Case Report

Tumor like swellings arising from Hoffa's fat pad: A report of three patients

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Abstract

We report three rare cases of tumor-like conditions arising from Hoffa's fat pad (HFP). Patients were having persistent knee pain, the cause of which was not diagnosed by the general physician, and then were referred to us for knee pain. Magnetic resonance imaging revealed the lesions to be arising from HFP (ganglion cysts and hemangioma), as was suggested by clinical findings. Anatomy, pathology, and radiological features of the Hoffa's disease are described here to increase awareness in orthopedic community of this rare but interesting disease which is often misdiagnosed as meniscal pathology. These cases illustrate that increased cognizance can facilitate timely intervention which will prevent morbidity of the patient.

Key words: Ganglion cyst, hemangioma, Hoffa's fat pad

Introduction

Hoffa's disease is the clinical condition characterized by anterior knee joint pain secondary to inflammation and/or impingement of Hoffa's fat pad (HFP). It was first described by Albert Hoffa in 1904.[1-3] The infrapatellar-HFP is intracapsular but of extrasynovial structure and can be affected by a variety of pathological conditions such as lipoma, hemangioma, synovial chondromatosis, focal villonodular synovitis, ganglion cyst, osteochondroma, and chondrosarcoma.[4-12] Even though the exact function of HFP is not known yet, involvement of HFP in a variety of tumors and tumor-like conditions has important clinical implications.

Case Reports

Case 1

A 28-year-old male presented with worsening of right knee pain since 9 months which started after blunt trauma to the knee. Immediately after trauma there was no swelling and the patient was able to walk. He was disabled due to repeated attacks of knee pain. On clinical examination, there was a small infrapatellar cystic swelling in the anterolateral region, which increased during extension of the knee and decreased with flexion of the knee. There was no collateral and cruciate ligament laxity and McMurray's test was negative. There was no joint effusion clinically detected. Range of movements was terminally restricted and was painless in all directions. X-ray and haematological parameters were both normal. Magnetic resonance imaging (MRI) showed well defined lobulated lesion which was of low signal intensity in T1-weighted images and of high signal intensity in T2-weighted images arising from HFP, suggestive of ganglion cyst arising from it that was extending inside the knee joint[3,12] [Figure 1a]. Rest of the knee joint was normal with no meniscal tear or continuity of the lesion with meniscus. Arthroscopic examination using high portal was done [Figure 1b], but it was not possible to resect the lesion through arthroscope; so, open resection and complete excision of the cyst was done. Histopathologic examination confirmed the diagnosis of ganglion cyst. Postoperative period was uneventful and the patient was given physiotherapy for strengthening of quadriceps. Cincinnati knee scoring improved from 300 to 380.[13,14] At 2 years of followup, the patient is completely asymptomatic with full painless range of movements.

Case 2

A 36-year-old female presented with long standing history of left knee pain. On clinical examination, there was minimal medial joint tenderness, and there was no palpable swelling or ligament laxity. McMurray's test was

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suggestive of meniscal injury. Movements were terminally restricted. X-ray was normal. MRI showed altered signal changes grade II in medial meniscus. There was well defined hyperintense in T2 and hypointense in T1, lobulated lesion arising from HFP, indicating a cystic swelling which was extending in the knee joint. There was no continuity with the meniscus of this lesion [Figure 2]. The patient was started on physiotherapy regime as she was not willing for any surgical intervention. With conservative management, she responded well and Cincinnati knee score improved from 280 to 360. At followup of 18 months, the patient has good range of movements and no complaints.

Case 3

A 12-year-old female child came with intermittent knee pain and swelling below patella since 6 months. She had taken treatment from other physicians, but without any relief. When the child came to us, there was knee synovitis on examination with small cystic swelling present around the inferior pole of patella just lateral to it [Figure 3]. There was no ligament laxity and knee alignment was normal. Preoperative Cincinnati knee score was 320. MRI of the patient revealed well defined swelling arising from HFP, which was hyperintense in T2 but isointense in T1-weighted images, suggestive of hemangioma or low-flow venous malformation (the swelling was extending in the joint and anterior and lateral to patellar tendon). The patient underwent open surgical resection of the swelling. It was a reddish-blue colored, well demarcated swelling arising from HFP encircling patellar tendon extending inside the joint [Figure 4] which was completely removed. Histopathologic report confirmed it to be hemangioma. Patient was started with knee range of movements and strengthening exercises. At followup of 1 year, the patient is completely asymptomatic with Cincinnati knee score of 390.

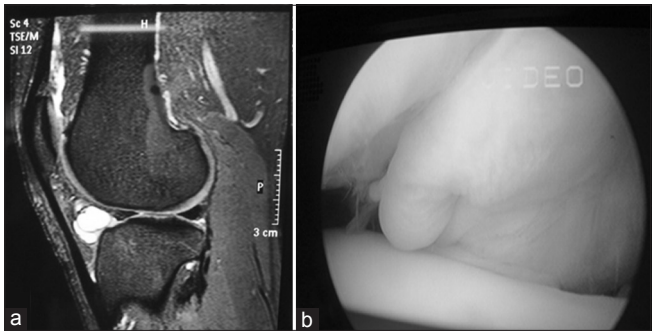

Figure 1: (a) MRI T2WI sagittal images of knee (case 1) showing hyperintense lesion from HFP. (b) Intraoperative arthroscopic picture showing intra-articular extension of cyst

Discussion

The classically pain is present on the anteromedial aspect of knee joint in Hoffa's disease.[8] 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).[1,3,15] As per

Figure 2: MRI of patient 2 showing lobulated lesion hypointense in T1WI

Figure 3: Clinical photo of case 3 showing swelling around inferior pole of patella

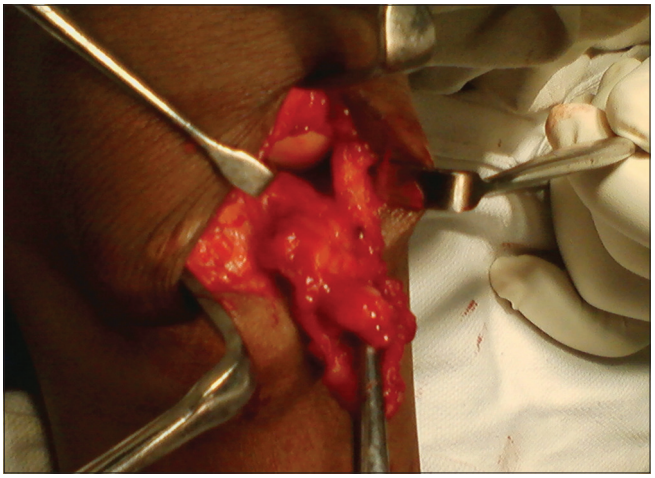

Figure 4: Intraoperative picture of patient 3 showing swelling arising from HFP encircling patellar tendon

Ushiyama *et al*., 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.[16] 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.[1,17] Pathological involvement could be due to intrinsic factors or extrinsic factors. Intrinsic causes are due to primary pathology of HFP such as intracapsular chondroma,[18] localized villonodular synovitis,[19] post arthroscopy, shear injury, and post surgery.[3] Extrinsic factors are synovial or intra-articular pathologies which secondarily involve HFP.[3,20]

The HFP, is pyramidal in shape; anterior to it lies infrapatellar tendon, posterior surface of patella and capsule, posteriorly it is related to synovium, superiorly it is related to patella, and inferiorly lies tibia and infrapatellar bursa. Lateral margins of HFP, which are known as alar plicae, protrude in the joint and project posteriorly along the anterior horn of meniscus.[1,3,21] Infrapatellar fat pad has two clefts as demonstrated by cadaveric and MRI studies. One is horizontal and the other is vertical.[3,18,20,22,23] Extensive nerve supply of HFP is important clinically as patterns of referred pain and associated muscle spasm. Confirmation that fat pad is involved in anterior knee pain and loss of motion was clinically made by Duri *et al*. (1966) by injecting local anesthetic and steroid, which was followed by transient relief of symptoms.[21]

Hoffa's disease is classified into acute and chronic stages. Acute stage is characterized by pain, swelling, bruising, and flexion deformity of knee. Chronic phase is characterized by knee discomfort, recurrent hydroarthrosis, and joint weakening.[1,17,24] Movements are usually less affected. Hoffa's test is specific but difficult to elicit. 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.[1,24] 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 as was seen in our second patient. Other pathologies that can confuse the physician are meniscal cyst, chondral flaps or loose body.[25]

A variety of intrinsic and extrinsic tumors and tumor-like conditions may affect the HFP. MRI is the technique of choice in evaluating these conditions.[3,26] MRI delineats the extent of the lesion inside the joint and rule out other intra-articular pathologies and is indicated for a complete and correct surgical planning, since the classic anterolateral arthroscopy and arthrotomy never visualize the pad itself.[24] A ganglion cyst may be seen in all joints with varying frequency depending on the location, but it is rare in the knee joint.[12,27] Ganglion cysts of the knee joint usually present near lateral meniscus or anterior cruciate ligament or posterior cruciate ligament; they rarely arise from HFP and only a few cases have been reported in the literature.[27,28] Principal differential diagnosis is meniscal or cruciate ligament cyst, especially when the cyst of HFP extends inside the knee joint.

The precise etiology of ganglion cysts is not understood. HFP contains residual synovial tissue, meaning that primary neoplastic conditions of synovium may originate and be confined to the fat pad.[20] Initial pathogenesis described by Hoffa was attributed to inflammation; hypertrophy of fat pad caused by impingement of the fat pad between patella and femoral condyle during extension was supported by arthroscopic studies recently.[1] As HFP has two clefts lined by synovium, the other possibility is that ganglion cyst may be arising from this synovial lining.[20,23,29] Repetitive microtrauma leads to alteration in the metabolism of cells leading to release of vasoactive substances that sensitize synovium and fat tissue, causing necrosis of adipocytes.[1,30] Fibrocartilagenous metaplasia of HFP was considered as the end stage of Hoffa's disease by many authors.[17-19] Wicham *et al*. demonstrated that HFP contains progenitor cells which can differentiate into chondrocytes, osteoblasts, and adipocytes.[31]

Intraarticular hemangioma of the knee is rare benign tumor. Very unusually it can show destructive potential.[32] It usually presents as persistent knee pain and recurrent hemarthrosis.[33-39] There may be palpable mass, loss of movements, and quadriceps atrophy. Presence of nonspecific symptoms and long standing knee pain should alert the physician about the suspicion of hemangioma, especially when the patient does not have recurrent hemarthrosis. It is found commonly in children and adolescents.[33,35,36,39] It is more common in females than males.[36,40] It can affect ankle, wrist, and elbow. But knee joint is commonly involved.[41,42] Even though it can involve all the areas of knee joint, its origin from HFP has been very rare; very few cases have been reported in the literature.[43,44]

Synovial hemangioma could be due to congenital malformation as it occurs at an early age and tends to involve many sites[45] or may be secondary to trauma.[46] MRI features of synovial haemangioma are homogenous low intensity to isointensity on T1 sequence which is heterogeneous high intensity with or without low-intensity spots or septae within the lesion on T2 sequence.[33] Gadolinium-enhanced images will further aid to know the extent and will help in arthroscopic excision.[34] But this

will not differentiate it from malignant conditions such as synovial sarcoma. This was not possible in our patient due to financial problems. Sometimes synovial hemangiomas can be aggressive and can infiltrate the surrounding soft tissues or bones.[32,37] Hence, early diagnosis and surgical treatment, preferably arthroscopic excision, if not possible then arthrotomy, need to be done to avoid damage to articular cartilage.[47]

Symptomatic treatment is given in the acute phase of Hoffa's disease. If there is no response to conservative treatment, i.e. ice, rest, and quadriceps strengthening exercises, especially vastus medialis, arthroscopic or open resection might be required. It is to be remembered that the standard anterolateral arthroscopic portals may not visualize the HFP and portals might have to be readjusted.[1,24] Open excision might be required, as in our cases, if arthroscopic excision is not possible.

In conclusion, Hoffa's disease is not very uncommon but rarely diagnosed and can be misinterpreted as meniscal pathology. Increased awareness is required to diagnose this clinical condition early and to start the appropriate treatment in order to avoid morbidity. Ganglion cyst and hemangioma arising from HFP is very rare and can be treated by either arthroscopic or open resection depending on its extent if there is no response to conservative treatment.

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