A New Method to Estimate the Anteversion Angle of the Femur from Femoral Head Size

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Purpose: Femoral neck anteversion (FNA) is the degree of torsion of the femur. It refers to the orientation of the femoral neck in relation to the condyles and is estimated using various methods. This study proposed a new method to estimate FNA.

Methods: The FNAs of 40 dry femoral bones were determined. Digital photography of proximal femurs were taken in two positions. In the anatomic position (P1), the two condyles were in contact with the table and the head was lifted off. In the version-corrected position (P2), the head was in contact with the table and the lateral condyle was lifted. The distance between the camera and the table was 30 cm. A graph paper was used as a scale. For each bone, two proximal femoral images were obtained. Two femoral head (FH) diameters were measured and documented for each bone, and the results obtained were analyzed.

Results: FH diameters obtained at P1 were persistently larger than those obtained at P2 (mean: 46.1 ± 3 mm and 43.7 ± 2.7 mm, respectively). The differences between FH diameters at P1 and P2 for each bone ranged from 0.5 mm to 6.5 mm (mean: 2.4 ± 1.3 mm). The differences were larger as the FNA increased (P = 0.0001). Regression analysis yielded the following equation: anteversion angle (0) = (2 * difference in head diameters at P1 and P2) + 13. The value obtained from the equation is ± 60 of the FNA.

Conclusion: This study revealed that the position of the proximal femur at the point of radiologic investigations could alter the FH diameters and result in inaccuracies when FH diameter is measured. This study also revealed that FNA can be estimated using the equation: anteversion angle (0) = (2 * difference in head diameters at P1 and P2) + 13. Clinically, this is applicable by taking two plain radiographs of the pelvis, without and with correction of the anteversion of the lower limb. The difference obtained between the measured FH sizes is substituted into the equation to obtain an estimated value of FNA.