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PREVALENCE OF FEMOROACETABULAR IMPINGEMENT IN NORTH INDIA- A RETROSPECTIVE STUDY

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Abstract

Most important cause of idiopathic osteoarthritis of hip is being considered as femoroacetabular impingement. We have studied anteroposterior and lateral radiographs of 151 hips of North Indian population to determine the prevalence of femoroacetabular impingement in India unlike the west, primary osteoarthritis of this type is rare. The prevalence of cam and pincer type of impingement was 4.8 which was statistically significant ($P < 0.1\%$). The prevalence of isolated pincer type of impingement was 1%. The mean lateral centre edge angle was 38 degrees with a standard deviation of 3.8 degrees. The mean femoral head extrusion index was 0.31 with a standard of 0.04. Femoral offset of less than 10 mm was found in 4% of cases. A negative acetabular index was found in 5% of patients suggestive of pincer type of impingement. OS acetabuli were present in 3% of the cases. Pistol grip deformity present in 4% of cases. Alba angle more than 55 degrees was noted in 3% of cases. The values through marginally less than western population still cannot explain such low incidence of primary osteoarthritis in north Indian population. Further studies are still required to evaluate the nature of disease process, its natural history, actual cause & effect relationship between femoro acetabular impingement and osteoarthritis as well as better definition of its various parameters.

Keywords: Femoro-acetabular impingement, north Indian population, Alba angle.

Introduction

Osteoarthritis hip is major challenge to orthopedic surgeons. It is most agonizing & painful disability for daily living activities of human beings. Idiopathic osteoarthritis account for approximately 40% to 50% of all cases of degenerative arthritis¹ in western population and recent literature implies that idiopathic osteoarthritis is frequently caused by radiographically occult, abnormalities at the femoral head-neck junction or acetabulum which gives rise to abnormal contact between the femur and the acetabulum². This condition known as femoroacetabular impingement, has been proposed as leading cause of labral tears, as well as degenerative hip arthritis.

During open hip surgery it was observed by Ganz et al that cartilage damage mechanism is associated with femoroacetabular impingement as well as its clinical & radiographic features^{3,4}. Although the association of femoro-acetabular impingement with hip osteoarthritis is well known, little is known about distribution of these malformations, their magnitude & related clinical problems especially in India and particularly in north India wherein primary osteoarthritis is rare.

Aims & Objectives

The main objective of this study is to know whether femoro-acetabular impingement is as significant problem in north Indian population as in western country population.

Methods

This retrospective study was conducted in Department of Orthopedics G.S. medical college, Hapur during the period of 2017-2018 after obtaining approval from ethical & research committee of institution

for the project. 151 patients between the age group of 15 to 50 years were included in the study.

Exclusion Criteria

1. Past history of hip pain.
2. Post history of surgery & fracture
3. Hip Dyspepsia & osteonecrosis of femoral head.

We retrospectively evaluated the plain radiograph. Measurements were made on standard anteroposterior & lateral radiographs of hip with pelvis. Moses concentric circles were used to determine the centre of femoral head. Measurements were initially sub classified in to pincer type or the cam type. Pincer type included the following parameters-

Lateral centre edge angle of Wiberg- It is formed by the intersection of a line drawn through the midpoint of the femoral head and a second line drawn from the centre of the femoral head to the upper outer margin of the acetabulum (Figure-1).

Acetabular Index- The angle between the line joining the inner edge of acetabulum and the outer edge with the horizontal is the acetabular index.

Acetabular Extrusion Index- The femoral head extraction index expresses the percentage of the femoral head diameter uncovered by the acetabulum, or the percentage of femoral head lateral from perkin's line.

Posterior wall sign - Posterior wall line should pass exactly through the centre of the femoral head.

OS Acetabuli - small accessory ossicles at the lateral margin of the acetabulum develop due to constant wear and tear. These accessory ossicles are known as OS acetabuli (Figure-2).

Linear indentation Sign- In Pincer Hips, corresponding linear indentation often occurs on femoral

side with reactive cortical thickening.

Cam type includes the following parameters:-

Pistol grip deformity- Pistol grip deformity occurs due to loss of concavity which is normally present at the anterosuperior margin of the femoral head, on plain radiograph it looks like the rear end of the Pistol (Figure-3).

ALFA Angle- Alfa angle is the angle between the femoral neck axis and a line connecting the head center with the point of beginning asphericity of the head-neck contour (Figure-4).

Anterior Femoral Off-Set- It is defined as the difference in radius between the anterior femoral head & anterior femoral neck on a cross table axial view of the proximal femur:-

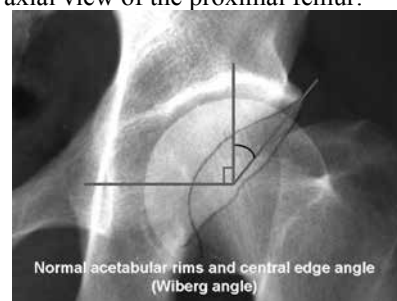


Figure – 1- Lateral centre edge angle of Wiberg



Figure- 2 – Os acetabuli



Figure- 3 - Pistol grip deformity

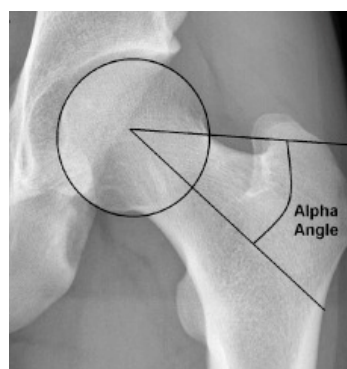


Figure- 4 Alfa angle

Results:- 151 Hips were included in the study with each hip evaluated using an antero posterior and lateral radiographs. There were 97 males and 54 females. The age wise distribution of patients is shown in table 1.

Table 1 Showing age distribution of the patients

Age in Years	Percentage
15-20	5%
20-25	14%
25-30	17%
30-35	18%
35-40	21%
40-45	9%
45-50	16%

The prevalence of cam and pincer type of impingement was 4.8% which was statistically significant ($P < 0.01\%$). The prevalence of isolated pincer type of impingement was 1%. The mean lateral centre edge angle was 38 degrees with a standard deviation of 0.04%. Femoral offset of less than

10 mm was found in 4% of cases. A negative acetabular index was found in 5% of patients suggestive of pincer type of impingement. OS acetabuli were present in 3% of cases. Pistol grip deformity present in 4% of cases. Alfa angle more than 55 degrees was noted in 4% cases.

Discussion

Femoroacetabular impingement “(Previously also called “acetabular rim syndrome”) or “cervicoacetabular impingement” is a major cause of early osteoarthritis of hip, especially in young and active patients. Though concept of impingement and the principles of treatment are nearly a century old, Ganz⁴ and his colleges from Bern reintroduced these ideas in the 1990 in a series of papers reporting impingement in various conditions. They have refined the concepts and proposed many patients with previously undiagnosed hip pain, had more or less subtle deformities of the anterior femoral neck, causing impingement and early osteoarthritis. It is cauterized by an early pathologic contact during hip joint motion between skeletal prominences of the acetabulum and the femur that limits the physiologic hip range of motion, typically flexion and internal rotation. Depending on clinical and radiographic findings, two types of impingement are distinguished. Pincer impingement is the acetabular cause of femoroacetabular impingement and is characterized by focal or general over coverage of the femoral head⁵. Cam impingement is the femoral cause of femoroacetabular impingement and is due to an aspherical portion of the femoral head -neck junction⁶. Most patients (85%) have a combination of both forms of impingement, which is called “mixed

pincer and cam impingement”, with only a minority (15%) having the pure femoroacetabular impingement forms of either cam or pincer impingement.⁷

Though a number of parameters have been described the centre edge angle of Wiberg is one of the most commonly used uniplanar discriminators of deep acetabular socket. Increasing age has been shown to influence the centre edge angle. In our study, since we included patients with age up to fifty years, we took centre edge angle of 45 degrees as the cut-off for pincer impingement. There is still some confusion in literature as to exact limit of normal centre-edge angle. Some studies have taken 40 degrees as the cut-off limit of centre -edge angle whereas some others have taken 45 degrees. We have taken 45 degrees as the cut-off because there is a strong correlation between centre-edge angle of more than 45 degrees and significant hip pain due to labral tears. Thus there is same obscurity as to the normal limits of centre-edge angle which needs to be refined further. The angle between the line joining the inner edge of acetabulum and the outer edge with the horizontal is the acetabular index⁵. It is positive in normal individuals. It becomes negative as acetabulum deepens.

The femoral head extrusion index, expresses the percentage of the femoral head lateral from Perkin's line cut-off value set at 25%. Any value less than 25% suggests pincer type of impingement. Posterior wall line should pass exactly through the centre of femoral head. If it passes laterally, then it is suggestive of pincer type of impingement. If the line passes medially then it is suggestive of cam type of impingement⁵. Quantification of the amount of asphericity that is the cam type of

impingement can be accomplished by the angle α , the femoral offset, or the offset ratio⁸. Angle α is the angle between the femoral neck axis and a line connecting the head centre with the point of beginning asphericity of the head-neck contour. An angle exceeding 50 degree is an indicator of an abnormally shaped femoral head-neck contour. Another parameter for quantification of cam impingement is the anterior off-set, which is defined as the difference in radius between the anterior femoral head and the anterior femoral neck on a cross table axial view of the proximal femur. In asymptomatic hips, the anterior offset is 11.5 ± 0.7 mm, hips with cam impingement have a decreased anterior offset of 7.2 ± 0.7 mm⁹. As a general rule for clinical practice, an anterior offset less than 10 mm is a strong indicator for cam impingement. We found the Prevalence of femoro-acetabular impingement in our study to be 5%. The estimated prevalence, as described by Leunig M, Ganz R in western countries is 10-15%. Takeyma et al in 2009 found the incidence of femoral acetabular impingement to be around 0.6% in Japanese population. They believed that such a low incidence of femoro-acetabular impingement is consistent with a low incidence of primary hip osteoarthritis in Japan. This discrepancy can be explained by the differences in the prevalence of osteoarthritis of hips in both countries. It is increasingly coming to notice that radiographs of idiopathic osteoarthritis of hip show signs of femoroacetabular impingement. Indeed according to one study up to 71% of cases of idiopathic osteoarthritis of hip show pistol-grip deformity. Therefore, there could be a casual association between femoro-acetabular impingement and idiopathic osteoarthritis of hip and

further studies are required for the same. One of the studies comprising of 85 hips in Indian population has found the prevalence of head-neck offset ratio at 11.7% and the mean α and β angles of 45.6° and 40.6° , respectively. The authors concluded that the differences in the prevalence of hip osteoarthritis in Indian & western populations are not attributable to variation in the prevalence of abnormal head-neck offset but the authors also acknowledged small sample size included in their study¹⁰. Therefore there could be a casual association between femoro-acetabular impingement and idiopathic osteoarthritis of hip and further studies are required for the same.

Conclusion

Femoro-acetabular impingement is an increasingly recognized condition causing hip pain in young active adults and is believed to be a cause of hip osteoarthritis. It indicates the abnormal abutment between the femoral head and the acetabular rim. Our study is an observational study which shows a statistically significant 5% prevalence of femoro-acetabular impingement in north India.

References

1. Solomon L. Patterns of osteoarthritis of the hip. *J Bone Joint Surg Br.* 1976;58:176-83
2. Tanzer M, Noiseux N. Osseous abnormalities and early osteoarthritis: the role of hip impingement. *Clin Orthop Relat Res.* 2004;429:170-7.
3. Beck M, Kalhor M, Leunig M, Ganz R. Hip morphology influences the pattern of damage to the acetabular cartilage: femoroacetabular impingement as a cause of early osteoarthritis of

the hip. *J Bone Joint Surg Br.* 2005;87:1012-8

4. Ganz R, Parvizi J, Beck M, Leunig M, Nötzli HP, Siebenrock KA. Femoroacetabular impingement: a cause for osteoarthritis of the hip. *Clin Orthop Relat Res.* 2003;417:112-20.
5. Tannast M, Siebenrock KA, Anderson SE. Femoroacetabular impingement: radiographic diagnosis—what the radiologist should know. *AJR Am J Roentgenol* 2007 ; 188 (6): 1540 – 1552
6. Jäger M, Wild A, Westhoff B, Krauspe R. Femoroacetabular impingement caused by a femoral osseous head-neck bump deformity: clinical, radiological, and experimental results. *J Orthop Sci* 2004; 9:256 –263
7. Ito K, Minka MA 2nd, Leunig S, Werlen S, Ganz R. Femoroacetabular Impingement and the cam-effect. A MRI-based quantitative anatomical study of the femoral head-neck offset. *J Bone Joint Surg Br.* 2001;83:171-6
8. Nötzli HP, Wyss TF, Stöcklin CH, Schmid MR, Treiber K, Hodler J. The contour of the femoral head-neck junction as a predictor for the risk of anterior impingement. *J Bone Joint Surg Br* 2002; 84:556 –560
9. Tannast M, Zheng G, Anderegg C, et al. Tilt and rotation correction of acetabular version on pelvic radiographs. *Clin Orthop Relat Res* 2005; 438:182 –190
10. Malhotra R, Kannan A, Kancherla R, Khatri D, Kumar V. Femoral head-neck offset in the Indian population: A CT based study. *Indian J Orthop.* 2012 Mar;46(2):212-5