Lipoma Arborescens of Knee Joint: Role of Imaging

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ABSTRACT

A 23 year old Asian female presented with swelling of right knee joint for 5 years with history of exacerbations and remissions of symptoms. She was initially diagnosed as a case of suprapatellar bursitis based on clinical and X-ray findings. Further evaluation with higher imaging modalities was pathognomonic of lipoma arborescens. Patient underwent synovectomy and the diagnosis was confirmed histologically. We describe a histologically proven case of lipoma arborescens to highlight the imaging findings on X-ray, Ultrasound and Magnetic resonance imaging with arthroscopic correlation. The unique feature of this case report is multimodality imaging correlation with arthroscopy and histopathology findings. We have highlighted the pathognomonic imaging findings of this rare but benign intra-articular lesion and also discussed the differential diagnosis in detail.

CASE REPORT

CASE REPORT

A 23 year old Asian female presented to the orthopaedic clinic with a history of painless swelling of the right knee joint for 5 years associated with exacerbations and remissions. There were no exacerbating or alleviating factors. She consulted a general physician, but her complaints did not subside and the swelling increased to attain the present size. She then came to the orthopaedic OPD at our hospital.

The general physical examination was unremarkable. Local examination revealed a swelling of the right knee joint (Figure 1) with fullness in the suprapatellar region. Fluctuation and patellar tap test were positive. She was then referred to the radiology department for knee joint x ray.

Her laboratory tests which included complete blood analysis, HIV, HBsAg and synovial fluid analysis for acid fast bacilli were normal. Synovial fluid routine and culture showed no growth after 48 hours. PCR (polymerase chain reaction) for tuberculosis was negative for mycobacterium TB and non TB mycobacterium. (SeeplexR MTB, NTM ACE Detection). Uric acid levels were normal and rheumatoid factor was negative.

X-ray AP and lateral views of the right knee joint (Figure 2) revealed fullness of suprapatellar pouch due to a soft tissue mass like lesion in the suprapatellar region, visualized bones appeared normal with maintained joint space. The Patient was then referred to Ultrasonography, with a provisional clinical diagnosis of suprapatellar bursitis.

High resolution Ultrasonography (Figure 3) revealed frond like villous projections of the synovium with associated joint effusion. A provisional diagnosis of lipoma arborescens (LA) was made, based on the presence of frond like villous projections and joint effusion.

The Patient was then referred to Magnetic resonance imaging (MRI) for further detailed evaluation. Sagittal T1 weighted image (Figure 4) showed high signal intensity frond like synovial thickening in the suprapatellar bursal region with effusion. Coronal and axial T2 weighted image (Figure 5) showed intermediate to high signal intensity of the villous projections similar to subcutaneous fat. Fat suppressed proton density images (Figure 6) revealed complete suppression of

signal intensity of villous projections in suprapatellar bursal region. Based on classic MRI findings of frond like synovial villous projections with associated fatty signal and joint effusion on various MRI sequences, a diagnosis of Lipoma arborescens was made.

The patient further underwent arthroscopy (Figure 7) which revealed the frond like projections seen on Ultrasonography and MRI. This was followed by synovectomy and a specimen sent for histopathological examination (Figure 8), which revealed multiple villi, having fatty core lined by hyperplastic synoviocytes. There was marked chronic inflammatory cell infiltration of stroma. These findings were consistent with lipoma arborescens.

DISCUSSION

LA is an uncommon intra-articular lesion consisting of villous lipomatous proliferation of the synovium seen in the knee joint, usually in the suprapatellar pouch. This condition is also seen in the glenohumeral joint, hip joint, elbow joint and subdeltoid bursa [1]. Less than hundred cases have been reported[2].

LA is a benign lesion arising from the synovium. It is characterized by villous proliferation of fat cells. The proliferating cells appear organic and resemble a tree, thus the name 'arborescens', from the Latin word 'arbor' for tree. The exact cause is not known. One explanation is that the synovial hyper-proliferation occurs in response to trauma and inflammation. LA is usually associated with trauma, osteoarthritis and rheumatoid arthritis but there have also been cases without any underlying cause[3].

There are 2 types of LA - primary and secondary. The primary type is usually not associated with degeneration of the knee joint. The secondary type is more common than the primary type and is defined as lipomatosis associated with chronic irritation. LA is a reactive process of the synovium due to chronic irritation, seen in conditions like degenerative joint diseases, trauma, meniscal injuries, chronic synovitis or arthritis, but it is not a true neoplasm[4]. Lipoma arborescens is noted between the age group of 9 to 68 years with an equal predominance both in women and men[5].

Patients present with chronic painless swelling of the knee of several years duration. The lesions are non tender and soft in consistency. Patients usually do not have history of trauma but their symptoms are cyclical with intermittent exacerbation caused due to trapping of the lipoma villi in the joint space [4].

Laboratory tests like ESR and serologic studies for rheumatoid factor and uric acid levels are normal. Joint aspirate is usually negative for crystals and cells. Culture for joint fluid is also negative [1].

Our patient was a 23 year old female who presented with painless swelling of the knee joint for five years with exacerbations and remissions. There was no under lying cause. The swelling was soft on palpation and non tender. Her lab tests which included complete analysis of blood, synovial fluid and serology were all negative.

Diagnosis - Role of imaging

Radiographs show a soft tissue lesion in the suprapatellar pouch often associated with osteoarthritic changes [6]. Ultrasound reveals frond-like projections of the mass which move in real time with an associated joint effusion [3].

X-ray -AP and lateral views of the right knee joint, in this case, showed fullness of the suprapatellar pouch due to a soft tissue mass like lesion in the suprapatellar region. There were no signs of osteoarthritis and the bones appeared normal. Ultrasonography revealed frond like villous projections of the synovium with an associated joint effusion.

Magnetic resonance imaging is the gold standard investigation to diagnose lipoma arborescens [4]. It produces high contrast multiplanar images which depict deep cortical bone, marrow, ligaments, tendons, fat, menisci and articular cartilage in one image. In addition to these, it is non-invasive without the use of ionizing radiation [5].

The MRI imaging findings are pathognomic for LA. The findings include

1) A synovial mass with a frond like architecture
2) Fat signal intensity on all pulse sequences
3) Suppression of signal with fat-selective presaturation
4) Associated joint effusion
5) Potential chemical shift artifact
6) Absence of magnetic susceptibility effects from hemosiderin [6].

The discussed case showed frond like villous projections in suprapatellar region, with joint effusion having signal intensity of fat on all pulse sequences , with corresponding suppression on fat-suppressed proton density sequence.

Differential diagnosis

MRI reveals findings that are characteristic of lipoma arborescens, but there are some conditions which may mimic lipoma arborescens clinically and sometimes pose a dilemma even radiologically. Appearance of the lesion and its signal intensity changes on various pulse sequences, combined with associated findings help in differentiating it from other conditions. Some of the conditions are as follows :

Synovial lipoma

Intra-articular synovial lipoma appears as a small, single, polyp like mass, round to oval in shape, with a short stalk arising from the fat pad area of the suprapatellar pouch, either penetrating the synovial membrane or as a result of fat over growth within the intra- articular synovial tissue, whereas lipoma arborescens appears as a frond like mass [4]. Absence of subsynovial fat deposition, villous appearance of the lesion, joint effusion and synovial cyst formation help in differentiating it from LA [7].

Pigmented villo nodular synovitis (PVNS)

MRI is the investigation of choice as hemosiderin deposition leads to signal loss on both T1 and T2 weighted sequences and gradient echo sequences [8]. PVNS reveals a lobulated mass with reduced signal intensity on T1 and T2 weighted images due to hemosiderin. Surrounding effusion and areas of fat within the lesion may also be noted in this condition [3].

Synovial Chondromatosis

This condition is associated with effusion and adjacent erosions. The signal intensity of intra articular bodies varies depending on the amount of cartilage or bones present [3].

Synovial Hemangioma

This lesion appears as an intra-articular mass lobulated in nature showing intermediate signal intensity on T1 weighted sequences and appears more hyperintense than subcutaneous fat on T2 and fat saturated sequences. There are some areas of low signal intensity, supposedly representing fibrous septa. Further these lesions also show enhancement on post gadolinium study [3].

Rheumatoid arthritis

The pannus appears as intermediate to low signal intensity on T1 and T2 weighted images. Other findings -like joint space narrowing, erosions and intraarticular loose (rice) bodies may also be seen [3].

Treatment and Prognosis

Arthrotomy and synovectomy is usually recommended in LA. The lesion is accessible through arthroscopic ports. Arthroscopy is the method of choice as it reduces soft tissue trauma and speeds up postoperative rehabilitation. Recurrence of LA is rare [4].

TEACHING POINT

Lipoma Arborescens (LA) is a rare intra-articular benign lesion seen most often in the knee joint. It should be considered in the differential diagnosis of painless swelling of the joint. MRI is the imaging modality of choice as it depicts the characteristic findings like

1) Synovial mass with a frond like architecture
2) Fat signal intensity on all pulse sequences
3) Suppression of signal with fat-selective presaturation
4) Associated joint effusion

which are pertinent to LA and allows for a specific pre-operative diagnosis.

REFERENCES

1. Ryu KN, Jaovisidha S, Schweitzer M, Motta A O, Resnick D. MR Imaging of Lipoma Arborescens of the Knee joint. AJR. 1996;167:1229-1232. PMID: 8911186

2. Teusink M, El-Khoury G, Buckwalter J. Lipoma arborescens of the subdeltoid bursa: A case report. Iowa Orthop J. 2010;30:177-178. PMID 21045993

3. Plotkin BE, Varma R. Lipoma Arborescens of the Knee in a 17 - year old man. Radiology case reports. 2008;3:01-05. DOI: 10.2484/rcr.v3i2.164

4. Yah CH, Wong JWK, Yip DKH. Bilateral knee Lipoma Arborescens: A case report. Journal of orthopaedic surgery. 2008;16(1):107-110. PMID: 18453672

5. Ensafdaran A, Vosoughi AR, Khozai A, Torabi A, Ensafdaran MR. Lipoma Arborescens of the knee : Report of a case with full range of motion. Middle East journal of Cancer. 2010;1(1):51-54. http://mejc.sums.ac.ir/files/PDFfiles/9.pdf250423973.pdf

6. Feller JF, Rishi M, Hughes EC. Lipoma Arborescens of the Knee: MR demonstration. AJR. 1994;163:162-164. PMID: 8010204

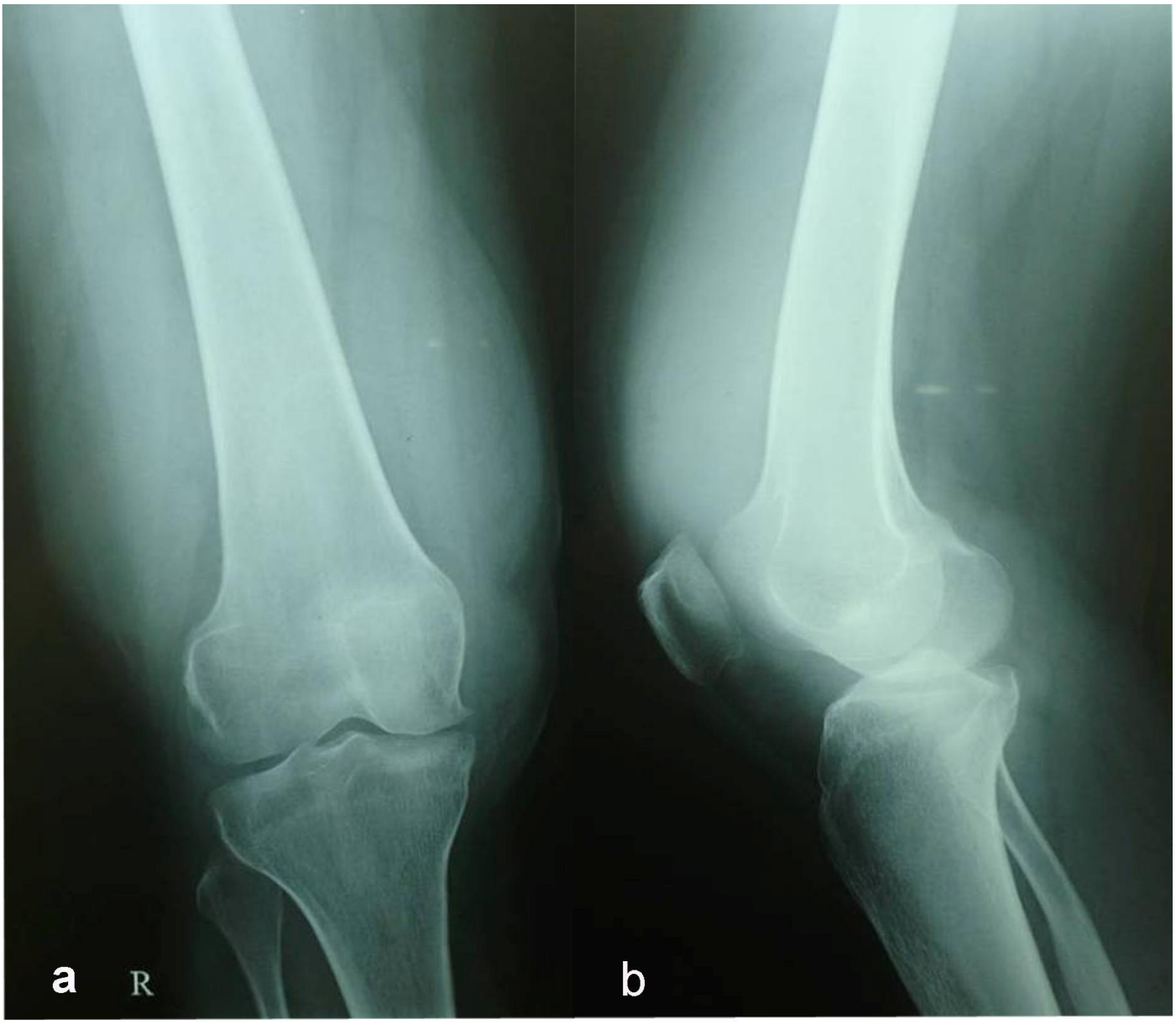
7. Karahan O I, Baykara M, Gulec M, Duygulu F. Mediopatellar plica limiting lipoma arborescens in the knee joint: MRI findings. European journal of Radiology extra. 2003;47 :55-58 doi:10.1016/S1571-4675(03)00085-3

8. Karantanas AH, Mitsionis GI, Skopelitou AS. PVNS of the knee simulating lipoma arborescens on MR imaging: CMIG extra cases. 2004;28:23-26 doi:10.1016/j.compmedimag.2004.01.004.

FIGURES

Figure 1 (left). 23 year old female with lipoma arborescens of the right knee joint. Local examination revealed swelling of the right knee joint with fullness in suprapatellar region.

Figure 2 (bottom). 23 year old female with lipoma arborescens of the right knee joint. Anteroposterior (a) and lateral (b) radiographs of the right knee joint revealed fullness of suprapatellar pouch due to a soft tissue mass like lesion in the suprapatellar region with normally appearing bones and maintained joint space



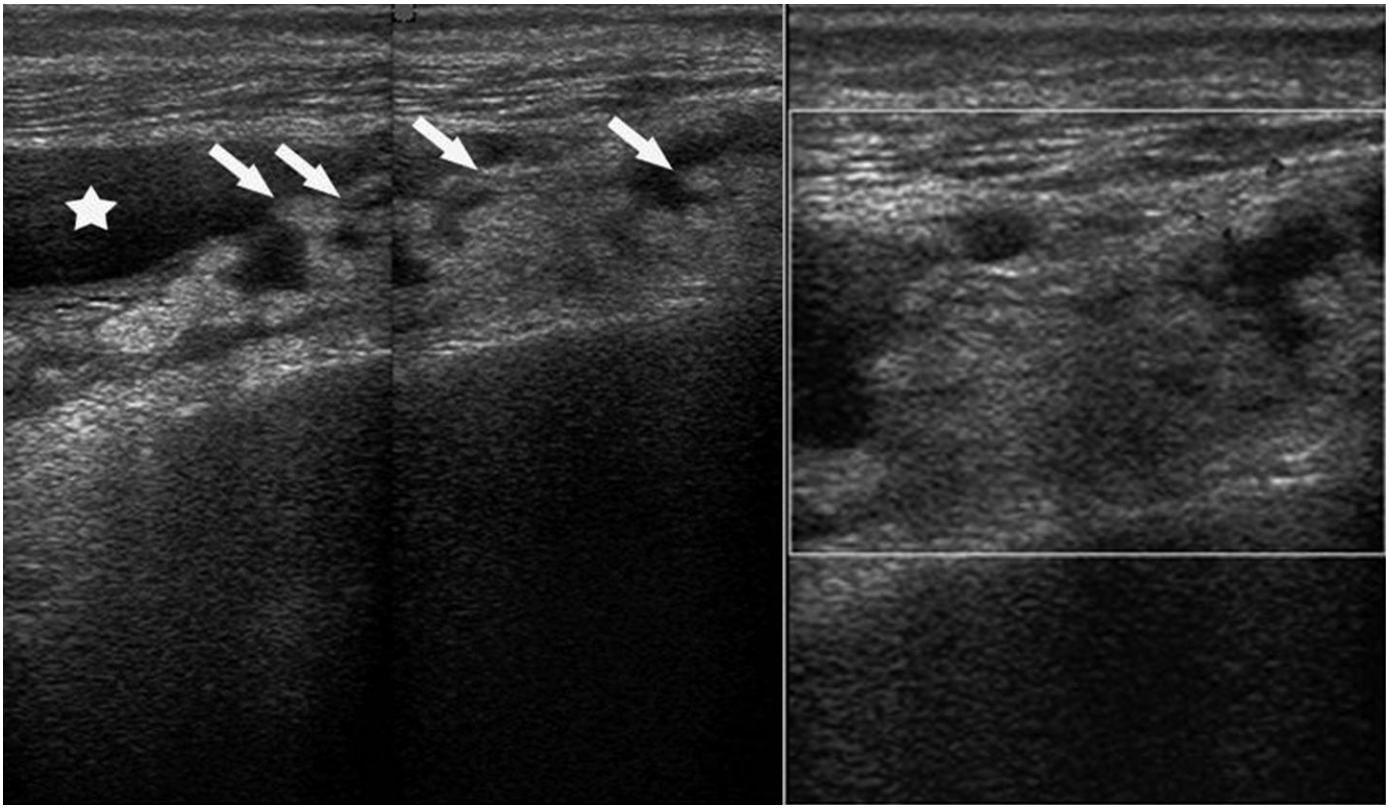


Figure 3. 23 year old female with lipoma arborescens of the right knee joint. High resolution Ultrasonography (Philips HD11 12 MHz linear transducer L12-3) of suprapatellar region revealed frond like villous projections of the synovium (arrows) with associated joint effusion (star) with no demonstrable flow on colour doppler study (right image).

Figure 4 (left). 23 year old female with lipoma arborescens of the right knee joint. Sagittal non contrast T1 weighted image showed high signal intensity frond like synovial thickening in the suprapatellar bursal region (arrows) with joint effusion (flower). GE HDe signa 1.5 Tesla magnetic resonance imaging system TR-520 TE-10.376 4mm slice thickness with interslice gap of 1.5mm.

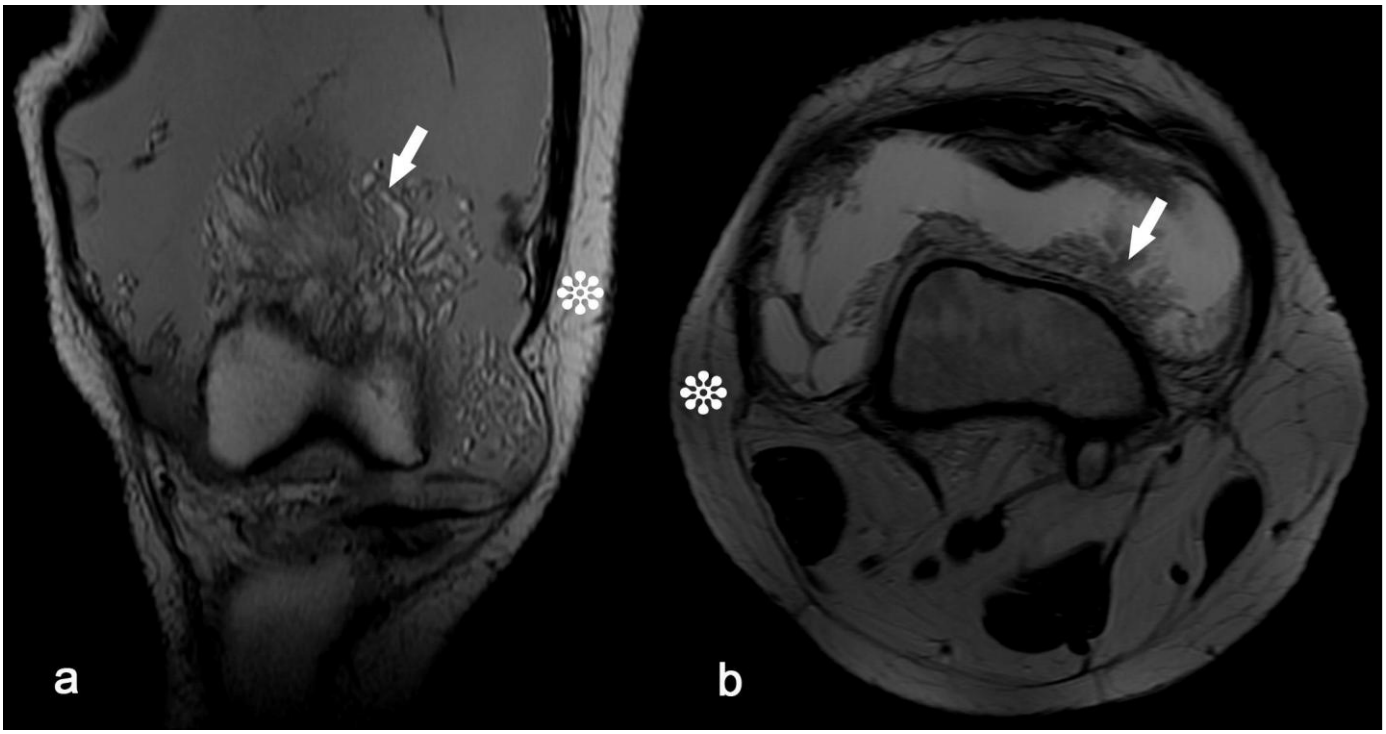


Figure 5. 23 year old female with lipoma arborescens of the right knee joint. Coronal T2 weighted (a) and axial T2 weighted (b) images showed intermediate to high signal intensity of the villous projections similar to subcutaneous fat (flower). GE HDe signa 1.5 Tesla magnetic resonance imaging system coronal TR-2540 TE-74.112 4 mm slice thickness with interslice gap of 0.5mm axial TR-3960 TE-83.34 7 mm slice thickness with interslice gap of 2.5mm.

Figure 6. 23 year old female with lipoma arborescens of the right knee joint. Sagittal (a) coronal (b) and axial (c) fat suppressed proton density images revealed complete suppression of signal intensity of villous projections (arrow) in suprapatellar bursa1 region. GE HDe signa 1.5 Tesla magnetic resonance imaging system. Sagittal TR-2200 TE-36.672 4mm slice thickness with interslice gap of 1.5mm, coronal TR-2220 TE-37.056 4 mm slice thickness with interslice gap of 0.5mm and axial TR-2040 TE-35.52 7 mm slice thickness with interslice gap of 2.5mm.

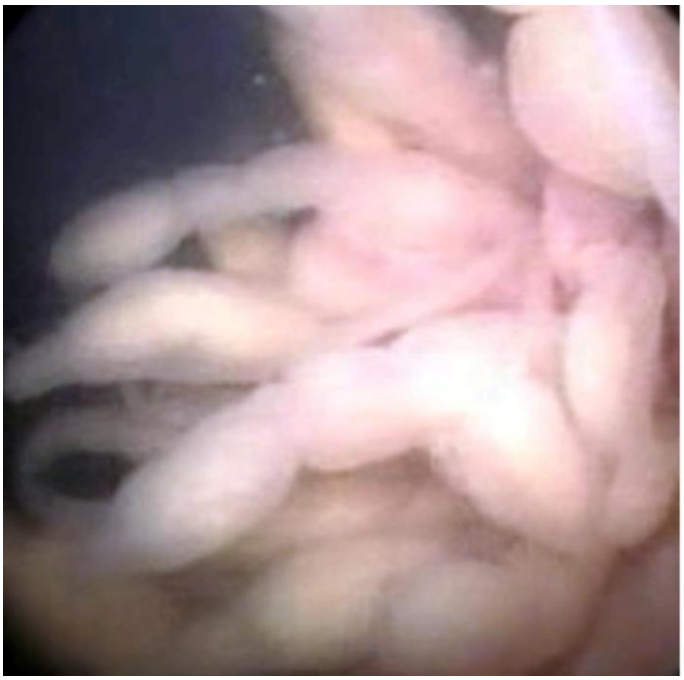
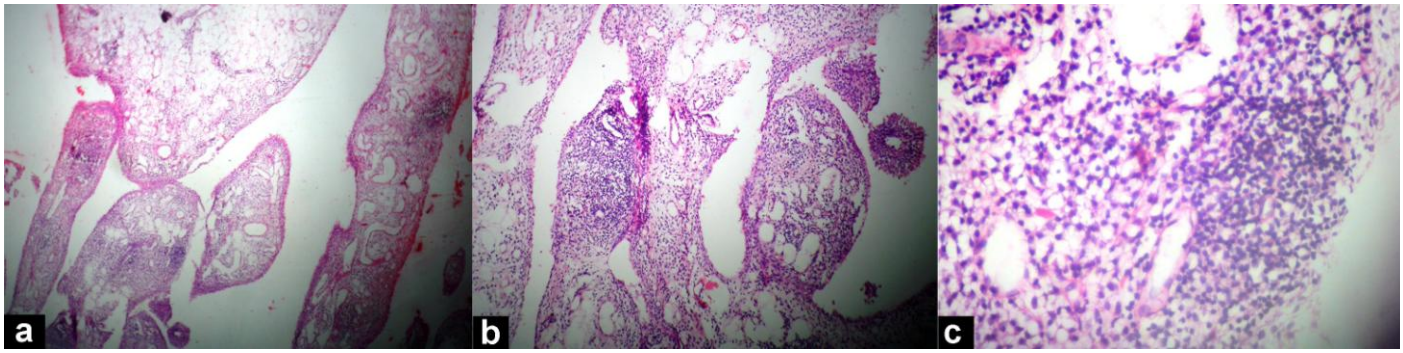


Figure 7 (left). 23 year old female with lipoma arborescens of the right knee joint. Arthroscopy showed the frond like villous projections described on ultrasound and MRI.

Figure 8 (bottom image). 23 year old female with lipoma arborescens of the right knee joint. Histopathology of synovectomy specimen revealed multiple villi having fatty core lined by hyperplastic synoviocytes with marked chronic inflammatory cell infiltration of stroma. Hematoxyllin & Eosin stain (a) 40X, (b) 100X & (c) 400X.



Incidence	Rare (Uncommon), around hundred reported cases
Gender ratio	Equal Predominance in both sexes
Age	9 to 68 years
Risk factors	Unknown, but is associated with degenerative joint diseases, trauma, meniscal injuries, chronic synovitis or arthritis.
Treatment	Synovectomy
Prognosis	Good (Recurrence is rare)
Imaging Findings	X-Ray Fullness of suprapatellar pouch due to a soft tissue mass like lesion in the suprapatellar region with sometimes associated with scattered lucent areas. Ultrasound Frond like villous projections of the synovium associated with Joint effusion MRI Frond like thickening of the synovium appears hyperintense on T1 and T2 similar to fat with suppression of signals from fronds on fat saturated sequences associated with joint effusion.

Table 1: Summary table for lipoma arborescens

	X-RAY	ULTRASOUND	MRI –T1	MRI-T2
Lipoma Arborescens	• Fullness of suprapatellar region with scattered lucent areas seen sometimes.	• Joint effusion • Frond like thickening of the synovium which move on real time	• Hyperintense finger like thickening of the synovium similar to fat with hypointense Joint effusion.	• Hyperintense finger like thickening of the synovium similar to fat. • With hyperintense Joint effusion
Synovial lipoma	• Fullness of suprapatellar region with scattered radiolucent areas suggestive of fat.	• Solitary polyp like mass round to oval in shape. • Joint effusion, synovial cysts and subsynovial fat deposition are absent	• Hyperintense solitary polyp like mass similar to fat intensity • No joint effusion	• Hyperintense solitary polyp like mass similar to fat intensity • No joint effusion
Pigmented Villo Nodular Synovitis	• Marginal erosions, • Intraarticular effusions • Dens lobulated masses • Subchondral cysts on both sides of the joint with Preserved joint space	• Soft tissue lobulated masses • Joint effusion present	• Nodular mass, iso to hypointense to muscle. Foci of high signal intensity may be present which represent lipid laden macrophages.	• iso to hypointense to muscle with scattered areas of hyperintensity
Synovial Chondromatosis	• Single or multiple soft tissue masses round or ovoid opacities. • If calcification is absent then they are visualized as indistinct soft tissue mass	• Presents as soft mass. If calcification is extensive then it is seen on ultrasound. • Doppler demonstrates intralesional vessels	• Intermediate signal intensity of fluid and low signal intensity osteochondral bodies	• Low signal intensity osteochondral bodies with surrounding bright fluid.
Synovial Hemangioma	• Phleboliths, soft tissue swelling and periosteal thickening. • Advanced maturation of Epiphysis. • Arthritic changes are occasionally present	• Heterogeneous nodule with calcification and reverberation. • Increased flow demonstrated on Doppler	• Soft tissue swelling showing Intermediate signal intensity • Marked enhancement on post contrast study	• Hyperintense more than subcutaneous fat. • T2* GRE detects high (arterial) flow
Rheumatoid Arthritis	• Periarticular erosions, uniform joint space reduction, subchondral bone cysts, juxtaarticular osteoporosis and soft tissue swelling are present.	• Joint effusion, synovitis and erosions. Doppler differentiates inflammatory from noninflammatory effusions by detecting the presence of hyperemia.	• Decreased signal intensity of erosions • Hypointense subchondral edema and effusion	• Increased signal intensity due to joint effusion • Erosions seen as signal intensity defects in subchondral bone at joint edges • Hyperintense subchondral edema

Table 2: Differential diagnosis table for lipoma arborescens

ABBREVIATIONS

AP - Anteroposterior
ESR - Erythrocyte Sedimentation Rate
HBsAg - Hepatitis B surface antigen
HIV - Human Immunodeficiency Virus
LA - Lipoma Arborescens
MRI - Magnetic Resonance Imaging
OPD - Out Patient Department
PCR - Polymerase Chain Reaction
PVNS - Pigmented Villonodular Synovitis
TB – Tuberculosis

KEYWORDS

Lipoma Arborescens; Knee; Synovium; Magnetic Resonance Imaging

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