Hoffa’s disease: A report on 5 cases

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Abstract We report the case of five patients referred to our department with Hoffa’s disease: three patients were at the initial stage of the disease and the two others had reached the chronic stage. This condition is one of the less well-documented causes of pain in the anterior compartment of the knee. The pathophysiological mechanism is still unclear. It is probably caused by repetitive micro trauma resulting in inflammatory, haemorrhagic and fibrous changes to Hoffa’s fat pad. The final outcome of the disease is an osteochondroma. The diagnosis is established by MRI, which demonstrates inflammation of the fat pad. At the chronic stage, a standard X-ray is sufficient to demonstrate ossification of the fat pad.
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Hoffa’s disease sometimes called hoffitis is an intrinsic disease of Hoffa’s fat pad (also called the infrapatellar adipose body). It was described for the first time in 1904 by Albert Hoffa and is defined as acute or chronic inflammation of the infrapatellar fat pad. From an anatomical point of view, Hoffa’s fat pad is a partly adipose wedge-shaped mass formed in the anterior region of the knee that is intracapsular but extrasynovial (and therefore extra-articular). It extends superiorly from the patella and alar folds to the tibia and infrapatellar bursa and is delimited anteriorly by the patellar ligament and joint capsule and posteriorly by the synovial membrane (Fig. 1) [1].

Hoffa’s fat pad has a soft consistency and is mobile and laterald in flexion. It is a deformable structure, which allows the expansion of the synovial compartment and facilitates the distribution of the joint fluid.

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There is a wide inter-individual variability in its volume, which decreases after loss of subcutaneous fatty tissue during extreme weight loss.

It consists of adipocytes and connective tissue. Unlike subcutaneous fat, Hoffa’s fat pad contains pluripotent cells that can differentiate into osteoblasts and chondrocytes [2].

It has an anastomotic type of vascularisation supplied by two vertical arteries located on either side of the patellar ligament and two to three horizontal arteries that connect the vertical arteries. These arteries emanate from the upper and lower geniculate arteries. This vascularity is rich at the periphery and poor in the centre [3,4].

Innervation is ensured by anterior fibres of the popliteal plexus connected to the posterior articular nerve, a branch of the tibial nerve.

There are two synovial folds in this Hoffa fat pad: a superior fold with a vertical orientation and a horizontal inferior synovial fold (Fig. 2). Above the latter is an anteroposterior fibrous structure called the adipose ligament, which attaches the Hoffa pad between the patellar apex and the condylar fossa or the ACL. The adipose ligament is present in 65% of cases. It is also called “infrapatellar plica” in particular in a pathological setting.

Clinical cases

Case 1

A 32-year-old male tiler consulted for anterior knee pain lasting for several months. Pain was induced during palpation of the medial and lateral edges of the patellar ligament during extension (Hoffa’s test).

Plain radiographs revealed no particular abnormality. MRI showed a diffuse oedema signal (hyposignal on T1-weighted images and hypersignal on PD fat sat sequences) within the Hoffa fat (Fig. 3).

The diagnosis of Hoffa disease was made from this MRI. The pain regressed after conservative treatment with physiotherapy and oral nonsteroidal anti-inflammatory drugs (NSAIDs).

Case 2

A 37-year-old man and former basketball player presented with chronic anterior knee pain. Radiography detected enthesopathy of the extensor apparatus. MRI (Fig. 4) showed
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Figure 4. Case 2. T1- and DPFS-weighted sagittal MRI sequences. Oedematous infiltration of Hoffa’s fat pad (arrows) in this male basketball player with chronic anterior knee pain. Note the traction enthesophytes of the extensor apparatus (arrowheads).

Figure 5. Case 3. T1-weighted and DPFS-weighted sagittal MRI sequences in this 50-year-old housekeeper, whose anterior knee pain was worsened by climbing and descending stairs. Oedematous infiltration of Hoffa’s fat pad (arrows) on a degenerative background.

an oedematous signal abnormality (hyposignal on T1-WIs and hypersignal on DPFS-WIs) in Hoffa’s fat pad indicating inflammation of the latter. Symptoms were improved by stopping sport jumping, symptomatic treatment based on NSAIDs and physical therapy to strengthen the quadriceps.

Case 3

A 50-year-old maid consulted an orthopaedic specialist for bilateral anterior knee pain lasting for several weeks. This knee pain was worsened by climbing or descending stairs. MRI found oedematous infiltration of the Hoffa fat pad (Fig. 5). The pain was relieved by symptomatic treatment.

Case 4

A 36-year-old male horticulturist consulted for anterior knee pain associated with patellar syndrome. MRI found significant oedematous infiltration of the upper part of the Hoffa fat pad with incipient upper ossification (Fig. 6). Symptomatic treatment with NSAIDs and physical therapy were ineffective. The patient therefore received injections of corticosteroids in the Hoffa fat pad, which relieved the pain.

Case 5

A 42-year-old man consulted in December 2010 for anterior right knee pain lasting for several years. During the interview the patient mentioned past trauma. On clinical examination, an anterolateral mass was palpated (Fig. 7a-b) and the patient presented active and passive limitation of flexion and extension of the knee. Assessment by plain radiography detected opacity in the infrapatellar fat pad. CT showed both ossification and infiltration of this infrapatella fat (Fig. 8).

The patient was lost to follow-up. Nine months later, after a new orthopaedic consultation, a second CT-scan found an increase in the size of the ossification and infiltration of the fat pad (Fig. 9).

Arthroscopic surgery by the anterolateral approach was decided, with lateral parapatellar arthrotomy, excision of

Figure 6. Case 4. Inflammation of Hoffa’s fat pad in a 36-year-old male horticulturist with chronic anterior knee pain and patellar syndrome. Sagittal T1- and DPFS-weighted and axial DPFS-weighted MRI sequences. Diffuse oedematous infiltration of Hoffa’s fat pad (arrows) with early ossification indicating a chronic process (arrowhead).
Figure 7. a-b: case 5. Visible and palpable anterolateral mass (arrows) in a 42-year-old man with a history of trauma with anterior knee pain and limitation of flexion-extension of the knee.

Hoffa’s fat pad and removal of a cartilaginous intracapsular tumour (Fig. 10a-c).

The histological examination showed that this was a benign osteochondral lesion.

Discussion

The crushing of the pad between the femur and tibia during extension causes inflammation of Hoffa’s fat pad. Its pathophysiology is not well documented, although several mechanisms are involved: acute trauma, micro trauma, over-solicitation (repeated rotation and hyperextension). Overall this leads to hypertrophy of the fat and the setting up of a vicious cycle of bleeding, acute inflammation with necrosis and fibrosis, or even ossification after chronic trauma [3,5,6].

This mechanism is supported by the results of recent pathological studies showing the presence of inflammatory signs with fibrin and haemosiderin deposits, macrophage infiltration and initial replacement of adipocytes by fibrocytes. The final stage is the formation of a fibrocartilaginous tissue or even secondary ossification [7].

Hoffa’s disease is more frequent in young women. The classic symptoms are anterior knee pain when climbing and descending stairs (patella syndrome).

High-risk sports are jumping sports such as basketball, volleyball or high jumping. Ligamentous laxity causing knee hyperextension may also cause inflammation of Hoffa’s pad.

A decreased range of motion, crepitus, moderate joint effusion and periligamentous swelling next to the patellar ligament may be observed.

Figure 8. Case 5. Joint CT with bone filter and sagittal reconstruction. Ossification of the Hoffa fat (arrow) with infiltration around this ossification (arrowheads).

Figure 9. Case 5 at nine months. CT with bone filter and sagittal reconstruction. Increase in size of the ossification of Hoffa’s fat pad (arrow) with persistent infiltration of the fat around it (arrowheads).
Hoffa’s test carried out with the patient in the supine position with hip and knee flexed to 90° consists in eliciting pain on palpation of the lateral and medial edges of the patellar ligament during knee extension.

Three pathological entities must be distinguished from Hoffa’s disease: patellar lateral femoral friction syndrome [8], impingement of the infrapatellar plica and arthrofibrosis or “cyclops syndrome”. It is not always easy to distinguish between them and there is probably an overlap between patellar lateral femoral friction syndrome, impingement of the infrapatellar plica and Hoffa’s disease [9–11].

Patellar lateral femoral friction syndrome is an impingement of the posterior, superior and lateral part of the patellar ligament and the lateral femoral condyl. The infrapatellar fat is sandwiched between the two. It occurs more frequently in the presence of a high riding patella [12] or patellar alignment abnormalities and leads to oedema of the superolateral part of Hoffa’s fat pad, which may extend to its central part.

The infrapatellar plica is the most common knee plica (present in 65% of individuals). It is a synovial plica overlying the adipose ligament which extends from the anterior part of the intercondylar notch and crosses Hoffa’s fat pad to the tip of the patella [13]. Although the adipose ligament is anatomically the most common plica, disease caused by its impingement is very controversial [10]. It is usually fine but can sometimes be thickened congenitally or after trauma (post-traumatic fibrosis). After trauma, the patient will present a limitation of knee extension and MRI will detect signal abnormalities in Hoffa’s fat pad along the path of this plica.

Oedema or focal fibrous thickening adjacent to the infrapatellar plica supports this diagnosis whereas diffuse swelling suggests inflammation of Hoffa’s fat pad.

Cyclops syndrome is arthrofibrosis complicating reconstruction of the ACL. It presents as a well-delimited T1-weighted hypointense nodule with a variable but non-fluid signal on T2-weighted images. It is located between Hoffa’s fat pad and the entrance of the plasty in the tibial tunnel. The name “Cyclops” refers to the appearance of this nodule by arthroscopy (eyeball shape). It develops around the distal stump of the ruptured ACL, which becomes horizontal and is displaced anteriorly.

MRI is the method of choice for analysing Hoffa’s fat pad. The standard sequences (proton density with fat saturation and T1) are sufficient for the diagnosis of Hoffa’s disease and the most informative sections are the axial and sagittal views.

The most suggestive MRI sign is the presence of a significant oedema of the infrapatellar fat pad associated with a fibrous area, which may contain deposits of haemosiderin and calcifications.

Figure 10. a–c: case 5. Surgery by the anterolateral approach (a–b) showing Hoffa’s fat pad (arrow) and a large tumour covered with cartilage (arrowheads). Note the size of the lesion relative to the imaging measurements. The gross appearance (c) suggested an osteochondroma with a bony central part (arrow) covered with cartilaginous tissue (arrowheads). Histological examination of the surgical specimen confirmed the diagnosis of osteochondroma.
Radiography is useful in the particular at the ossified stages. Conservative treatment is proposed as first-line therapy based on ice, physiotherapy (strengthening of the quadriceps and particularly the vastus medialis muscle) and oral NSAIDs associated with different degrees of immobilisation. Injections of corticosteroids into Hoffa’s fat pad may also be effective [14].

In case of failure of conservative treatment or if Hoffa’s disease has become chronic, arthroscopic resection remains the treatment of choice.

Disclosure of interest

The authors declare that they have no conflicts of interest concerning this article.

References