Arthroscopic approach of femoroacetabular impingement: Early clinical outcomes. A multicentric study

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ABSTRACT

Femoroacetabular impingement (FAI) is a common cause of hip joint dysfunction and pain in adults aged between 30–60 years. The main objective of the study is to evaluate the short term clinical outcome of hip arthroscopy in patients diagnosed with FAI. A total of 105 patients were studied. This minimal invasive technique has shown to be highly effective in comparison to open surgery in young patients.

1. Introduction

Hip arthroscopy is an increasingly used procedure to treat Femoroacetabular Impingement (FAI). Patients are usually young adults with a working lifestyle. Arthroscopy offers a minimally invasive technique to solve FAI and offers shorter recovery times and similar outcomes to open surgery techniques^{1,2}.

Femoroacetabular impingement is a common cause of hip joint dysfunction and pain in adults aged between 30–60 years³. The average age suffering this condition is of 28.4 years old, with a slight predominance in male patients. FAI causes symptoms that affect the daily life of patients, conditioning their working and/or sports performance.

We can divide three types of FAI: CAM, which involves an increased ossification of the superior arch of the femoral neck; Pincer which is the growth of the upper border of the acetabular cup. The third type is known as Mixed which is a combination of Pincer and CAM conformations, thus being the most common variant^{3,4}.

The diagnosis of FAI is made essentially by means of imaging techniques, mainly computer tomography scan (CT-scan) or magnetic resonance imaging (MRI)². Clinical manifestations such as hip joint pain and decreased rotational motion are also helpful in the reach of a diagnosis; however patients may have asymptomatic periods in which clinical data is not as relevant.

1.1. Treatment options

The treatment of FAI is a controversial issue. The fact that young adults are more affected raises the dilemma whether open surgical or arthroscopy procedures should be performed.

An initial, non-surgical approach can be executed. The patient

should reduce the amount of sport exercise and regular anti-inflammatory consumption is recommended. This will diminish symptoms but will not reduce nor stop the ongoing progress of the pathology.

A surgical approach is often required as the clinical manifestations often affect the day to day life of patients.

1.1.1 Open surgical approach involves an excision osteoplasty if there is a CAM variant or a periacetabular osteotomy if there is a Pincer variant. Either a lateral or a posterior approach can be used. A trochanteric osteotomy is usually carried out in order to improve the femoral neck exposure^{5,16}.

1.1.2 Arthroscopy approach: The main advantage of the arthroscopy technique is the evaluation of central structures (labrum osteophytes-Pincer) and peripheral compartment (femoral neck-CAM). The patient will usually be in a lateral position and traction will be applied. Three portals are usually used: Anterior portal for the central compartment, anterolateral portal for the peripheral compartment and a posterior portal in case more surgical instruments are needed or regions of postero-medial labrum require osteotomy^{5,6}.

2. Materials and methods

2.1. Data source

Patients were selected from Hospital Doctor Peset of Valencia and Clinico Hospital of Valencia databases. These databases allowed us to screen according to different criteria. There were 53 females and 52 males aged between 19 and 79 years old, being the average age of 42 years. The most common variant was MIXED type deformity. The modified Harris Hip score was applied preoperative and 1 year post-operative. The diagnosis was done by measuring the hip joint angle,

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Table 1

Modified Harris Hip Score of all patients previous and after the arthroscopy.

HIP DEFORMITY	N PATIENTS	AVERAGE AGE	AVERAGE HIP PRE	AVERAGE HIP POST	AVERAGE HIP DIF.
CAM	35	40	41,26	59,77	18,51
PINCER	33	37	45,19	58,58	13,39
MIXED	37	43	41,55	57,29	15,74

Table 2

Complications and post arthroscopy morbidities [25].

COMPLICATIONS	MOMENT OF DIAGNOSIS
Infection	Early
Deep Vein Thrombosis	Early
Partial Sciatic nerve neurapraxia	Early
Instability	Early
Avascular Necrosis of the Femoral Head	Late
Adhesions	Late
Heteroscopic Ossifications	Late
Femoral Neck Fracture	Late
Trochanteric Bursitis & iliopsoas Tendinitis	Late

Table 3

Statistical significance and confidence intervals.

HIP DEFORMITY	Two-Tailed P Value	HIP Dif Mean	95% CI
PINCER	< 0.0001	−13.391	(−21.762 − −15.255)
CAM	< 0.0001	−18.509	(−17.159 − −9.622)
MIXED	< 0.0001	−15.743	(−18.548 − −12.938)

known as alpha, both in X-Ray images and CT scan imaging.

2.2. Selection criteria

In order to accurately screen patients with primary FAI and that met the requirements to undergo arthroscopic procedure, several items were screened to consider:

- Ages between 25–55 years old: Ages above or below this boundary may bias the result, and arthrotic and degenerative processes may determine false positives in the diagnosis of FAI⁷.
- Tönnis Arthrosis grading scale: Patients with up to grade 1 Tönnis were selected: Above this grading there are usually signs of more severe arthrosis involving the presence of small cysts and osteophytosis, both at the labrum edge and the femoral head^{7, 8}.
- Patients with at least 6 months of conservative treatments and rehabilitation procedures^{8, 9}.
- Patients with Pincer, CAM or Mixed morphologies were chosen.
- Hip Joint alpha angle: We considered > 50.5° alpha angles as the cut-off value to diagnose femoroacetabular impingement^{11–15}.

2.3. Exclusion criteria

- Above grade 2 Tönnis arthrosis scale.
- Patients with associated pathology that conditioned the post-operative control and can bias the results of the arthroscopy procedure: congenital dysplasia, Perthes disease, moderate and severe sciatic pain, history of spine or femoral tumoral presence either treated or not, multiple myeloma etc.¹⁰

2.4. Tested variables

Each patient was interviewed using the Harris Hip Score. This interview was done four weeks prior to the surgery. This one-month span between the interview and the surgery was considered in order to mitigate possible subjective and somatic symptoms that patients could

experience as a consequence of the close proximity to the day of the procedure.

A second interview was repeated 9 months after the arthroscopic procedure. Other clinical data was also collected which included:

- Surgical complications.
- Comorbidities associated that debuted during 9 months post surgery.

Patients were categorized in Pincer, CAM and mixed groups depending on the predominant hip joint anatomy. In order to determine these groups, X-Ray images and CT scans were taken before the diagnosis was done.

Each group was treated by means of arthroscopy but using different techniques:

- Pincer: Periacetabular osteoplasty and excision of labral osteophytes and heterotopic calcifications^{17–20}.
- CAM: Femoral neck osteotomy resection of the cam deformity¹⁶.
- MIXED: Both techniques, removing the acetabular and the femoral neck morphologies were practiced¹⁸.

During the arthroscopy, the articular capsule was closed systematically in all patients and in all hip deformities.

3. Results

3.1. Combined results of all patients

Table 1 shows the number of patients included in each Hip Joint deformity, average age and modified Harris Hip Score previous and after the arthroscopy.

The average difference in functional improvement after the arthroscopy was found to be on CAM deformity (Table 1). However, patients with CAM deformity had a wide variety of clinical responses to the procedure with some patients having negative HHS differences.

Although the incidence is low, the use of metallic material and soft tissue manipulation can lead to an infection. In our study, there were no cases of post operative infections. All patients that underwent hip arthroscopy were prescribed a minimum of 10 day thromboprophylaxis medication following procedure with the aim of reduce the incidence of deep vein thrombosis. Patients with anticoagulant medication were prescribed with higher doses and longer duration. In addition, patients were recommended immediate mobilization of the limb²⁵.

Till the recent follow-up of all patients, there were no further cases of the rest of the complications mentioned in Table 2.

3.2. Statistical analysis

T-student with paired results were used to determine statistical significance.

Despite being CAM the deformity with the biggest average increase (Table 3), the most consistent results are acquired when a MIXED deformity is present. All patients with MIXED hips had clinically relevant increases in joint functionality.

4. Discussion

Hip joint arthroscopy is increasingly being used to treat affections in young adults. Adults between 30–55 years old are an active social collective with many being involved in high performance sports or labor activity with high physical demands. This pushes the orthopedic surgeons to handle hip joint problems in what it seems as a more secure and efficient way.

In our results, we found there is a strong statistical significance when comparing patient's functional hip joint mobility and satisfaction before and after the procedure. This occurs in the three types of deformities involving FAI.

However, the benefits of the arthroscopy are not guaranteed as many patients obtained only subtle increases Harris Hip Score and some even had worse outcomes after the arthroscopy. We can see that Pincer type FAI alone had the worst mean results. This may be due to the technical difficulties when tackling the labral anatomy: It may be needed to resect tear pieces of labrum or even suture and reconstruct them. This makes the arthroscopy method in Pincer a more heterogeneous procedure being therefore more difficult to quantify.

Nevertheless, our results are similar to those obtained in other studies in the case of MIXED type FAI (Table 3). In this case, the improvement of patient satisfaction is the most considerable. This supports the fact that arthroscopy should be a first option procedure in active adults as MIXED deformity accounts for the vast majority of hip joint FAI.

MIXED anomaly is treated using the two-way approach: tackling both the acetabular rim and the femoral neck hump. This favors the biomechanics of the hip joint by solving the anatomical boundary within both sides of the joint. In pure pincer or cam deformities were only acetabulum or femoral neck is treated we can risk leaving residual deformities or mild anomalies that can trigger future symptoms. For these reasons some authors consider treating all FAI with osteoplasties on both borders of the hip joint⁶.

Capsule plication is another controversial issue regarding hip arthroscopy. Most orthopedic surgeons prefer capsule closure as it improves the clinical outcome of the procedure. However some authors consider unrepaired capsulotomy to favor inflammatory hip joints, severe arthrosis and borderline dysplasia^{23,24}.

5. Limitations

There are big limitations considering this study. The fact that FAI diagnosis requires imaging techniques may under-estimate the real volume of patients suffering FAI. We used a cutoff of 50.5° in accordance to other similar studies thus this is not a universally considered parameter as some surgeons consider values > 60° and < 50°^{15,22}. We therefore emphasize that the symptomatology of the patient and the functional performance should be a priority when considering FAI diagnosis.

6. Harris hip score limitations

There exist limitations in the interpretation of the HHS. Firstly, the numeric results obtained from the patients do not correlate in all cases with the degree of severity seen in CT or MRI scans. Secondly, this entails that the Harris Hip questionnaire is subjectively based on the clinical aspects of each patient completely.

7. Conclusion

- Hip Joint arthroscopy is as effective treatment as open surgery for treatment of FAI.
- Arthroscopy offers a less invasive procedure and therefore reduces the amount of postoperative complications such as infections or wound dehiscence.

- Arthroscopy offers a shorter time recovery compared to open surgery²³.
- MIXED type FAI is the deformity which best favors of hip joint arthroscopy.
- More studies are required in order to compare individual Pincer and CAM deformities with open surgery procedures.

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Conflicts of interest

There are no conflicts of interest

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