

The A-B-C of fluid-filled structures around the knee



Dr John Ferrier, Dr Samir Paruthikunnan and Dr Kate Kingston
York and Scarborough Teaching Hospitals NHS Foundation Trust

Introduction - Fluid-filled structures present clinically as non-specific soft tissue lumps. The low cost and lack of ionising radiation offered by ultrasound (US) makes it the first line investigation for this presentation. Fluid-filled structures have similar ultrasound characteristics. We aim to outline the appearances of a variety of fluid-filled structures around the knee, referring to their clinical presentations & expected anatomical location.

General principles - Fluid-filled 'lesions' generally have identical ultrasound characteristics. They appear **anechoic** or uniformly hypoechoic with significant **through-transmission**. They are **avascular** with no internal Doppler signal. However, the spectrum of fluid-filled structures around the knee varies from normal anatomy to pathological cysts or bursae. The following cases demonstrate how to differentiate such similar-appearing structures.

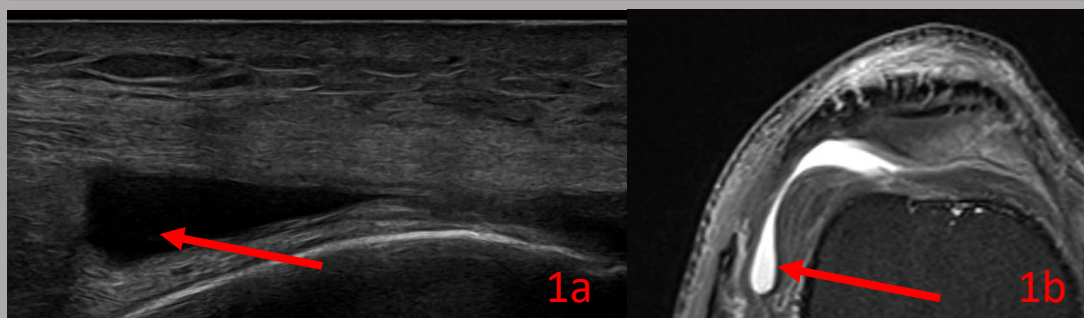


Figure 1 (above) - The **knee joint capsule** is a potential space; this can become distended with fluid and present as knee swelling/ lump. The fluid is most commonly seen in the suprapatellar 'pouch' (see figure 2 for explanation of anatomical terminology). This space has recesses laterally and medially where fluid will settle dependently (**arrow** in **(a) - transverse US and (b) - axial PDFS MRI**). Unless the volume of effusion is significant and 'tense', the fluid may be fluctuant and able to be manipulated. Please note that joint fluid is not the only source of effusion, which can contain blood or fat, depending on aetiology.

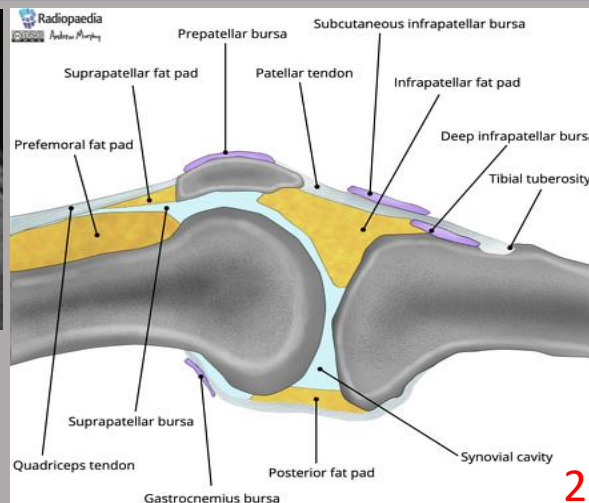


Figure 2 (left) - The suprapatellar bursa (light blue) is in continuity with the synovial cavity of the knee joint. As such, the word 'pouch' is preferred to bursa. Bursae (purple) are separate to the joint capsule but can also become distended and appear as fluid-filled structures on US - see case 4, below. Please note that several other bursae are not shown on this single sagittal diagram. Source: radiopaedia.org

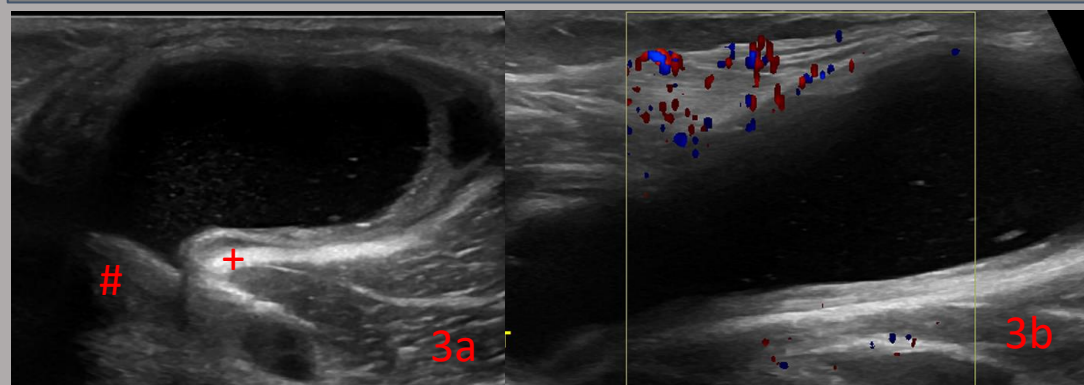


Figure 3 (above) - **Baker's Cyst** on **transverse (a) and longitudinal, with Doppler (b) US**. Although referred to as a cyst, this actually an outpouching of the joint capsule into the popliteal fossa. Joint fluid enters the 'cyst' between the distal semimembranosus (#) and medial gastrocnemius (+) tendons. It is described as appearing like a speech bubble. They are often incidental and seen while performing US for DVT. They can also present after rupture, often with more complex contents or surrounding fluid. Important differential for popliteal fossa mass is popliteal artery aneurysm (this will contain Doppler flow and appear pulsatile).

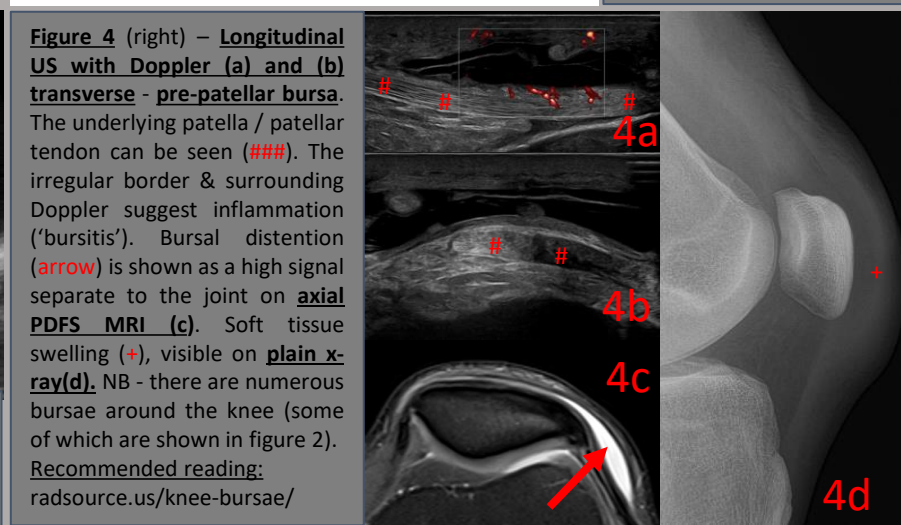


Figure 4 (right) - **Longitudinal US with Doppler (a) and (b) transverse - pre-patellar bursa**. The underlying patella / patellar tendon can be seen (###). The irregular border & surrounding Doppler suggest inflammation ('bursitis'). Bursal distention (**arrow**) is shown as a high signal separate to the joint on **axial PDFS MRI (c)**. Soft tissue swelling (+), visible on **plain x-ray(d)**. NB - there are numerous bursae around the knee (some of which are shown in figure 2). Recommended reading: radsourc.us/knee-bursae/

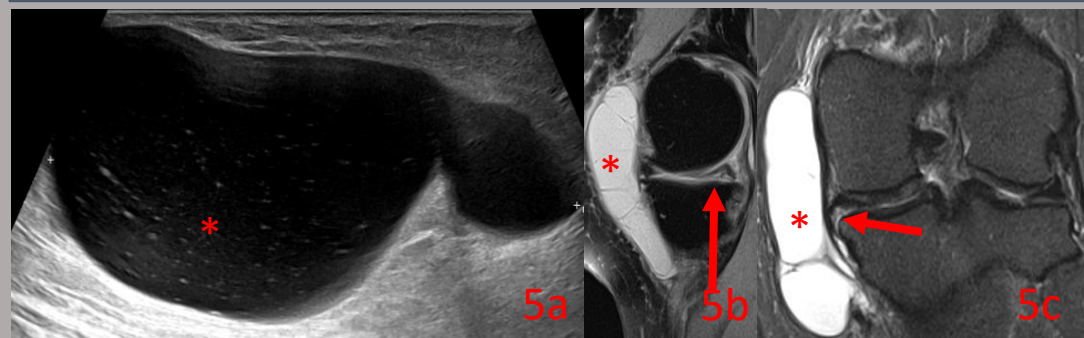


Figure 5 (above) - **Longitudinal US (a)** of a large peri-articular cyst (*). Subsequent **MRI (sagittal PDFS (b) and STIR coronal (c))** show the cyst as high signal (white) fluid. The MRI also shows a tear (**arrows**) extending to the undersurface of the adjacent meniscus. As such, the likely diagnosis is **parameniscal cyst**. If no meniscal tear is present on MRI, parameniscal cyst is unlikely. The differential includes pes anserine bursa (see description of bursae in case 4) and ganglion cyst from the knee joint or pes anserine tendons.

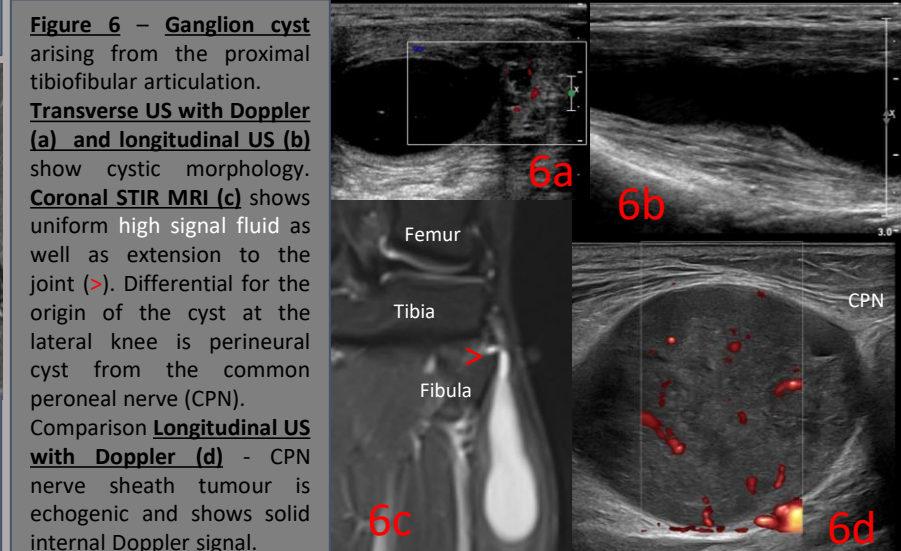


Figure 6 - **Ganglion cyst** arising from the proximal tibiofibular articulation. **Transverse US with Doppler (a) and longitudinal US (b)** show cystic morphology. **Coronal STIR MRI (c)** shows uniform high signal fluid as well as extension to the joint (>). Differential for the origin of the cyst at the lateral knee is perineural cyst from the common peroneal nerve (CPN). Comparison **Longitudinal US with Doppler (d)** - CPN nerve sheath tumour is echogenic and shows solid internal Doppler signal.

- Take home points** - The most common fluid-filled structures are:
- Articulation (the knee joint capsule and its outpouchings)
 - Bursae (infra-/ pre-patellar the most common)
 - Cysts (often arising from the knee or tib-fib joints)

Location is the most useful differentiator. Although often referred to as a bursa, the suprapatellar 'pouch' communicates with the knee joint. Exclusion of popliteal aneurysm is important - this will contain Doppler!

Summary - Although fluid-filled structures look similar on ultrasound (anechoic, through transmission, no internal Doppler), the clinical presentation, location and nature of the fluid will help differentiate the common structures outlined above. US is the most useful tool for diagnosis and can also be used to guide aspiration. Confirmation of cystic morphology is a strong contributor to excluding sarcoma. MRI is a reliable problem solver, if required.



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