

Geometrical Variations in the Measurements of Head and Neck of Femur

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Abstract: ***Introduction:** Considering the fracture of proximal epiphysis of femur being very common the present study has been undertaken. **Material and Method:** 30 dry bones were taken and X-rayed. The measurements were taken on dry bone as well as X-ray of the same bone. **Result:** Wide range of variation was observed in both the parameter taken. **Conclusion:** Marked variation were observed in the length of femoral neck and diameter of femoral head.*

Keywords: femoral head, neck of measurements

1. Introduction

Fractures of proximal end of femur are considered to be the major cause of morbidity and fatality especially in elderly population may be due to increasing osteoporosis and associated medical ailment by reducing their mobility.

In most of the cases fracture of neck of femur and intertrochanteric area are observed in a fall in bathroom. Such injuries need to be treated surgically in order to make the patient mobile in minimum time. Usually the partial replacement of hip is done by replacing the upper end of femur. Taking in view the present study was undertaken to establish a standard data for dimensions of upper end of femur in population of Uttar Pradesh, in order to help in the manufacturing of implants for patients.

2. Aims and Objective

- 1) To measure the diameter of head of femur.
- 2) To measure the length of neck of femur.

3. Material and Method

This study was conducted on 30 dry bones of unknown and age, collected from the department of Anatomy, Integral Institute of Medical Science and Research, Lucknow, Uttar Pradesh and Hind Institute of Medical sciences Safedabad, Barabanki, Lucknow.

We excluded the damaged bone with mark of old healed fracture and deformed bones.

Proximal femoral dimensions of the bone and skiagram of the same bones were measured by using the digital caliper.

FHD-the femoral head diameter was the distance in a vertical line between the upper ends to the lower end of the femoral head in cranio-caudal axis. (Figure-1)

FNL-the anterior neck length is the distance between the base line of head and intertrochanteric line at the junction of the front of neck with shaft. (Figure-2)

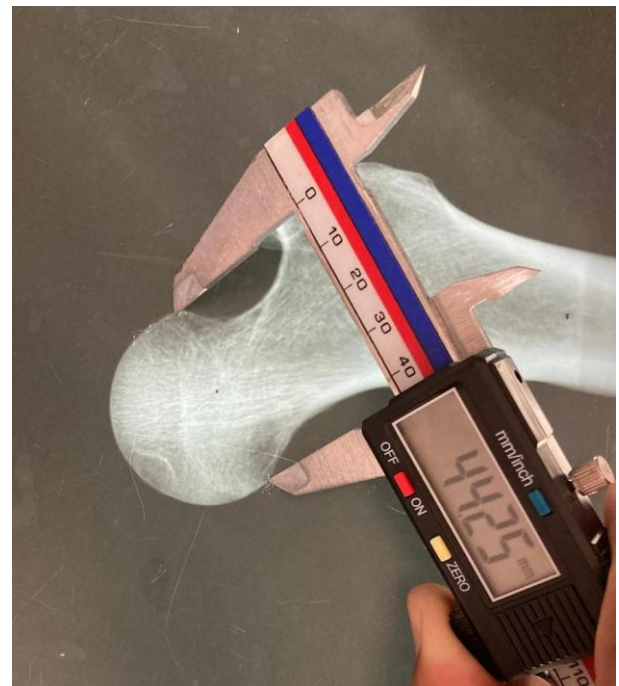


Figure 1: Showing measurement of femoral head diameter on X-ray



Figure 2: Showing Measurement of femoral neck length on bone



Figure 4: Showing Measurement of femoral neck length on X-ray



Figure 1: Showing Measurement of femoral head diameter on bone

Table 1: Comparison of Femoral Head diameter on bone and X-Ray

S. No.	Bone (mm)	X-Ray (mm)
1.	37.66	37.22
2.	37.90	38.38
3.	39.09	38.45
4.	39.59	39.20
5.	40.41	39.52
6.	40.78	40.28
7.	41.36	40.66
8.	41.48	40.89
9.	41.52	41.18
10.	41.92	41.43
11.	41.95	42.44
12.	41.96	42.59
13.	42.27	42.86
14.	42.40	42.99
15.	42.51	43.02
16.	43.14	43.25
17.	43.43	43.52
18.	43.51	43.80
19.	43.81	44.02

20.	44.11	44.36
21.	44.45	45.03
22.	44.58	45.23
23.	44.64	45.49
24.	44.87	45.51
25.	45.45	46.25
26.	45.59	46.84
27.	46.22	47.28
28.	46.51	47.31
29.	47.48	47.72
30.	48.50	50.51

Table 4: Comparison of Femoral neck length on bone and X-Ray

S. No.	Bone (mm)	X-Ray (mm)
1	30.89	34.12
2	31.03	35.13
3	31.05	35.54
4	36.09	35.81
5	36.33	36.08
6	36.67	36.13
7	37.69	36.19
8	38.16	36.55
9	38.32	37.08
10	38.86	37.30
11	39.05	38.18
12	39.09	38.98
13	39.37	38.99
14	40.41	39.16
15	40.91	39.61
16	41.32	39.71
17	41.34	39.96
18	41.41	40.01
19	42.49	40.02
20	42.51	40.12
21	42.56	40.27
22	42.79	42.21
23	43.31	42.36
24	43.62	42.75
25	44.09	43.41
26	44.29	44.60
27	44.89	44.78
28	45.57	45.13
29	46.04	49.63
30	47.77	50.17

The obtained data was tabulated and subjected to analysis.

4. Results

The obtained data indicates a wide range of variation in both the parameters taken

The diameters of head of femur ranged between 37.66mm to 47.48mm. The length of neck of femur also showed wide variation ranging from 30.89 to 47.77mm.

The same measurements on the X-rays of the same bones were also recorded and for head of femur it was observed to be between 37.22 to 47.31 and for length of neck it varied between 34.12 to 50.17.

The average diameter of head of femur and length of neck was calculated to be 42.77 and 40.26 and like average reading for the x-ray was 47.22 to 39.99 respectively.

5. Discussion

In our study we found the minimum diameter of head of femur on bone as 37.66mm and maximum as 47.48mm and with an average of 42.77mm. Our finding are in agreements with the finding of peter Ericson who reported the average diameter of head of femur to be 42.30 in 2016.

Our finding also confirm the findings of P. Durga et al who in 2018 conducted the same study on 100 dry femur bones on reported the diameter of head to be 42.33mm.

Yet another study done in 2016 reported the average diameter to be 41.77mm. in 2012 study conducted on 60 adult femora by Megendran Chandran et al reported the average diameter is 46.00mm. This is higher then the reading observed in our study. This could be because of the regional variation. Our reading more or less confirm finding of Savita Takale et al (2016). Khaleel et al (2014). Rajendran et al (2020)

The measurements of vertical diameter head of same femur were also done on radiographs of the same bone and the obtained data revealed the value to be 47.72mm which goes in parellar with finding of S. M. Arvind Kumar who conducted the similar study in 2017.

We observed the length of the neck of femur as 40.26mm which is in line with the finding of study conducted by Vinay et al in 2019.

Another study conducted in 2016 by Ravi reported it to be 36.30mm which is 10% less then our finding may be because of racial or resgional variation we have conducted the same observation the skiagram of the same bones and the data obtained revealed it to be more or less near the raw bone measurements

6. Conclusion

There was a large variation in the femoral neck length as measured on bone and its skiagram

Distinct variations in the femoral head diameter was observed, as measured on bone and on x-ray

Large variations in the result may have been due to the difference in the stature of the individuals from where bone has been obtained

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