

VARIATIONS IN FEMORAL ANTEVERSION IN ADULT DRIED FEMORA: A STUDY

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Abstract: Femoral anteversion is the inward rotation of upper end of femur causing pigeon-toed appearance. The angle of femoral anteversion is highly variable in different populations and also in living and dried specimens. The knowledge of femoral anteversion is beneficial in understanding the biomechanics of hip joint in surgical interventions, for studies in forensic medicine and anthropology. The present study is designed to know the range of anteversion in adult dried femora. Tracings from pictures of individual femora are taken and the angle of anteversion measured. 59 bones were used for this purpose. The results were tabulated and compared with other studies. The mean angle of femoral anteversion of right sided femora was 10.46^o with a standard deviation of 7.506 and on the left side came to be 19.42^o with a standard deviation of 10.29. This study provides the data of dried femora of Visakhapatnam district.

Key Words: Dried femora, anteversion, biomechanics, mean angle.

1. INTRODUCTION:

Femoral anteversion is the rotation of neck of femur anteriorly in relation to posterior surfaces of femoral condyles. It normally ranges from 10-15 degrees in adult ^[1]. The degree of anteversion affects lower limb biomechanics, abductor moment arm, patellar tracking and foot orientation. It shows racial variations ranging from 7-8^o in Caucasian skeletal surveys ^[2, 3] to upto 19^o in African population ^[4, 5]. This angle is the result of developmental process and torsional stress as the child grows and may automatically correct or persist leading to W sitting or gait disturbances. The present study is designed to determine the angle of femoral anteversion in adult dried femora of Visakhapatnam region in a simple method and to compare with other studies.

2. MATERIALS AND METHODS:

59 adult dried femora were evaluated for the study. There is a documentary variation of the femoral anteversion obtained by different procedures like measurement by CT, ultrasound, 3D reconstruction, Kingsley Olmsted method or parallelograph method ^[6]. A simple method is used to determine the femoral anteversion in dried bones in this study. After determining the side, each femur was kept on a flat surface with both condyles touching the table. Photograph was taken at an angle so that upper end is visualized. Tracing of the pictures were taken. A tangential line was drawn connecting posterior borders of two condyles. Axis of the neck and head of femur was drawn and extended to meet the tangential line. The angle was measured with a protractor. The results were tabulated and compared with other studies.

3. RESULTS:

The angles of femoral anteversion were tabulated as follows.

Table 1: Percentage distribution of femoral anteversion

Range of Angle of femoral anteversion (degrees)	Right femora		Left femora		Total	
	Number	%	Number	%	Number	%
0	2	3.38	0	0	2	3.38
1-5	10	16.94	1	1.69	11	18.64
6-10	5	8.47	3	5.08	8	13.55
11-15	7	11.86	6	10.16	13	22.03
16-20	5	8.47	5	8.47	10	16.94
>20	3	5.08	12	20.33	15	25.42

Graph 1: Comparison of angles between right and left sides

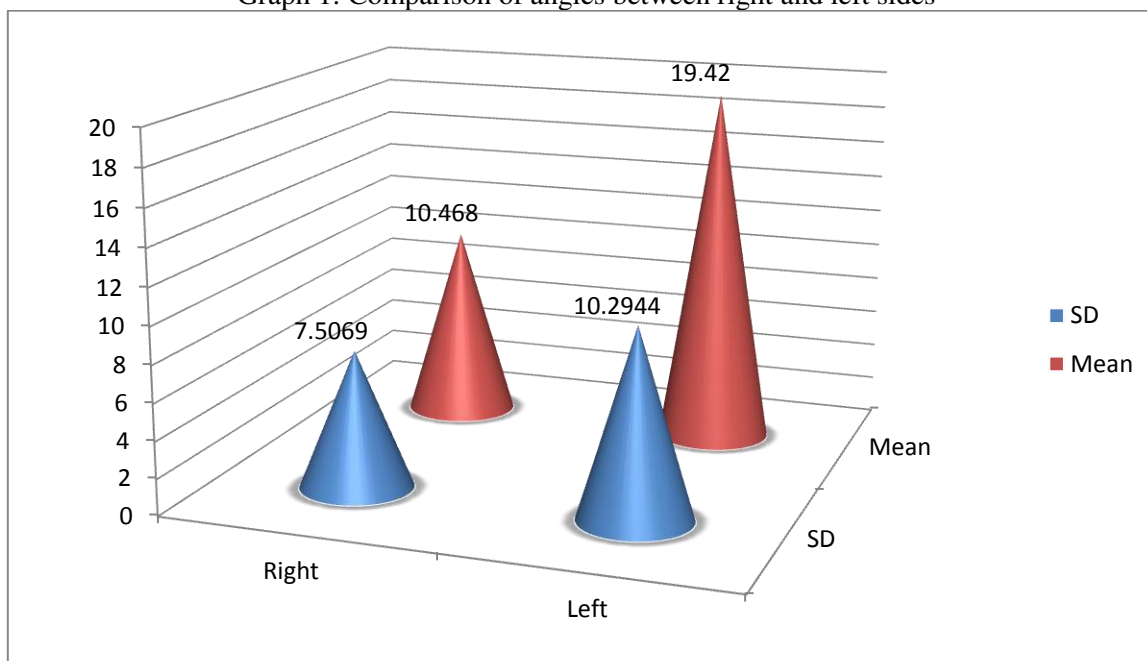


Fig 1: Right and Left femora positions to trace and measure

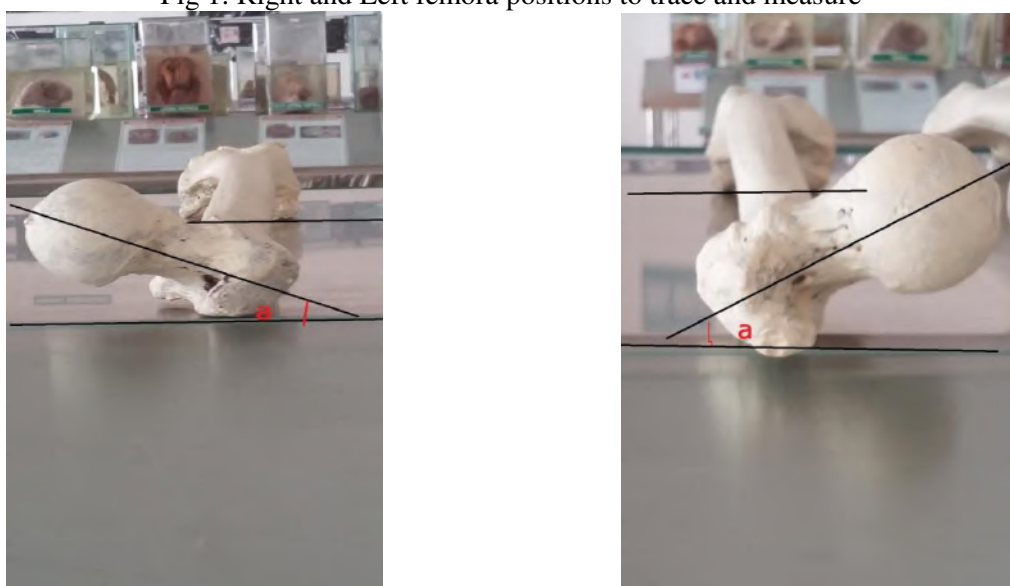


Table 2: Comparison with other Indian studies

Study	Year	Mean femoral anteversion		Average
		Right	Left	
Kate BR etal	1976	9.0	8.6	8.8
Nagar M etal	2002	21.05	11.17	16.11
RC Siwach etal	2003			13.68
Maini PS etal	2005			16.31
Dr. Ankur Zalawadia etal	2010	M-7.2;F-10.5	M-14.3;F-16.4	12.4
Srimathi etal	2011	9.49	10.13	9.81
Moulik Debnath etal	2016	M-18.3;F-19.4	M-21.61;F-21.67	20.05
Present study	2017	10.46	19.42	14.94

4. DISCUSSION:

The angle of femoral anteversion is between 10-15 degrees. Variations in this angle may be due to congenital causes or sporadic. Most of the cases resolve with age but persistent cases will have the effect on biomechanics of the joint. A better understanding of the anatomy and mechanical factors of the hip joint is essential to deal with hip replacement surgeries and arthroplasties [7]. There is a considerable variation in the values documented by various

procedures. The present study determines the angle of femoral anteversion in a simple method and compares the values with other studies in India^[8-13]. The average angle of femoral anteversion from the study was 14.94⁰ which are close to the study made by RC Siwach et al in 2003^[14].

5. CONCLUSION:

The mean angle of femoral anteversion in dried bones was 10.46⁰ on right side and 19.42⁰ on left side. This study provides data of range of femoral anteversion in Visakhapatnam region using a simple method. When compared with other studies it was close to high normal range.

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