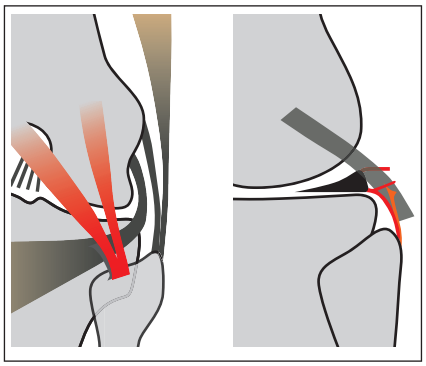
The posterolateral corner



The term "posterolateral corner" refers to a unit of multiple small capsular and ligamentous structures (Figs. 7.159, 7.160). It is thought to play a major role in joint stability.[87-89] Injury to the posterolateral corner often occurs with tears of the ACL and is a negative prognostic factor.[90] When contusions are present at the anteromedial femoral condyle and the posteromedial tibial plateau, injuries of the posterolateral corner are particularly frequent. Therefore this area should be carefully evaluated (Figs. 7.161 to 7.166).[90]

Major problems for MRI interpretation are the variability of the distinct structures, their inconsistent visibility on MRI and inconsistent nomenclature. Besides the popliteus tendon, the biceps femoris tendon and the lateral collateral ligament, the popliteofibular ligament is the most important component. In addition there are the meniscopopliteal ligament, the fabellofibular ligament and the arcuate ligament, which runs as the most superficial layer from the fibula to the posterolateral joint capsule.

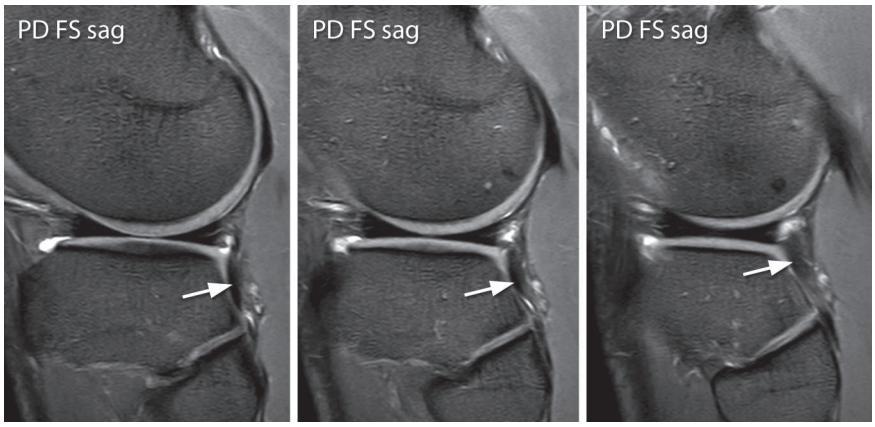


Fig. 7.159 Posterolateral capsular structures in three consecutive sagittal slices. Arrows: Popliteus tendon. Note the fascicles originating at the base of the meniscus and running to the joint capsule and the popliteus tendon.

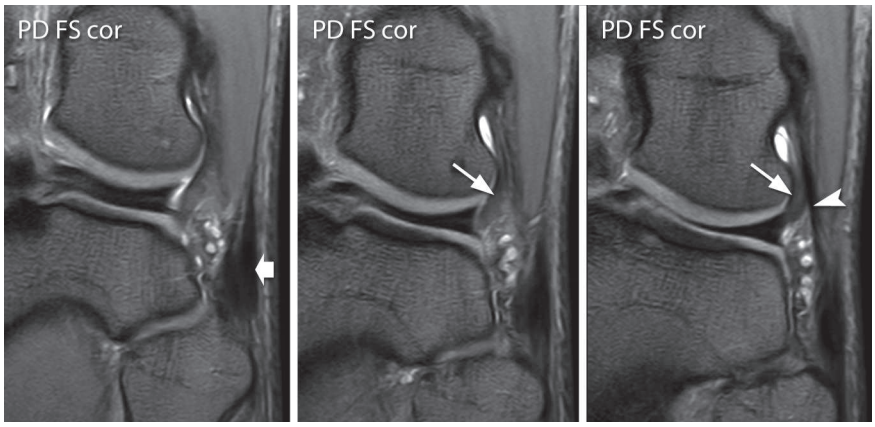


Fig. 7.160 Posterolateral capsular structures in three consecutive coronal slices. Long arrows: Popliteus tendon. Arrowhead: Lateral collateral ligament. Short arrow: Biceps femoris tendon.

Fig. 7.161 Tear of the origin of the popliteus tendon (arrow) and of the lateral collateral ligament (arrowhead). Arthroscopy showed only a partial avulsion (arrow) and a longitudinal split (arrowheads).

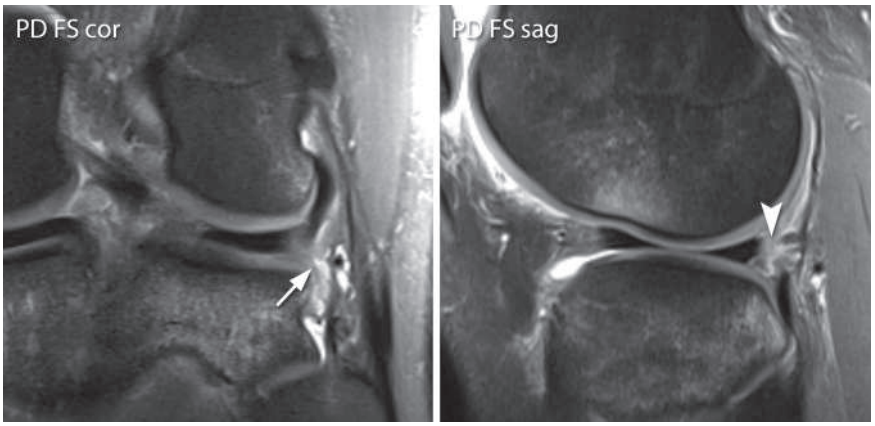


Fig. 7.162 Tear of the popliteofibular (arrow) and the meniscocapsulare ligaments (arrowhead). Note the root tear of the lateral meniscus.

Fig. 7.163 Tear of the popliteofibular ligament (arrow). Additional chondral fractures.

Fig. 7.164 Tear of the meniscopopliteal ligament (arrow).

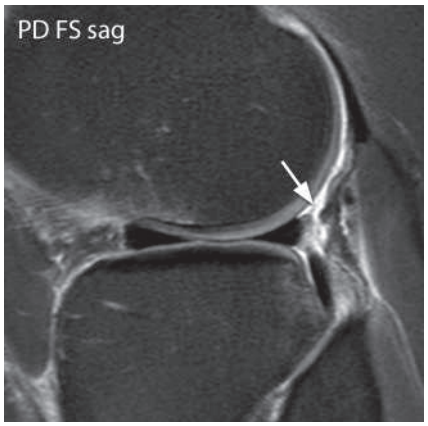
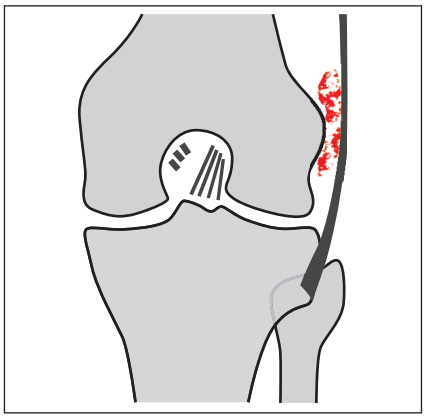


Fig. 7.165 Tear of the meniscocapsular ligaments (arrows).

Fig. 7.166 Tear of the fibular insertion of the arcuate ligament (arrow). Note the far-posterior slice position, compared to the preceding cases. The lateral collateral ligament and the biceps femoris tendon are torn as well.

Iliotibial band



Iliotibial band friction syndrome (**"runner´s knee"**) is an overuse injury mainly affecting runners, characterized by inflammation between the iliotibial tract and the lateral femoral condyle due to friction during flexion. It is particularly seen in the posterior portion of the iliotibial band. In most cases, edema is seen only between the iliotibial tract and the femur, but occasionally it also extends superficially. The inflammatory tissue is high signal on fluid-sensitive sequences and enhances with contrast media. It is well demonstrated on unenhanced T1-weighted sequences. Thickening of the iliotibial band is indicative of chronic damage.

! On water-weighted images there is risk of confusion with the lateral recess of the joint capsule. This is always anterior and proximal to the epicondyle. The edema in runner´s knee is located between the epicondyle and iliotibial tract.[91]

Imaging findings of friction syndrome are also visible in some asymptomatic volunteers. Furthermore, they are frequently found in patients with medial joint degeneration, probably caused by increased traction in the setting of a degenerative genu varum.[92]

Fig. 7.167 Typical iliotibial tract friction syndrome with fibrovascular tissue between the iliotibial tract and the lateral femoral condyle.

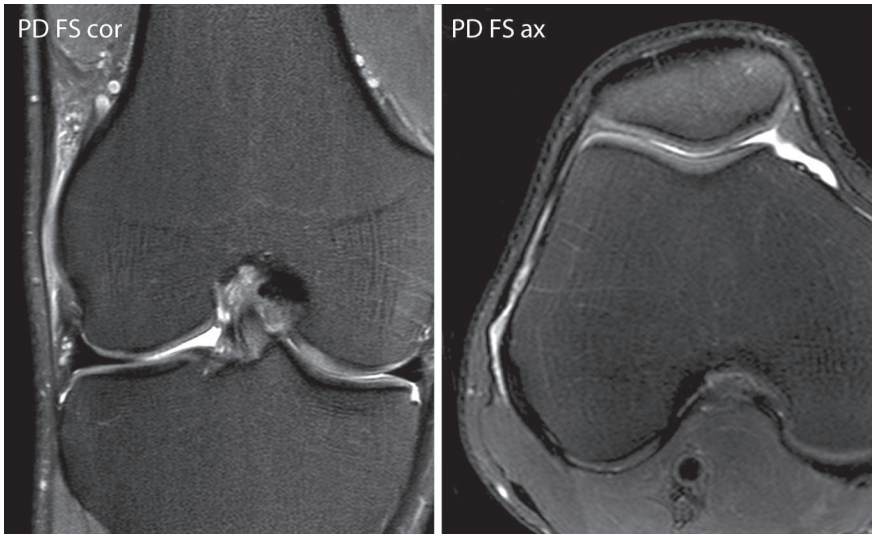
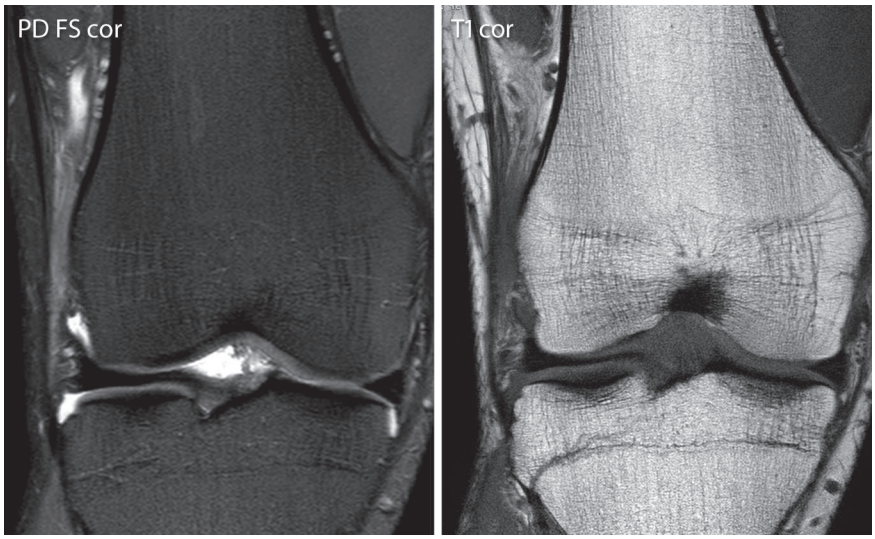


Fig. 7.168 In chronic cases, fibrosis may be seen between the iliotibial tract and the femoral condyle, instead of edema. This is most obvious on T1-weighted coronal images.



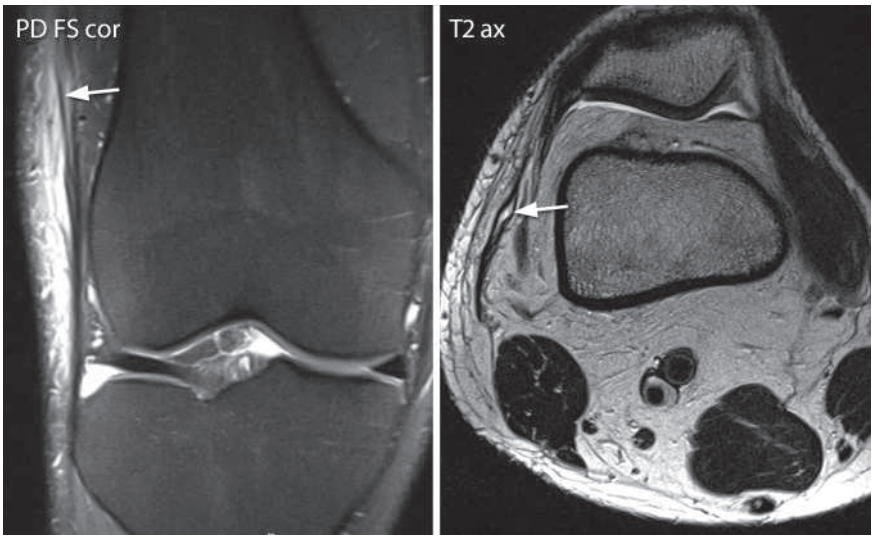


Fig. 7.169 Extended iliotibial tract syndrome with interstitial tear and resulting splitting of the iliotibial tract.

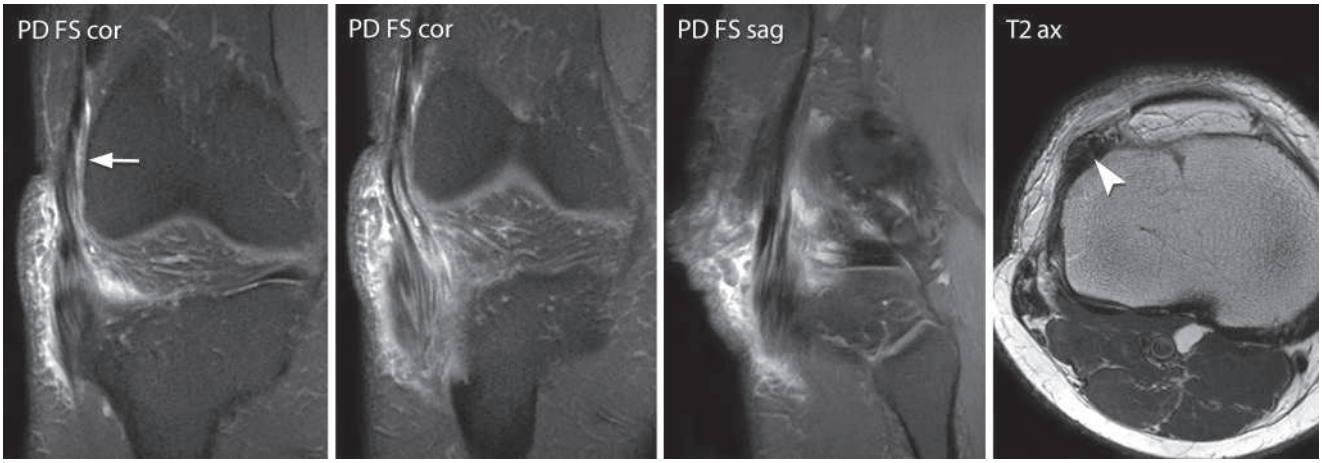


Fig. 7.170 In this example of a long distance runner, the inflammation is found not only at the typical site between the iliotibial tract and femur (arrow), but there is also intense enthesitis of the whole iliotibial tract. Note the marked thickening at the insertion (arrowhead).

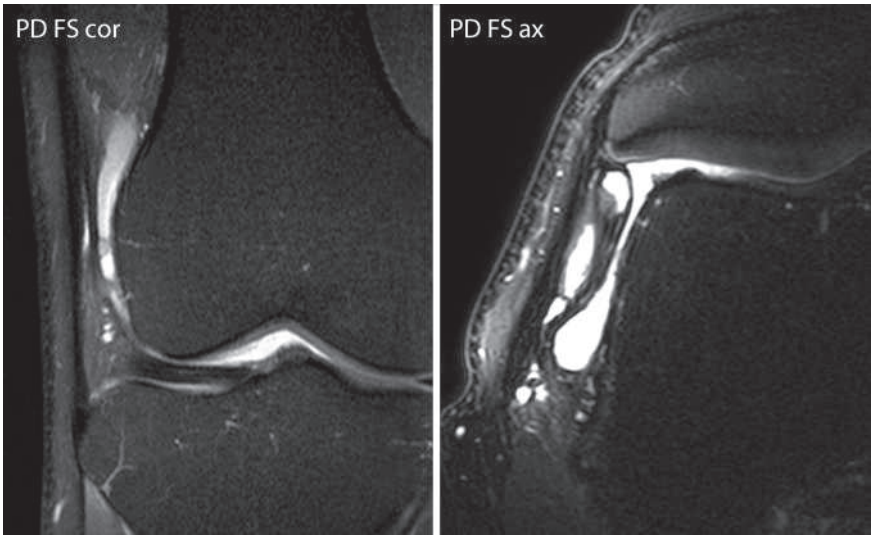
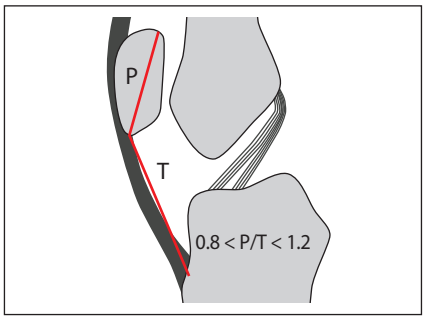
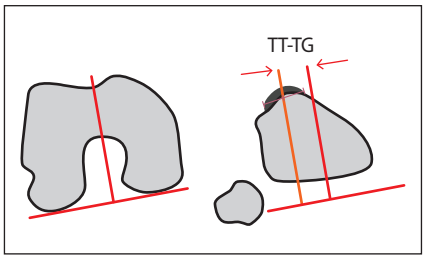


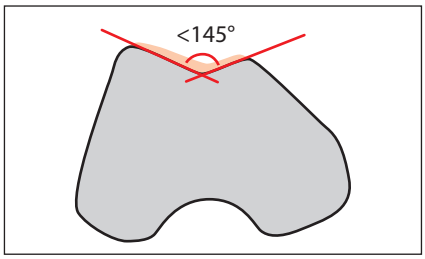
Fig. 7.171 Another chronic case with formation of an encapsulated ganglion between the iliotibial tract and the lateral femoral condyle.

Fig. 7.172 Iliotibial tract syndrome (arrowhead) in a patient with advanced medial gonarthrosis and narrowing of the joint space (arrow).

Morphology of the patellofemoral joint







Patellofemoral joint degeneration is a frequent cause of knee pain. It often occurs in conjunction with femorotibial degeneration, but about 25% of cases appear in isolation.[93] Many attempts have been made to correlate the risk for patellofemoral joint degeneration with morphologic parameters of the joint. An unmanageable number of measurements and parameters have been proposed.[94,95] Most are insufficiently reproducible and of no clinical value,[95] in part because of inadequate definition of representative slice location and angulation. Relatively reliable measurements are possible for the Insall-Salvati index and the tibial tuberosity – trochlea groove distance (TT-TG).

- The **Insall-Salvati index** describes the vertical position of the patella (Fig. 7.173). It represents the ratio of highest craniocaudal length of the patella to the length of the patellar ligament. Normal values are between 0.8 and 1.2. Higher values indicate a low patellar position ("patella baja"), lower values a high patellar position ("patella alta").
- The tibial tuberosity – trochlea groove distance (**TT-TG**) is a measurement of the amount of lateralization of the tibial tuberosity ("TT") compared to the deepest point of the trochlea groove ("TG").
  It is defined by drawing a perpendicular line from the deepest point of the trochlear groove onto the intercondylar line, which is then projected onto a slice containing the insertion of the patellar ligament. A parallel line is drawn through the center of the insertion (Fig. 7.174).[96] TT-TG distance was first evaluated on CT, and lateralization was considered to have occurred if the distance between the lines exceeded 20mm.The exact threshold is subject to debate. When MRI is used to measure the distance, measurements are 2-3 mm lower.[97] The TT-TG distance has to be determined with the knee in full extension or the obtained values will be too low (Fig. 7.175). Consequently, the lower leg has to be supported and elevated, if the examination is performed in a knee coil.[98]

To evaluate the trochlear groove itself, its depth or the **sulcus angle** are measured. The latter represents the angle between the surface of the lateral and medial facets of the trochlea. Values higher than 145 degrees are considered to be a sign of trochlear dysplasia. Again, this measurement has to be interpreted very cautiously, as the representative slice location is not defined, although often a slice 3 cm above the joint line is recommended.[99-102] The measurements are sometimes taken at the bony and sometimes at the cartilaginous surfaces, and reproducibility is low.[100]

As with all morphologic measurements, interpretation has to be tempered by the consideration that their significance for the development of joint degeneration is not clear. Some reports say that a shallow trochlear groove indicates a higher risk for joint degeneration[99,103,104] while other reports contradict them.[105,106]

One should not interpret the mediolateral position of the patella with the knee extended. Any "lateralization" may be physiologic or caused by the tight positioning of the knee in the knee coil (Fig. 7.176).

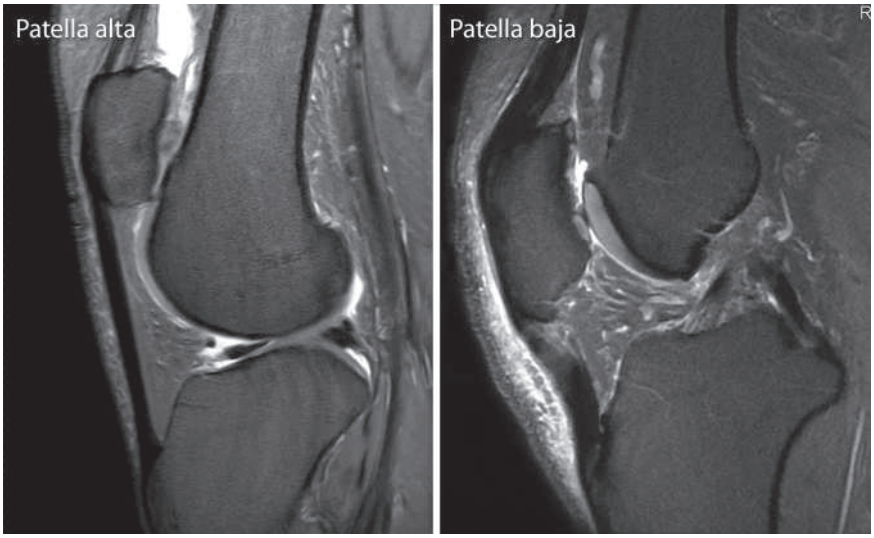


Fig. 7.173 Measurement of the Insall-Salvati-Index shown in a case of a high-lying patella (patella alta, left) and a case of low-lying patella (patella baja, right). Values between 0.8 and 1.2 are normal.

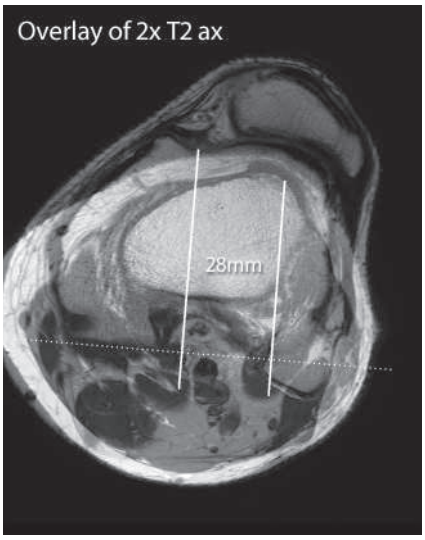


Fig. 7.174 Increased lateralization of the tibial tuberosity with a TT-TG distance of 28 mm. Superposition of two axial slices to demonstrate the measurement.

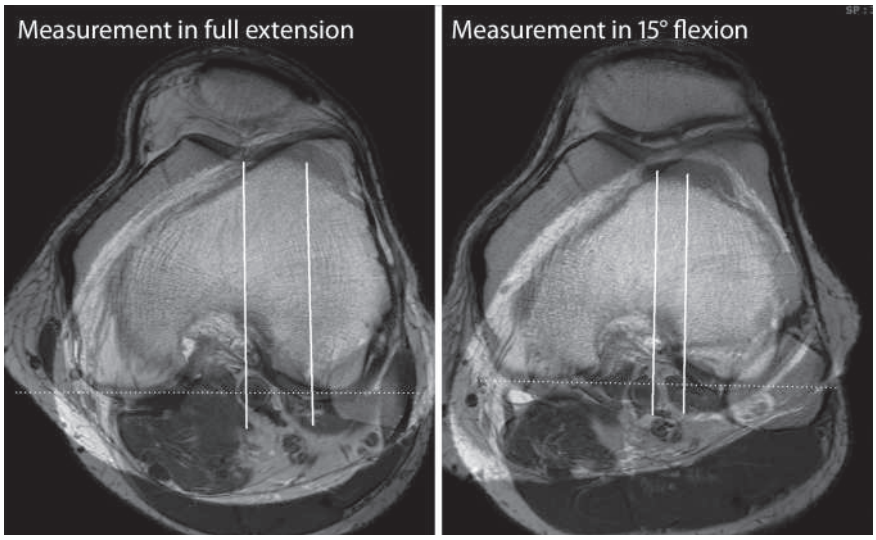


Fig. 7.175 When measuring the TT-TG distance, the examination has to be performed in full extension, as the so-called "terminal rotation" of the tibia has taken place. Evaluation with the knee in slight flexion (right) will render incorrect, inferior values.

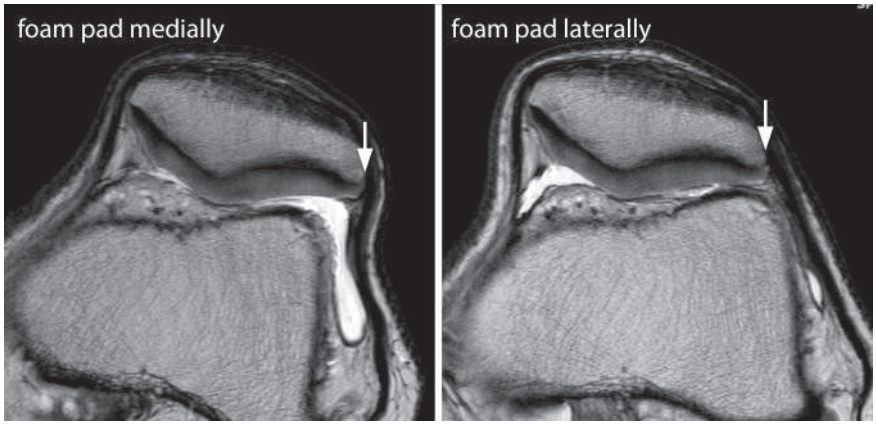
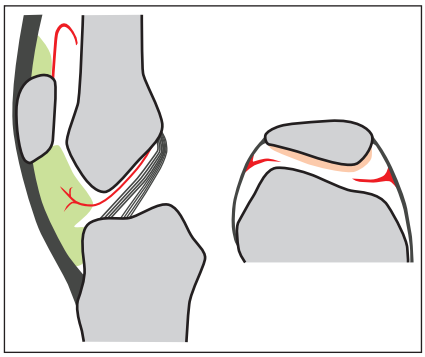
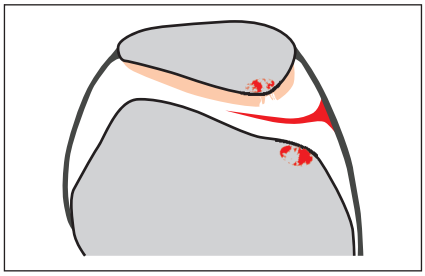


Fig. 7.176 Pseudo-lateralization of the patella due to the placement of foam pillows during positioning of the patient. In full extension, the position of the patella is markedly influenced by the location of foam pillows between knee and receiver coil.

Plicae





In the majority of cases, plicae represent asymptomatic synovial folds. They are located:

- Below the patella, anterior to the anterior cruciate ligament, called an infrapatellar plica or lig. mucosum (frequent, Fig. 7.177);
- superior to the patella, behind the quadriceps tendon, called a suprapatellar plica (frequent, Fig. 7.178);
- medial to the patella, called the medial patellar plica (very frequent, Figs. 7.179 to 7.182);
- lateral to the patella, called the lateral patellar plica (rare)

Plica syndrome presents as pain immediately superomedial to the patella. It most often occurs in young athletes. Plica syndrome is thought to be caused by inflammation, fibrosis and thickening of the medial patellar plica. There are, however, very different opinions about the clinical significance of this plica and its therapeutic consequences.[107] The differences in opinion arise because the medial patellar plica is quite common; 80% of individuals have a medial patellar plica, and a quarter of those even extend into the precondylar space.[108,109] Nonetheless, the association with chondral damage in the medial patellofemoral compartment is striking.[110,111]

MRI can confirm the presence of a medial plica and assess its extent. It can also identify associated chondral lesions at the medial patellar facet or inferiorly at the medial border of the trochlea (**"kissing lesions"**, Figs. 7.179 to 7.182). However the distinction between a normal variant (frequency 25% to 70%) and a symptomatic plica has to be made clinically. Furthermore, in the absence of a joint effusion distinguishing a plica from the synovial membrane is not always possible.[112,113]

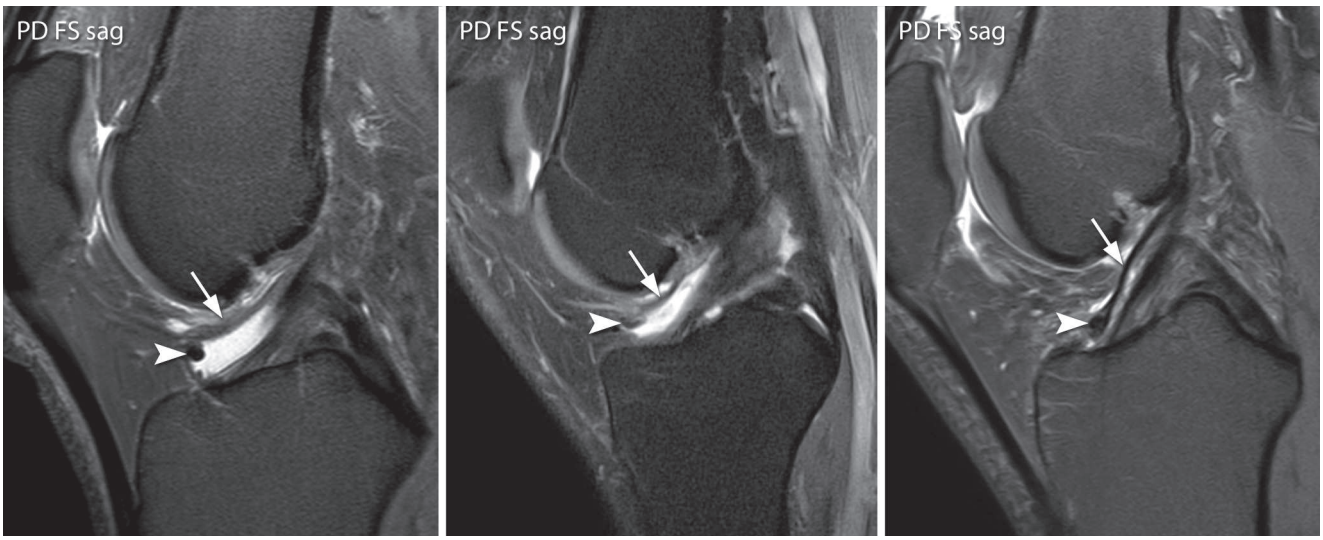


Fig. 7.177 Three examples with delineated infrapatellar plicae (arrows). Usually they blend with Hoffa´s fat pad above the transverse ligament (arrowheads). In the right example the plica runs to the transverse ligament itself.

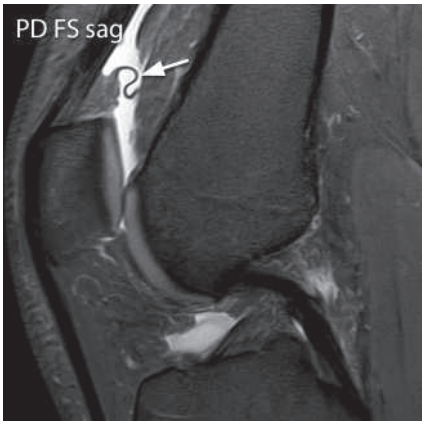


Fig. 7.178 Small physiologic suprapatellar plica (arrow).

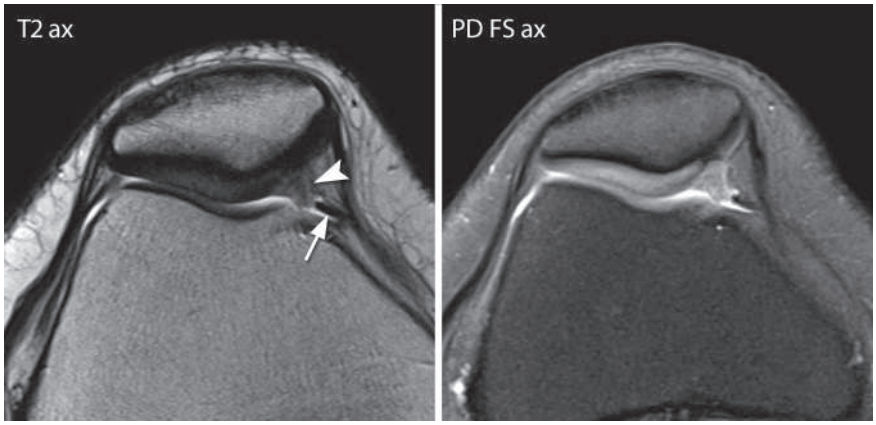


Fig. 7.179 Medial patellar plica (arrow) with adjacent focal fibrosis (arrowhead). PD FS shows a partial-thickness cartilage defect at the medial patellar facet, and edema in the area of fibrosis. A 30-year-old woman with focal pain.

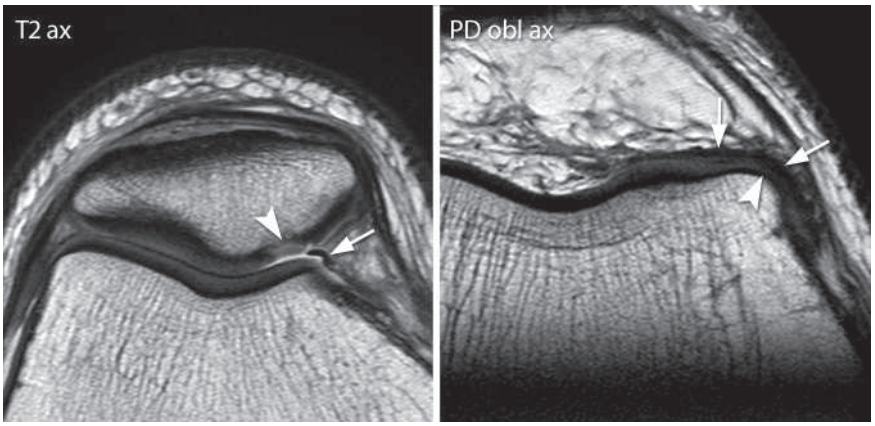


Fig. 7.180 Medial patellar plica (arrows) with focal cartilage defects retropatellar and at the medial trochlear facet (arrowheads). The oblique plane shows the wide branches of the precondylar plica.

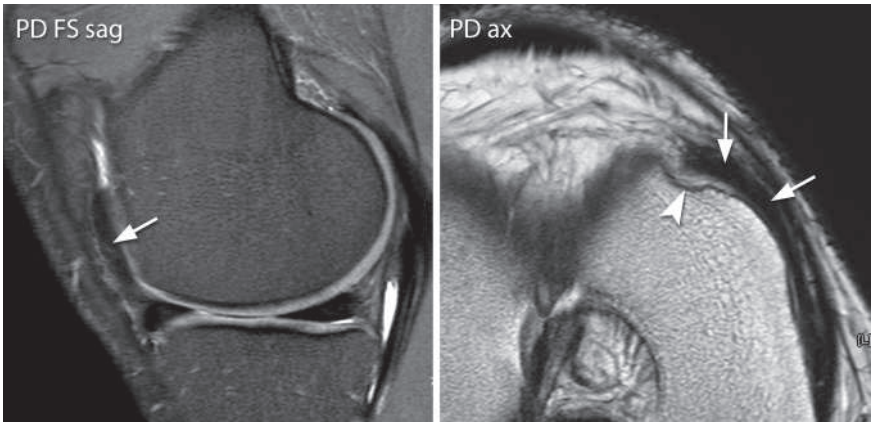


Fig. 7.181 A 31-year-old man with exercise-induced pain for two years. No trauma or operation in the history. Extensive fibrotic thickening of the medial patellar plica (arrows) has already caused bone erosion (arrowhead).

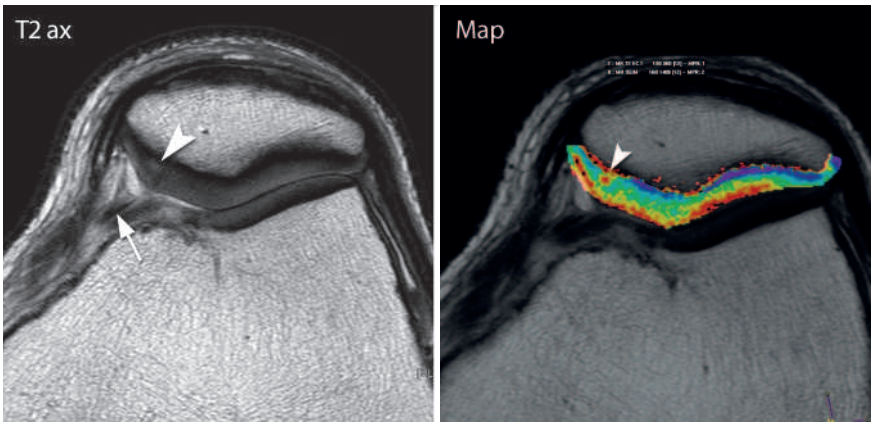
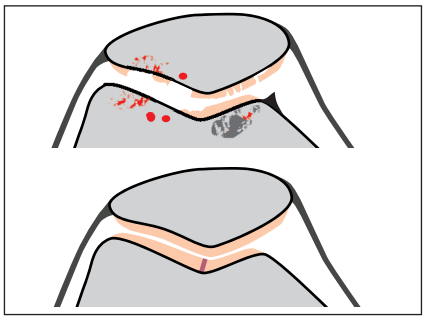


Fig. 7.182 Small medial patellar plica (arrow). On T2 initial chondral damage is visible, and can be confirmed with T2 relaxation time measurement (arrowheads).

Femoropatellar cartilage



Beside chronic degenerative cartilage loss and presumably plica-associated cartilage defects, cartilage fractures and delaminations are frequently encountered in the patellofemoral joint compartment (Figs. 7.183, 7.184).
For evaluation of the trochlea, oblique or radial slice orientations are often helpful.

In the center of the trochlear groove, dark lines within the cartilage are occasionally seen (Figs. 7.185, 7.186). These probably represent fissures without fluid, that may progress to cartilage delaminations, or circumscribed defects.[114]

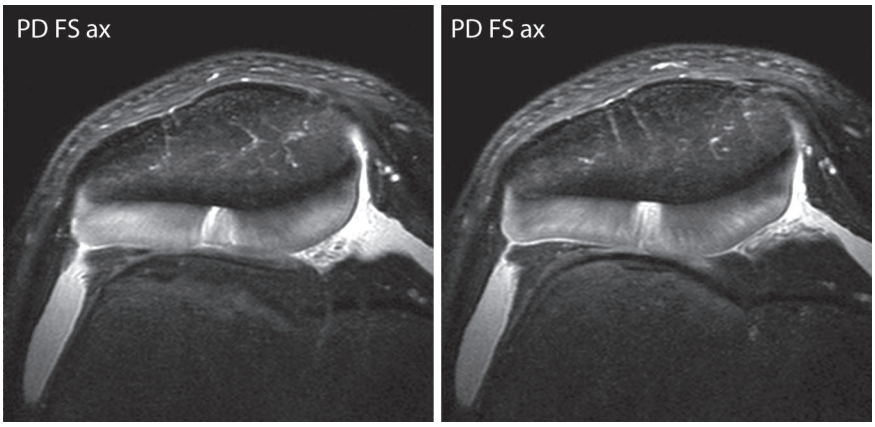


Fig. 7.183 Focal chondral damage after a twisting injury, in a 15-year-old girl.

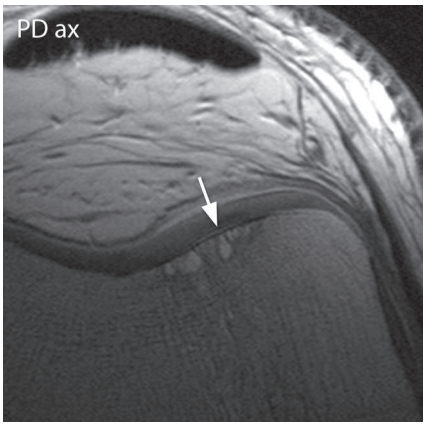


Fig. 7.184 A 63-year-old man with chronic exertional pain. There is extensive cartilage delamination at the trochlea (arrow) with subchondral cyst formation.

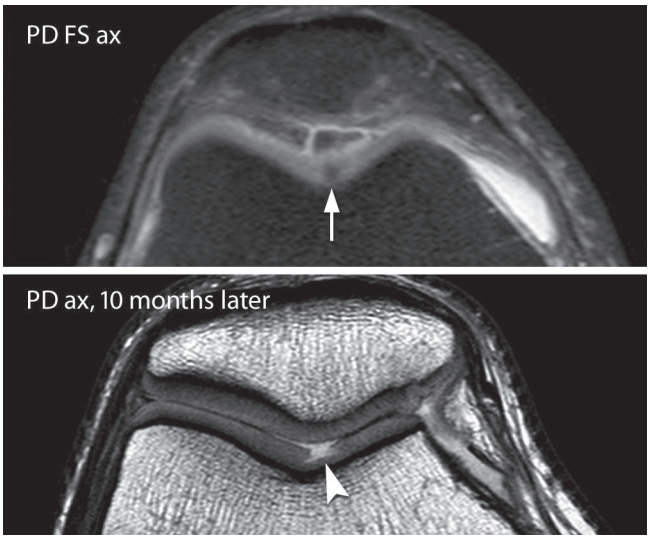


Fig. 7.185 Very discreet low signal stripe in the cartilage of the trochlear groove (top, arrow). Ten months later, a focal, partial-thickness cartilage defect has developed (arrowhead). A 43-year-old man.

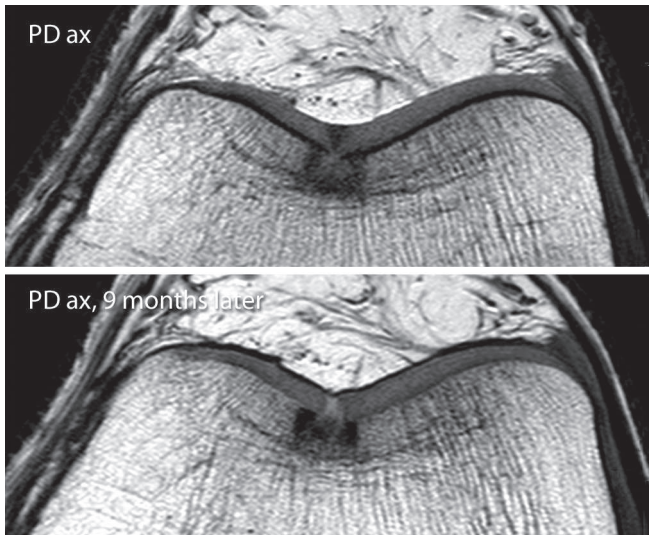


Fig. 7.186 Another example of a low signal stripe at the typical location in the middle of the trochlear groove, evolving to a focal cartilage defect. A 23-year-old man.