



Arthroscopic Versus Open Resection of Infrapatellar Fat Pad Tumour

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Authors' contributions

This work was carried out in collaboration between all authors. All authors read and approved the final manuscript.

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ABSTRACT

Background: While few comparative studies exist, it has been suggested that open resection of Hoffa's fat pad tumour provides inferior results when compared with the all-arthroscopic technique.

Purpose: The purpose of this study was to compare the intermediate-term results of patients undergoing arthroscopic versus open resection for the treatment of Hoffa's fat pad tumours.

Methods: We report prospective study of 15 patients with symptomatic Hoffa's fat pad impingement. Patients were divided into two groups (9 arthroscopic, 6 open). The mean follow-up for group I (open) and group II (arthroscopic) was 2.3 years and 1.2 years, respectively. The diagnosis was made by clinical exam, MRI imaging and verified by anatomopathology. Lysholm score and American knee score were obtained pre and post operative and at final follow up. Each patient completed a questionnaire assessing their scar satisfaction, percentage of normal knee function and willingness to have the surgery again. Risk factors for poor outcomes were analyzed.

Results: There was a significant improvement in their symptoms and function after the surgery at

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an average follow-up of 14 months. Arthroscopic patients had significantly less pain ($P = .035$) by Visual analog scale (0.61 ± 1.02) compared to open excision group (1.59 ± 2.15) and better knee function ($92.9\% \pm 8.6$ in arthroscopic group vs $89.7\% \pm 12.5$ in open excision group) at final follow-up. The average operative time was (53.1 minutes using arthroscopic technique vs 41 minutes by open technique). The one poor result was because of paresthesia over the distribution of the infrapatellar branch of the saphenous nerve after open resection.

Conclusion: Open and arthroscopic resection of infrapatellar fat pad are both effective surgeries. Hoffa's fat pad tumours should be treated by arthroscopic resection because of less residual pain and less complication using this technique. In case of high volume of tumours only open excision can provide complete excision to avoid recurrence.

Keywords: Knee; Hoffa fat pad; tumours like; excision; arthroscopy.

1. INTRODUCTION

Many tumours or tumours like can affect the Hoffa's fat pad. They usually occur in young active patients participating in activities involving repetitive microtrauma to the knee joint. Hoffa's disease was first described by Albert Hoffa in 1904 [1,2,3]. It's characterized by an impingement between the patellofemoral or femorotibial joints due to large volume tumours in the infrapatellar fat pad, causing chronic anterior knee pain [2]. Tumours of the fat pad may be categorized as either diffuse or solitary disease. Knee joint has many fat pads which are extrasynovial but intracapsular. First one of the anterior fat pads is anterior suprapatellar (quadriceps), the second one is posterior suprapatellar (prefemoral), and the third one is infrapatellar (Hoffa, IFP) [1,3,4]. Solitary tumours are relatively uncommon but with the widespread use of high-resolution magnetic resonance imaging scans (MRI) as a routine investigation an increasing number of Hoffa's fat pad (HFP) tumours are being recognized. Hoffa's fat pad tumours like can be defined by their origin intrinsic or extrinsic to Hoffa's fat pad. The intrinsic are characterized by pain, swelling, bruising, and flexion deformity of knee. The extrinsic are characterized by knee discomfort, recurrent hydroarthrosis, and joint weakening [1,4,5]. But in Hoffa's disease the movements are usually less affected. Hoffa's test is specific but difficult to elicit. The pain is present on the anteromedial aspect of knee joint like in Hoffa's disease [6]. Examiner presses on either side of the patellar tendon in flexed knee and the patient gradually extends the knee. Positive sign is pain, apprehension, or antalgic block during terminal extension [1,7]. Clinical diagnosis poses difficulty as there are no definitive clinical symptoms and signs, but a palpable mass may suggest the diagnosis. The main differential diagnosis involves meniscal lesions [1,3,4]. As per

Ushiyama et al. [5] HFP modulates chondrocyte function through production of cytokines like tumor necrosis factor (TNF), interleukin (IL)-1, basic fibroblast growth factor (bFGF), and vascular endothelial growth factor (VEGF) in the joint fluid. Hoffa's disease occurs in normal knees and Hoffa's syndrome is associated with hypertrophy of fat pad due to meniscal, capsular, or ligamentous lesions [1,8]. In the past, the disease was believed to be due to repetitive trauma, and in the chronic state, fibrosis and cartilage and osseous metaplasia may ensue. The macroscopic hypertrophied fatty synovium is most frequently villous, but can be diffuse or even nodular. Traditionally, open excision have been associated with soft tissues damage and require more time to recovery. More recently arthroscopic resection has been described. However, the risk of recurrence persists because arthroscopy may not afford complete surgical excision [9]. The purpose of this study was to compare the intermediate-term results of patients undergoing arthroscopic versus open resection for the treatment of Hoffa's fat pad tumours.

2. PATIENTS AND METHODS

2.1 Details

The study was conducted at a single institution between January 2010 and December 2013. All patients were evaluated and treated by 2 senior lower leg surgeons. Patients were excluded if they had previous surgery, or a history of a fracture, knee instability or meniscal tear. All Patients failed a minimum of six weeks of physical therapy before surgery.

Patients who agreed to participate in the study were randomly assigned to have open or arthroscopic excision. Randomization was performed at initial presentation by assigning odd-numbered medical record identifiers to the

open excision group (group I) and even-numbered medical record identifiers to the arthroscopic excision group (group II). The gender and age of the patients at presentation, the clinical features (Fig. 1), investigations, preoperative diagnosis, operative findings, the anatomical site of origin of the tumour, the treatment and complications, including recurrence, were recorded (Table 1). The Lysholm knee score and American knee score were used for assessment preoperatively and at 3 months and at 1 year postoperatively, as well as at the conclusion of this study (3 years follow up) [10,11]. The protocols of this study have been approved by the relevant ethics committees. All human subjects gave informed consent to participate in this study. The study offered no risk or harm to participants. Its methodology included painless procedures. The participant or his responsible guardian could interrupt the procedure if necessary. The participant or his guardian may request at any time the termination of the research, without any financial or material damage. The study was prepared in accordance with the Guidelines and Rules of Research Involving Human Subjects. The project was approved by the Ethics Research Committee of medical school in Fez, Morocco (number: 120,790).

2.2 Imaging

All our patients had radiographic examinations of the knee (anterior-posterior, lateral, and skyline

views) and MR imaging 3 T to identify or exclude other knee pathology (Fig. 2).

2.3 Surgical Technique

The arthroscopy surgery was performed by using the standard anteromedial and anterolateral portals. Each knee compartment was inspected thoroughly and palpated using a blunt hook. The infrapatellar area is difficult to see in arthroscopic examination using the conventional anteromedial and anterolateral portals. We, therefore, made two accessory portals on the far medial and lateral sides of the conventional portals. Arthroscopic examination through these two accessory portals revealed a mass at the posterior border of the patellar tendon (Fig. 3). The open technique consisted of a vertical skin incision approximately from the distal pole of the patella (Fig. 4) then vertical 2- to 3-cm transpatellar tendon incision was made. The surrounding soft tissues were excised along with the tumors using the shaver (Fig. 5). The excised sample was sent for laboratory testing and the type of fat pad tumour has been confirmed post op histopathologically.

Postoperatively the patients were placed on a vigorous physiotherapy program to strengthen the quadriceps power and regain range of movement. They were allowed full weight-bearing on the knee. Antiinflammatory drugs were prescribed for the first 10 days postoperatively. The patients were reviewed using The Lysholm knee score. This was compared with the preoperative score.

Table 1. Clinical details of our series

Case number	Age (years)	Sex	Imaging modality	Histology	Treatment
1	44	F	MRI	Lipoma arborescens	Arthroscopic
2	31	M	MRI	Lipoma arborescens	OE
3	45	M	MRI	Ganglion cyst (recurrence)	Arthroscopic
4	53	F	MRI	Lesions of Hoffa's disease	Arthroscopic
5	38	F	MRI	Ganglion cyst	OE
6	26	F	MRI	Lesions of Hoffa's disease	Arthroscopic
7	18	F	MRI	synovial cyst	Arthroscopic
8	34	M	MRI	Lipoma	Arthroscopic
9	29	F	MRI	Synovial cyst	Arthroscopic
10	54	M	MRI	Lipoma	OE
11	24	F	MRI	Lipoma	Arthroscopic
12	25	M	MRI	Lipoma	OE
13	41	F	MRI (recurrence)	ganglion cyst (recurrence)	Arthroscopic
14	46	F	MRI	synovial cyst	OE
15	37	F	MRI	synovial cyst	OE



Fig. 1. Chronic kneepain, mild anterior swelling and mild loss of knee extension



Fig. 4. Open resection of Hoffa's fat pad

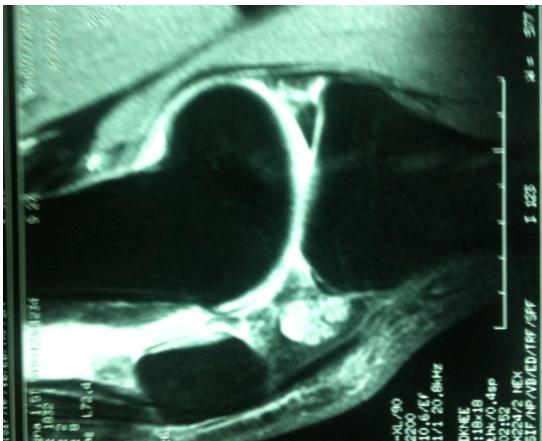


Fig. 2. Abnormally increased volume of Hoffa's fat pad



Fig. 5. Excised Hoffa's fat pad

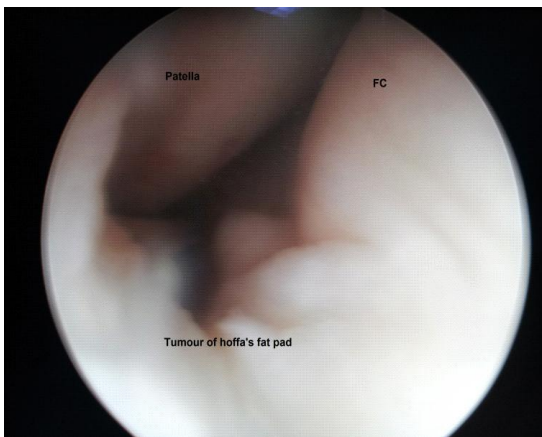


Fig. 3. Arthroscopic view of the Hoffa's tumour like

3. RESULTS

In this study 15 patients were diagnosed and treated for isolated tumours of Hoffa's fat pad. Nine patients had arthroscopic excision, and six patients had open excision. The mean age for the arthroscopic group was 34 years (range, 16–54 years), and the mean age for the open group was 36 years (range, 10–54 years) ($p = .559$). Six tumours occurred on the right and three occurred on the left in the arthroscopic group, and 4 tumour occurred on the right and 2 occurred on the left in the open group ($p = .611$). The arthroscopic group was composed of 7 females and 2 males, and the open group was composed of 3 females and 3 males ($p = .178$). The average duration of symptoms was 16 months with a range of 7 to 36 months. Six patients had sustained minor injuries in the past but were unsure whether that precipitated their

current symptoms, and just one denied any history of injury whatsoever.

Laboratory tests and radiographs were normal in all with no patella alta or patellar subluxation. MR imaging showed a mass-like lesion, encompassing the entire infrapatellar fat pad except for the anterior region just beneath the patellar tendon. The mass demonstrated a generalized heterogeneous hypointensity on T1- and T2-weighted images, with a poorly defined margin and amorphous internal clefts. Microscopy of the infrapatellar fat pad showed lipoma arborescens, ganglion cyst and synovial cyst in most cases. These findings supported the diagnosis of Hoffa's tumour and were consistent with the MRI findings. At the second postoperative examination at 4 to 8 weeks, three patients (51%) in the open group reported residual pain, and 1 patients (10%) in the arthroscopic group reported residual pain (p = .369). At the third postoperative assessment, 1 patient (11%) in the arthroscopic group and 1 patient in the open group were lost to follow-up. Two patients in the arthroscopic group reported tumour recurrence (p = .809) that was subsequently treated with open excision. The open group had 1 immediate postoperative complication (16%) of neuropraxia of the infrapatellar branch of the saphenous nerve branch, which improved after treatment with neurolysis. The arthroscopic group had no postoperative complications (p = .381). Neither group had any postoperative hematomas, infections, wound problems, or complications related to anesthesia.

The mean preoperative Lysholm knee score [12] was 37.44, and it improved postoperatively to 82.20, 93.02, and 90.76 at 3 months, at 1 year, and at the latest follow-up (3 years), respectively. The average score for symptoms preoperatively was 32 and postoperatively was 46 (p < 0.001) (Table 2). The mean paired difference was 14 with a standard deviation of 6.3 and a 95% confidence interval of 9 to 18. The pre-operative score for function had a mean of 31 compared to

a post-operative score of 46. The mean paired difference was 13 with a standard deviation of 7 and 95% confidence intervals of 9-18. This was significant (p < 0.001). American Knee Society scores improved from 76 (range 17–100) pre-operatively to 96 (range 46–100) post-operatively with an improvement in functional scores from 92 (range 60–100) to 100.

4. DISCUSSION

This study describes a series of solitary HFP tumours treated by planned surgical excision. The results demonstrate a varied differential diagnosis of benign tumour within HFP and that the commonest presenting symptom is anterior knee pain. With symptomatic solitary HFP lesions, MRI and plain radiographs are the imaging modalities of choice and the outcome following arthroscopic and HFP resection is good. Recurrence is uncommon. Patients who have trauma to the IFP may undergo a process of hemorrhage, inflammation, and fibrosis that may become painful. An intriguing hypothesis taking into consideration and the osteogenic activity of bone marrow stromal cells is that lipoma arborescens and synovial chondromatosis share a common etiology from reactive synovial change with different endpoints [13].

Metheny and Mayor [14] described the anatomy of the infrapatellar fat pad based on their cadaveric study and were the first investigators to report its arthroscopic resection, in 4 patients. Jacobson et al. [3] and Saddik et al. [15] described the MRI appearance of the infrapatellar fat pad in various disorders, stressing the importance of this diagnostic tool.

A large fat pad or signals suggestive of inflammation seen on MRI are nonspecific and do not necessarily mean impingement. Our patients have been investigated by MRI to locate additional pathology, meniscle or ligamentary.

Table 2. Clinical outcomes in both groups

	Mean preoperative score	Mean postoperative score (last follow up)		P value
		Open resection	Arthroscopic	
Lysholm knee score	37,44	86,44	90,76	<0,001
Score symptoms	32	44	46	--
Score function	31	44	46	--
American knee score	76	92	96	<0,001

The majority of solitary Hoffas fat pad tumours are benign. PVNS and intraarticular ganglia are the most common in the literature [9], but in our series lipoma arborescens and synovial cyst were the two most common pathologies. Lipoma Arborescens" is a differential diagnosis from the Hoffa's disease. It is located most often in the supra patella pouch and is characterized by slow-growing painless swelling with intermittent effusions.

In this series the diagnosis of fat pad impingement was made preoperatively and confirmed with arthroscopic and histological findings. From a technical point of view the fat pad was completely resected using arthroscopy in five cases. But complete excision was too difficult, so the patients underwent open excision in two cases for a ganglia cyst. Similar results are reported by Magi et al. but without detailed follow-up [8]. Overall there were one unsatisfactory result. In this particular case, and after an open excision, the patient had persistent symptoms behind the patella tendon that caused a mild limitation of their functions in addition to paresthesia of the infrapatellar branch. In this series we record two cases of recurrence due to high volume of tumours. So, large tumours required open resection in which case the size of the tumour itself may be the cause of poor result [16,17]. Limitations of the study included a small sample size, lack of control and short to mid-term follow up, however a long-term follow-up study, high level of evidence and controlled trials should be more conclusive.

5. CONCLUSION

Open and arthroscopic resections of infrapatellar fat pad are both effective surgeries. At intermediate-term follow-up, they provide similarly good to excellent results with regard to patient satisfaction and knee function. Less residual pain and less complication were found using the arthroscopic technique. In order to reduce the risk of recurrence open excision should be performed in case of high volume of tumours.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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