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Lipoma Arborescens of the knee: a Series of three uncommon Maladies of Synovium

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ABSTRACT
Lipoma arborescens is a slow-growing, intraarticular lesion that is benign in nature andis characterized by a villous lipomatous proliferation ofthe synovium. It is mostly amonoarticular condition involvingmajor jointssuch as the knee, ankle, hip, shoulder,and elbow,however, it can also be polyarticular. Here,we describecases of threepatients, who presented with a history of gradual progressive unilateral swelling involving the knee joint with two of them havingan antecedent history of trauma. The characteristic findings which were noted on MR imaging were the presence of villous synovial proliferation (predominantly of the suprapatellar bursa) with signal intensity similar to fatty tissue and was associated joint effusion in both the cases.
Keywords - Lipoma arborescens, Ultrasonography, MRI, CT,Synovium, Joint, Pathology

I. INTRODUCTION

Lipoma arborescence (diffuse articular lipomatosis) is a rare benign intraarticular lesioncharacterized by subsynovial villous proliferation of mature fat cells.[1]This lesion has a characteristic frond-like appearance of hypertrophied synovium,aptly portrayed by the word ‘‘arborescens’’ (tree-like). This is typically a monoarticularcondition commonly affecting the knee joint,particularly the suprapatellar pouch.[2]

The exact etiology is unknown,but it has been hypothesized to be due to a non-specificreactive synovial fatty proliferation in response to chronictraumatic or inflammatorystimuli rather than a neoplasticprocess.[3],[4] It equally affects males and females, withthe highest incidencein the fourth and fifth decades of life.[3],[5],[6]Several other joints are also involved apart from the knee, which include the shoulder, hip, elbow, ankle, and wrist, aswell as the periarticular bursae and tendon sheaths.[7],[8],[9],[10]

Clinically, the patient presents with a slow-growingpainless swelling,associated with intermittent effusion of the joint. Magnetic Resonance (MR) Imaging is considered as themodality of choice.[3],[4]The MR imaging appearance of a fatty proliferation of a synovial lesion, guides to a specific diagnosis of lipoma arborescens. Lipoma arborescens is an extremely uncommon tumour of the synoviumand is rarely seen in day-to-day practice. Here, we present three patients with lipoma arborescens of the knee and their clinical appearance, symptoms, imaging, and histological characteristics.

CASE SCENARIOS

Patient 1- A 29-year-old woman presented with a history of slowly progressive swelling of her right knee for 2 years, which was present while climbing downstairs and sitting with her knee flexed. Shegavean alleged history of trauma to right knee5years back. Patient denied anyhistory suggestive of tuberculosis.

On clinical examination, a diffuse swelling was seen in the suprapatellar region of the right knee,with mild restriction of motion.However, there wasno evidence of meniscal lesion or anteroposterior and collateral instability in the patient. (Figure1)

All the laboratory parameters including total leukocyte count, the RA factor, C- reactive protein, ESR were within normal limits.Plain radiograph of right knee joint showed a normal alignment of bones with maintained right knee joint space and a rounded homogenous soft tissue density within the suprapatellar recess. An ill-defined radiolucency was also seen superior to popliteal fossa region. No degenerative changes wereseen.(Figure-2)

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USG of the right kneerevealedthe presence of joint fluid surrounded by well-defined lobulated and frond like hyperechoic soft tissue masses arising from the hypertrophied synovium. No vascularity was seen with in these projections on colour doppler. (Figure-3)

MRI of the right knee joint done on 1.5T scannerrevealed multiple intraarticular frond-like soft tissue masses seen projecting into the joint cavity from the synovium which showed a high signal intensity on T1W and T2W images and low signal intensity on fat-saturated sequences.Alarge knee joint effusion and Baker's cyst were also observed. On post contrast sequences,enhancement was seen in the frond like projection, however there was thin linear, continuous enhancement of the joint synovium suggestive of synovitis.(Figure-4).

Percutaneous synovial biopsy with 14G coaxial biopsy gunrevealedsynovial hyperplasia with villous projections of mature adipose cells and focal chronic inflammatoryinfiltrates. No signs suggestive of malignancy were seen.(Figure-5) Synovial fluid for cytology was composed of cellular components which included neutrophils, few lymphocytes and macrophages.

Patient 2- A38-year-old man presented with the chief complaint of a gradual progressive swelling involving the left knee jointsince past four years,that occurred only during flexion of knee joint.He gave no history of trauma or tuberculosis in the past.

On clinical examination, aminimal swelling was seen around the left knee joint, predominantly in suprapatellar region. The joint had no restriction of movement in any direction, with no sign suggestive of meniscal, anteroposterior or collateral instability.

Biochemical and laboratory parameters including complete blood counts, C- reactive protein, RA factor, HLAB27, ESR were with in normal limits.

Plain radiograph demonstrated a well-defined soft tissue opacity in the popliteal fossa region causing obliteration of posteromedial fat planes. (Figure- 6). There is normal alignment of the left knee joint without any evidence of degenerative changes or bony erosions.

Ultrasonography of left kneerevealedfluid collection within suprapatellar bursa with multiple echogenic frond like soft tissue masses filling and projecting into the joint cavity. On colour doppler, no vascularity was seen with in these projections (Figure-7)

MRI left knee was done using 1.5T scanner, which revealed mild joint effusion,synovial thickening with multiple lipomatous fronds showing signal intensity parallel to that of subcutaneous fat on T1W and T2Wand fat suppression images. On post contrast imaging, no enhancement was seen in those frond-like projections, but there was thin linear continuous enhancement of the joint synovium noted suggestive of synovitis.(Figure 8)

Histopathological examination findings showed broad papillary projectionswith stroma consisting of lobules of adipose tissue (Figure-9)

Patient 3- A 23-year-old woman presented with a history of slowly progressive painless swelling of her right knee for 2 years. She gave an alleged history of trivial trauma to right knee 3 years back. Patient denied any history suggestive of tuberculosis or autoimmune disease.

On clinical examination, a moderate swelling was seen in the right knee predominantly in the suprapatellar region, withoutany restriction of motion. There was no evidence of meniscal lesion or anteroposterior and collateral instability in the patient.All the laboratory parameters including total leukocyte count, the RA factor, C- reactive protein, ESR were within normal limits.

CT scan of the right knee done on 64 slice GE scanner revealed intraarticular frond like projections showing low density fat attenuation with moderate right knee joint effusion. (Figure 10)

On MRI right knee of the patient, intraarticular frond like synovial proliferations were noted eliciting high signal on T1 and T2 weighted images and appeared supressed on fat saturated images, with no obvious post contrast enhancement, seen along with joint effusion. These findings were more pronounced within the suprapatellar bursa. (Figure-11) Histopathological examination findings showed villous papillary projections of adipose tissue within the synovial proliferations.

II. DISCUSSION

Lipoma arborescens is abenign ailment that is characterized by diffusereplacement of subsynovial tissue by mature adipocytes associated with prominent villous transformation.[12]The etiology is unclear, however,an association with certain conditions such as degenerative joint disease, diabetes mellitus, rheumatoid arthritis, and psoriatic arthritis, suggests the possibility of anunderlyinginflammatory process.[4],[13]

Lipoma arborescensis a monoarticular conditionthat follows aninsidious clinical course and usually occurs without any gender predilection. The hypothesis of lipoma arborescens being a reaction to chronic inflammation is supported by

the histologic finding of a mononuclear cell infiltrate in the underlying synovial membrane.[6],[12] Lipoma arborescens can be classified into primary and secondary types. The Primary type is a rare form of synovial lipomatosis characterized by the presence of hypertrophy and degenerative knee joint changes. The secondary type refers to lipomatosis that results from chronic irritation of the synovium and is the most common type of lipoma arborescens.[12],[14],[15]

Magnetic resonance imaging (MRI)is the gold standard investigation used for the diagnosis of Lipoma arborescens. The diagnostic criteriacomprise of the presence ofsynovial lined villous proliferation, presence of villi, that are diffusely infiltrated by mature fat, and the involvement of a large joint.[16]

In our case,the presence of joint effusion and villous lipomatous proliferation of the synovium were seen,showing signal intensity similar to the subcutaneous fat.No finding suggestive of degenerative joint disease was seen in any of the three cases. The differential diagnosis of lipoma arborescens of the knee includes pigmented villonodular synovitis, intra-articular lipoma of the knee, synovial chondromatosis, synovial haemangioma, and rheumatoid arthritis.A proliferative synovial mass with villous architecture is seen on MRI which is isointense to the subcutaneous fat in all MR sequences.

The recommended treatment of Lipoma arborescens is synovectomy.[12],[16]Previously,Lipoma arborescens was treated using open synovectomy; however, it wasassociated with severalmorbidities like the stiffness of the knee and occurrence ofhematoma. Open synovectomy has mostly been replaced with the advent ofarthroscopic synovectomy, which has theadvantage of decreased morbidity and faster recovery.[17],[18] The first patient of our case series was referred for arthroscopic synovectomy and the other twopatients weremanaged conservatively. As long-term undiagnosed lipoma arborescens carries a significant risk for degenerative osteoarthritis, an early diagnosis and timely treatment can prevent the further progression of the disease.

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CONFLICT OF INTEREST

There exists no conflict of interest for this article.

IMAGES

Figure 1: Showing diffuse swelling over suprapatellar pouch of the right knee

Figure 2a,2b: Frontal and lateral radiograph of right knee joint showing a well-defined rounded homogeneous soft tissue density within the suprapatellar recess and an ill-defined radiolucency located superior to popliteal fossa region.2b

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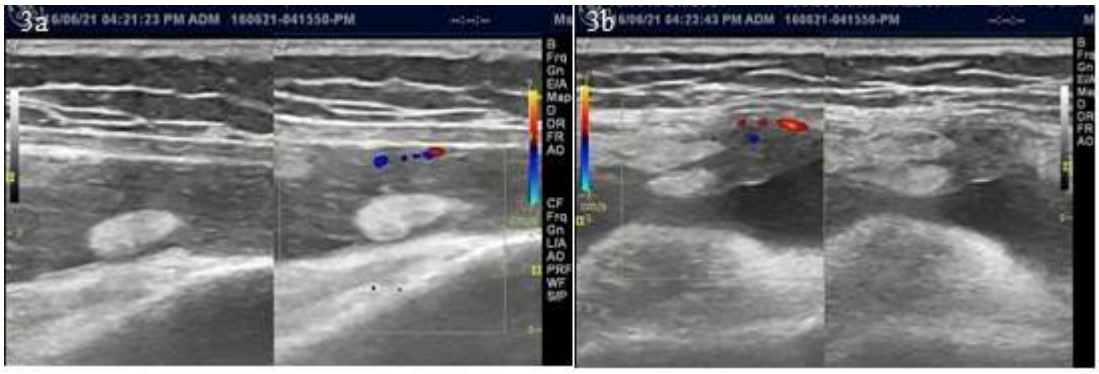

Figure 3a,3b: USG of right knee joint showing a large hypoechoic fluid collection containing well defined lobulated and frond like soft tissue masses that are similar in echotexture with adjacent subcutaneous fat, arising from the hypertrophied synovium showing no vascularity on colour doppler.

Figure 4A,4B,4C: Axial, T1, T2, PD fat saturated MR images of the right knee displaying multiple intraarticular frond like soft tissue masses showing high signal on T1W and T2W images.Figure 4D,4E,4F: Sagittal T1,T2 and PD fat saturated MR images depict the similar findings with large knee joint effusions and associated finding of Baker's cyst

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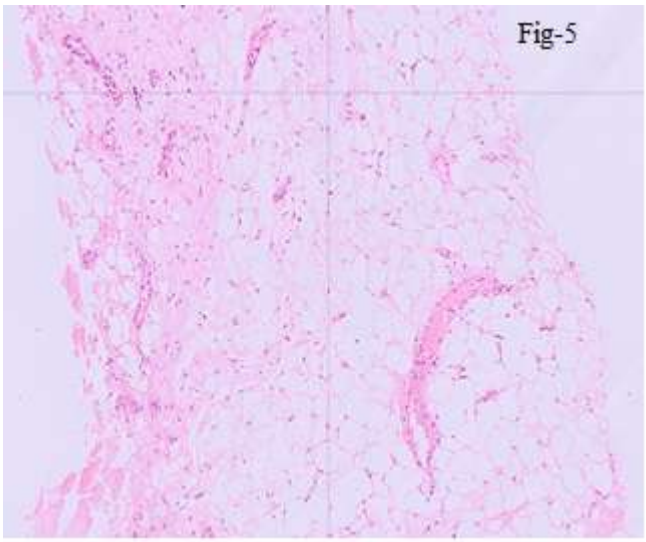

Figure 5: Photomicrograph (Hematoxylin and Eosin stain) shows focal synovial hyperplasia and villous projections of fat lined synovial cells with focal chronic inflammatory infiltrates

Showing diffuse swelling over suplar pouch of the right knee

Figure 6a,6b: Radiographs of the left knee in AP and lateral views showing a well-defined soft tissue opacity in popliteal fossa region causing obliteration of posteromedial fat planes

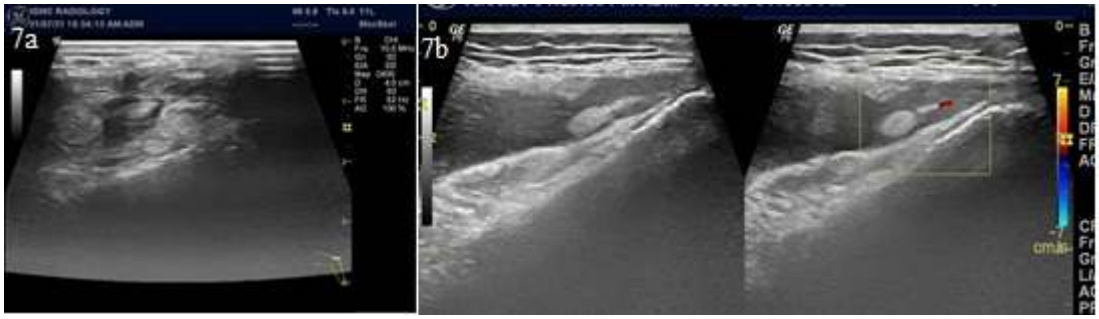

Figure 7a,7b: Longitudinal USG images of left knee demonstrating minimal joint effusion with multiple echogenic frond like soft tissue masses filling and projecting into joint cavity.

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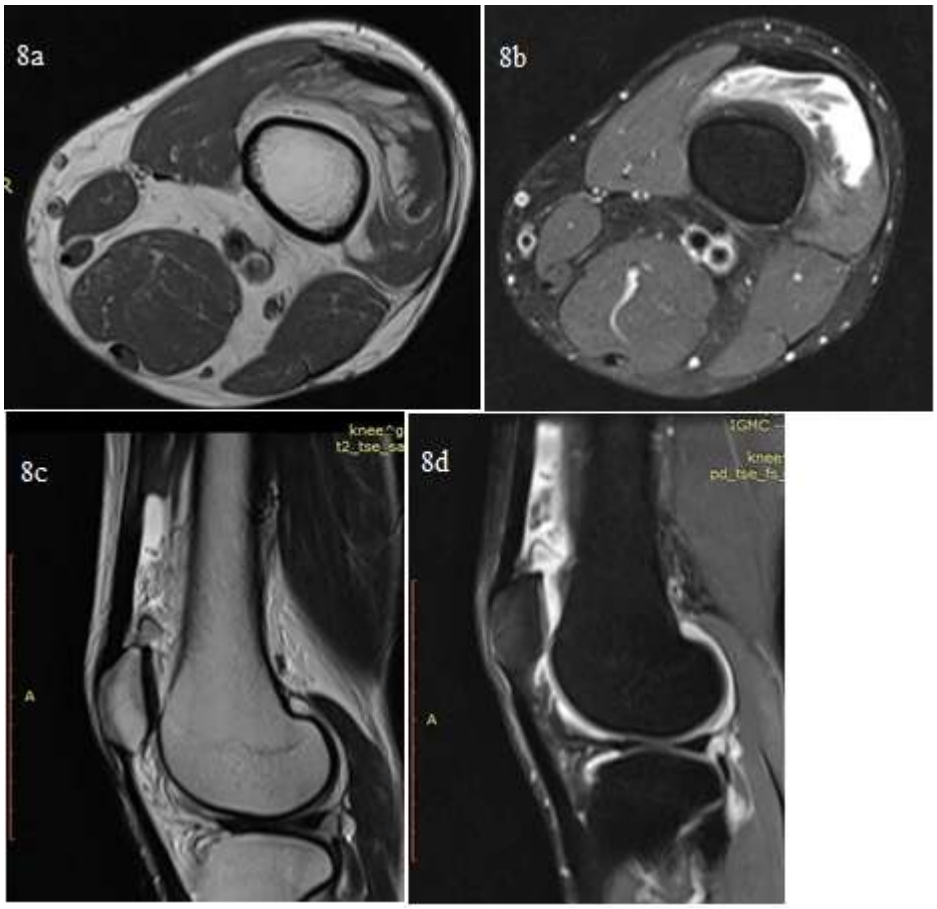

Figure 8A,8B [MR Axial T1TSE, PD fat saturated(post contrast) sequence] Figure 8C,8D [Sagittal T2TSE, PD fat saturated sequence] showing synovial hypertrophy with multiple lipomatous fronds showing high signal intensities similar to subcutaneous fat on T1W, T2W axial images and low signal on fat suppressed images with moderate left knee joint effusion.

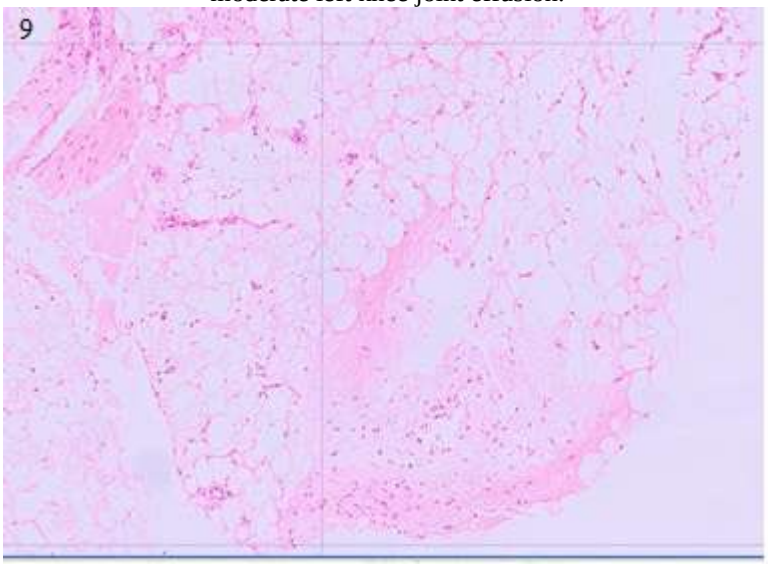

Figure 9: Histopathological Photomicrograph showing broad papillary projections with stroma consisting of lobules of mature adipose tissue and focal areas of inflammatory infiltrates

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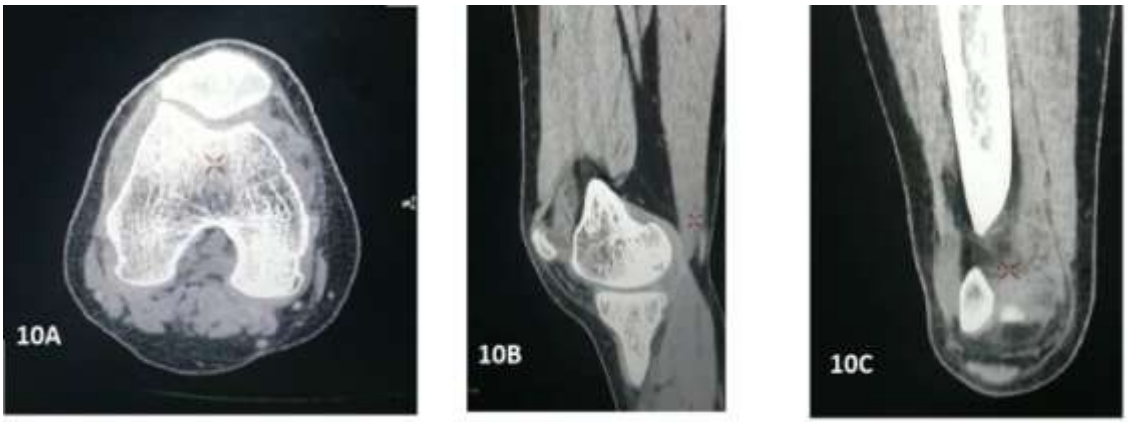

Figure 10a,10b,10c: Axial, Sagittal and Coronal CT sections of right knee joint showing low density intraarticular frond like projections with joint effusion, which is more pronounced within suprapatellar bursa

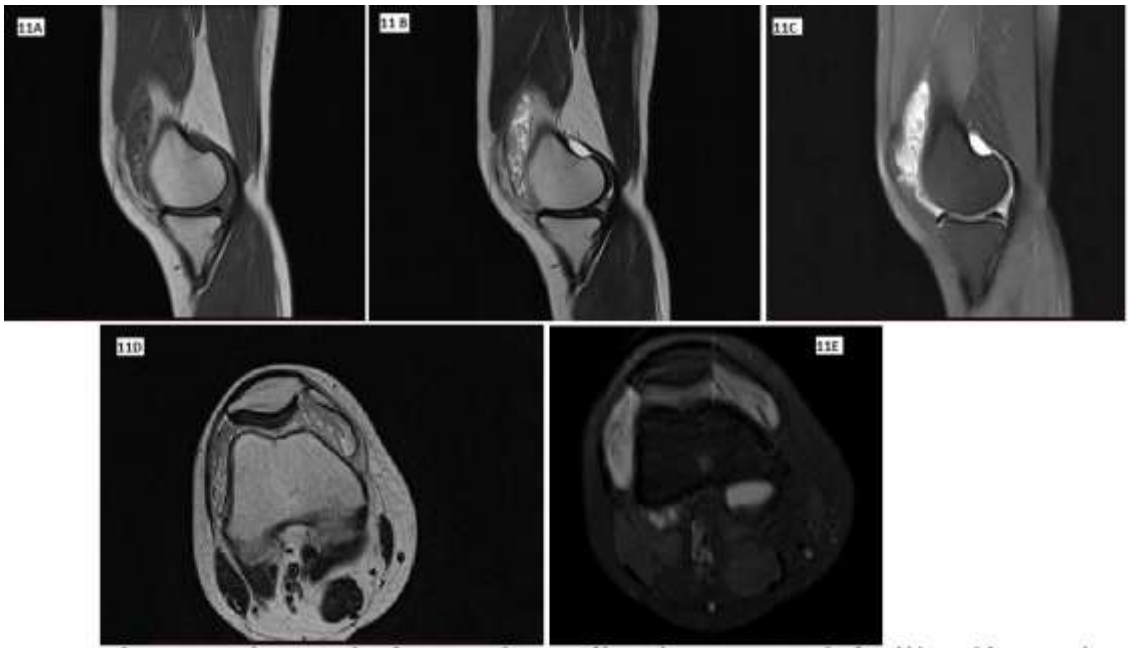

Figure 11A,11B,11C: Sagittal T1W, T2W, PD fat saturated images of right knee showing intraarticular frond like projections eliciting high T1, T2 signals and low signal on fat saturated sequences with knee joint effusion more pronounced in suprapatellar recess. Figure 11D,11E: Axial,T2W and PD fat saturated (post contrast) images showing similar findings of T2 hyperintense synovial fronds showing no enhancement on PD fat sat post contrast sequence