Pigmented villonodular synovitis of the knee

Clinical History:
A 59-year-old female patient presented with a 6-month history of spontaneous knee swelling and intermittent pain. Joint effusion was haemorrhagic on aspiration. She had no history of a bleeding disease or trauma. Physical examination revealed mechanical blockage of the knee joint.

Imaging Findings:
Plain radiographs demonstrated suprapatellar swelling and degenerative changes of the knee joint (Fig. 1a, 1b). Sagittal T2-WI (Fig. 2a, 2b, 2c) and axial PD fat suppressed (Fig. 3a, 3b) MRI images disclosed joint effusion in multiple recesses demonstrating low-signal-intensity rim with nodular thickening, attributed to a thickened synovium. In T2* sequence the nodular thickened synovium presented blooming artefact consistent with deposition of haemosiderin (Fig. 4a, 4b, 4c). Sagittal T1-WI fat-suppressed postcontrast images showed enhancing synovium and villonodular synovial fronds (Fig. 5a, 5b). Ultrasonography also demonstrated the joint effusion with hypertrophied synovial fronds, mildly hypervascular in colour Doppler ultrasound (Fig. 6a, 6b).

Imaging findings were consistent with diffuse pigmented villonodular synovitis, confirmed histologically after arthroscopic synovectomy (Fig. 7a, 7b).

Discussion:
Pigmented villonodular synovitis (PVNS) represents an uncommon benign neoplastic process that may affect the synovial tissue intraarticularly (diffusely or focally, PVNS) or extraarticularly involving the bursa (pigmented villonodular bursitis, PVNB) or the tendon sheath (pigmented villonodular tenosynovitis, PVNTS) [1, 2]. Hypertrophic synovium may appear villous, nodular, or villonodular with prominent haemosiderin deposition. PVNS and PVNB are usually located in the knee, followed by the hip, whereas PVNTS in the hand and foot [3, 4]. Localised disease represents 77% of cases compared with 23% of the diffuse form and is frequently located in Hoffa’s fat body [5]. It usually occurs between 20-45 years of age [6]. Most of the patients present with monoarticular complaints of a soft-tissue mass, pain or swelling [5].

In PVNS of the knee, plain radiographs may appear normal or demonstrate a periarticular soft tissue density, expansion of the suprapatellar pouch and local osseous changes [8], like extrinsic bone erosions, osteopenia, joint space narrowing, intraarticular osteochondral bodies and degenerative disease, however, more frequently encountered in smaller capacity joints such as the hip, shoulder, elbow and ankle. In the hip, concentric erosion of the femoral head produces a characteristic “apple core” deformity [10]. In the diffuse form ultrasonography may...
reveal joint effusion, heterogeneous echogenic masses, and thickened hypoechoic synovium that may have nodular and villous projections. In the localised form a solitary focal synovial mass may be seen. Doppler imaging may detect increased blood flow [3, 7].

MRI reveals joint effusion generally surrounded by, plaque-like and less frequently villous or villonodular, thickened synovial rinds of haemosiderin-laden tissue. Synovial thickening may show intermediate-low signal intensity on T1-WI and low on T2-WI MR-images, due to T2-relaxation time shortening caused by haemosiderin. An enlargement of the low-signal-intensity areas (“blooming”), on gradient-echo-images, is consistent with the presence of haemosiderin and is nearly pathognomonic of PVNS. Variable degree of enhancement is present in post-contrast-images [9].

Additional MRI findings include bone erosion, subchondral cysts, septations, oedema in adjacent bone or soft tissue and articular cartilaginous defects [4]. MRI defines disease extent in order to guide complete surgical excision (the treatment of choice). Differential diagnosis should include a) haemophilic arthropathy, clinical history of haemophilia is necessary, b) haemorrhagic synovitis, requires history of trauma, c) rheumatoid arthritis, a systemic inflammatory disorder usually presented as a polyarticular disease, d) hypertrophic synovitis, thickened synovium does not present blooming artifact in gradient-echo-images, e) synovial haemangioma, serpentine vascular channels are invariably present [3].

**Differential Diagnosis List:** Pigmented villonodular synovitis of the knee, Haemophilic arthropathy, Haemorrhagic synovitis, Rheumatoid arthritis, Hypertrophic synovitis, Synovial haemangioma

**Final Diagnosis:** Pigmented villonodular synovitis of the knee

**References:**


Description: Plain films of the knee joint: sclerotic margins (blue arrow), bone sclerosis of the tibial condyles (red arrow), degenerative changes in the tibial intercondylar eminence (green arrow) (Fig. 1a), large suprapatellar swelling (x) (Fig. 1b). Origin: Department of Radiology, University Hospital of Alexandroupolis, Democritus University of Thrace, Greece
Description: Consecutive sagittal T2-WI images demonstrate joint effusion in the suprapatellar (blue arrow), popliteal (green arrow) and pregastrocnemius (red arrow) recess. Note the low signal intensity rim (arrowhead) with areas of nodularity (yellow arrow). Origin: Department of Radiology, University Hospital of Alexandroupolis, Democritus University of Thrace, Alexandroupolis, Greece
Figure 3

Description: Axial PD fat-suppressed images demonstrate joint effusion (blue arrow) surrounded by a low signal intensity rim (arrowhead) with areas of nodularity (red arrow). Origin: Department of Radiology, University Hospital of Alexandroupolis, Democritus University of Thrace, Alexandroupolis, Greece
Figure 4

Description: Consecutive T2* axial images demonstrate blooming artifact (red arrows) in the areas of nodularity, owing to haemosiderin deposition. Origin: Department of Radiology, University Hospital of Alexandroupolis, Democritus University of Thrace, Alexandroupolis, Greece
Description: Sagittal T1-WI fat-suppressed images before and after intravenous gadolinium administration demonstrate diffuse enhancement of the thickened synovium (blue arrows), as well as of villonodular synovial fronds (red arrows). Origin: Department of Radiology, University Hospital of Alexandroupolis, Democritus University of Thrace, Alexandroupolis, Greece
Figure 6

Description: Ultrasound images demonstrate diffuse synovial thickening (blue arrow), thickened villonodular synovial fronds (red arrow) (Fig. a) and discrete synovial hypervascularity in Colour Doppler (Fig. b). Origin: Department of Radiology, University Hospital of Alexandroupolis, Democritus University of Thrace, Alexandroupolis, Greece
Description: Photographs obtained during arthroscopic synovectomy show thickened villonodular fronds. Origin: Department of Orthopaedic Surgery, University General Hospital of Alexandroupolis, Democritus University of Thrace, Alexandroupolis, Greece