

## Original Research

### Assessment of age related variation on morphometric dimensions of Proximal Femoral of males in a known population

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#### **ABSTRACT:**

**Background:** The femur is the longest, heaviest, and strongest bone in the human body. The morphology of the proximal femur, specifically the relationships among the head, neck, and proximal shaft, has been a subject of interest and debate. The present study was undertaken for assessing the age related variation on morphometric dimensions of Proximal Femoral of males in a known population. **Materials & methods:** A total of 20 male femur bones were obtained from department of human anatomy. All the bones were categorized into two groups; Less than 45 years of age and More than 45 years of age. Only those bone were included which were within the age range of 30 to 60 years. Complete demographic and clinical data of all the bones was collected from the data record files. Measurements were done and different morphometric parameters were assessed. All the parameters were compared on the basis of age group. All the results were recorded and analyzed by SPSS software. **Results:** The mean anteroposterior physal angle was  $74.12^\circ$  while mean lateral physal angle was  $81.99^\circ$ . Mean neck version was  $9.46^\circ$  while mean angle of inclination was  $129.41^\circ$ . Non-significant results were obtained while comparing the morphometric dimension of male's femur among different age group. **Conclusion:** We couldn't appreciate any significant age related changes in few structural components of proximal femur after fourth to fifth decade of life.

**Key words:** Skeletal, Deformities, Males

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#### **INTRODUCTION**

The femur is the longest, heaviest, and strongest bone in the human body. At the proximal end, the pyramid-shaped neck attaches the spherical head at the apex and the cylindrical shaft at the base. There are also 2 prominent bony protrusions, the greater trochanter and lesser trochanter, that attach to muscles that move the hip and knee. The angle between the neck and shaft, also known as the inclination angle is about 128 degrees in the average adult. However, the inclination angle decreases with age.<sup>1-3</sup> The hip is a ball-in-socket joint that is composed of the acetabulum of the pelvis encompassing the femoral head. The head is pointed in a medial, superior, and slightly anterior direction. Ligamentum teres femoris connects the acetabulum to the fovea capitis femoris, which is a pit on the head.<sup>4,5</sup>

The morphology of the proximal femur, specifically the relationships among the head, neck, and proximal shaft, has been a subject of interest and debate in orthopaedic literature dating back to at least the middle of the 19th century. As an area susceptible to numerous pediatric and adult disorders, many of which may correlate with variations in this morphology or whose treatment might benefit from a detailed understanding of this area's anatomy, a substantial body of research aimed at academically defining and pragmatically measuring the proximal femur's dimensions has developed. These efforts have led to a robust vocabulary for discussing proximal femoral anatomy and abundant methods for its quantification through various linear and angular measures.<sup>5-7</sup> Hence; the present study was undertaken for assessing the age related variation on

morphometric dimensions of Proximal Femoral of males in a known population.

**MATERIALS & METHODS**

The present study was undertaken for assessing the age related variation on morphometric dimensions of Proximal Femoral of males in a known population. A total of 20 male femur bones were obtained from department of human anatomy. All the bones were categorized into two groups; Less than 45 years of age and More than 45 years of age. Only those bone were included which were within the age range of 30 to 60 years. Complete demographic and clinical data of all the bones was collected from the data record files. Measurements were done and different morphometric parameters were assessed. All the parameters were compared on the basis of age group. All the results were recorded and analyzed by SPSS software. Mann-Whitney U test was used for evaluation of level of significance.

**RESULTS**

The mean anteroposterior physeal angle was 74.12° while mean lateral physeal angle was 81.99°. Mean neck version was 9.46° while mean angle of inclination was 129.41°. Mean anteroposterior physeal angle in subjects of less than 45 years and more than 45 years of age was 74.1° and 74.14° respectively. Mean lateral physeal angle among subjects of less than 45 years and more than 45 years of age was 81.95° and 82.05° respectively. Mean neck version among subjects of less than 45 years and more than 45 years was 9.51° and 9.42° respectively. Non-significant results were obtained while comparing the morphometric dimension of male’s femur among different age group.

**DISCUSSION**

The main function of the femur is weight bearing and gait stability. The upper body’s weight sits on the 2 femoral heads. The capsular ligament is a strong thick sheath that wraps around the acetabulum periosteum and proximal femur. It holds the femoral head within the acetabulum of the pelvis. The capsular ligament limits internal rotation but allows for external

rotation.<sup>5,6</sup> Hence; the present study was undertaken for assessing the age related variation on morphometric dimensions of Proximal Femoral of males in a known population.

In the present study, the mean anteroposterior physeal angle was 74.12° while mean lateral physeal angle was 81.99°. Mean neck version was 9.46° while mean angle of inclination was 129.41°. Mean anteroposterior physeal angle in subjects of less than 45 years and more than 45 years of age was 74.1° and 74.14° respectively. Mean lateral physeal angle among subjects of less than 45 years and more than 45 years of age was 81.95° and 82.05° respectively. Toogood et al analyzed 375 adult cadaveric femurs in order to provide a global assessment of proximal femoral morphology and comparisons between gender and age. Similarly, Unnanuntana et al performed a limited evaluation of the anatomy of adult femurs, specifically comparing genders and race, based upon only five measurements (neck-shaft angle, femoral head diameter, horizontal and vertical offset, and the distance from the lesser trochanter to the centre of the femoral head). Moreover, Young et al conducted studies comparing the left and right proximal femurs and found substantial symmetry among adults. Bixby et al performed a cross-sectional investigation examining CT scans of paediatric hips, but only analyzed adolescent subjects and limited their assessment to alpha angle, femoral head diameter, offset and epiphyseal extension.<sup>9-13</sup>

In the present study, mean neck version among subjects of less than 45 years and more than 45 years was 9.51° and 9.42° respectively. Non-significant results were obtained while comparing the morphometric dimension of male’s femur among different age group. Beutel BG et al characterized structural anatomy in skeletally-immature patients, examined potential differences between genders, and analyze how these anatomical parameters change with age. Cadaveric femurs from the Hamann-Todd Osteological Collection were examined. A total of 43 femurs from ages four to 17 years met inclusion criteria. The majority were female (56%); no difference existed in age between genders (p = 0.62).

Table 1: Morphometric measurements

Measurements	Mean	SD
Anteroposterior physeal angle	74.12°	6.32°
Lateral physeal angle	81.99°	6.12°
Neck version	9.46°	8.69°
Angle of inclination	129.41	6.11°

Table 2: Comparison of Morphometric measurements among subjects divided on the basis of age group

Measurements	Age group (years)		p- value
	Less than 45 years	More than 45 years	
Anteroposterior physeal angle	74.10°	74.14°	0.62
Lateral physeal angle	81.95°	82.05°	0.41
Neck version	9.51°	9.42°	0.33
Angle of inclination	129.37°	129.45°	0.81

The specimens had a neutral mean neck-shaft angle (130.7°) and anteversion (12.8°), and the sphericity of the ossified femoral heads was symmetrical. Male specimens had significantly higher alpha angles ( $p = 0.01$ ), posterior offset ( $p = 0.02$ ), neck width ( $p = 0.04$ ) and head-neck length ratio ( $p = 0.02$ ) values than female specimens. Strong positive correlations exist between length/size parameters and age, while negligible correlations were noted for angular measurements. Their study establishes reference values for a comprehensive list of anatomical parameters for the skeletally-immature ossified proximal femur.<sup>14</sup>

## CONCLUSION

We couldn't appreciate any significant age related changes in few structural components of proximal femur after fourth to fifth decade of life.

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