Lipoma arborescens, or villous lipomatous proliferation of the synovial membrane, is a rare intraarticular lesion that usually involves the knee. It is characterized by villous proliferation of the synovium and extensive replacement of the subsynovial tissue by mature adipose cells. About 50 cases of lipoma arborescens have been reported [1]. Magnetic resonance (MR) imaging characteristically shows a synovial mass with a fat component and an arborescent or frond-like architecture on all pulse sequences. Here, we describe the imaging findings in lipoma arborescens of the knee in a young male. This rare disease should be considered in the differential diagnosis in patients with a chronically swollen knee.

Case Report

A 17-year-old male complained of painful swelling of the right knee for 1 year. He was a member of a basketball team, and a history of knee trauma during routine training was documented 4 years ago. Physical examination revealed swelling, especially over the suprapatellar pouch, and tenderness over the medial aspect of the right knee joint. The range of motion of the right knee was 0° to 130° (0°–150° for the left knee). No laxity or McMurray sign was noted. Plain radiographs showed soft tissue density in the suprapatellar bursa with foci of low density suggesting the presence of fat (Fig. 1). Computerized tomography revealed villous projections with fat attenuation filling the right knee joint and associated effusion (Fig. 2). MR imaging revealed a villous frond-like synovial mass with signal intensity similar to fat on all pulse sequences (Figs. 3 and 4). Under the impression of lipoma arborescens, open synovectomy was performed and revealed an extensive villous fatty mass growing over the entire synovial membrane (Fig. 5). Histologic examination confirmed the diagnosis and showed the subsynovial collection of mature adipose tissue lined by hypertrophied synovium.

Discussion

Lipoma arborescens is a rare condition characterized by replacement of subsynovial tissue by mature adipose cells, which appear as frond-like projections on synovial surfaces of the involved joint. It is usually a monoarticular condition and primarily occurs in the knee joint. However, it may also occur bilaterally [2–6], and in other joints including the hips [2, 7], shoulders [1, 8], wrists [9], and elbows [10]. The etiology is unknown. While some cases appear to arise de novo, some authors have reported that lipoma arborescens is a non-specific reactive process to a variety of insults and certain diseases such as rheumatoid arthritis and...
Lipoma Arborescens

Fig. 1. Plain lateral radiograph of the right knee shows a suprapatellar mass (arrows) with an area of low density indicating a fat component of this lesion. Intervening septal structures (arrowheads) can be seen in this fatty mass.

degenerative joint diseases [2, 3, 5, 6, 11, 12]. As expected, laboratory studies and arthrocentesis usually reveal no abnormalities. Because of the non-neoplastic nature of this condition, Hallel et al advocated the use of the name villous lipomatous proliferation of the synovial membrane instead of the potentially misleading term of lipoma arborescens [5]. Histologically, lipoma arborescens may be indistinguishable from a normal collection of subsynovial fat, with the only differences being its large size and frond-like macroscopic appearance [4, 6]. Definite pathologic diagnosis requires a large tissue specimen to demonstrate the complete proliferative pattern [4].

Plain radiographs in patients with lipoma arborescens show effusion or mass density in the involved joints. The repeated mechanical stress and injuries may predispose these joints to early osteoarthritic change. Direct radiographic evidence of fat content as in our patient is seldom reported [2]. Sonography can show a villous appearance and hyperechogenicity [13]. Computerized tomography can show an intraarticular frond-like mass with low attenuation indicative of fat and variable effusions, as well as the associated degenerative changes and the extent of the lesion. MR imaging shows an intraarticular synovial mass with frond-like morphology with high signal intensity. Signal intensity is readily suppressed by fat-selective presaturation.

Fig. 2. Axial precontrast computerized tomographic scan at the suprapatellar pouch level shows fat density villous synovial projections (arrows) with connective tissue septa (arrowheads) and associated joint effusions (e).

Fig. 3. Axial T1-weighted magnetic resonance image (TR/TE/NEX = 550/15/1.5) using a knee coil shows a frond-like synovial mass with signal intensity identical to subcutaneous fat and concurrent effusions (e) in the suprapatellar pouch.
Fig. 5. Operative photograph shows villous fatty tissue growth covering the entire synovial surface of the right knee.

Fig. 4. A) Sagittal fast spin echo proton density magnetic resonance image (TR/TE/NEX = 3500/13E/2) shows distension of the posterior joint capsule due to extension of the villous synovial lesion (arrowheads). B) Gadolinium diethylenetriamine pentaacetic acid enhanced sagittal T1-weighted image with fat saturation shows no enhancement of the synovial villous projections; however, linear enhancement is seen along the connective tissue septa (arrowheads). A focal area of synovial thickening with enhancement suggests concurrent chronic synovitis.

There are no magnetic susceptibility effects from the presence of hemosiderin or due to calcification. Lack of enhancement after injection of gadolinium diethylenetriamine pentaacetic acid (Gd-DTPA) excludes other synovial inflammatory or neoplastic processes [14]. Only 14 cases of lipoma arborescens with diagnostic imaging data have been previously reported. In our patient, MR imaging revealed enhancement of the connective tissue septa of the villous projections (Fig. 4B), a finding not previously described. MR imaging can also demonstrate the precise extent of involvement of lipoma arborescens and associated lesions of the ligaments, tendons, or menisci.

All conditions causing painless effusion and synovial thickening should be considered in the differential diagnosis. Synovial lipoma usually occurs in the infrapatellar bursa and is round or oval in shape [2, 3]. Synovial osteochondromatosis usually demonstrates typical chondroid calcification on plain radiographs [2]. On T1-weighted MR imaging, the marrow-containing loose bodies show signal void surrounding central high signal intensity of fat marrow [2, 3, 11]. T2-weighted imaging shows variable signal intensity depending on the degree of chondroid calcification [2, 3, 11]. Pigmented villonodular synovitis shows low signal intensity on both T1- and T2-weighted imaging owing to the paramagnetic effects of hemosiderin [2, 6, 11]. Contrast injection shows strong enhancement. Synovial hemangioma usually shows low signal intensity on T1-weighted imaging with intervening strands of high signal due to the presence of linear fibrofatty septa, and T2-weighted imaging shows a high signal intensity mass with hypointense linear fibrous septa [2, 11, 12]. Low signal foci in the lesion might be due to the presence of calcified phleboliths or signal void in
flowing vascular channels. Open synovectomy is curative for lipoma arborescens, and only one case of recurrence has been reported [15].

Data from the present case further suggest the superiority of MR imaging for tissue characterization in lipoma arborescens. With the increasing application of MR imaging, more precise preoperative diagnosis and small lesion detection can be achieved, which can facilitate the meticulous surgical planning required for treatment of this condition.

References