Frequency of Femoral Ante Version in Patients Presenting with Developmental Dysplasia of Hip (DDH)

Anwar Imran,[1] Sayed Muhammad Qasim Shah,[2] Hamad Ali Shah,[3] Aimon Zia,[4] Rafiullah,[5] Atiq uz Zaman[6]

[1,5]Paediatric/Trauma Orthopaedic Fellow Ghurki Trust Teaching Hospital Lahore

[2]Trainee Medical Officer Hayatabad Medical Complex Peshawar.

[3]Paediatric Orthopaedic Fellow Hayatabad Medical Complex Peshawar

[4]Spine Fellow Khyber Teaching Hospital Peshawar

[6]Professor Orthopaedic and Spine Surgery
Ghurki Trust Teaching Hospital Lahore

Authorship and contribution Declaration:
[1]Anwar Imran: Conception and design of the study, acquisition of data
[2]Sayed Muhammad Qasim Shah: Interpreted the data
[3]Hamad Ali Shah: Revised the manuscript critically for important intellectual content
[4]Aimon Zia: Drafted the manuscript
[5]Rafiullah: Acquisition of data, analysis of data
[6]Atiq uz Zaman: Final the version for publication

Correspondence Author:
Anwar Imran
Email:
dranwarbangash@gmail.com

ABSTRACT

Objective: To determine the frequency of femoral ante version in patients presenting with Developmental Dysplasia of Hip (DDH).

Methods: This Cross-sectional was conducted in Ghurki Trust Teaching Hospital, Lahore from April 2019 to September 2019.All children of DDH fulfilling the inclusion criteria were subjected to Craig test for the evaluation of femoral anteversion. An angle more than 15° (normal 8-15°) was termed as femoral anteversion (internal torsion).

Results: In our study total 57 children with mean age 5 years± 3.26 were included. Male children were 33 (58%) and female 24 (42%). The frequency of femoral anteversion was detected in 30(52%) children with DDH.

Conclusion: Femoral anteversion was found in most of children suffering from developmental dysplasia of hip. All children with DDH must be screened for femoral anteversion and the operating surgeon must plain to correct this deformity precisely while operating on patients with DDH.

Key words: Craig Test, Developmental Dysplasia of Hip, Femoral Anteversion

This article may be cited as: Imran A, Shah SM, Shah HA, Zia A, Rafiullah, Atiq uz Zaman. Frequency of Femoral Ante Version in Patients Presenting with Developmental Dysplasia of Hip (DDH).J Pak Orthop Assoc 2019;31(4):142-145.

INTRODUCTION

Developmental Dysplasia of Hip(DDH) is a spectrum of disorder that involves several abnormalities which

ranges from simple hip dysplasia to complete dislocation of the head of the femur from acetabulum.[1] The characteristic features of Developmental Dysplasia of Hip(DDH) are acetabular dysplasia, capsular elongation, ligamentum teres hypertrophy and elongation. The hip joint, including femur is one of the most frequently studied region in the human body, and determination of Femoral Anteversion Angle (FAA) has been a topic of interest for Orthopaedic surgeons, anatomists, and physiotherapy researchers throughout the world since long.[2,3] The femoral anteversion angle is formed by a line that passes through the center of head and neck of femur and the Intercondylar Line in the frontal (coronal) plane. Increased femoral anteversion is related to hip instability, retroversion is associated with instability, hip pain, and osteoarthritis of the hip.[4-6]

Since Femoral anteversion can be altered in various conditions such as in polio, cerebral palsy, and congenital dislocation of the hip, clinically its measurement is essential and requires an accurate assessment.[7,8] Abnormal femoral anteversion can lead to hip osteoarthritis, DDH, and gluteal tendinopathy.[9] Prolong hip dislocation can lead to deformation of femoral head and shallow acetabulum. All of these factors lead to difficulty in reducing the hip especially in cerebral palsy patient having hip dislocation and in DDH patients who are delayed walker.[10]

The investigation of choice for femoral ante version is CT scan but because of radiation hazards and lack of affordability we used Craig test to determine the frequency of ante version. The objective of our study was to determine the frequency of femoral ante version in patients presenting with Developmental Dysplasia of Hip(DDH) so that the angle of femoral de-rotation osteotomy can be determining pre-operatively and the operating surgeon must plain accordingly. The results of our study would help to formulate standard guidelines regarding routine femoral osteotomy in all cases of DDH.

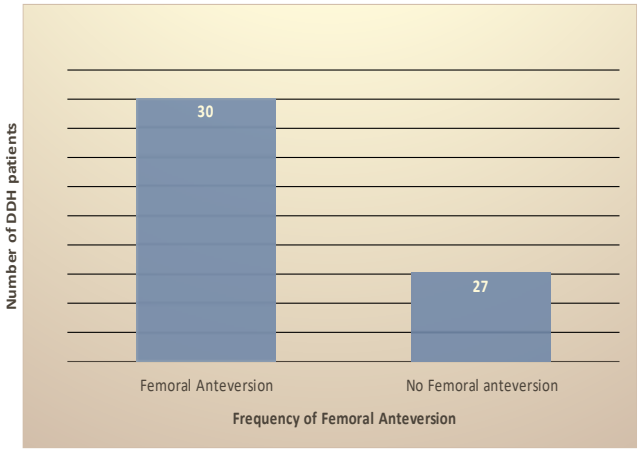
METHODS

This was a Cross-sectional study conducted in Ghurki Trust Teaching Hospital, Lahore from April 2019 to September 2019 after the approval from the Ethical Committee of the hospital. All children of DDH with either gender and age range 1 to 10 years presented to Out Patient Department were included. Written informed consent from parents were taken. A detailed history, clinical examination and relevant investigations were done for all the patients. Craig Test was performed for the evaluation of femoral anteversion. The child was positioned prone with his or her knee on the affected side flexed to 90°.Lateral aspect of greater trochanter was palpated and the angle between the long axis of the leg and vertical axis of anteversion was measured. An angle more than 15° (normal 8-15°) was termed as femoral anteversion (internal torsion). All the tests were performed by the same orthopaedic consultant. All the information like age, gender was recorded in a pre-design proforma.

We analysed our data with SPSS(version 18). Important numerical variables like age was presented as mean and standard deviation while categorical variables like gender and femoral anteversion were represented as frequency and percentages. Stratification of femoral anteversion according to the age and gender was done and post stratification chi square test was applied (P value< 0.05 was considered significant). Strengthening the Reporting of Observational Studies in Epidemiology (STROBE)[11] guidelines had been followed while reporting the results of this study.

RESULTS

In our study total 57 patients were included with developmental dysplasia of the hip. The mean age was 5 years± 3.26. Male children were 33 (58%) and female 24 (42%). According to distribution of age observed among children the study noted that 40(70%) children were in 1-5years age range while 17(30%) children had the age range of 6 to 10 years. Femoral anteversion was detected in 30(52%) children with DDH(graph I) including 17(56.6%) male and 13(43.3%) female children. The mean femoral anteversion was 22 degrees(range 18 to 32 degrees). When the stratification of femoral anteversion was done concerning age, 21(52.5%) out of 40 patients were between the ages of 1-5 years while 9(52.9%) out of 17 patients were between ages of 6-10 years. No significant relationship of femoral anteversion with age and gender was found(p value ≥0.05)



Graph I: showing the frequency of femoral ante version in our study participants.

DISCUSSION

There was general agreement in the past that DDH is associated with excessive femoral anteversion, but the indication of De- rotational femoral osteotomy in DDH is still controversial due to inconsistent findings of femoral anteversion in various studies. There are some studies that show acetabular anteversion combine with femoral anteversion especially in unilateral DDH having Tonnis grade II, III, and IV.[12]

In our study the frequency of femoral anteversion was 52% with mean femoral anteversion angle of 22 degrees (range 18 to 32 degrees). Sankar13 documented that there was an increased incidence of femoral anteversion as compared to available published data. In their study mean femoral ante version was 50.3 degrees+/-17.9 degrees. However, significant variation in femoral anteversion angle was observed that range from as low as 0 degrees to as high as 95.7 degrees. Lerch et al[14] studied 538 hips and found femoral anteversion in 52%. In his series 18% children had femoral anteversion of 26°-35° while 12% had femoral anteversion of >35.

Tomczak[15] did a CT based comparative study between children and adults(mean age 11 years) and reported 34-degree femoral anteversion in children and 22.2 degrees in adults.

Although femoral derotation osteotomy is usually done on the basis of femoral anteversion But JingYu[10] in his study proposed the combine anteversion angle (CAA) which is the sum of femoral angle and acetabular angle (CAA=FA+AA), also called Instability Index, for determining whether the patient needs de-rotational osteotomy.

The amount of femoral anteversion must be determined in early walker as well as in non-walker especially in DDH associated with other conditions like polio, cerebral palsy and arthrogrypotic children. Because in these cases there are usually low threshold for correction of ante version in non- walker as compared to walkers. The limitations of our study were that we did not measure the acetabular version combine with femur version and because of our strict inclusion criteria our sample size was small. We therefore recommend further studies with larger sample size to confirm our findings.

CONCLUSION

Femoral anteversion was found in most of children suffering from developmental dysplasia of hip. All children with DDH must be screened for femoral anteversion and the operating surgeon must plain to correct this deformity precisely while operating on patients with DDH. Excessive de-rotational osteotomy can lead to posterior hip dislocation especially if this surgery is combined with salter pelvic osteotomy.

Conflict of Interests: None
Grants/Funding: None

REFERENCES

1. Jain AK, Maheshwari AV, Nath S, Singh MP, Nagar M. Anteversion of the femoral neck in Indian dry femora. Journal of Orthopaedic Science 2003 1;8(3):334-40.
2. Byun HY, Shin H, Lee ES, Kong MS, Lee SH, Lee CH. The availability of radiological measurement of femoral anteversion angle: three-dimensional computed tomography reconstruction. Annals of Rehabilitation Medicine 2016 Apr;40(2):237.
3. Buckley SL, Sponseller PD, Magid D. The acetabulum in congenital and neuromuscular hip instability. Journal of Pediatric Orthopedics 1991;11(4):498-501.
4. Sankar WN, Neubuerger CO, Moseley CF. Femoral anteversion in developmental dysplasia of the hip. Journal of Pediatric Orthopaedics 2009 ;29(8):885-8.
5. Kim WY, Hutchinson CE, Andrew JG, Allen PD. The relationship between acetabular retroversion and osteoarthritis of the hip. J Bon Joint Surg Br 2006 ;88(6):727-9.
6. Giori NJ, Trousdale RT. Acetabular retroversion is associated with osteoarthritis of the hip. Clinic Orthop Rel Res 2003;1:263-9.
7. Ning B, Yuan Y, Yao J, Zhang S, Sun J. Analyses of outcomes of one-stage operation for treatment of late-diagnosed developmental dislocation of

the hip: 864 hips followed for 3.2 to 8.9 years. BMC Musculoskeletal Disorders 2014;15(1):401.
8. Kohno Y, Nakashima Y, Akiyama M, Fujii M, Iwamoto Y. Does native combined anteversion influence pain onset in patients with dysplastic hips?. Clinic Orthop Rel Res 2015;473(12):3716-22.
9. Maheshwari AV, Zlowodzki MP, Siram G, Jain AK. Femoral neck anteversion, acetabularanteversion and combined anteversion in the normal Indian adult population: A computed tomographic study. Indian Journal of Orthopaedics 2010 ;44(3):277.
10. Jiang N, Peng L, Al-Qwbani M, Xie GP, Yang QM, Chai Y et al. Femoral version, neck-shaft angle, and acetabular anteversion in Chinese Han population: A retrospective analysis of 466 healthy adults. Medicine 2015;94(21).
11. Vandenbroucke JP, von Elm E, Altman DG, Gotzsche PC, Mulrow CD, Pocock SJ et al. Strengthening the Reporting of Observational Studies in Epidemiology (STROBE): Explanation and Elaboration. PLoS Med 2007; 4(10):297-307.
12. Jia JY, Li LY, Zhang LJ, Zhao Q, Liu XJ. Three dimensional CT evaluation of femoral neck anteversion, acetebularanteversion and combined anteversion in unilateral DDH in an early walking age group. International Orthopaedics 2012;36:119-124.
13. Sankar WN, Neubuerger CO, Moseley CF. Femoral anteversion in developmental dysplasia of the hip. Journal of Pediatric Orthopaedics 2009 ;29(8):885-8.
14. Lerch TD, Todorski IA, Steppacher SD, Schmaranzer F, Werlen SF, Siebenrock KA et al.Prevalence of femoral and acetabular version abnormalities in patients with symptomatic hip disease: a controlled study of 538 hips. The American Journal of Sports Medicine 2018;46(1):122-34.
15. Tomczak RJ, Guenther KP, Rieber A, Mergo P, Ros PR, Brambs HJ. MR imaging measurement of the femoral antetorsional angle as a new technique: comparison with CT in children and adults. AJR 1997;168(3):791-4.