10 Infrapatellar Fat Pad Lesions, Loose Bodies, Prepatellar Bursae

10.1 Technique and Method

Along with T1-weighted imaging, T2-weighted and fat-suppressed sequences are particularly suited to identify lesions within the adipose tissue of Hoffa's fat pad. Additional imaging after intravenous contrast medium administration may be useful in assessing reactive synovial proliferation or tumor-related changes.

10.2 Anatomy

Hoffa's fat pad is a malleable structure lying below the patella between the synovial membrane and the fibrous membrane of the joint capsule where it fills a variable space whose configuration changes with the movement of the joint. The infrapatellar fat pad is wedge-shaped and may continue proximally in three synovial plicae.

The prepatellar bursa may be subcutaneous, subfascial, or subtendinous in location and never has a connection to the joint cavity.

10.3 Normal MRI Appearance

Hoffa's fat pad consists of fatty tissue divided into compartments by fibrous structures. Consequently, its signal is isointense to fat in all sequences, i.e. markedly hyperintense on T1-weighted images, moderately hyperintense on T2-weighted images, and hypointense on relatively T2-weighted images (Fig. 10.1).

The prepatellar and infrapatellar bursae are hypointense on T1-weighted images only in a flat zone extending no more than 0.5 cm in depth and typically do not show much increase in signal on relatively T2-weighted images or fat-suppressed T2-weighted images.

10.4 Pathomechanism/Pathophysiology

- Hoffa's disease – the enlargement of the infrapatellar fat pad by proliferation of fatty tissue – is no longer considered a separate disease entity. Instead, it is now held that it is a condition occurring secondary to other disorders of the knee area.
- Chronic irritation of the knee or overuse may cause symptomatic fibrosis and hyperplasia of a plica, in particular of the medial patellar plica.
- Intra-articular loose bodies occur in articular chondromatosis and severe degenerative joint disease (gonarthrosis) or represent displaced bone fragments detached from the native bone in aseptic bone necrosis and chondral or osteochondral fractures.
- Prepatellar bursitis may be acute or chronic but more important is the distinction of purulent and nonpurulent inflammation of the bursa.

10.5 MRI Signs of Abnormal Findings

Fat Pad Hypertrophy

Fatty tissue proliferation of Hoffa's fat pad most often leads to posterior extension toward the intercondylar fossa and may result in reversible impingement of the protruding parts, seen as hypointensity on T1-weighted images and increased signal intensity at relative T2-weighting (Fig. 10.2).
Fat Pad Tears

Tears of the infrapatellar fat pad are depicted by MRI as disruptions of surface continuity. Fluid having entered the cleft is identified by a reduced signal intensity on T1-weighted images and increased signal on relative and pure T2-weighting. There may be necrosis as a secondary complication (with low or absent signal intensity on all sequences; Figs. 10.3–10.5).

Fat Pad Inflammation (Hoffa’itis)

Inflammation is characterized by a diffuse signal decrease of the fat pad on T1-weighted images and an increased signal intensity on relative T2-weighting. Reactive exudative or proliferative synovial inflammation associated with rheumatoid arthritis may involve the fat pad and is identified on MRI as focal signal changes with otherwise normal signal intensity (Fig. 10.6).

Fat Pad Tumors

Ganglion-like cysts may occur within Hoffa’s fat pad as well as circumscribed focal areas of synovial proliferation and synoviomas. These changes appear hyperintense on T2-weighted images. Most ganglion cysts show partial septation. Intravenous administration of a contrast medium is in particular required when assessing synovial proliferation (Figs. 10.7–10.11).

Table 10.1. Characteristic signal intensities

<table>
<thead>
<tr>
<th></th>
<th>T1w</th>
<th>T2w</th>
<th>T2*</th>
<th>rho-w</th>
<th>FAT-SAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hoffa’s fat pad</td>
<td>↑↑</td>
<td>↑</td>
<td>0</td>
<td>↑</td>
<td>0–↑</td>
</tr>
<tr>
<td>Fat pad tear</td>
<td>0–↑</td>
<td>↑↑↑</td>
<td>↑↑↑</td>
<td>↑↑↑↑</td>
<td>↑↑–↑↑↑</td>
</tr>
<tr>
<td>Fat pad inflammation</td>
<td>↑</td>
<td>↑–↑</td>
<td>↑–↑</td>
<td>↑↑</td>
<td>↑↑–↑↑</td>
</tr>
<tr>
<td>Bursitis</td>
<td>0–↑</td>
<td>↑↑↑</td>
<td>↑↑↑</td>
<td>↑↑</td>
<td>↑↑</td>
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0 No signal; ↑ low SI; ↑↑ intermediate SI; ↑↑↑ high SI.

Intra-articular Loose Bodies

Loose bodies in the joint space have low or absent signal intensity in all sequences and can be clearly delineated from hyperintense fluid, especially on T2-weighted images. Such loose bodies comprise articular chondromas, joint osteomas with marrow signal (cf. Figs. 11.2, 11.3, 11.15, and 11.16) as well as clusters of small hemosiderin-laden particles, depicted as signal voids, in pigmented villonodular synovitis (Figs. 10.8, 10.9 and Figs. 17.32, 17.33).

Chronic Bursal Irritation

Chronic irritation of a bursa is primarily characterized by increased intrabursal fluid volumes, appearing as correspondingly larger areas of hyperintensity on relative or pure T2-weighting with signal reduction on T1-weighted images. Hemorrhagic components in the fluid may produce a slightly hyperintense signal on T1-weighting (Figs. 10.16–10.24).

10.6 Clinical Role of MRI Findings

MRI may contribute important information in differentiating fatty tissue proliferation of the infrapatellar fat pad (Hoffa’s disease) from other conditions such as tumors.

A medial patellar plica of variable extent and shape is present in about half of all knees. Treatment