Section: Anatomy

Original Research Article

AN ANTHROPOMETRIC STUDY ON PROXIMAL PART OF FEMUR IN TAMIL NADU POPULATION

B. Anbumalar[1], P. Maharathi[2], Nisha S R Manuel[3]

[1]Associate Professor, Department of Anatomy, Government Chengalpattu medical college, Chengalpattu, Tamil Nadu, India
[2]Assistant Professor, Department of Anatomy, Government Chengalpattu medical college, Chengalpattu, Tamil Nadu, India.
[3]Associate Professor, Department of Anatomy, Government Kilpauk medical college, Chennai, Tamil Nadu, India.

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Corresponding Author:
Dr. B. Anbumalar,
Email: palanianbumalar@gmail.com

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Abstract

Background: The morphology of proximal end of femur was studied in 120 bone specimens of femur. **Materials and Methods:** Cross sectional observational study in 120 dry Femora (60 right& 60 left) were studied in the Department of Anatomy, Government Chengalpattu Medical College, Chengalpattu for a period 15 months. **Result:** The neck shaft angle, femur neck length, vertical diameter of head and femur neck width parameters on right and left femur were observed tabulated and compared. **Conclusion:** There was no significant difference in measurement of proximal end of right and left femurs. Adequate knowledge regarding various dimensions of Proximal Femur will be useful for reconstructive orthopedic surgical procedures involving the distal part of hip joint.

INTRODUCTION

Femur is the strongest longest and heaviest bone of the body. It consists of a proximal part, shaft and a distal part. The proximal part in turn consists of head, neck, greater and lesser trochanter. The upper part of the Femur articulates with the Acetabulum of the hip bone to form the ball and socket variety of synovial joint.[1-3]

The most common bone disease is osteoporosis. It develops when there is a decrease in bone mass or mineral density or when there is a structural change which may result in decrease in strength of the bone. The bone loss in osteoporosis is insidious, occurs over a period of time and does not manifest any symptom or sign until a trivial fall where it is revealed as a fracture. Osteoporotic fractures can occur in any bone most often in bones of the hip, vertebrae of spine and wrist.[4-8]

Fractures of femoral neck can be intracapsular. The femoral neck having no periosteum, has to heal by endosteal ossification. A widely displaced intracapsular fracture may tear the synovium and cause disruption of subsynovial vascular ring leading to osteonecrosis of head of femur. The angiogenic inhibiting factors in synovial fluid can inhibit fracture repair resulting in a non union of head of femur necessitating a total hip replacement or hemiarthroplasty.[9-13]

In intertrochanteric fractures, of femur the neck of femur is not involved and blood supply is preserved. The fracture line extends from greater to lesser trochanter. These fractures are aligned to central portion of neck of femur with plates and pins.[14-16]

Of recent trend, fractures involving neck and trochanters are preferably managed with minimally invasive surgical techniques with implants as they speed up recovery, decreasing the morbidity of patients and encourages early mobilization of patients.[17,18]

The implants are designed based on the dimensions of upper end of femur which are usually based on European or American standards. Presently orthopaedic surgeons need to be informed about dimensions of upper end of femur of Indian subcontinent to sartor to the needs of Indian patients.[19]

This study will shed light to the implant designers to tailor the design of the implant to suit to Indian population.[20]

Aims and objective of the study:

1. To describe
   - The angle between neck and shaft of femur on both sides (measured in degrees)
   - Vertical diameter of head of femur (measured in millimetres)
   - Anterior femoral neck length (measured in millimetres)
   - Femoral neck width (measured in millimetres)
2. To find out whether there is significant difference between right and left.

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MATERIALS AND METHODS

The Descriptive observational cross sectional study was carried out in the department of Anatomy, Government Chengalpattu medical College, Chengalpattu using

Sample Size: 120 Dry Femora (60 right, 60 left)

Inclusion Criteria

Completely intact adult femurs without gross distortion or abnormality were included in the study.

Exclusion Criteria

The femurs with pathological fractures or with gross mutilation or abnormality were excluded as it could affect the observation in the study. The Parameters were analysed and represented as mean +/- SD and sidewise comparison also done.

Materials to Be Used: Goniometer, Vernier calliper, Colour thread, Measuring Scale, Marker pens

Parameters to be Used:

1. The Angle Between Neck And Shaft Of Femur: Using coloured thread axis of neck will be determined. The thread divided the anterior surface of neck into two equal halves. In mid sagittal plane over the anterior surface, the axis of shaft was marked using the same thread. Then the angle between the neck – shaft is measured using the goniometer.
2. Vertical diameter of head of femur: Measured by the maximum diameter of head in vertical diameter.
3. Anterior Femoral Neck Length: Measured from below the head of femur to midpoint on intertrochanteric line anteriorly using vernier calliper.
4. Femoral Neck Width: It is the minimal diameter of the neck of femur along the supero-inferior margin of neck of femur and measurement taken using a vernier caliper.

RESULTS

The following parameters were taken and recorded in 120 dry Femora and results are Tabulated [Table 1].

Table 1: showing mean values of the Parameters observed in present study

S.no	Parameters		Number	Measurement	Mean	SD
1.	Neck shaft angle	Right	60	129.6	122.7	3.53
		Left	60	131.9	120.1	4.76
2.	Femur neck Length	Right	60	30.4mm	2.83	0.32
		Left	60	31.2mm	2.79	0.29
3.	Vertical diameter of Head	Right	60	41.2mm	4.52	0.28
		Left	60	42.4 mm	4.54	0.32
4.	Femur neck Width	Right	60	25.1 mm	2.84	0.32
		Left	60	27 .8 mm	2.80	0.26

Table 2: Comparison of neck shaft angle (in Degree)

S.No	Authors	year	NSA -R	NSA -L
1.	Subhas Gujar	2013	136.	136.6
2.	Khan et al	2014	137.3	136.9
3.	Dhivya et al	2015	132.6	135
4.	Ravi.G.O	2016	136.9	136.7
5.	Mukhia R et al	2019	122.9	131.3
6	Shivasakarappa	2017	136.2	140.1
7	Minakshi Verma et al	2017	128.9	
8.	Present study	2022	129.6	131.9

Table 3: anterior femur neck length (in mm)

S.no	Authors	year	R Anterior neck length	L
1	Issac et al	1997	28.6	28.1
2.	Ossario et al	2009	35	36.4
3.	De Sousa et al	2010	30.1	30.5
4.	Gujar et al	2013	34.5	34.2
5.	Khan et al	2014	36.1	36.4
6.	Dhivya et al	2015	29.8	31.6
7.	Ravichandran et al	2011	31.8	
8.	Present study	2022	30.4	31.2

Table 4: vertical diameter of head (in mm)

S.No	Authors	Year	VDH -R	L
1.	Minakshi varma et al	2017	42.51	42.11
2.	Rajeev mukhia	2019	13.10	13.0
3.	Ismail BM	2014	41. 9	41.9
4.	Present study	2022	41.2	42.4

Table 5: femur neck width (in mm)

S.no	Authors	Year	FNW -R	L
1.	Minakshi verma et al	2017	24.1	23.8

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2.	Rajiv Mukhia et al	2019	21.9	25.3
3.	Baharuddin et al	2011	25.9 F, 28.8 M	
4.	Present study	2022	25.1	27.8

DISCUSSION

There are many previous studies done about the proximal Femur in different countries among different races by many Authors. These Morphometric studies show racial and gender differences. In the present Study the different parameters are compared and tabulated in Table columns. The varies with age, sex, race, dominant or nondominant leg, development of femur. The neck shaft angle ranges from 115 -140 in adults. The neck shaft angle of the present study is 129.6 Right, 131.9 on Left and correlates with Studies of Mukhia R et al.[20] The Femur neck length in present study is 30.4mm on Right and 31.2 mm on Left which close to the measures of D Sousa et al,[3] and Dhivya et al.[11] The vertical diameter of the present study is 41.2 on Right and 42.4 on Left is close to values of Minakshi verma et al,[17] and Ismail BM et al. The femur neck width in present study is 25.1 on Right and 27.8 on left,which correlates with the findings of Baharuddin et al.[5] In some studies they stated that morphometric measure are associated with increased risk of Fracture like longer hip axis, length of femur, a larger neck shaft angle and a larger neck width.[16]

CONCLUSION

The neck shaft angle of the present study is 129.6 Right, 131.9 on Left. The Femur neck length in present study is 30.4mm on Right and 31.2 mm on Left. The vertical diameter of the present study is 41.2 on Right and 42.4 on Left. The femur neck width in present study is 25.1 on Right and 27.8 on left. There is no significant difference between the right and left Femur bones. The studied parameters would be very useful for designing the Hip Prostheses in planning Osteotomy procedures of Femur and in the diagnosis of various Hip pathologies and to determine the Racial variations.

REFERENCES

1. Susan Standring, Gray's Anatomy, The Anatomical basis of Clinical practice, 40th edition, 2008, pg 1360-65
2. Textbook of Anatomy, Moore KL, Dalley AF, 6th Edition, Philadelphia, Elsevier, 2010, 517- 20
3. De Sousa EB, Fernandes RM, Mathias MB, Rodrigues MR, Ambram AJ, Babinski MA et al, Morphometric study of Proximal Femur extremity in Brazilians. Int J Morphol 2010;28: 835-40
4. Essentials of Human Anatomy, Dutta AK, 4th edition, 2010, p 138-45
5. Baharuddin A MY, Kadir RA, Zulkifly AH, Saat A, Aziz AA, Lee M et al Morphology study of of the Proximal Femur in Malay population. Int J Morphol., 2011; 29(4): 1321- 25
6. Ravichandran D, Muthukumaravel N, Jaikumar R,Das H Rajendran M Proximal Femoral Geometry in Indians and its Clinical Appilcations, J Anat Soc Ind 2011: 60(1): 6-12
7. Subhash Gujar, Sanjay vikani, Jigna Parmar, Bondre KV A Correlation between femur neck shaft angle to femur neck length , IJBAR.2013; 04(05)
8. Shakil Mohamad Khan, Shaik Hussain Saheb, Study on Neck shaft angle and Femoral length of South Indian Femurs, International Journal of anatomy and research, 2014, Vol 2(4):633-35, ISSN 2321 -4287.
9. Prasath RA, Ismail BM, A Correlative study of morphometric analysis of acetabulum and femur head in male and female south indian human cadavers, Journal of Science, 2014: 4 (1) 4-8
10. Bhattacharya S et al, A Correlation between neck shaft angle of femur with age amd anthropometry: A Radiological study. Indian Journal of basic and applied medical research 2014.:3 (3): 100-07
11. Dhivya S, Nandhini V A Study of Certain Femoral Metrics in south Indain Population and its Clinial Importance, International journal of Scvientific Study2015: 3(7): 132-135
12. Ravi G.O et al, A Morphometric study of Femur and Its Clinical Importance, International journal of Integrative Medical Sciences, 2016, Vol 3(7): 341-44, ISSn: 2394-4137
13. Smirti jha et al, Study of Right and Left Asymmetry in Neck Shaft angle and Neck Length of Femur in Jharkhand Population, IOSR Journal of Dental and Medical Sciences, September 2016, Volume 15, Issue 9 Ver IV,PP 19-21
14. Prabha Nand Chaudhary, V.S .Shiroi, Rajendra D Virupaxi,A Morphometric study of femoral length, anterior neck length and neck shaft angle in dry femora: A cross sectional study, Indian journal of Health sciences and biomedical research KLEU@2017
15. Shivashankarappa et al, A Study of Femur neck shaft Angle and its Clinical Importance, International Journal of Orthopedics Sciences, 2017,:3 (4): 755-757
16. Rajiv Ranjan Sinha et al, Study of Neck Shaft Angle of Femur in population of Bihar, International journal of Research in Medical Sciences,2017, Nov:5(11): 4819- 4821
17. Minakshi varma et al, Morphometry of Proximal femur in Indian population, Journal of Clinical and Diagnostic research, 2017, Feb vol 11(2):AC01 -AC 04
18. Vineeta Laxmi, Study of Neck shaft angle of adult femur in Relation to Sex and Bilateral Asymmetry in Population of Bihar, Journal Medical Science and Clinical Research, Volume 06, Issue 05 may 2018
19. Gattu Praveen Kumar, Study of Neck Shaft Angle of Femur on Bones – Original report,Journal of Trauma and Orthopedic Nursing, 2018, Vol.2.No.1:1
20. Rajeev mukhia et al Morphometric Study of Proximal end of Femur of Nepalese People, Nepal Journal of Medical Sciences, 2019; 4(1): 9-14

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