(mm)	Right	32	24.70	20.68-28.81	1.44	25.65±2.11	0.556
	Left	30	26.61	21.51-37.98	3		
Horizontal offset(mm)	Right	32	43.52	38.65-49.71	1.95	43.30±1.76	0.245
	Left	30	43.09	39.81-48.36	1.56		

In the table given above the minimum Femoral head diameter measured on the right side was 35.12mm and on the left side was 36.34mm.The maximum Femoral head diameter measured on the right side was 46.39mm and on the left side was 46.83mm.In the present study the mean head diameter of all femurs measured were 41.07mm which is less when compared with the observation of Rawal *et al* 2012 who has observed mean head diameter of 45.41mm.Sindhoorani *et al* 2016,in their study on south Indian population has reported mean Femoral head diameter as 41.77mm.Our results are similar to that of Sindhoorani *et al* 2016 but differs from that of Rawal *et al* 2012.

Similarly, In the table given above the minimum Femoral neck thickness measured on the right side was 20.68mm and on the left side was 21.51mm.The maximum Femoral neck thickness measured on the right side was28.81mm and on the left side was 37.98mm.In the present study the mean Femoral neck thickness of all femurs measured were 25.65mm which is less when compared with the observation of Pathrot *et al* 2016 who has observed Femoral neck thickness of 27.5mm.Verma *et al* 2017,in their studies has reported Femoral neck thickness of all femurs as 24.01mm.Our results are similar to that of Verma *et al* 2017, but differs from that of Pathrot *et al* 2016.

Similarly, In the table given above the minimum Femoral Horizontal off measured on the right side was 38.65mm and on the left side was 39.81mm.The maximum Femoral Horizontal off measured on the right side was 49.71mm and on the left side, 48.36mm.In the present study the mean Femoral Horizontal off of all femurs measured were 43.30mm which is more when compared with the observation of Sindhoorani *et al* 2016 who has observed mean Femoral

Horizontal off as 40.75mm in south Indian population. Verma *et al* 2017, in their studies has reported Femoral Horizontal off of all femurs as 42.92mm. Our results are similar to that of Verma *et al* 2017, but differs from that of Sindhoorani *et al* 2016.

CONCLUSION

The results of our study shows that there is marked differences in various parameters of femur on both sides. Hence the study of Proximal femoral Anthropometry should be considered during surgical fixation of femoral fractures and also for designing orthropaedic implants and hip prosthesis .Otherwise inappropriate sized prosthesis can cause aseptic loosening, improper load distribution causing discomfort to patient.

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How to cite this article:

Nuzhat Bashir *et al* (2021) 'Anthropometric Study of Proximal End of Femur and Its Clinical Implications', *International Journal of Current Advanced Research,* 10(08), pp. 25035-25037.
DOI: http://dx.doi.org/10.24327/ijcar.2021.24890.4993

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