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Femoral Neck Anteversion and Neck-Shaft Angles: Determination and Their Clinical Implications in Fetuses of Different Gestational Ages

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Abstract : Introduction: Precise anatomical assessment of femoral neck anteversion (FNA) and the neck shaft angles (NSA) would be essential in diagnosing the pathological conditions involving hip joint and its ligaments. FNA of greater than 20 degrees is considered excessive femoral anteversion, whereas a torsion angle of fewer than 10 degrees is considered femoral retroversion. Excessive femoral torsion is not uncommon and has been associated with certain neurologic and orthopedic conditions. The enlargement and maturation of the hip joint increases at the 20th week of gestation and the NSA ranges from 135- 140◦ at birth. Material and methods: 48 femurs were tagged according to the GA and two photographs for each femur were taken using Nikon digital camera. Each femur was kept on a horizontal hard desk and end on an image of the upper end was taken for the estimation of FNA and a photograph in a perpendicular plane was taken to calculate the NSA. The images were transferred to the computer and were stored in TIFF format. Microsoft Paint software was used to mark the points and Image J software was used to calculate the angles digitally. 1. Calculation of FNA: The midpoint of the femoral head and the neck were marked and a line was drawn joining these two points. The angle made by this line with the horizontal plane was measured as FNA. 2. Calculation of NSA: The midpoint of the femoral head and the neck were marked and a line was drawn joining these two points. A vertical line was drawn passing through the tip of the greater trochanter to the inter-condylar notch. The angle formed by these lines was calculated as NSA. Results: The paired t-test for the inter-observer variability showed no significant difference between the values of two observers. (FNA: t=-1.06 and p=0.31; NSA: t=-0.09 and p=0.9). The FNA ranged from 17.08º to 33.97 º on right and 17.32 º to 45.08 º on left. The NSA ranged from 139.33 º to 124.91 º on right and 143.98 º to 123.8 º on left. Unpaired t-test was applied to compare the mean angles between the second and third trimesters which did not show any statistical significance. This shows that the FNA and NSA of femur did not vary significantly during the third trimester. The FNA and NSA were correlated with the GA using Pearson’s correlation. FNA appeared to increase with the GA (r=0.5) but the increase was not statistically significant. A decrease in the NSA was also noted with the GA (r=-0.3) which was also statistically not significant. Conclusion: The present study evaluates the FNA and NSA of the femur in fetuses and correlates their development with the GA during second and third trimesters. The FNA and NSA did not vary significantly during the third trimester.

Keywords : anteversion, coxa antetorsa, femoral torsion, femur neck shaft angle
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