

Anterolateral complex injuries occur in the majority of 'isolated' anterior cruciate ligament ruptures

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<https://pubmed.ncbi.nlm.nih.gov/33796903/>

Background:

Not only the Anterolateral ligament (ALL), but also the entire “anterolateral complex” (ALC) are increasingly discussed structures of the knee, that are frequently injured in association with anterior cruciate ligament (ACL) ruptures. The ALC is composed of (i) Superficial iliotibial band (ITB) and the iliopatellar band, (ii) the deep portion of the ITB, including the capsulo-osseous layer of the ITB (COL) and the Kaplan fibers (KF) and (iii) the ALL and the adjacent capsule. Injuries of the ALC are reported to contribute to persistent anterolateral rotatory instability (ALRI) after ACL reconstruction.

Manuscript summary:

Balendra G. et al. retrospectively reviewed MRI images of 100 professional athletes who suffered from acute ACL rupture at the knee regarding ALL and KF injuries.

The KF were identified proximal to the lateral femoral condyle, adjacent to the branches of the superior lateral genicular artery. Low signal was considered normal. Discontinuity, wavy appearance, avulsion, thickening, signal-change, focal bone marrow edema at the KF insertion site to the femur, and/ or adjacent soft tissue edema were considered as injury to the KF. The ALL was identified as a low signal band posterior-proximal to the lateral femoral epicondyle crossing superficial to the fibular collateral ligament, deep to the ITB to its tibial insertion halfway between the Gerdy's tubercle and fibular head.

The authors found combined KF and ALL injuries (including two Segond fractures) in 21% of cases. Isolated ALL injuries were only found in additional 2% of cases. Isolated KF injuries (including one combined with ITB injury) were found in additional 40% of cases. Injuries of the KF were associated significantly with bone marrow edema of the lateral and medial femoral condyle and medial tibia plateau (associations for ALL injuries were not significant), indicating that more severe knee distortion resulted in KF injury. Also the association with superficial and deep medial collateral ligament injuries and ramp lesions indicate more severe trauma. However, the significance remains unclear, since the authors state in their materials and methods section that “Patients with [...] any

abnormal ligament clinical examination findings, apart from ACL laxity, were excluded”, and therefore these associations may be questionable. Most importantly, no positive correlation with higher grade clinical scores (Pivot-shift, Lachmann) was found.

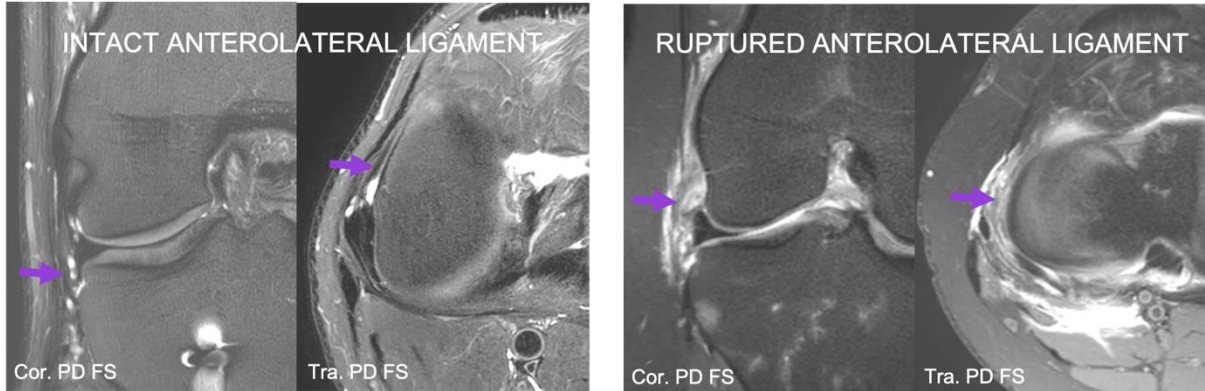


Figure 1: Anterolateral ligament on MRI. left: Intact ALL on coronal and transverse MRI images.

Right: Ruptured ALL on coronal and transverse MRI images.

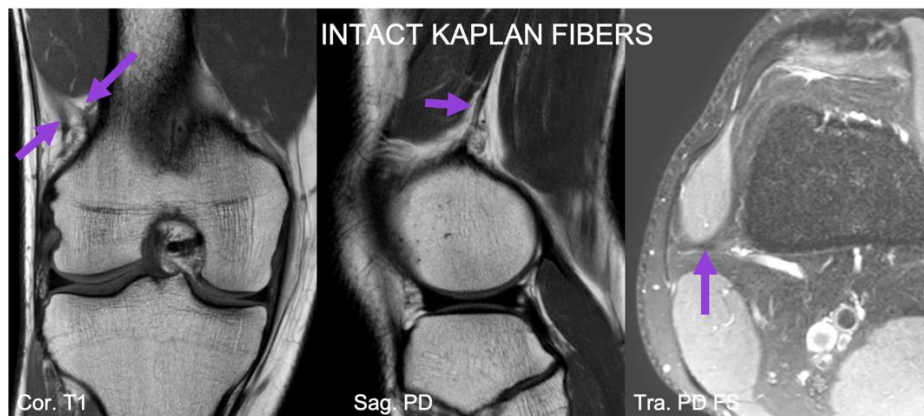


Figure 2: Intact Kaplan Fibers on MRI.

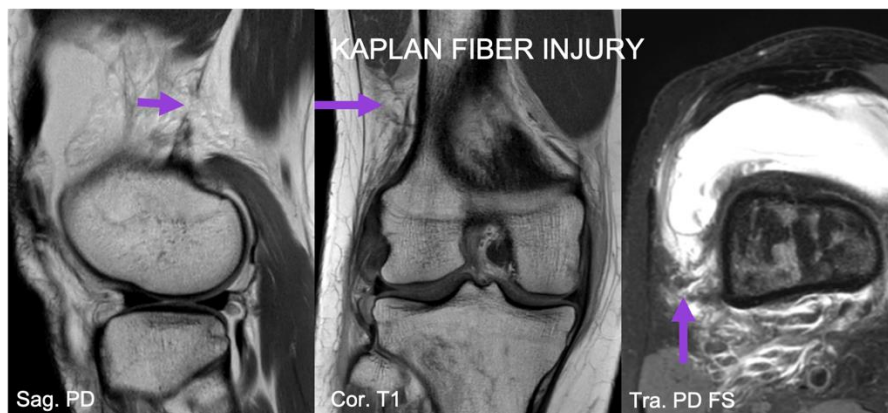


Figure 3: Injury of Kaplan Fibers on MRI.

Plus:

- Only professional Athletes
- MRI evaluation by two radiologists
- Correlation with clinical findings/ knee stability

Limitations:

- Retrospective design
- Different MRI quality and different protocols
- MRI within 0-21 days 2.5 ± 3.2 days (publication by Runer et al. (see below): all 3T at the same scanner using an identical protocol, but up to 6 weeks after injury)
- Injury definition of KF was very broad, based on the publication by Batty et al.
- Injury definition of ALL was not provided in the manuscript.

Discussion/ Comment:

For identification, findings and even definition of the normal and injured ALL on MRI, a recent systematic review reported high variability (<https://pubmed.ncbi.nlm.nih.gov/31000390/>). The entire portion of the ALL was frequently not seen (variation of 51 to 100% visibility). Presence of injuries to the ALL (combined or in isolation) in knees with ACL ruptures showed a variability of 11 to 98%. In the presented study prevalence 21%. Recently some authors focus on the deep attachments of the ITB to the distal femur, consisting of KF and the capsule-osseous layer of the ITB (COL). The KF was described to have proximal and distal supracondylar fibers, that connect the ITB to the posterolateral femur. A varying visibility of 60 to 100% on MRI has been reported. Incidences of KF injuries (combined or in isolation) in ACL ruptures knees range between 19-85%.

In another study by Runer et al. (<https://pubmed.ncbi.nlm.nih.gov/33770221/>) that also ranked in the ESSR sportsimaging committee top 10 Sportsimaging papers Q1 2022 and which was published also by the KSSTA, a similar investigation was performed. They did not assess clinical knee stability.

In contrast to the above mentioned studies, the authors found a visibility of 79% for the ALL and 85% for the KF and an injury rate of 56% for the ALL and 18% for the KF in 66 adults up to 6 weeks after ACL rupture, which provides an inverse picture. They used a more narrow definition for presence of injury (partial vs complete tear), which consequently resulted in a lower injury rate for KF. In addition they provide the definition for the diagnosis of an ALL rupture. In a study by Berthold et al. AJSM (<https://pubmed.ncbi.nlm.nih.gov/34086492/>; ranking under the top 10 sportsimaging papers in Q3 2021) an incidence of 53-56% of KF injuries on MRI in ACL ruptured knees were found – none of these were mentioned in the initial MRI report. The COL was not addressed in the presented manuscript. Runer et al. were not able to identify it in any patient.

Although Feretti et al. reported that injury to the anterolateral structures at the knee is the most important risk factor for grade 3 pivot shift in acute ACL-injured knees (<https://pubmed.ncbi.nlm.nih.gov/32631068/>), as shown by the presented study, the true importance regarding the clinical and biomechanical function and implications remain unclear and will need to be assessed in future investigations.

This presented study, as well as the number of other investigations show highly insufficient consensus for detection of the structures and injuries on MRI and therefore demonstrate, that it is hard to properly identify the structures during everyday practice. Following, the conclusion of the reading is, that MSK radiologists need to be aware of this trend of interest in orthopedic surgery regarding the ALC, make sure they are able to identify the structures on MRI scans and provide information on potential injury (particularly look for it in cases with ACL rupture and bone marrow edema). Still, reviewing lots of MR images seems essential to get used to this new “hype” and provide correct information.