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Tips and Tricks

Lipohemarthrosis of the knee: specific imaging findings

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Abstract. Joint effusions are common after sports injuries. In a specific form they can be very accurate for the diagnosis of intraarticular fractures; however, assessment can be tricky. Several imaging means are compared which outline the advantages and disadvantages of each technique.

Keywords. Lipohemarthrosis - Knee - CT - MRI - US

Joint effusions constitute a common finding after sports injuries. They can be an indirect trauma sign on conventional X-rays in case of intraarticular fractures, which is especially helpful if the cleft between the fragments is not visible.

However, the constitution and therefore the diagnostic value of joint effusions varies. Serous or sanguinous effusions alone tend to be non-specific, whereas lipohemarthrosis, the presence of lipid material and blood, is very accurate for an intraarticular fracture penetrating the cartilaginous parts of the joint [*1*]. Almost the only differential diagnosis is a rupture of the infrapatellar fat pad (Hoffa's fat pad), as the latter resides within the capsula of the knee.

Lipohemarthrosis can be found in approximately 40% [*2*] of all intraarticular fractures of the knee and evolves at the latest 3 h after the trauma [*3*]; however, gravity and a certain time of rest are needed to depict the characteristic double fluid-fluid layer which is characteristic of lipohemarthrosis [*4*, *5*]. Three bands can normally be distinguished: the top band consists of fatty material, whereas the following band below is composed of serum and serous joint effusion. The cellular parts of the blood, i.e., erythrocytes and leukocytes, sediment due to gravity and form the lowest band [*6*].

Lipohemarthrosis can be evaluated using different imaging methods comprising conventional X-rays, ultrasound, CT, and MRI.

Conventional X-rays are sometimes not capable of depicting the fluid-fluid level, as an exactly horizontal X-ray is needed to distinguish fat from serum (Fig. 1) [*7*, *8*, *9*, *10*]. The constitution of the patient, i.e., voluminous soft tissue around the joint, can lead to decreased contrast and therefore makes it sometimes difficult to reach the correct diagnosis.


a
b

Fig. 1. a Conventional anteroposterior X-ray of the left knee. A fracture cleft is visible in the tibia; however, an involvement of the joint is not discernable (*arrow*). **b** Lateral X-ray of the left knee. The fracture radiating into the joint still cannot be seen; however, a fat-fluid layer (*arrow*) is visible and leads to the suspicion of an articular involvement

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Ultrasound is a very valuable means to assess joints and can clearly depict several different fluid layers; however, sometimes visibility of the fluid-fluid level is hampered due to swelling of soft tissue and to pain expressed by the patient [*11*].

Computed tomography can distinguish between cellular material, serum, and fat, as they all have different Hounsfield densities. The CT can also be used to acquire a 3D data set allowing for multi-planar reconstruction, thus aiding the surgeon in his reconstructive work; however, the need for ionizing radiation is sometimes unwanted by patient or physician.

Magnetic resonance imaging can also depict double-fluid levels (Fig. 2), it can distinguish between the various components the effusion consists of, and it does not use ionizing radiation for imaging; however, it is a time-consuming method which is not available in all radiology departments; thus, different opportunities exist for the evaluation of joint effusions, and they have to be applied according to the patient’s needs as well as to the local availability of technical equipment.

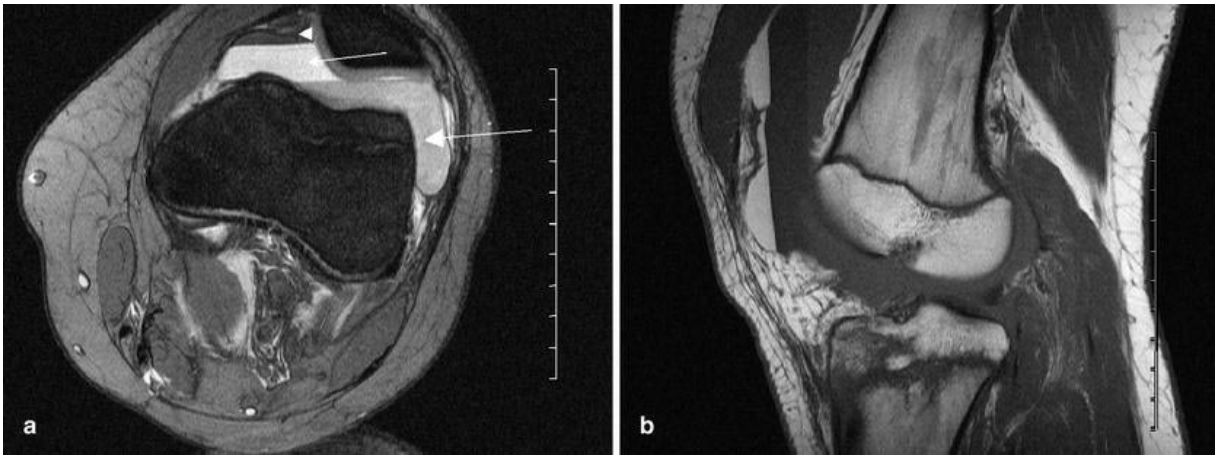

Fig. 2. a Left knee, transverse section. Conventional MRI scanner (Siemens Sonata, 1.5 T). A MEDIC sequence (TR/TE/flip angle: 1380 ms/24 ms/25°). A double-fluid level is visible. Note the low signal intensity of the highest layer, which is comparable to surrounding fatty tissue (*arrowhead*). A high-intensity band follows and consists of serum (*small arrow*). Cellular parts of blood have sedimented and display an intermediate signal (*large arrow*). **b** Left knee, sagittal section. A MEDIC sequence. The same double-fluid level as in **a** can be seen. Note the clear distinction between the three layers

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Most commonly, double-fluid layers are found in knee injuries; however, other locations, such as elbows or shoulders, can be the site of an intraarticular fracture making it more difficult to depict the fluid-fluid layer due to a smaller size or the complex anatomy, thus asking for more advanced tomographic imaging means.

Conclusion

Lipohemarthrosis is very suggestive of an intraarticular fracture. It can be assessed by various tomographic and non-tomographic methods, each of which has its advantages and disadvantages. An accurate diagnosis helps the patient during his treatment as it paves the way to either conservative treatment or surgical intervention [*1*, *2*, *3*, *4*, *5*, *6*, *7*, *8*, *9*, *10*, *11*, *12*, *13*, *14*].

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