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Functional Outcomes of Arthroscopic Treatment in Femoroacetabular Impingement in Patients over 60 Years Old Compared with Patients Aged 40 Years or Younger*

Resultados funcionais do tratamento artroscópico no impacto femoroacetabular em pacientes com mais de 60 anos em comparação com pacientes com 40 anos ou menos

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Abstract

Objective To evaluate the functional outcomes of patients diagnosed with femoroacetabular impingement (FAI) older than 60 years, compared with those of patients of age 40 years or younger.

Methods This was a retrospective review of patients with FAI who underwent hip arthroscopy between 2010 and 2015. The patients were adults aged over 60 years with Tönnis ≤ 1 matched in a 1:1 ratio with adults aged 40 years or younger, according to the type of deformity (cam, pincer, or mixed), sex, and the date when the surgery was performed.

Results Thirty-four patients were included in each group. The mean age was 30.6 ± 6.9 years and 65.6 ± 4.6 years in the control and case groups, respectively. There were no significant differences between the groups at 1-year follow-up ($p > 0.05$). In the group with older patients (case group), we observed a change in the total Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) score from 46.3 to 22.0 in the 1st postoperative year, while the control cases improved in the WOMAC score from 38.1 to 7.2 in relation to the preoperative stage.

Conclusion In the group of patients ≤ 40 years old, a considerable change was observed in the WOMAC score without a statistical significance compared with the > 60 years group.

Keywords
- hip
- arthroscopy
- femoroacetabular impingement

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This observation suggests that hip arthroscopy is beneficial when there is an appropriate selection of patients with FAI, regardless the age of the patient.

Resumo

Objetivo Avaliar os resultados funcionais de pacientes diagnosticados com impacto femoroacetabular (IFA) e com mais de 60 anos de idade em comparação aos resultados de pacientes com até 40 anos de idade.

Métodos Esta é uma revisão retrospectiva de pacientes com IFA submetidos à artroscopia do quadril entre 2010 e 2015. Os pacientes eram adultos com mais de 60 anos de idade e Tönnis ≤ 1, alocados na proporção de 1:1 com adultos de até 40 anos de idade, de acordo com o tipo de deformidade (came, *pincer*, ou misto), sexo e data de realização da cirurgia.

Resultados Trinta e quatro pacientes foram incluídos em cada grupo. A idade média foi de 30,6 ± 6,9 anos e 65,6 ± 4,6 anos no grupo controle e de casos, respectivamente. Não houve diferenças significativas entre os grupos no acompanhamento de 1 ano ($p > 0.05$). No primeiro ano após a cirurgia, a pontuação Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) passou de 46,3 para 22,0 no grupo de pacientes mais velhos (casos) e de 38,1 para 7,2 no grupo controle em comparação ao estágio pré-operatório.

Conclusão O grupo de pacientes com até 40 anos de idade apresentou uma mudança considerável na pontuação WOMAC, mas sem significado estatístico em comparação ao grupo de pacientes acima de 60 anos. Essa observação sugere que a artroscopia do quadril é benéfica quando a seleção de pacientes com IFA é apropriada, independentemente da idade dos indivíduos.

Palavras-chave
- quadril
- artroscopia
- impacto femoroacetabular

Introduction

Femoroacetabular impingement (FAI) is recognized as a predisposing factor in the development of early hip degeneration and progression to advanced osteoarthritis (OA).[1–3] Advances of the hip arthroscopy have allowed the diagnosis and treatment of various hip pathologies, expanding the indications to include the treatment of older patients who have pain associated with radiological signs of FAI.[4]

Previous studies, such as Ben Tov et al.,[5] have revealed an improvement in pain and functionality after an arthroscopic treatment of FAI in patients older than 50 years with Tönnis grade 0 or 1 OA. Philippon et al.,[6] in 3 years of follow-up, reported a joint survival of 90% in patients older than 50 years, concluding that patients with an articular space greater than 2 mm may improve their pain and functionality after a hip arthroscopy.

Although there are isolated results of hip arthroscopy in the young and adult populations, there are few comparative studies to assess the functionality in both groups.[7,8] Domb et al.,[7] in a retrospective study, compared the clinical and functional results of patients ≥ 50 years with those of patients ≤ 30 years, with comparable scores in scales of satisfaction.

The purpose of this study was to evaluate the functional outcomes of patients diagnosed with FAI older than 60 years, compared with patients of age 40 years or younger. Our hypothesis was that appropriately selected patients of both groups would have an improvement in symptoms regardless of the age group.

Methods

We conducted a retrospective study of patients diagnosed with FAI who underwent hip arthroscopic surgery between 2010 and 2015, performed by a single surgeon (B. A. B.). Adults > 60 years of age diagnosed with FAI without advanced OA who were treated with hip arthroscopy during the period of the study were defined as the case group. Patients with grade 1, 2, or 3 in the Tönnis classification of OA, hip inflammatory or metabolic disease, residual dysplasia and history of previous hip surgery or fracture were excluded.

The control group included patients of 40 years or younger matched according to the type of defect (pincer, cam or mixed), gender, and surgery date. When more than one control met the inclusion criteria for a specific case, the youngest one was selected. Retrospective selection was performed using a ratio of 1:1.

The diagnosis of FAI was made based on clinical data clinical data, the flexion-adduction-internal rotation (FADIR) test, and morphological alterations (cam, pincer, or mixed). The institutional hip arthroscopy registry was reviewed to identify the cases and control group (►**Fig. 1**). This study was conducted in compliance with the declaration of Helsinki. The Institutional Review Board (No. IRB00008539) approved this study.

Data Collection

Demographical data, preoperative symptoms, range of motion (flexion, internal and external rotation), and Western

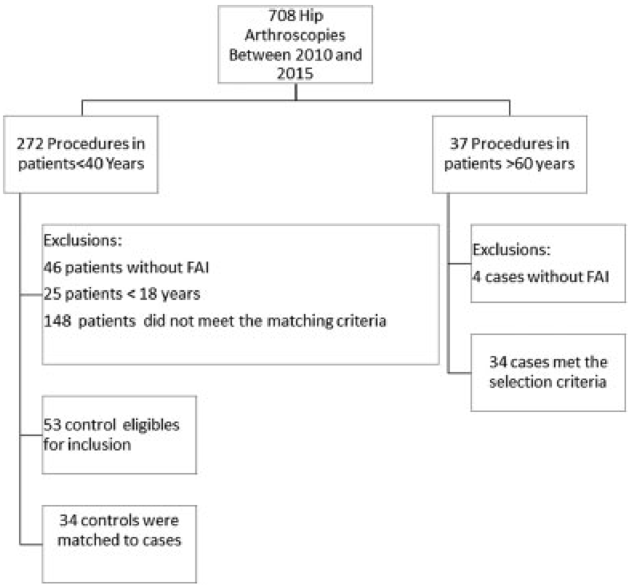

Fig. 1 Flow chart of the study selection process.

Ontario and McMaster Universities Osteoarthritis Index (WOMAC) score were gathered from the clinical record. All patients were assessed with the WOMAC including 3 dimensions: pain, stiffness, and functionality before and 1-year follow-up. The identification of the patients that required a total hip replacement or a review procedure was done by telephone contact and review of the medical history.

Surgical Procedure

Before the procedure, all patients were evaluated with provocation maneuvers (flexion, adduction and internal rotation [FADIR]) and radiographic measurements: α and lateral center-edge (LCE) angle. The surgical procedure was performed with the patient under a balanced anesthetic regimen (spinal anesthesia and general anesthesia), using a traction orthopedic table (MAQUET, Gmbh, Rastatt, Germany) with the patient in supine position.

Access to the central and peripheral hip compartment was done through standard arthroscopic portals. The procedure began with the anterolateral portal for introducing 30° or 70° lenses using outside-in or inside-out technique. The tenosuspension technique was used to enhance the visualization of the supra-acetabular region,[9] identifying areas of pincer-type injuries for acetabuloplasty. Depending on the degree of labrum injury, up to three sutures were performed through the inferior anterolateral accessory portal.

Afterward, the hip was positioned at a 30° flexion to reach the cam area at the head-neck junction, and a capsulotomy of the iliofemoral ligament was performed to proceed with the osteochondroplasty. Finally, a dynamic maneuver was used to evaluate the areas of conflict and the hip stability.

Rehabilitation Protocol

From the 2[nd] postoperative day, hip flexion (active and passive ROM from 0° to 70°,) and circumference movements were started at home, followed by walking with axillary crutches according to patient's tolerance.

The physical rehabilitation protocol started after the 2[nd] postoperative week and was divided into 3 phases with 20 sessions each (5 sessions per week). In the initial phase, patients began to walk with assistive devices to prevent extension of the operated hip and to protect the repaired tissue. In the second phase, the patients were assigned to walk without crutches and exercises to progressively perform external rotation in the surgically repaired hip. Finally, in phase III, some muscle strengthening exercises were started to improve hip stability and proprioception.

Statistical Analyses

The matched-pair *t*-test and Wilcoxon test were applied to compare clinical outcomes between cases and controls, according to the normality assumption. Categorical variables were compared with the McNemar test. Normal assumption of data was assessed by Shapiro-Wilk. A p-value < 0.05 was considered as statistically significant. All analyses were performed using the Stata13 software (StataCorp, College Station, TX, USA).

Results

A total of 68 patients were analyzed. Thirty-four patients were included in each group (≤ 40 and > 60 years), the mean age was 30.6 ± 6.9 years and 65.6 ± 4.6 years in the control and case groups, respectively. The majority of patients had a mixed type of defect with similar manifestation of their symptoms before surgery. There were no differences in traction time between the groups. ►**Table 1** presents a description of the clinical and demographic characteristics for both groups.

Preoperatively, patients older than 60 years showed a diminished internal rotation ($p < 0.05$). There were no differences in external rotation and flexion. Although the α angle did not change between groups, there were significant differences in the LCE angle (►**Table 2**).

The functional outcomes, as defined by the WOMAC score, are summarized in ►**Table 3**. In the first postoperative year, there were differences in pain, stiffness, and functionality score between the two groups. The group > 60 years had the highest scores compared with the control group (≤ 40 years). When the change (Δ) in the WOMAC scale from the preoperative stage to the first-year follow-up between the two groups was compared, the only score with statistically significant differences was the stiffness dimension. In the control group (≤ 40 years), there was a greater change in the WOMAC score of pain and functionality, without a statistically significant difference.

In the WOMAC pain, functionality and total score, there was a decrease in the average score of 79.1%, 81.7%, and 81.1%, respectively, in the younger control group during the 1[st] follow-up year since the preoperative period, compared with a decrease of 52.3%, 53.7% and 52.5% in patients over 60 years old. (►**Fig. 2A-D**).

Table 1 Demographic and clinical characteristics of control and case groups

Variables	≤ 40 Years n = 34	> 60 Years n = 34	*P*-value
Gender, n (%)			
Female	23 (67.6%)	23 (67.6%)	–
Male	11 (32.4%)	11 (32.4%)	
Age (years)			
Mean ± SD	30.6 ± 6.9	65.6 ± 4.6	–
Range	18–40	61–76	
Traction time (Min)			
Mean ± SD	59.1 ± 41.1	57.9 ± 29.6	0.55
Range	16–182	6–131	
Laterality n (%)			
Right	19 (55.9%)	18 (52.9%)	–
Left	15 (44.1%)	16 (47.1%)	
FAI, n (%)			
Cam	3 (8.8%)	3 (8.8%)	–
Pincer	4 (11.8%)	4 (11.8%)	
Mixed	27 (79.4%)	27 (79.4%)	
Inguinal pain, n (%)	27 (79.4%)	30 (88.2%)	0.54
Pain sitting down, n (%)	27 (79.4%)	31 (91.2%)	0.28
Pain at entering/ exiting car, n (%)	22 (64.7%)	27 (79.4%)	0.17

Abbreviations: FAI, femoroacetabular impingement; Min, minutes; SD, standard deviation.

Complications

In the group of patients older than 60 years, only one patient required an arthroscopic revision due to a bone apposition on the acetabular border 1 year after the surgery, which corresponded to a 2.9%. During this follow-up period, none of the cases required a total hip replacement.

Discussion

Femoroacetabular impingement is considered the main indication for hip arthroscopy, a technique widely used in the past decade. Although hip arthroscopy is primarily reported in young adult populations with satisfactory results,[8,10] recent studies suggest that it is a viable treatment option for mature adult populations.[6,11] In this study, we evaluated the outcomes during the 1st postoperative year in an adult population > 60 years compared with young adults ≤ 40 years. The results showed an improvement in symptomatology and functionality in both groups.[4] This supports the current tendency to offer less invasive treatment options to patients over 60 who are functionally active and do not undergo degenerative changes.

In our cohort of patients > 60 years (mean age: 65.5 ± 4.6 years), we observed an average improvement of 50% on the

Table 2 Results of the preoperative physical evaluation and imaging findings of the control and case groups

Variables	≤ 40 years n = 34	> 60 years n = 34	*P*-value
Flexion			
Mean ± SD	121.1° ± 9.1°	119.7° ± 10.9°	0.58
Range	90°–140°	90–135	
External rotation			
Mean ± SD	49.7° ± 18.9°	47.1° ± 17.3°	0.45
Range	10°–80°	20°–80°	
Internal rotation			
Mean ± SD	29.5° ± 20.6°	22.4° ± 14.7°	0.04*
Range	−20°–70°	−10°–45°	
Alpha angle			
Mean ± SD	64.4° ± 12.3°	64.8° ± 9.4°	0.84
Range	42°–86°	50°–86°	
LCE angle			
Mean ± SD	38.8° ± 6.8°	42.1° ± 7.3°	0.04*
Range	28°–53°	30°–60°	

Abbreviations: FAI, femoroacetabular impingement; LCE, lateral center-edge angle; Min, minutes; SD, standard deviation.
*P-value < 0.05.

WOMAC scale over a 1-year follow-up. These results are similar to those of other authors who evaluated the functionality with the modified Harris Hip Score (mHHS). Redmond et al. reported a change in average mHHS during a 2-year follow-up from 63.0 to 80.1 compared with the preoperative period, which was equivalent to a 27% improvement.[12] Meanwhile, Mardones et al.[13] included 28 patients with a mean age of 64.3 ± 5.1 years, reporting a 47% improvement with a preoperative median of 53 points for mHHS. Other studies, such as the ones by Philippon et al[6] and Ben Tov et al.,[5] have also reported satisfactory results in an adult population ≥ 50 years.

Domb et al.[7] evaluated and compared the functional outcomes of patients > 50 years old matched with adults < 30 years at a 2-year follow-up, determining that there are no statistically significant differences in mHHS between the 2 groups of patients (> 50 years group: 82.2 ± 16.2; < 30 years group: 84.2 ± 19.1, p-value > 0.05). This suggests that adults > 50 years old could benefit from an arthroscopic treatment. In our study, we found no statistically significant difference between the groups at 1-year follow-up. However, clinical relevance with an average improvement of 81.1% was observed in patients ≤ 40 years on the WOMAC scale, compared with the older case group. These differences between the two groups may be associated with the aging factor and its impact on functional capacity and rehabilitation. McCormick et al.[14] demonstrated a similar result in adults < 40 years with better functional results.

In the adult population, specifically those > 50 years, the postoperative outcomes depend mainly on adequate patient selection. The presence of chondral lesions and advanced OA

Table 3 WOMAC score pre and postoperative

WOMAC	Group	Preoperative			1 year postoperative			Δ Before-After		
		Mean ± SD	Median (range)	P-value[a]	Mean ± SD	Median (range)	P-value[b]	Mean ± SD	95% CI	P-value[c]
Pain	≤40 years	8.6 ± 4.9	8.5 (0–18)	0.084	1.8 ± 2.5	0.5 (0–11)	0.006*	6.8 ± 4.6	−1.65–3.65	0.448
	> 60 years	10.7 ± 5.4	11 (0–23)		5.1 ± 5.2	3 (0–20)		5.5 ± 5.6		
Stiffness	≤40 years	3.1 ± 2.3	3 (0–7)	0.850	0.6 ± 1.2	0 (0–6)	0.000*	2.5 ± 2.4	0.25–2.36	0.017*
	> 60 years	3.2 ± 2.3	3 (0–8)		2.0 ± 2.0	2 (0–8)		1.1 ± 2.6		
Functionality	≤40 years	26.3 ± 17.2	29 (0–59)	0.114	4.8 ± 8.2	3 (0–45)	0.001*	21.5 ± 16.0	−3.57–10.72	0.315
	> 60 years	32.4 ± 19.4	30 (0–66)		15.0 ± 15.1	10.5 (0–63)		16.9 ± 16.7		
Total	≤40 years	38.1 ± 23.3	40.5 (0–79)	0.112	7.2 ± 11.5	4 (0–62)	0.001*	30.8 ± 21.6	−3.92–15.68	0.230
	> 60 years	46.3 ± 25.6	43 (0–93)		22.0 ± 21.4	17 (0–89)		23.6 ± 22.7		

Abbreviations: CI, confidence interval; SD, standard deviation; WOMAC,.
*P-value < 0.05.
[a]Preoperative difference between groups.
[b]1-year follow-up differences between the groups.
[c]Change differential between both groups.

are recognized as negative prognostic factors in clinical outcomes.[4,15] A prospective study by Byrd et al.[16] with a follow-up of 10 years on a cohort of 50 patients who underwent hip arthroscopy found unsatisfying results in cases with evidence of OA at the moment of intervention (14 hips). In 78.6% of these hips, total hip arthroplasty (THA) was required to improve symptoms, concluding that the presence of OA was considered a poor prognosis factor. Menge et al.,[17] in a long-term follow-up of 145 patients, found a THA conversion rate of 34% with a mean age of 53 years at the time of surgery, while none of the patients under 35 required THA. The results reported a higher conversion rate with older age, joint space < 2 mm and the presence of acetabular microfracture. Previous findings have motivated the medical community to scrutinize the patient selection for hip arthroscopy in mature populations. In our experience, we did not operate on patients > 60 years old who had advanced degenerative changes, previous trauma, and comorbidities such as peritrochanteric or neurological disorders.

In our cohort, the revision rate was of 2.9% (one case) in the older group, with a follow-up period of 12 months. Degen et al.,[18] in a 2-year follow-up, described that only 3.8% of the 8,267 procedures underwent arthroscopic revision and identified age over 50 years as a risk factor 2.09 (95% confidence interval: 1.82–2.39 p-value < 0.01).

Among the strengths of this study, first of all, is the matching process between the population of adults > 60 years and younger adults (≤ 40 years), performed according to the type of FAI, procedures, and time of clinical evolution since the procedure. This process allowed us to control possible factors that could influence the patient's functional results, such as the surgical technique and the learning curve of the orthopedic surgeon. All cases were performed by the same surgical team (surgeon and anesthesiologist) in a hip-preservation referral center, which does not allow a direct generalization of the results to another institution. Therefore, readers should interpret our findings with caution according to patients' characteristics and medical criteria.

Second, the exclusion of patients with a certain degree of advanced OA or other hip pathologies allowed the possibility to objectively describe the clinical results of hip arthroscopic in the mature population. Although our follow-up time in the study was short, it allowed us to the evaluate clinical outcomes simultaneously among patients ≤ 40 and > 60 years old. The WOMAC scale was the only scale used to evaluate the degree of pain and functionality; however, it did not allow to accurately assess the degree of physical activity after the procedure and the level of satisfaction. In addition, the fact that this scale has not been used in most studies implies that it may preclude a direct comparison with other cohorts. Although, the WOMAC is not the best scale to evaluate the functional results in the field of hip preservation surgery, we believe that it allows us to evaluate the functional results from the patient's perspective.

The support of more long-term studies that quantify surgical revisions and THA conversion rate of THA in the mature population with appropriate selection criteria for hip arthroscopy is essential.

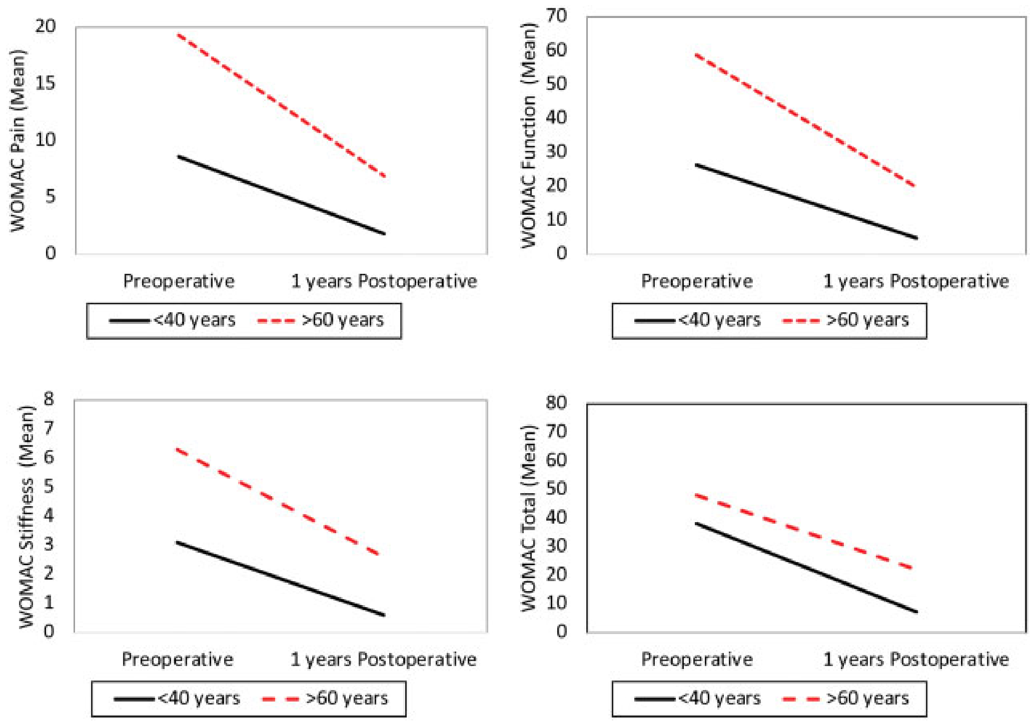

Fig. 2 Change in WOMAC score from preoperatively to 1 year postoperatively.

Conclusion

In the group of patients ≤ 40 years old, a considerable change was observed in the WOMAC score, without a statistical significance, compared with the group of patients > 60 years. This observation suggests that hip arthroscopy is beneficial when there is an appropriate selection of patients with FAI regardless the age of the patient.

Conflict of Interests

The authors declare that there are no conflict of interests.

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