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Risk factors for conversion to arthroplasty after hip arthroscopy for femoroacetabular impingement

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ABSTRACT

Background: Hip arthroscopy is a surgical procedure that is increasingly used worldwide, mostly in the management of femoroacetabular impingement (FAI). The purpose of this study is to evaluate risk factors for conversion of hip arthroscopy to THA within 3 years after the procedure.
Methods: Hip arthroscopies for FAI performed at our institution between 2013 and 2019 were reviewed. Inclusion criteria included a minimum 3-year follow-up or a conversion to THA within 3 years. Patient characteristics and radiographic evaluation was made for each patient. This collected data were compared in the two groups Total hip arthroplasty vs non total hip arthroplasty (THA vs non-THA).
Results: A total of 136 patients met the inclusion criteria (69 men, 67 women, mean age 38,21 years). During the follow-up period, 22 underwent a THA in less than 3 years after the procedure (16.2%). A statistically significant association was found between conversion to THA and the Tönnis grade ($p<0.05$), Kellgren-Lawrence grade ($p<0.05$) and the joint space ($p<0.05$). It was also found that the patient's age, body mass index (BMI), race and sex did not add independent predictive information.
Conclusions: Our analysis demonstrates a strong and significant association between the radiographic evaluation of osteoarthritis (Tönnis grade, Kellgren-Lawrence grade and joint space narrowing) and the risk of early conversion to THA. Other patient characteristics, like patient's age, BMI, race and sex, doesn´t seem to increase the risk.

Keywords: Hip arthroscopy, Prognostic factor, Total hip arthroplasty, Femoroacetabular impingement

INTRODUCTION

Hip arthroscopy is a surgical procedure that is increasingly used worldwide.[1-5] With the advances in the technical aspect, improvement in the material, establishment of precise surgical indications, as well as greater demand by the population to maintain their standard of living, more and more surgeons are using this technique to treat various pathologies around hip.[6] Most commonly, hip arthroscopy is used to manage FAI, with good reported results.[7]

FAI presents in three forms: cam-type: a sphericity mismatch of the femoral head to the acetabulum; pincer-type impingement: excess acetabular overhang; a combined cam/pincer impingement pattern.[8] Both types are associated with chondral and labral damage, however, there appears to be a greater relationship with the cam type and the development of coxarthrosis.[9]

Arthroscopic treatment aims to restore normal biomechanics of hip, allowing an improvement in function as well as preventing joint degeneration that could lead to a THA. The most commonly reported reoperation after hip arthroscopy is THA.[10-16] The patient should be informed about the risk of failure, therefore, risk factors that predicts THA after hip arthroscopy should be identified.

The purpose of this study is to evaluate risk factors for conversion of hip arthroscopy for FAI to THA within 3 years after the procedure.

METHODS

This study was performed using information captured by the electronic medical record ("SClínico") system of our institution-centro hospitalar de Vila nova de Gaia/Espinho. We performed a retrospective search for all patients who underwent hip arthroscopy for FAI at our institution between January 2013 and December 2019 using international classification of diseases, ninth revision (ICD-9) diagnostic codes. All patients expressed written informed consent for research participation. Inclusion criteria included a minimum 3-year follow-up or a conversion to THA within 3 years, and a complete quality radiographic evaluation with a radiographic diagnosis of FAI. Patients with <3 year of follow-up or previous hip conditions (including avascular necrosis, Legg-Calve-Perthes disease, and slipped capital femoral epiphysis) were excluded.

Patient characteristics were recorded at the time of the procedure, including age, sex, race and BMI. Body mass index (BMI) was calculated from height and weight at surgery and classified based on internationally recognised cut-offs (>18.5 kg/m^2, underweight; 18.5 to <25 kg/m^2, normal; 25.0 to <30 kg/m^2, overweight; >30.0 kg/m^2, obese). A radiographic evaluation was made for each patient using Tönnis grade, Kellgren-Lawrence grade and joint space narrowing. All measurements were taken by the same orthopaedic surgeon using a picture archiving and communication system computer program. A classification of the impingement type was made based on the radiographic evaluation.

This collected data were compared in the two groups (THA vs non-THA). Statistical analyses were performed with SPSS software version 29 with the threshold of statistical significance set at $p<0.05$. To determine if data were normally distributed, data were analyzed using the Kolmogorov-Smirnoff test. Descriptive statistics were utilized to present patient data with means, standard deviations, and percentages, as appropriate. Nominal variables were tested with the Chi-square test. Independent Samples t-Test was used to analyze independent numerical variables, while paired Samples t test was used for dependent numerical variables.

RESULTS

A total of 151 patients underwent arthroscopic treatment for FAI between January 2013 and December 2019, 136 of whom met the inclusion criteria (Figure 1). Descriptive characteristics were compared between the THA group and the non-THA group (Table 1). There were sixty-nine men and sixty-seven females. The mean follow-up time was 4,25 years. The mean age of patients was 38.21 years (range 18 to 65). BMI ranged from 20.42 to 35.48 kg/m2.

During the follow-up period, 22 underwent a THA in less than 3 years after the procedure (16.2%). In bivariable analyses, age, BMI, race, and laterality were not significantly associated with the outcome.

A joint space of 2 mm or less predicted a THA in 91,4% of the patients, whereas a Tönnis score of 2 or greater was accurate in 90,9% and a Kellgren-Lawrence score of 3 or greater was accurate in 83.3%. Thus, a statistically significant association was found between conversion to THA and the Tönnis grade ($p<0.05$), Kellgren-Lawrence grade ($p<0.05$) and the joint space ($p<0.05$) (Table 2 and Figure 2).

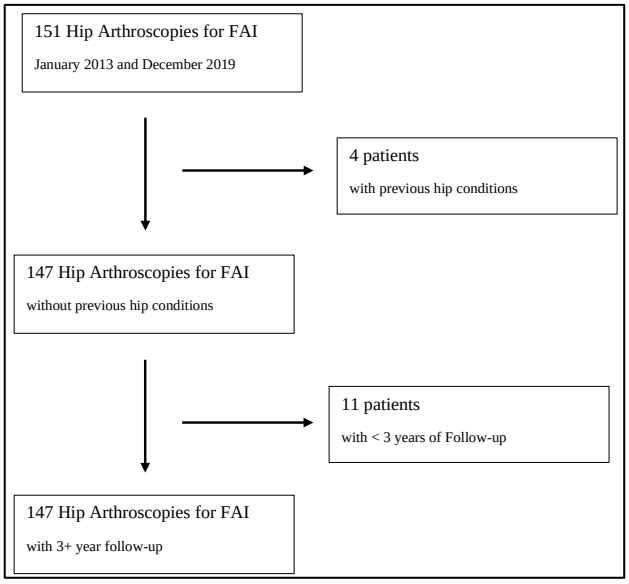

Figure 1: Study inclusion and exclusion criteria flowchart for patient eligibility.

Table 1: Patient demographics.

Variables	All patients	THA group, N (%)	Non-THA group, N (%)
Number of patients	136 (151)	22 (16.2)	114 (83.8)
Age, mean±SD (In years)	38.21 ±10.78	42±11,3	36±9.7
BMI ± SD	25.8±4.3	28±4.1	25±4.3
Males/females	69/67	13/9	56/58
Race			
White	125	18	107
African	9	3	6
Asian	2	1	1
Laterality			
Right	71	12	59
Left	65	10	55
Type of impingement			
Isolated pincer	57	9	48
Isolated cam	25	5	20
Combined cam/pincer	54	8	46

Table 2: Comparison of Kellgren-Lawrence grades and Tönnis grades between two groups.

Variables	THA group, N (%)	Non-THA group N (%)
Tonnis grade		
0	0	56
1	2 (3.4)	56
2	20 (90.9)	2
3	0	0
Kellgren-Lawrence grade		
0	0	81
1	0	31
2	3 (25)	9 (75)
3	12 (100)	0
4	0	0

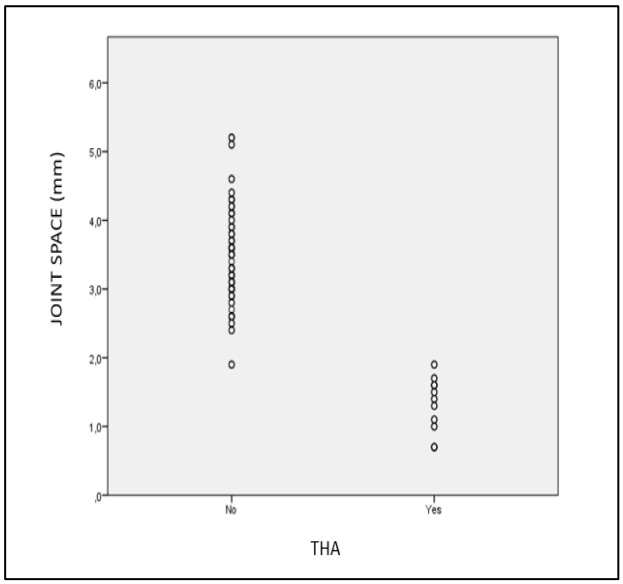

Figure 2: Comparison of joint space between two groups.

DISCUSSION

Hip arthroscopy can be used to successfully treat several conditions, including femoroacetabular impingement, chrondral lesions, symptomatic acetabular labral tears and ligament injuries.[17] It is important to note that the number of index and revision procedures performed annually is rising in tandem with the expanding indications. The number of "failed" arthroscopy and revision procedures has also increased as a result of this growing list of indications.[18]

Our analysis demonstrates a strong and significant association between the radiographic evaluation of osteoarthritis (Tönnis grade, Kellgren-Lawrence grade and joint space narrowing) and the risk of early conversion to THA. This association was already proved in the previous literature, noting that the degree of chondral damage is an independent predictor of arthroscopic failure.[7,19-22]

While the majority of patients undergoing hip arthroscopy are younger than age 40 years, primary HA in older patients >age 40 years is still commonly performed. Several studies note a particularly increased association of age >40 years with conversion to arthroplasty, however in the present study the patient´s age was not a predictive factor.[3,7,10,13,15,22] These findings may indicate that hip arthroscopy treatment can lead to a good clinical result, regardless of age.

Other studies demonstrate an association between a high BMI and failure of arthroscopic treatment; however, this association was not found in this study.[23,24]

There are several limitations to consider in this study. First, we did not have clinical outcomes data, which would help us better understand pain and function. Our findings do not consider the patient satisfaction, pain scores, or return-to-sport and activity levels. It is true that some patients with "failed" hip arthroscopy A may not undergo revision or conversion procedures and thus our numbers belie the true failure rate. Furthermore, no data was gathered about which arthroscopy techniques would probably need to be revised or converted in the future.

CONCLUSION

In conclusion, this study allows us to conclude that a Tönnis score of 2 or greater, a Kellgren-Lawrence score of 3 or greater, as well as a joint space of 2 mm or less, increased substantially the risk of conversion to THA. Consequently, it is imperative for all surgeons to do a thorough preoperative screening of radiographs. It is our opinion that patients who have been identified as having risk factors for THA conversion should receive preoperative counseling regarding possible negative outcomes. This will enable the patient and physician to participate in the shared decision-making process.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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