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Prevalence of asymptomatic femoroacetabular impingement in Turkey; cross sectional study

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ABSTRACT

Objectives: Femoroacetabular impingement (FAI) is one of the causes of hip pain in young-adult patients. The purpose of our study is to determine the prevalence of radiological FAI findings in asymptomatic population in Turkey.

Methods: Trauma patients aged 18–65 years who applied to the emergency service between September 2015 and September 2016 were retrospectively evaluated for this study. After a preliminary study and power analysis, 2152 hips of the 1076 previously asymptomatic patients were evaluated radiologically with pelvis antero-posterior and frog-leg radiographs. On radiographs of these patients; alpha angle, lateral central edge angle (LCEA), Tönnis angle (TA) and collodiaphyseal angle were measured. Alpha angle values higher than 55° were noted as cam type FAI. TA values lower than 0° or LCEA values higher than 39° were noted as pincer type FAI. LCEA values lower than 25° or TA values higher than 10° were noted as acetabular dysplasia.

Results: Mean age of 1076 patients (602 female, 474 male) was 42.1 ± 15.6 years. The assessment showed that 15.9% of the patients had cam type, 10.6% had pincer type, 3.1% had combined type FAI and 9.3% had findings of acetabular dysplasia. The prevalence of asymptomatic FAI is significantly more in males (46%) in comparison to females (17%) in Turkey.

Conclusion: Even though FAI is considered to be a pathology associated with hip osteoarthritis; it is very common in asymptomatic population. In this respect, our study showed that prevalence of radiological FAI findings in asymptomatic adult population was 29.6% in Turkey.

Introduction

Femoroacetabular impingement (FAI) is considered as one of the most common causes of hip pain in young-adult population and is associated with development of osteoarthritis. In recent years, awareness of FAI have risen and FAI has become a popular pathology.[1,2] Different treatment modalities including open or arthroscopic surgery have been described and large numbers of studies were published stating successful short and mid-term clinical results of FAI treatment.[3–6]

Radiological findings of FAI can be seen in high ratios, reaching up to 60% of the population, especially in asymptomatic athletes.[7,8] Radiological findings of FAI can be encountered incidentally when investigating other conditions which may cause hip pain such as soft tissue injuries, other impingement syndromes around hip region, lumbar discopathy etc. The clinicians may misdiagnose some of these patients due to the high prevalence of radiological FAI.[9,10] There are many etiological factors of FAI such as genetic factors, congenital anatomical disorders, pediatric diseases. However, developmental and acquired factors are considered to be the prominent etiological factors.[11] Therefore, it has been stated that there may be some differences in FAI prevalence according to ethnicity and social habits like sports etc. For these reasons, there are some studies that evaluate the prevalence of asymptomatic FAI in different populations or ethnicities.[12–14] However; to our knowledge, there is not any study which was performed in Turkey, evaluating the prevalence of FAI in asymptomatic population. The purpose of our study is to determine the prevalence of radiological

Abbreviations: FAI, Femoroacetabular impingement; LCEA, lateral central edge angle; TA, Tönnis angle; CDA, collodiaphyseal angle.

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FAI findings in asymptomatic adult population in Turkey. We hypothesized that ethnical properties and social habits may affect the prevalence of FAI in different populations and orthopedic surgeons should be aware of the prevalence of asymptomatic FAI in Turkey.

Materials and methods

Trauma patients aged 18–65 years who applied to the emergency service between September 2015 and September 2016 were retrospectively investigated for this study. Pelvis antero-posterior (AP) and pelvis frog-leg radiographs of these patients were evaluated in terms of radiological findings for FAI. Ideal radiographs in which both iliac crests and proximal femurs were seen, with symmetrical obturator foramens and centralized symphysis pubis were accepted as suitable for evaluation. Patients with proper radiographs were questioned by telephone that if they had any hip pain before trauma, and those who did not have any hip pain history or rheumatologic disease anamnesis were included in the study. Radiographs which were positioned improperly and patients who had fractures in the pelvic ring or lower extremity, ligamentous injuries in lower extremity and with radiological findings of coxarthrosis or previous surgeries around hip joint were excluded from the study. Our study was approved by the ethical committee of Istanbul University Istanbul Faculty of Medicine (IU2016/254).

Due to the lack of FAI prevalence data in Turkey and wide range of FAI prevalence in different populations in the literature; with a preliminary study over 562 patients, we observed radiological FAI in 30% of the 562 patients. In order to give asymptomatic FAI prevalence of Istanbul cohort, a power analysis was assessed for this prevalence value with 5% error margin and a sample amount of "1076 patients (2152 hips)" was found in order to assess asymptomatic FAI prevalence in Turkey. Then we conducted the analysis until a total of 1076 patients was reached. Thereby with the continuation of the study, medical records of 9766 trauma patients who applied to the emergency service were scanned and 2152 hips of 1076 patients that were suitable to the inclusion criteria, were included to the study.

In the pelvis radiographs of the patients; alpha angle, lateral central edge angle (LCEA), Tönnis angle (TA) and collodiaphyseal angle (CDA) were measured and results were noted. In radiological evaluation; hips with alpha angle higher than 55° were noted as cam type FAI, hips with TA lower than 0° or LCEA higher than 39° and hips with a positive crossover sign morphologically were noted as pincer type FAI. In addition to this, hips with TA higher than 10° or LCEA lower than 25° were noted as acetabular dysplasia.[15] Radiological measurements were made digitally using the PACS system of our hospital (Extreme PACS Version 3.4.0.1676 Copyright ©) and the results were recorded.

Statistical analysis

Qualitative variables were described as frequency and percentage. Quantitative ones were described as minimum, maximum, mean and standard deviation. Radiological measurements were performed by two resident physicians. After measurements, a definite analysis for morphological characteristics had done by senior author on digitally measured and recorded files with other authors and only cases which were considered positive by all observers were defined as true FAI-related morphologic features. An intraclass correlation coefficient (ICC) was found between the two sets of measurements. Interobserver agreements were almost perfect for the LCEA (ICC: 0.98), TA (ICC: 0.97) and alpha angle (ICC: 0.91) on all radiographs; substantial to almost perfect in rating cam-type and pincer type morphologic features. p-values of <0.05 were considered significant. All statistical tests were performed using SPSS software for Windows, version 12.0 (SPSS, Chicago, IL, USA).

Results

Within the 1076 patients that included in the study, 474 were male and 602 were female. Mean age of the patients was 42.1 ± 15.6 years (males 39.1 ± 15.3 years; females 44.5 ± 15.4 years; $p = 0.104$).

In radiological evaluation of the study group, the mean alpha angle was 47.3 ± 7.1° for right hips and 46.7 ± 6.0° for left hips in pelvis AP radiographs. In pelvis frog-leg radiographs; the mean alpha angle was 50.5 ± 6.6° for right hips and 49.2 ± 6.3° for left hips. On pelvic AP radiographs, mean LCEA was measured as 31.0 ± 6.2° for right hips and 32.1 ± 6.6° for left hips. Mean TA was 6.6 ± 4.1° for right hips and 6.1 ± 4.2° for left hips. Mean CDA was 128.9 ± 6.6° for right hips and 129.2 ± 7.2° for left hips. Distribution of average values of alpha angle, TA, LCEA and CDA according to gender were resumed in Table 1. There were no statistical differences between right and left hips regarding alpha angle, TA, LCEA and CDA (n.s.).

The assessment of radiographs showed that 658 patients (61.2%) had morphologically normal hip joints. 171 (15.9%) of the patients had cam type FAI, 114 (10.6%) had pincer type FAI and 33 (3.1%) had combined type FAI. In addition to this, 100 patients (9.3%) had findings consisted with acetabular dysplasia. After the radiological evaluation of 474 male patients; 232 patients (48.9%) were seen to have normal hip morphology. 146 patients (30.8%) had cam morphology, 44 patients (9.3%) had pincer type FAI and 26 patients (5.5%) had combined type FAI. Results of 602 female patients showed that 426 of them (70.8%) had normal morphology. 25 patients (4.2%) had cam morphology, 70 patients (11.6%) had pincer type FAI and 7 patients (1.2%) had combined type FAI. The radiological evaluation resulted that asymptomatic FAI prevalence in Turkey is 29.6%; 45.6% in male population and 16.9% in female population (Figs. 1 and 2).

The radiological assessment made in regard of acetabular dysplasia showed that 100 patients (9.3%) had radiological findings of acetabular dysplasia. The evaluation according to the gender resulted that acetabular dysplasia prevalence is 5.5% for male population and 12.3% for female population.

Discussion

Awareness of FAI continues to rise. Besides this, many orthopedic surgeons consider FAI in the first order among other pathologies when investigating hip pain. The high prevalence of this morphological disorder in asymptomatic population and extreme awareness to this pathology may cause overdiagnosis in some cases.[16–18]

Table 1
Mean and standard deviation values of radiological measurements (R: right hip, L: left hip).

	General population	Male	Female
Alpha Angle – R (AP)	47.3 ± 7.1°	51.4 ± 9.8°	44.0 ± 7.1°
Alpha Angle – L (AP)	46.7 ± 6.0°	51.2 ± 10.0°	43.2 ± 6.0°
Alpha Angle – R (Frog leg)	50.5 ± 6.6°	56.6 ± 8.8°	45.7 ± 8.1°
Alpha Angle – L (Frog leg)	49.2 ± 6.3°	55.7 ± 2.3°	44.1 ± 8.5°
LCE Angle – R	31.0 ± 6.2°	31.2 ± 5.7°	30.8 ± 6.5°
LCE Angle – L	32.1 ± 6.6°	32.7 ± 6.1°	31.8 ± 6.8°
Tonnis Angle – R	6.6 ± 4.1°	6.2 ± 3.8°	6.9 ± 4.3°
Tonnis Angle – L	6.1 ± 4.2°	5.5 ± 4.1°	6.5 ± 4.2°
Collodiaphysial Angle – R	128.9 ± 6.6°	129.5 ± 6.9°	128.3 ± 6.3°
Collodiaphysial Angle – L	129.1 ± 7.2°	130.1 ± 6.4°	128.5 ± 7.7°