

Primary synovial osteochondromatosis of the suprapatellar pouch of knee. Correlation of imaging features with surgical findings

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ABSTRACT

A 31 years old female presented with swelling and pain above the right knee for three years. On examination, there was a tender swelling over the right knee more pronounced over the suprapatellar region. Plain X-ray, US, CT scan and MRI of the knee were suggestive of Primary synovial osteochondromatosis (PSC) of the suprapatellar pouch. Patient underwent total synovectomy and the diagnosis of synovial osteochondromatosis was confirmed histopathologically. Recognizing the imaging appearances of PSC is important to improve patient management.

CASE REPORT

CASE REPORT

A 31 years old female presented at our institution with swelling and pain above the right knee for three years. There was no history of trauma or any other inflammatory or infectious disease. On examination, there was a tender swelling over the right knee more pronounced over the suprapatellar region (Figure 1). Aspiration of the suprapatellar pouch was carried out which demonstrated reddish hemorrhagic fluid (Figure 2).

Plain X-ray of the knee revealed a well defined mass in the expected location of suprapatellar pouch above the knee containing beaded ossified nodules (Figure 3). The fat planes were displaced circumferentially around the mass without any blurring. The ossified nodules were almost of equal size. Synovial calcification was also seen superior to the upper pole

of patella (Figure 3). The diagnosis of PSC was suggested and the patient was referred to the surgical department.

Further investigations were suggested to the patient but for personal reasons she denied. Patient presented again to our radiology department after six months. Her swelling had increased in size and had become more tender. An X-ray of the knee showed increase in the size and number of the ossified nodules (Fig. 4 and 5). The synovial based calcification had also increased in size and had become dense. Small faintly calcified foci were also revealed in addition which were interspread within the lesion. Few of the calcifications had curvilinear arc-like configuration (Fig. 5). Ultrasound showed suprapatellar pouch to be completely filled with fluid. Multiple calcified lesions were found within the fluid, with a diameter ranging from 4 mm to 13 mm. (Figure 6, 7).

Plain CT scan of the knee was carried out which demonstrated fluid filled, distended suprapatellar pouch and dense synovial calcification as well (Figure 8). No bone erosion or solid component was seen. MRI of the Right Knee was carried out which revealed intra-articular bodies to be of low signal intensity on T1W images and of increased signal intensity on T2W images (Figure 9, 10, 11). Few of the loose bodies had a hypointense rim with central hyperintensity on T2W images. Intravenous contrast injection revealed enhancing synovium circumferentially around the suprapatellar pouch. Based on our imaging findings a diagnosis of extra-articular PSC of supra-patellar pouch was suggested. Patient was admitted to the surgical department and total synovectomy was performed and the diagnosis was confirmed histopathologically. Open synovectomy with removal of chondral and ossified fragments was carried out (Figures 12, 13 and 14). Histological evaluation of the tissue specimen demonstrated numerous cartilaginous nodules and focal areas of calcification. The cartilaginous tissue had a myxochondroid background in which clusters of chondrocytes were visible.

DISCUSSION

PSC is a benign condition characterized by synovial membrane nodular proliferation and metaplasia. The proliferated fragments may break off from the synovial surface into the joint space, where they may grow and calcify. The calcification may vary from speckled to frankly ossific bodies while their size may vary from few millimeters to a few centimeters (1).

Primary synovial chondromatosis is a relatively uncommon disease that typically affects patients in the third to fifth decades of life, although the age range for clinical presentation is wide. Men are affected two to four times more frequently than women (2).

The knee and hip are the most commonly involved sites. Other commonly involved joints are elbow, shoulder, and ankle. The pathologic appearance may simulate chondrosarcoma because of significant histologic atypia, and radiological correlation to localize the process as synovially based is vital for correct diagnosis (2).

Secondary synovial chondromatosis can be distinguished from primary disease both radiologically (underlying articular disease and fewer chondral bodies of variable size and shape) and pathologically (concentric rings of growth). Recurrence rates range from 3% to 23%. Malignant transformation to chondrosarcoma is unusual (5% of cases) and, although difficult to distinguish from benign disease, is suggested by multiple recurrences and marrow invasion. (2).

The differential diagnosis of PSC include pigmented villonodular synovitis, secondary synovial osteochondromatosis, rheumatoid or other seronegative arthritis, synovial hemangioma and synovial chondrosarcoma (3).

Computerized tomography has a higher sensitivity than plain radiography for the detection of calcified foci within a joint and/or in a periarticular bursa. The presence of a soft tissue mass, isodense to water, with calcifications (linear or as loose bodies) either intra-articular or in an adjacent bursa is highly indicative of synovial chondromatosis. Pressure defects at the articular margins are frequently apparent (4).

The treatment of PSC is surgical. Open surgery or arthroscopic intervention can be performed with resection of the diseased synovium and removal of any loose intra-articular bodies. Recurrence is frequent after partial synovectomy; hence total synovectomy has been suggested as the preferred treatment (5). Recurrence rates for PSC after surgical treatment have been reported as varying from 7% to 23% (6). MRI is a valuable tool in detecting PSC in an early phase and in estimating the intrasynovial extent of the disease. In the treatment of the disease, surgical removal of the loose bodies and partial or total synovectomy have been suggested. Magnetic resonance also reveals the precise site of the bodies (loose or attached to the synovium) and shows the amount of intraarticular fluid and demonstrates the damage of articular cartilage in late stages (7). Magnetic resonance (MR) imaging findings are more variable, depending on the degree of mineralization, although the most common pattern (77% of cases) reveals low to intermediate signal intensity with T1-weighting and very high signal intensity with T2-weighting with hypointense calcifications (2).

TEACHING POINT

Curvilinear or rounded calcified lesions within a soft tissue mass in close vicinity of the joint should always be further investigated for the possibility of primary synovial osteochondromatosis (PSC). The imaging appearance of PSC appears sufficiently unique to allow its differentiation from other causes of intraarticular pathology.

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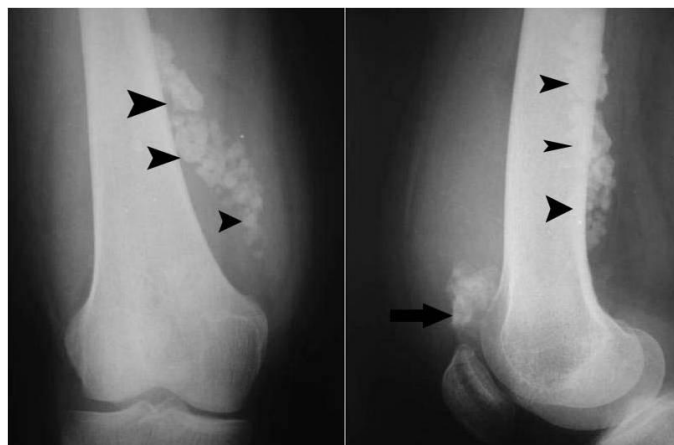


Figure 3: 31 year old Female with PSC of the suprapatellar pouch. X-Ray Right knee (AP and Lateral views) shows distended suprapatellar pouch with displaced fat planes showing multiple ossified nodules (arrowheads). Black arrow = calcification within synovium.

FIGURES

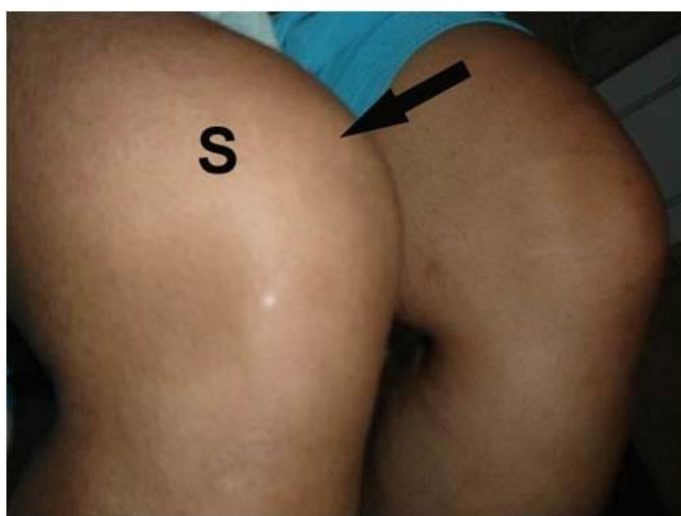


Figure 1: 31 year old Female with PSC of the suprapatellar pouch. (S) =Swelling, Black arrow = region of swollen Suprapatellar pouch.



Figure 2: 31 year old Female with PSC of the suprapatellar pouch. Hemorrhagic fluid was aspirated from the swelling.

Figure 5 (right): 31 year old Female with PSC of the suprapatellar pouch. Magnified view of the X-Ray Right knee (AP) views done 6 months after initial X-ray shows distended suprapatellar pouch with displaced fat planes (white arrows) showing multiple ossified nodules (C). Black arrowheads = Small calcific foci within the mass. Few of them appearing curvilinear in shape. Asterisk = calcification within synovium.

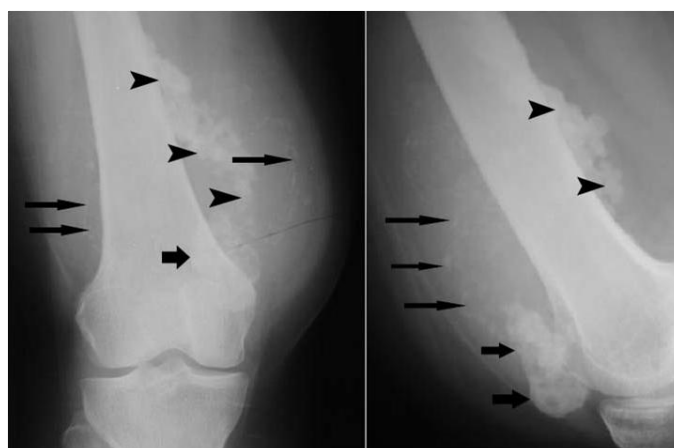


Figure 4: 31 year old Female with PSC of the suprapatellar pouch. X-Ray Right knee (AP and Lateral views) done 6 months after initial X-ray shows increase in the size and number of ossified nodules (Black arrowheads). Large black arrows = small calcific foci, small black arrows = Calcification within synovium.



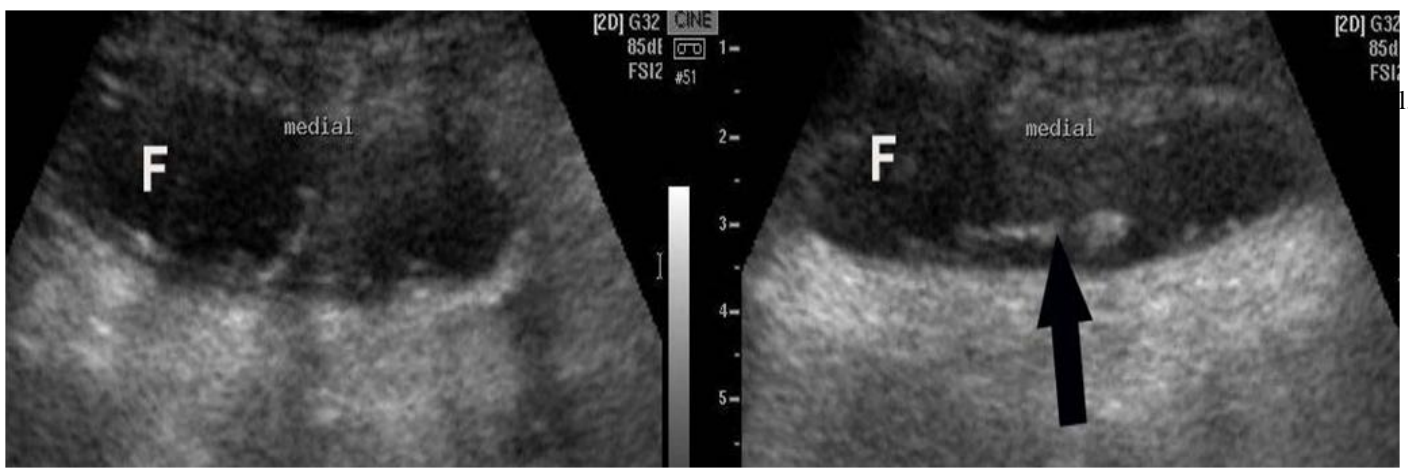


Figure 6: 31 year old Female with PSC of the suprapatellar pouch. US (Medison, Sonoace X4, 3.5 MHz Probe) of the knee shows fluid filled suprapatellar pouch, F= Fluid, black arrow = calcified loose bodies.

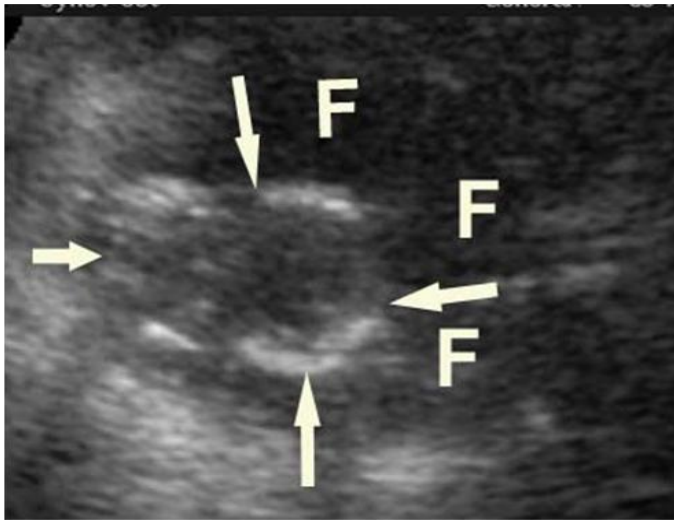


Figure 7: 31 year old Female with PSC of the suprapatellar pouch. US of the knee (Medison, Sonoace X4, 3.5 MHz Probe) shows fluid filled suprapatellar pouch, F= Fluid, White arrows = calcified loose body.

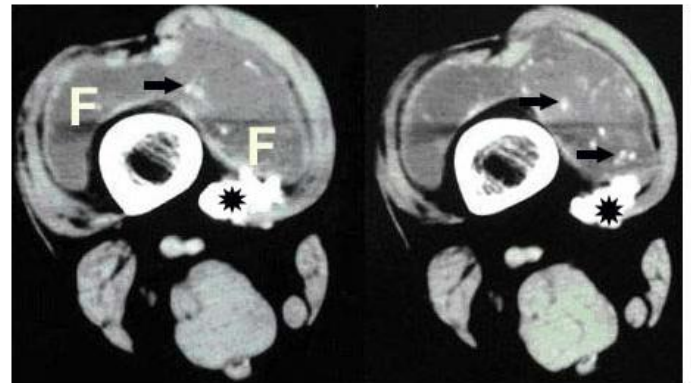


Figure 8: 31 year old Female with PSC of the suprapatellar pouch. Axial CT Scan of the right knee done without contrast. GE-CT Pace Plus (120 KV, 200 mAs) F = fluid within the distended suprapatellar pouch, black arrows = small calcified loose bodies, Asterisk= synovial calcification.



Figure 9: 31 year old Female with PSC of the suprapatellar pouch. (A) (Philips 1.5 T) T1 W MRI (TR=617, TE=11) scan shows distended suprapatellar pouch. Arrow= fluid (B) (Philips 1.5 T) T2 W MRI (TR=3000, TE=101) SCAN shows distended fluid filled suprapatellar pouch. Loose bodies are also seen as hyperintense lesions with hypointense rims (asterisk). Arrows= fluid (C) (Philips 1.5 T) Gadolinium enhanced T1W MRI (TR=617, TE=11) Transverse scan showing enhancing inflamed synovial lining (white arrows).

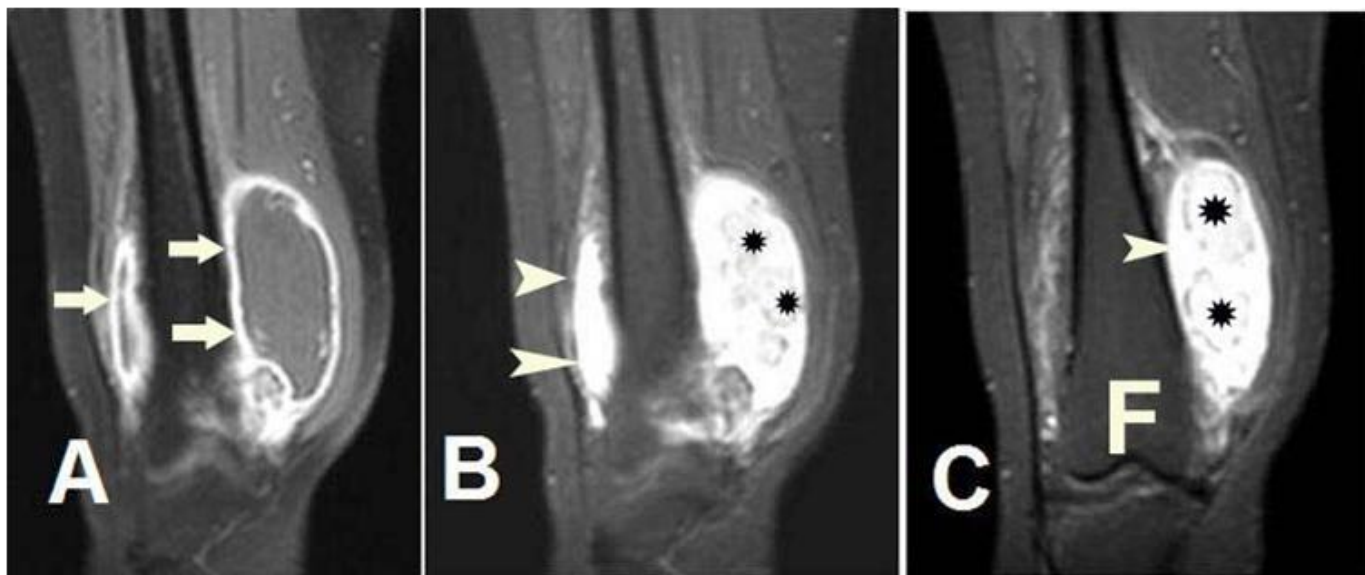


Figure 10: 31 year old Female with PSC of the suprapatellar pouch. (A) Gadolinium enhanced T1W MRI (TR=617, TE=11) (Philips 1.5 T) Coronal Scan shows enhancing inflamed synovial lining (white arrows). (B) and (C) (Philips 1.5 T) T2W MRI (TR=3000 ,TE=101) Coronal Scans showing distended fluid filled suprapatellar pouch. Loose bodies are also seen as hyperintense lesions with hypointense rims (asterisk). Arrowheads = fluid within suprapatellar pouch.

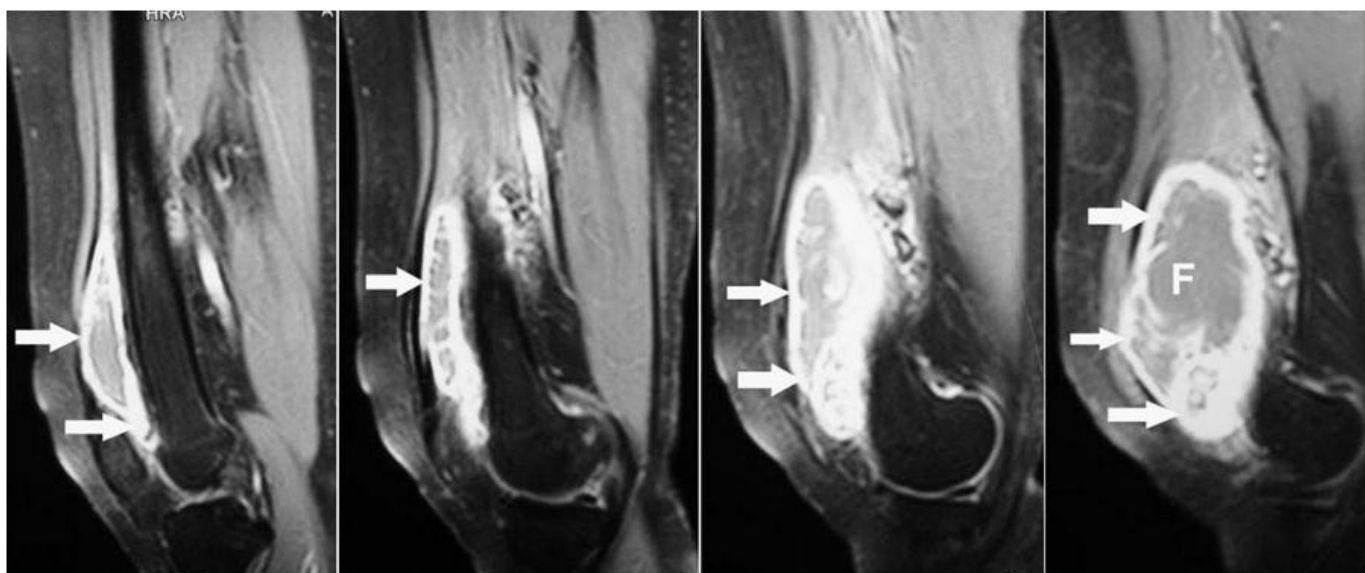


Figure 11: 31 year old Female with PSC of the suprapatellar pouch. (Philips 1.5 T) (A) Gadolinium enhanced T1W MRI Sagittal Scan (TR=926, TE=11) shows enhancing inflamed synovial lining (white arrows). F = Fluid within suprapatellar pouch

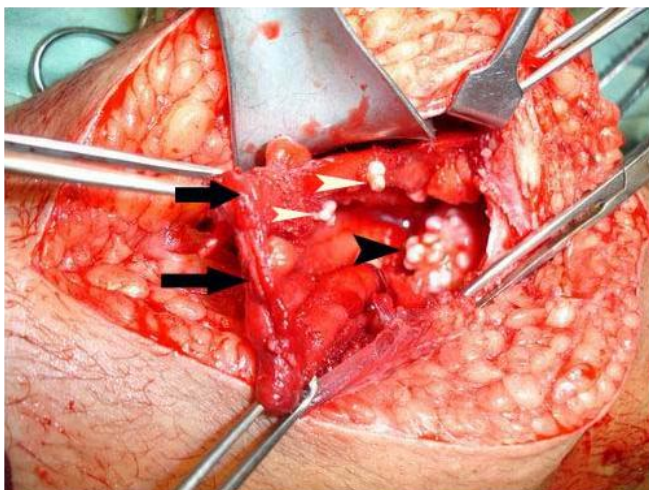


Figure 12 (left): 31 year old Female with PSC of the suprapatellar pouch. Intraoperative picture showing thickened and inflamed synovium (black arrows). Black Arrowhead = large cartilaginous body. White arrowheads = smaller calcific/cartilagenous loose bodies

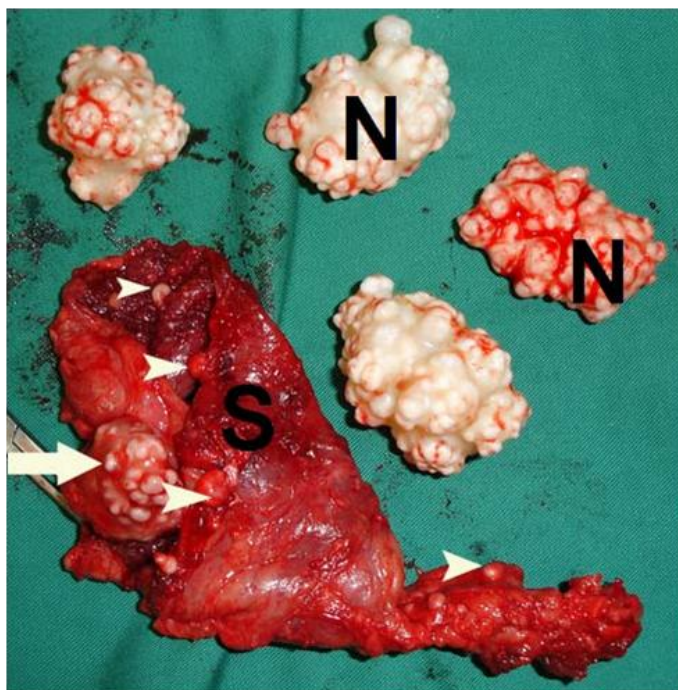


Figure 14: 31 year old Female with PSC of the suprapatellar pouch. Surgically removed cartilaginous bodies measuring 4-5 cm in size.

Figure 13: 31 year old Female with PSC of the suprapatellar pouch. Surgically removed inflamed synovium(S) showing small cartilaginous nodules (white arrowheads).Excised large cartilaginous nodules (N) are also seen.

Etiology	Synovial osteochondromatosis is a benign, metaplastic disease of unknown etiology in which synovial tissue can differentiate into cartilage and/or bone.
Incidence	Knee (50%–65%), Other commonly involved joints are the hip, elbow, shoulder, and ankle.
Age predilection	Third to fifth decades of life.
Treatment	Treatment of choice for primary synovial chondromatosis is surgical synovectomy with removal of chondral fragments.
Findings on Imaging	Radiography demonstrates innumerable calcified intra-articular chondral bodies of similar size and shape. CT shows calcified intra-articular fragments and extrinsic erosion of bone. The non-calcified regions of hyaline cartilage typically demonstrate high signal intensity on T2-weighted MR images because of the high water content of this tissue. Most common pattern (77% of cases) reveals low to intermediate signal intensity with T1-weighting and very high signal intensity with T2-weighting with hypointense calcifications.

Table 1: Summary table of primary synovial osteochondromatosis (PSC)

DISEASE	CLINICAL	PLAIN X –RAY	US	CT	MRI
Primary synovial osteochondromatosis	Adults, most common site knee, others hip, shoulder, elbow,	Uniform sized multiple intra-articular calcified bodies	Heterogeneous mass containing foci of hyperechogenicity	calcified Intra-articular fragments and extrinsic bone erosion.	Intra-articular bodies low signal on T1W, high on T2W, marked enhancement of synovial lining
Pigmented Villonodular Synovitis	Young adults, knee/ diffuse and Localized forms	Nonspecific joint effusion/ fluid may appear dense/ cystic bone erosions	Hypoechoic synovial proliferation	Rounded lytic lesions, usually bordered by sclerotic margins	Decreased signal intensity on both T1 and T2W due to hemosiderin
Secondary synovial osteochondromatosis	Aged polyarticular mostly	Few intra-articular bodies/ variable in size/ degenerative spurs/subchondral sclerosis	None	Degenerative osteophytes , Not done to diagnose Secondary synovial osteochondromatosis	Not done to diagnose Secondary synovial osteochondromatosis
Synovial hemangioma	Adolescents pain, joint swelling and recurrent joint effusions	Nonspecific, phleboliths,	None	Soft tissue mass, identify phleboliths	Decreased signal on T1W, high signal on T2W rounded signal voids due to phleboliths
Synovial Chondrosarcoma	Between 4th and 7th decades, joint pain swelling, limitation of movement.	Soft tissue swelling, calcified bodies, and marginal bony erosion	Solid mass with calcifications	Soft tissue mass with calcifications bone window can detect erosions early	Lobulated intraarticular soft tissue mass hypointense T1W hyperintense T2W

Table 2: Clinical and imaging features of Primary Synovial Osteochondromatosis and its differentials

ABBREVIATIONS

MRI= Magnetic Resonance Imaging

CT =Computed tomography

US = Ultrasound

T = Tesla

PSC = Primary synovial osteochondromatosis

KEYWORDS

Primary Synovial osteochondromatosis, calcified nodules, fluid, suprapatellar pouch

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