# Cystic and "cyst-like" lesions of the knee joint and around the knee: a pictorial essay in MR imaging

**Poster No.:** C-2338  
**Congress:** ECR 2015  
**Type:** Educational Exhibit  
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**Keywords:** Musculoskeletal system, Musculoskeletal joint, MR, Imaging sequences, Education and training  
**DOI:** 10.1594/ecr2015/C-2338

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Learning objectives

A cystic or a "cyst-like" lesion represents a common finding in a MRI examination of the knee. They are usually fluid-filled bursae, synovial cysts of the popliteal space, meniscal cysts, ganglionic cysts or other fluid collections. The learning objective of this presentation is the description of above abnormalities and make the radiologist familiar and confident with their imaging features.

Background

The cystic lesions of the knee represent a common clinical problem. Histologically they are divided in two types: ganglia and synovial cysts (bursae). Ganglia are benign cystic lesions lined by a dense fibrous capsule containing internal viscous material. Ganglia may arise from joint capsules, ligaments, tendon sheaths, bursae or subchondral bone and generally do not communicate directly with the joint. Sometimes ganglia may undergo process of synovialization. Synovial cysts are lined by synovial cells and usually contain viscous fluid. Bursae are located between surfaces, where there is friction and movement, often between different tissues (ie tendon and bone). Bursae are seen in predictable locations. Both ganglia and synovial cysts may undergo to haemorrhage. It is also important to keep in our mind that synovial cysts (bursae) reveal all the potential pathologies of the synovium (such as synovitis, PVNS, tumors).

The clinical presentation of a cystic lesion depends on its location, size and relation with the surrounding structures.

Findings and procedure details

According to the location of a cystic or "cyst-like" lesion they can be categorised in posterior, anterior, medial, lateral and other cystic lesions.

POSTERIOR KNEE

Popliteal or "Baker" cysts are seen in 10-41% of the knee and the prevalence increases with the age and the presence of arthritis or knee effusions. They are located in the medial gastrocnemius-semimembranosus bursa, which is composed by two parts, the gastrocnemius and the semimembranosus bursa, that maybe partially separated by a central septum (Fig.1). The typical location of a popliteal cyst is along the medial side of the popliteal fossa. However, they can extend laterally, or superiorly depending on their
size. We must have always in mind that more complex pathologies such as neoplastic synovial lesions may arise in bursae locations (Fig. 2).

The **popliteus bursa** lies at the distal aspect of the popliteous tendon sheath and can also communicate with the tibiofibular joint (Fig. 3).

**ANTERIOR KNEE**

The **suprapatellar bursa** lies proximal to the knee joint capsule between the rectus femoris tendon and femur. Communication of this bursa with the knee joint is found in approximately 84% of the adults.

The **prepatellar bursa** is located between the patella and the overlying subcutaneous soft tissues. Inflammation of this bursa can occur as a result of overuse and maybe caused by occupational kneeling or crawling. Prepatellar bursitis maybe also a manifestation of gout. Other synovial disorders such as PVNS may also affect this bursa (Fig. 4).

The **superficial infrapatellar bursa** is located between the tibial tubercle and the overlying skin. Direct trauma to this bursa may result in inflammatory and haemorrhagic bursitis. However, this not a common site of bursitis (Fig. 5).

The **deep infrapatellar bursa** is located between the posterior margin of the distal part of the patellar tendon and the anterior aspect of the tibia. A tiny amount of fluid is usually seen in asymptomatic patients. We believe this is a normal finding. Large collections in this bursa usually results from overuse of the knee extensor mechanism particularly in jumbers and runners and is manifested as anterior knee pain suggestive patellar tendonitis (Fig. 6).

**MEDIAL KNEE**

The **anserine bursa** separates the pes anserinus, which is formed by the distal parts of the tendons of the sartorius, gracilis and semidendinosus muscles, from the distal portion of the tibial collateral ligament and the bony surface of the medial tibial condyle. Anserine bursitis results from overuse, especially in runners and is manifested by medial knee pain and swelling that may mimic medial meniscal tear or injury of the medial collateral ligament. Its MR appearance is a fluid collection in the aforementioned location (Fig. 7). The differential diagnosis includes an atypical synovial cyst and a parameniscal cyst, lesions that may also be found in this position.

The **semimembranosus-tibial collateral ligament bursa (SM-TCL)** is located posterior and superior to the pes anserine bursa (Fig 8). The superficial part of this bursa lies between the semimembranosus tendon and the medial collateral ligament and the deep
part lies between the semimembranosus tendon and medial tibial condyle\textsuperscript{10}. Inflammation of this bursa results in pain over the posteromedial aspect of the knee and may simulate a meniscal abnormality.

The \textbf{medial collateral ligament bursa} is located between the superficial and deep layers of the medial collateral ligament. Bursitis in this location causes medial joint pain suggestive of injury of the medial meniscus or medial collateral ligament. MR images show a well-defined fluid collection between the deep and superficial portions of the medial collateral ligament (Fig.\textsuperscript{9}). Differentiation of bursal fluid from a parameniscal cyst can sometimes be difficult, but most tears of the medial meniscus are seen posteromedially, and therefore, most parameniscal cysts occur posterior to the MCL\textsuperscript{10}.

\textbf{LATERAL KNEE}

The \textbf{iliotibial bursa} is located between the diastal part of the distal iliotibial part near its insertion on Gerdy’s tubercle and the adjacent tibial surface. It may mimic iliotibial tendinitis and lateral meniscal or lateral collateral ligamentous pathology\textsuperscript{11}. On MR images iliotibial bursitis is demonstrated as a well-demarcated fluid collection between the insertion of the distal iliotibial band and the adjacent bony surface (Fig.\textsuperscript{10 and 11}).

\textbf{OTHER CYSTIC LESIONS}

\textbf{Parameniscal cysts} are formed by extrusion of joint fluid through a meniscal tear into the adjacent tissues, indicating thus the presence of a meniscal tear. Parameniscal cysts are manifested by knee pain, locking, and a mass adjacent the joint\textsuperscript{4}. On MR images, they appear as well-defined cysts located adjacent to a meniscal tear (Fig.\textsuperscript{12, 13}).

\textbf{Cysts of the proximal tibiofibular joint} communicate with the knee joint in approximately 10\% of the population\textsuperscript{8}. They can cause focal masses, apin or neuroapthy due to compression on the common peroneal nerve if they arise on the posterior aspect of the tibiofibular joint. A cyst may also extend laterally around the fibular head, causing either a neural compression or an intraneural ganglion in the peroneal nerve\textsuperscript{10}. Large proximal tibiofibular joint cysts may erode adjacent bone, simulating a more aggressive lesion (Fig.\textsuperscript{14, 15}).

\textbf{Ganglia around the knee joint} can produce pain and swelling in the knee, but are usually asymptomatic\textsuperscript{10}. Ganglia have a predilection for periarticular locations, can be attached to a joint capsule or tendon sheath and sometimes reveal connection with the synovial cavity. Other possible locations of ganglia are within muscles, ligaments, tendons or nerves\textsuperscript{12}. On MR images, para-articular ganglia present as well-defined, rounded or lobular lesions (Fig. \textsuperscript{16, 17, 18}).
**Hoffa's fat pad ganglion** is an intracapsular, extrasynovial structure in the anterior aspect of the knee that lies below the patella, posterior to the patellar tendon and anterior to the tibiofemoral articulation. Although the cause is not known, speculation includes trauma and transverse ligament degeneration. Hoffa's fat pad ganglia are typically rounded hyperintense structures that may be unilocular or multilocular (Fig.19,20).

**Mucoid degeneration and ganglia related to the cruciate ligaments.** Mucoid degeneration of the cruciate ligaments is characterised by interstitial glycosaminoglycan deposits between the normally aligned collagen bundles, resulting in a thickened ligament with intermediate signal intensity on T1W and diffuse increased on T2W images. Mucoid degeneration is usually seen in middle-aged and elderly patients, but can also occur in young people. Mucoid degeneration can be mistaken for a ligamenous tear on MR imaging, but the diffuse nature and thickening of the ligament without a history of trauma can aid in the diagnosis. Mucoid degeneration and ganglion cysts of the cruciate ligaments though to represent separate entities. Some authors have suggested there is a common pathogenesis. In MRI the ACL ganglia are interspersed within the ACL fibres and it may extend towards the Hoffa's fat pad or posteriorly towards the femoral intercondylar fossa (Fig.21). PCL ganglia have a more typical appearance and resent as well-defined multilocular cysts adjacent and along the dorsal PCL surface (Fig.22).

**Intraosseous ganglion cysts** may arise at the site of insertion of the cruciate ligaments or meniscotibial attachments and appear on MR images as small well-defined lesions with minimal or no oedema in the adjacent marrow. They are usually asymptomatic and have been reported to occur in 1% of routine MR examinations of the knee. They are manifested as sharply and well-demarcated homogenous fluid filled lesions, surrounded by an outer low-signal margin due to fibrous tissue (Fig.23).

**Images for this section:**
Fig. 1: Axial PD fat sat: There is fluid filled medial gastrocnemius-semimembranosus bursa divided by a thin septum.
Fig. 2: Axial PD Fat Sat : There is a complex (solid and partially cystic) hyperintense invasive mass in the medial aspect of the popliteal fossa that histologically was proven as synovial sarcoma.
Fig. 3: Coronal PD fat sat image shows a multilocular cystic lesion along the distal popliteus tendon. It may be represents a ganglion cyst of the popliteus tendon or a fluid filled popliteus bursa (there is no obvious communication with the tibiofibular joint).
Fig. 4: The sagittal PD fat sat image shows a fluid-filled prepattellar bursa, which reveals thickened dense septa and solid elements. PVNS was found after biopsy.
Fig. 5: Sagittal PD fat sat image: There is a large fluid collection in the superficial infrapatellar bursa.
**Fig. 6:** Sagittal PD fat sat image: There is a trace of fluid in the deep infrapatellar bursa (yellow arrow).
**Fig. 7:** Axial PD fat sat image at the level of the tibia shows a fluid-filled anserine bursa, located medially to the pes anserine tendons adjacent to the tibia.
**Fig. 8:** Axial PD fat sat image at the level of medial femoral condyle. There is a very small effusion in the SM-TCL bursa above the position of pes anserine bursa and between the semimembranosus tendon and medial collateral ligament.
**Fig. 9:** Fig. 9 Cor PD Fs image shows a distended medial collateral bursa.
Fig. 10: Coronal PD fat sat image shows a focal septated fluid collection (arrow) between the iliotibial band and lateral femoral condyle.
**Fig. 11:** The same patient as in Fig.10. Axial PD fat sat image shows a septated fluid collection (arrow) in the iliotibial band bursa in a runner.
Fig. 12: Sagittal PD fat sat image demonstrates a large cystic lesion in front of the lateral meniscus, on a background of an horizontal tear in the anterior horn.
**Fig. 13:** The same patient as in Fig. 12. There is a large septated lateral parameniscal cyst., which lies anteriorly to the lateral meniscus.
**Fig. 14:** Axial PD fat sat image shows a large anterior septated cyst in the proximal tibiofibular joint, which erodes the fibular head.
**Fig. 15:** Fig.15. The same patient as in Fig.14. The coronal STIR image shows a large septated cyst of the proximal tibiofibular joint.
**Fig. 16:** Axial PD fat sat image demonstrates a septated ganglionic cyst adjacent to the pes anserine tendons at the level of the femoral metaphysis.
**Fig. 17:** Axial PD fat sat image shows a ganglion cysts in front of the medial patellofemoral ligament.
Fig. 18: Coronal PD fat sat image reveal a lobulated-septated ganglionic cyst adjacent to the popliteus tendon.
**Fig. 19:** Fig. 21 Sagittal PD fat image shows a large lobular ganglion cyst into Hoffa's fat pad.
**Fig. 20:** Fig 22. The same patient as in figure 21. Axial PD fat sat image. There a large lobular and septated Hoffa's fat pad ganglion cyst posterior to the patellar tendon.
**Fig. 21:** Fig. 21 Sagittal PD fat sat image shows a small ganglion cyst embedded on the posterolateral bundle of the ACL.
Fig. 22: Coronal PD fat sat image demonstrates a lobular ganglion cyst embedded in the PCL.
**Fig. 23:** Axial PD fat sat image shows a small intraosseous ganglion cyst of the tibia (arrow) adjacent to a small fluid-collection in the anserine bursa.
Conclusion

Cysts and "cyst-like" lesions are a common finding inside and around the knee joint. MRI can demonstrates excellent all these lesions. The radiologists must be familiar about their appearances and differentiation, guiding thus specific treatment and avoiding unwarranted interventional procedures.

Personal information

References


