LATERAL MENISCUS SLOPE AND ITS CLINICAL RELEVANCE IN PATIENTS WITH A COMBINED ACL TEAR AND POSTERIOR TIBIA COMPRESSION

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HYPOTHESIS: the lateral meniscus has its own dedicated surface on the tibial plateau - the plateau’s disruption leads to the reduction of the LM's support in turn resulting in progression of degenerative changes of the meniscus as well as articular surface.
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BACKGROUND: Identification of disruptions in the congruency of the lateral meniscus (LM)' setting on the tibial plateau in case of patients with the anterior cruciate ligament (ACL) injury combined with the damage to the posterior margin of the tibia is important due to the meniscus’ role in knee biomechanics.

HYPOTHESIS: The reduction of the meniscus’ support affecting its normal movement is a potential source of accelerated progression of degenerative changes of the meniscus and tibial plateau.

AIM OF THE STUDY: to establish the proper setting of the lateral meniscus on the plateau and estimate possible outcomes of the disruption of LM’s movement.
CONTROL GROUP: MRI scans of 10 healthy volunteers

STUDY GROUP: MRI scans of 10 pain-free* ACL patients with a damage to the posterior margin of the tibia

*a proper MRI examination of the lateral meniscus in full knee flexion is limited in case of patients with mild to severe knee pain

MRIs: scans done in maximum knee flexion (sagittal plane, PD) using GE 3.0T Discovery device.

visual and measurement comparison of control and study group’s scans
determination of the position and setting of the lateral meniscus against the articular surface
MRI. PD sagittal plane. Healthy knee in extension (L) and in full flexion (R)
Correct setting of the posterior part of the lateral meniscus. Convex (domed)
shape of the posterior margin of lateral tibial condyle with the meniscus on its
dedicated articular surface.
MRI. PD sagittal plane. Healthy knee in flexion. Posterior part of the lateral meniscus is not gliding to the back.

MRI. PD sagittal plane. Healthy knee in full flexion. Posterior part of the lateral meniscus is gliding on its dedicated surface on the tibial plateau.
MRI, PD sagittal plane. Post acute ACL rupture knee in flexion: a bone bruising and minor compression (grade II) slightly changes the original convex (domed) shape of the tibial plateau, but it does not significantly affect the lateral meniscus’ movement on its dedicated surface; ligaments of the capsular meniscal attachments are swollen.
Based on the findings of the pilot study, we drew a preliminary conclusion that in cases of a smaller compression (grades II-III) of the posterior margin of the tibia, the lateral meniscus loses its support in flexion, but retains it in extension.
The control group’s MRIs confirmed the lateral meniscus slope onto its “dedicated” surface on the posterior tibial plateau.

The study group’s images have also confirmed the incorrect setting of the lateral meniscus and its deformation in the maximal knee flexion in cases when the compression fracture of the lateral posterior tibial plateau led to the significant reduction of the support required for the proper LM’s movement.
**GRADE I**
oedema resulting from the contusion of the bone, **no changes** in the shape of the plateau

**GRADE II**
slight compression, but the meniscus is still **fully supported**

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**TIBIAL PLATEAU COMPRESSION**

**BASED ON A RETROSPECTIVE STUDY**  
**BASED ON A LARGE (300+) SAMPLE**

- high incidence of posterior tibial fractures coinciding with ACL rupture but also as a separate injury

- **GRADES I & II** do not require surgical intervention

- FAT SAT & STIR projections are a golden standard for bone bruising detection; literature analysis combines with the study and researchers’ own clinical experience concludes that **FAT SAT** best visualises both the oedema and the fracture (grades I through IV)
GRADE III
bone degradation, only about 50% tibial support for the meniscus remains.

TIBIAL PLATEAU COMPRESSION

GRADE IV
less than 50% tibial support for the meniscus

★ GRADES III & IV require surgical intervention (if diagnosed as concurrence with ACL rupture recommended at the time of the primary ACLR)
➢ to verify the extent of depression of the bone axial plane scans provide the best assessment
CONCLUSIONS AND CLINICAL RELEVANCE

MENISCUS MOVEMENT & TIBIAL PLATEAU

- The lateral meniscus glides on its dedicated articular surface on the tibial plateau and the absence of the congruence between the LM and its dedicated slope appears to be a likely source of accelerated degeneration of both the meniscus and the adjoining articular surface of the tibia in patients with prior ACL injury.

- The results gathered so far should be considered preliminary findings and require further validation on a larger group and done in conditions allowing the assessment of the meniscus’ movement at more angles.

CLINICAL RELEVANCE

- The presented pilot study in combination with the retrospective MRIs analysis performed to design an intuitive compression tibial plateau fractures classification point to the importance of careful observation of the tibial plateau's surface in ACL patients due to the high incidence of compressions as well as tibia’s role in supporting the meniscus’ proper movement.

- If cases of grades III or IV are diagnosed, surgical treatment is recommended to avoid long-term complications such as ACL re-rupture and/or unsatisfactory outcomes.
REFERENCES


In case of any questions do not hesitate to contact us at: rsmigielski.contact@gmail.com