CASE OF THE MONTH

A case of chronic knee pain and swelling

¹D DAS, MRCS, FRCR, ²D F SALLOMI, DMRD, FRCR and ²D C HOWLETT, MRCP, FRCR

¹Department of Radiology, Guy's and St. Thomas' Hospitals, London SE1 7EH, UK, and ²Department of Radiology, Eastbourne District General Hospital, East Sussex, BN21 2UN, UK

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A 67-year-old female was referred to the rheumatology clinic with a 6 year history of progressively worsening left-sided knee pain and swelling. No other joints were affected and the patient was otherwise fit and

well. There was no history of trauma. A plain radiograph of the left knee demonstrated a large suprapatellar pouch effusion (Figure 1).

- What are your differentials?

Differentials

The clinical and radiological findings are consistent with monoarthritis, and the differentials can be divided into three broad categories:

Figure 1. Lateral radiograph of the left knee demonstrating suprapatellar soft-tissue density consistent with an effusion (asterisk).

Figure 2. Axial T_2^* image of the left knee. High-signal effusion fluid can be seen within the joint, and multiple low-signal synovial projections are demonstrated throughout the suprapatellar pouch (arrows).

Address correspondence to: D Das, Department of Radiology, Guy's and St. Thomas' Hospitals, London SE1 7EH, UK. E-mail: d_das2000@hotmail.com

Figure 3. Sagittal T_1 image of the left knee. There are multiple high-signal projections arising from the synovium of the suprapatellar pouch (arrows). The large joint effusion is demonstrated as low signal (asterisk).

Figure 4. Coronal T_1 image of the left knee. There are multiple high-signal synovial projections that have a villous appearance (black arrows). A frond-like mass can also be seen arising from the anterior synovium (white arrows).

- 1) joint infection;
- 2) arthropathy (e.g. gout, rheumatoid arthritis, inflammatory osteoarthritis etc.); and
- 3) synovial disorders (e.g. non-specific synovitis, pigmented villonodular synovitis (PVNS), synovial osteochondromatosis, synovial haemangioma etc.).

Synovial fluid aspiration was unremarkable in terms of bacteriology and crystal microscopy; plasma white cell count, rheumatoid factor assay auto-antibody screen were all negative. However, serum erythrocyte sedimentation rate (ESR) was raised to 137 mm h^{-1} . Given the lack of any significant bony abnormalities on the initial radiograph, non-specific synovitis was suspected and treatment commenced with non-steroidal anti-inflammatory drugs, and a single dose of intra-articular steroid. An MRI scan of the knee was requested to exclude any underlying pathology (Figures 2–5).

- What is the diagnosis? Would you recommend any further investigations?

Figure 5. Coronal proton density fat-saturated image. Signal loss is demonstrated from the synovial mass and all of the synovial projections seen in Figure 4 (arrows).

Diagnosis

MRI confirmed the presence of a large joint effusion (Figure 2), but reveals a diffuse, villous proliferation of the suprapatellar pouch synovium (Figures 2–4). In addition, a frond-like mass can be seen arising from the anterior aspect of the synovium (Figure 4). All of these changes are iso-intense to subcutaneous fat on all the sequences performed, including the fat-saturation sequence (Figure 5). These are classic features of lipoma arborescens.

No further investigations were required and the patient was counselled regarding arthroscopic synovectomy. At present this has been declined for personal reasons, and symptomatic therapy with oral steroids has been commenced in the interim.

Discussion

Lipoma arborescens is a rare benign synovial disorder caused by the proliferation of adipocytes within the subsynovial layer of joint capsules and bursae [1]. The resultant fatty mass produces characteristic frond-like and villous synovial projections that give rise to a macroscopic appearance reminiscent of a leafy tree, hence the name *arbour* (tree in Latin).

The aetiology of lipoma arborescens is unknown, and the majority of cases arise *de novo*. A significant minority of cases, however, are associated with trauma and various arthritides, such as rheumatoid arthritis and osteoarthritis, leading to the hypothesis that injury or inflammation may trigger adipocyte proliferation [2].

Lipoma arborescens occurs in both males and females and across a wide range of age groups, including children [1–3]. Typically it is a mono-articular disease with a predilection for the suprapatellar pouch of the knee. There are infrequent reports of lipoma arborescens presenting with bilateral and polyarticular disease, and isolated cases occurring within the hip, shoulder, ankle, within the extra-articular synovium of the subacromial and bicipitoradial bursae, and the ankle and wrist tenosynovium [1, 2].

Clinical presentation is insidious and the typical presenting complaint is a chronically swollen joint, usually the knee, with variable levels of longstanding pain and debilitation [1–3]. Laboratory tests including synovial fluid analysis for crystals and micro-organisms, and blood assays for inflammatory markers, rheumatoid factor and auto-antibodies are all usually unremarkable [4]. The raised ESR in the present case is likely to be secondary to the presence of a concomitant non-specific synovitis, another recognised association of lipoma arborescens [5].

Radiographs are non-specific and usually demonstrate opacity and fullness within the affected joint or bursa, partly secondary to joint effusion and partly owing to the proliferative synovium itself. Rarely, the opacity may demonstrate areas of heterogeneous lucency, which indicates the presence of fat [2].

MRI appearances, however, are pathognomonic and three broad morphological categories have been recognised [3]. The most common consists of villous synovial

projections occurring diffusely throughout the affected joint or bursa (Figure 2). The least common is an isolated frond-shaped synovial mass and the third morphology, with intermediate prevalence, is a combination of the first two categories and effectively represents the findings in our patient (Figure 4).

Diagnosis with MRI requires complete signal iso-intensity of all of the proliferative changes to subcutaneous fat and should be seen on each imaging sequence that is performed, including fat-suppression sequences [1–3]. The subsynovial fatty proliferations of lipoma arborescens do not demonstrate contrast enhancement; however, the presence of synovitis can cause post-gadolinium enhancement of the overlying synovial membrane [5]. In the largest series to date, Vilanova et al [1] have shown that unenhanced MRI is sufficient to make a diagnosis of lipoma arborescens without further investigation. Given the pathognomonic appearances in our patient, we elected not to administer contrast.

Lipoma arborescens has numerous additional findings on MRI, but by far the commonest is joint effusion, which is seen in almost all cases [1, 3]. Other findings, in descending order of frequency, include degenerative changes, meniscal tears, synovial cysts and bone erosions.

In terms of differentials, the only other synovial lesion that shows complete signal iso-intensity with fat is a synovial lipoma [1, 3]. This can be readily distinguished from lipoma arborescens, as synovial lipoma usually manifests as an isolated, well-defined, round or ovoid mass. The various other proliferative synovial disorders mentioned in the initial differential diagnoses, such as PVNS, synovial osteochondromatosis, and synovial haemangioma can all bear a superficial resemblance to lipoma arborescens in terms of their diffuse morphology and variable fat content, but none will show the complete signal iso-intensity of the entire lesion to fat that is required for diagnosis.

Lipoma arborescens can be effectively treated with synovectomy and the procedure can be performed either as an open operation or arthroscopically [4]. Non-surgical synovectomy, for example with intra-articular Yttrium-90, has also been used successfully in lipoma arborescens [6] and may be a less invasive option for our patient to consider in the future.

In conclusion, lipoma arborescens is a rare synovial proliferative disease with insidious and non-specific clinical presentation, but with pathognomonic MRI features. Familiarity with these imaging characteristics can obviate the need for any further investigation and expedite curative therapy.

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