

# Preliminary Outcomes of Hip Arthroscopy in the Treatment of Femoroacetabular Impingement with Early Stage Osteoarthritis

## Femoroasetabular Sıkışma Sendromunun Eşlik Ettiği Erken Evre Kalça Artrozunda Artroskopik Tedavinin Erken Dönem Sonuçları

✉ Tahsin Gürpınar, ✉ Yusuf Öztürkmen

İstanbul Training and Research Hospital, Clinic of Clinic of Orthopedics and Traumatology, İstanbul, Turkey

### ABSTRACT

**Introduction:** Femoroacetabular impingement (FAI) has been recognized as a risk factor of osteoarthritis that causes a painful joint and decreased range of motion. Arthroscopic procedures were used for the treatment of FAI with satisfactory outcomes. However, the outcomes of arthroscopic treatment after arthritic findings have been shown to be unsatisfactory. There are only limited studies focusing on the effect of arthroscopic treatment of FAI on the setting of arthrosis. In this study, we aimed to evaluate the early results of arthroscopic treatment in patients with FAI and osteoarthritis (OA).

**Methods:** We retrospectively identified 17 consecutive patients with FAI and Tönnis grade 1 or 2 OA of the hip who had undergone hip arthroscopy and had a follow-up period of at least one year. The arthroscopic procedures included femoral osteoplasty, acetabular rim trimming, labral repair, labral debridement, microfracture and debridement of the ligamentum teres. The Tönnis grading was used in this study for the assessment and grading of OA. Functional outcomes were measured by Harris Hip score (HHS), Hip Outcome Score (HOS) and Short Form 12.

**Results:** At the last follow up, the mean HHS and HOS increased from 53.2 and 65.3 to 82.4 and 88.1, respectively. In total, 16 of 17 (94%) patients reported that they were satisfied with the outcome of the surgery. One patient reported that the symptoms relieved for 6 months, but returned. He was offered arthroplasty but he refused.

**Conclusion:** In the current study, it was observed that arthroscopic treatment could help to relieve patient symptoms in early stage OA with FAI.

**Keywords:** Hip arthroscopy, femoroacetabular impingement, hip osteoarthritis

### ÖZ

**Amaç:** Femoro-asetabular sıkışma (FAS) sendromu ağrı ve hareket kısıtlılığı ile beraber dejeneratif eklem hastalığının bir nedenidir. Artroskopik yöntemler erken dönemde FAS tedavisinde etkili olarak kullanılmaktadır. Ancak eklemde dejeneratif bulguların ortaya çıkmış olması artroskopik tedavinin başarısını olumsuz olarak etkilemektedir. Literatürde, artroz gelişmiş kalçalarda artroskopik yöntemlerin başarısını araştıran çalışma sayısı kısıtlı olmakla beraber artroskopik tedavinin başarısı konusunda bir fikir birliğine varılamamıştır. Biz bu çalışmamızda kliniğimizde FAS sendromu ile beraber Tönnis evre 1-2 artrozu (OA) olan hastalarda artroskopik tedavinin kısa dönem klinik sonuçlarını araştırmayı amaçladık.

**Yöntemler:** Kliniğimizde FAS sendromu ile beraber Tönnis evre 1-2 OA'sı olan ve artroskopik olarak tedavi edilmiş 17 hasta retrospektif olarak incelendi. Artroskopik tedavide artroskopik bulgulara göre femoral osteoplasti, asetabular tıraşlama, labral tamir, labral debridman, mikro kırık ve lig teres debridmanı yapıldı. Radyolojik değerlendirilmede Tönnis evrelemesi ve OA'nın değerlendirilmesinde kullanıldı. Hastaların fonksiyonel durumları operasyon öncesi ve sonrası Harris Kalça skoru (HKS), Hip Outcome skoru (HOS) ve Short Form 12 ile değerlendirildi.

**Bulgular:** Son klinik kontrolde HKS ve HOS sırasıyla 53,2 ve 65,3'ten 82,4 ve 88,1'e yükseldi. Toplamda 17 hastanın 16'sı (%94) sonuçtan memnun olduklarını bildirdi. Bir hasta semptomlarının yaklaşık 6 ay kadar gerilediğini ancak tekrar başladığını ifade etti. Bu hastaya artroplastisi önerildi ancak hasta kabul etmedi.

**Sonuç:** Bu çalışma bize artroskopik tedavinin erken orta evre OA'sı gelişmiş FAS sendromlu hastalarda erken dönemde semptomatik ve fonksiyonel iyileşme sağladığını gösterdi.

**Anahtar Kelimeler:** Kalça artroskopisi, femoroasetabular sıkışma, osteoartrit



Address for Correspondence/Yazışma Adresi: Tahsin Gürpınar MD, İstanbul Training and Research Hospital, Clinic of Orthopedics and Traumatology, İstanbul, Turkey

Phone: +90 505 685 64 39 E-mail: tahsingurpinar@msn.com ORCID ID: orcid.org/0000-0002-8194-6492

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## Introduction

Femoroacetabular impingement (FAI) has been recognized as a risk factor for labral tears, chondral delamination and finally osteoarthritis which lead to pain and decreased range of motion (ROM) on the hip joint (1). Repetitive microtrauma at flexion and internal rotation can cause labral delamination and tears caused by abnormal femoral offset or acetabular over coverage. Satisfactory outcomes with the arthroscopic treatment have been reported if arthroscopic osteoplasty of the impinging lesion and debridement of the injured labrum are performed in the setting of normal femoral and acetabular articular surfaces (2,3). However, only few studies have specifically evaluated patients with FAI and osteoarthritis (OA), and they generally reported favorable results in terms of patient-reported outcome measures (4-7). Daivajna et al. (5) concluded that hip arthroscopy improved outcome scores in 56% of patients with severe OA of the hip (Tönnis grade 2 and 3) for at least two years after surgery. On the other hand, Philippon et al. (8) showed that, in the elderly population, 20% of patients aged 50 years and older required total hip arthroplasty (THA) within three years of hip arthroscopies.

In this study, our hypothesis was that arthroscopic intervention could reveal the symptoms of patients with OA and delay the need for arthroplasty. Therefore, we aimed to report our preliminary results of hip arthroscopy in the treatment of FAI with early stage OA.

## Methods

The Institutional Review Board of Istanbul Training and Research Hospital approved this study (decision no: 1523) and consent form was obtained from all patients. We retrospectively identified 17 consecutive patients with FAI and Tönnis grade 1 or 2 OA of the hip who had undergone hip arthroscopy and included them in this study. Inclusion criteria were patients diagnosed with FAI and OA based on physical examination and radiographs who were operated arthroscopically and had at least one-year follow-up. Exclusion criteria were as follows: patients with no signs of impingement (negative impingement sign, negative FABER test, and no radiographic signs of impingement), patients with avascular necrosis or previous hip surgery (open or arthroscopic). The diagnosis of FAI was based on patient history, physical examination and radiological findings consistent with FAI of cam type, pincer type or mixed. The OA is diagnosed based on patient history and clinical examination, and graded on plain radiographs. The Tönnis radiological grading was used in this study for the assessment and grading of OA as this is widely used in practice and is practical in the outpatient clinical situation than other systems that may require the physical measurement of radiographs or other imaging techniques. In Tönnis grading, no signs of OA is defined as “grade 0”; increased sclerosis, slight narrowing of the joint space, no or slight loss of head sphericity or lipping at the joint margins are defined as “grade 1”; small cysts, moderate narrowing of the joint space, moderate loss of head sphericity are defined as “grade 2” and large cysts, severe narrowing or obliteration of the joint space, severe deformity of the head are defined as “grade 3” (9).

The surgical decision was made based on clinical findings and radiological images. Patients diagnosed with FAI and early/moderate

stage OA that did not respond to conservative treatment for six months were scheduled for arthroscopic treatment.

Age at the time of surgery, gender, duration of symptoms and hip ROM were noted. Preoperative and postoperative subjective pain scores were measured by visual analog scale. Preoperative and postoperative functional outcomes were measured by Harris Hip score (HHS), Hip Outcome score (HOS) and Short Form 12 at six weeks, six months, one year and at the last follow up. Surgical findings including chondral pathologies, labral tears and osteophytes were noted.

## Surgical Technique

Under general anesthesia and muscle relaxation, traction was applied on fracture table to distract the hip joint properly. All surgeries were performed by the first author. Standard anterolateral portal was established under fluoroscopic guidance and an anterior portal was established under direct visualization. Central compartment was first evaluated. If present, intra-articular free bodies were removed, and chondral or labral pathologies were addressed. The treatments for chondral pathologies were debridement and microfracture (Figures 1,2). Labral tears were either repaired or debrided (Figures 3-5). Repair versus debridement of the labrum was based on the amount of labral tissue, location of the tear, size of the tear, and reparability of the tear. Acetabular over-coverage (pincer) was removed using the burr. Access to the peripheral compartment was achieved through a capsulotomy between anterolateral and anterior portals and a transverse cut. Traction

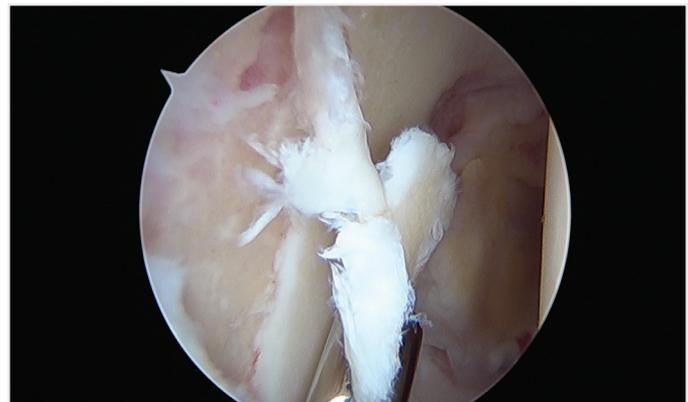


Figure 1. Unstable cartilage remnants are removed



Figure 2. Blood and marrow elements coming from microfracture holes

was then released and a careful cam resection, between far lateral, far medial/caudal and posterior was performed. An intra-operative dynamic assessment of impingement was performed in order to avoid residual impingement. The surgical procedure was individualized and femoral micro-fracturing was performed in cases with localized cartilage loss (Figure 6,7), depending on the intra-operative findings so posterior or lateral osteophytes were resected if present (Figure 8). Arthroscopic findings and treatments were noted including chondral surfaces, labrum, ligamentum teres, capsule, femoral neck, and acetabular rim, as well as other pathologies such as loose bodies and adhesions (Table 1). Patients were evaluated with preoperative and postoperative X-rays (Figure 9-12). Patients without micro-fracturing were generally allowed

full weight bearing. In case of micro-fracturing, partial weight bearing was recommended for 6 weeks.

### Statistical Analysis

Mean, standard deviation, median, minimum, maximum, frequency and percentage values were used in the descriptive statistics of the data. The distribution of the variables was measured by Kolmogorov-Smirnov test. Wilcoxon test was used in the analysis of the dependent quantitative data. McNemar's test was used in the analysis of the dependent qualitative data. Furthermore, the SPSS 22.0 program was used to conduct the analyses.

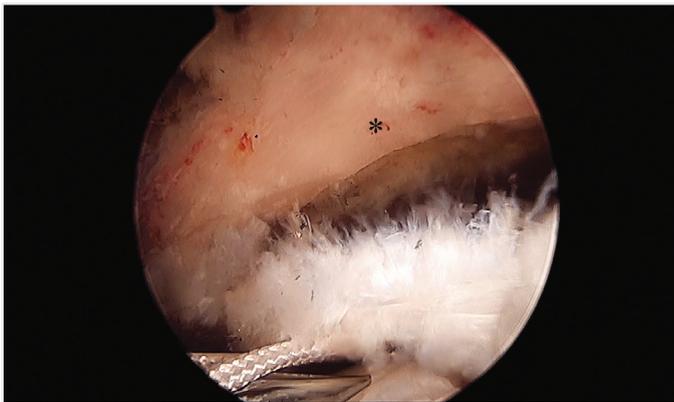


Figure 3. Rim trimming is performed and detached labrum



Figure 6. Femoral chondral defect



Figure 4. Detached labrum is repaired with knotless suture anchors



Figure 7. Micro-fracture performed with surgical awls

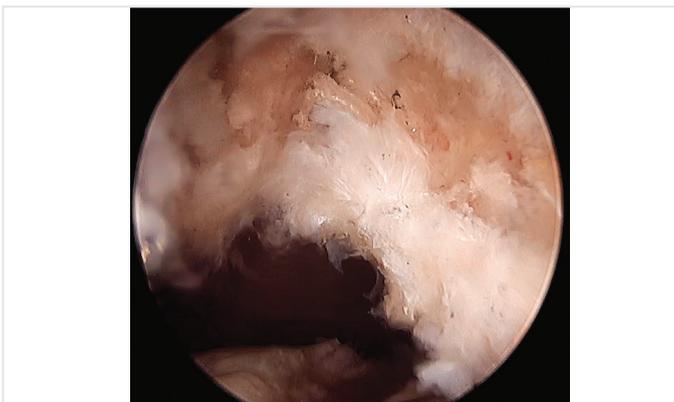


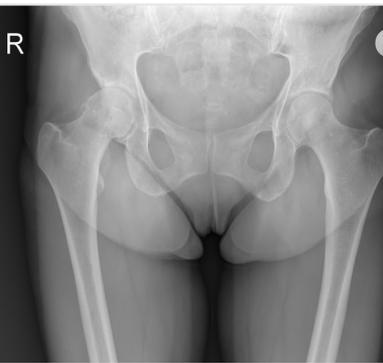
Figure 5. Repaired labrum



Figure 8. Femoral osteophytes



**Figure 9.** Preoperative X-ray of a patient with pincer type impingement and Tönnis grade 2 arthrosis



**Figure 10.** Postoperative X-ray of the same patient with pincer type impingement and Tönnis grade 2 arthrosis



**Figure 11.** Preoperative X-ray of a patient with cam type impingement and Tönnis grade 2 arthrosis



**Figure 12.** Postoperative X-ray of the same patient with cam type impingement and Tönnis grade 2 arthrosis

## Results

The mean age of the patients was  $47.2 \pm 4.9$  years. The mean duration of symptoms reported before surgery was  $6.4 \pm 2.03$  years and mean postoperative follow-up was  $14 \pm 1.85$  months. Eight patients were male and nine were female. According to the preoperative Tönnis classification, 10 hips had grade 1 OA and seven had grade 2 OA.

On radiographic assessment, the mean anterior joint space, the mean lateral joint space and the mean joint space at the fovea were measured as 3.6 mm, 3.7 mm and 3.8 mm, respectively. Only in two patients, the joint space was measured less than 2 mm in one of the spaces.

On clinical examination, mean flexion was  $102^\circ$  (range,  $90^\circ$  to  $140^\circ$ ), mean internal rotation was  $30^\circ$  (range,  $10^\circ$  to  $45^\circ$ ), and mean external rotation was  $33^\circ$  (range:  $15^\circ$  to  $55^\circ$ ) preoperatively. At the last follow-up, mean flexion was  $100^\circ$  (range,  $90^\circ$  to  $140^\circ$ ), mean internal rotation was  $32^\circ$  (range:  $10^\circ$  to  $45^\circ$ ), and mean external rotation was  $35^\circ$  (range,  $20^\circ$  to  $55^\circ$ ).

All cases had labral lesions. The labrum was sutured in two hips and debridement of labral tears were performed in 15 hips. Depending on the intraoperative condition, additional procedures were performed except for resection of impinging bone (Table 1). Grade 4 chondral lesions were localized at the impingement zone (ventral-cranial acetabulum) in 12 cases and at the corresponding femur in three cases. Micro-fracturing was performed in these areas in a total of 13 cases. Of the included procedures (Table 1), 16 patients underwent cam resections and five patients underwent pincer resections.

A comparison of preoperative scores compared with those obtained at the last follow-up revealed improvements for all measured outcomes. At the last follow-up, the mean HHS and HOS increased from 53.2 and 65.3 to 82.4 and 88.1, respectively (Table 2).

**Table 1. Arthroscopic procedures performed in included hips**

Treatment	Number of procedures
Acetabular micro-fracturing	12
Femoral micro-fracturing	3
Labral repair	2
Labral debridement	15
Cam-osteoplasty	16
Pincer-rim trimming	5
Loose body removal	9
Ligamentum teres debridement	3

**Table 2. Preoperative and follow-up scores**

	Preoperative mean score	Postoperative mean score	p
Modified Harris Hip score	53	82	<0.001
HOS for activities of daily living	65	88	<0.001
HOS for sports	42	63	<0.001
SF-12 physical component score	33	45	<0.001
VAS	6	3	<0.001

HOS: Hip Outcome score, SF: Short Form, VAS: visual analog scale

Patients were asked at the last follow-up whether they were satisfied with the surgery, and 16 of 17 (94%) patients reported that they were satisfied with the outcome of the surgery. One patient reported that the symptoms relieved for 6 months but returned. He was offered total hip replacement, but he refused. None of the patients had revision arthroscopy. No complications were observed in this small cohort.

## Discussion

The most important finding in this study was that arthroscopic treatment of patients with FAI with mild to moderate OA showed significant improvements in all clinical scores at least one year of follow-up. Patients with Tönnis grade 1 or 2 benefited from arthroscopic treatment. In addition, we observed clinical improvement in cases with a joint space of less than 2 mm. However, the number of patients with a narrowed joint space less than 2 mm was too small (n=2) to reach any definitive conclusions.

Hip arthroscopy has been used for a long time to effectively treat femoral and acetabular deformities (cam and pincer, respectively), and repair injuries of the acetabular labrum and adjacent cartilage (10-12). In many studies, hip arthroscopy has been reported to have poor clinical outcomes when performed in patients with advanced OA (13). Haviv and O'Donnell reported their experience in 564 hips with OA and they reported that 50% of patients required THA within 1.5 years after arthroscopy (14). In addition, they stated that patient's age (older than 55 years) and advanced OA (Tönnis 3) were associated with poor clinical results. In our study, we only included patients with Tönnis grade 1 and 2 OA. This may be main explanation of our better results. Only one patient needed replacement surgery after a minimum follow-up of 12 months. Therefore, debridement of osteophytes and impinging lesions may decelerate the OA in hip joint.

Philoppon et al. (8) reported their outcomes of arthroscopic treatment of FAI and stated that patients improved in terms of clinical scores, but that they had an increased rates of conversion to THA with any joint space of 2 mm or less (8). In our study, we did not see any clinical difference in patients with joint space less than 2 mm or not. However, only two patients had joint space less than 2 mm. On the other hand, Beaulé et al. (15) showed no correlation between the outcome after open correction for FAI and the intraoperatively documented chondral damage.

Daivajna et al. (5) reported their results in patients with Tönnis grade 2 and 3 OA who had undergone hip arthroscopy and they found that 44% of patients required a total hip replacement after a mean of 18 months after surgery. This worse outcome is probably due to patient selection. They included patients with advanced OA in their study, and it is not a surprising that they had inferior outcomes after surgery. However, they stated that 44% failure implied 56% success and that patients should decide whether 56% chance of symptomatic improvement for a mean of two years was acceptable or not. These patients would go THA even if they had not undergone hip arthroscopy. In addition, hip arthroscopy has very little complication rate and does not compromise possible THA (16).

Arthroscopic debridement has been used for the treatment of the knee OA, it was abandoned after worse outcomes (17). Arthroscopic

debridement has been shown to have no clinical benefit compared to conservative or placebo treatment in knee joint (18). Therefore, it has been avoided in the treatment of hip OA. However, biomechanical features of the hip joint are unlike to knee joint (19,20). It is much more congruent compared to knee, and unlike knee osteophytes, is not only the consequence but also the reason of the disease (21,22). Therefore, debridement of osteophytes and impinging lesions may decelerate the OA in the hip joint. On the other hand, there are limited studies investigating the results of hip arthroscopy in OA and patients should be informed for success rates and any possible revision or replacement surgeries (23,24). Literature still lacks long-term controlled studies, and future studies should focus on long-term results in large cohorts.

## Study Limitations

There are some limitations to this study. The number of patients included in this study was limited, there was no control group and follow-up period was relatively short. However, early outcomes can give us what to expect in a short time after surgery. In addition, arthroscopic treatment of arthritic hip joint is not a standard treatment and is individualized for each patient. Therefore, it is not always possible to conceive which steps of the surgery affected the outcomes most.

## Conclusion

Hip arthroscopy may be effective in the treatment of early stage OA with a low complication rate. Early results after surgery are satisfactory, however; patients should be informed for high conversion rates to THA particularly in advanced cases.

**Ethics Committee Approval:** The Institutional Review Board of Istanbul Training and Research Hospital approved this study (decision no: 1523).

**Informed Consent:** Consent form was obtained from all patients.

**Peer-review:** Externally peer-reviewed.

**Author Contributions:** Surgical and Medical Practices - T.G.; Concept - T.G.; Design - T.G.; Data Collection and/or Processing - T.G.; Analysis and/or Interpretation - T.G., Y.Ö.; Literature Search - T.G., Y.Ö.; Writing Manuscript - T.G.

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