Injuries and tears of the Anterior Cruciate Ligament (ACL) are quite a prevalent phenomenon, and its discussion is an ongoing topic in biomechanics. Recently, a group of scientists came up with the idea to reproduce these injury patterns in human cadaveric specimens. Enjoy the read!

**Timing of Strain Response of the ACL and MCL Relative to Impulse Delivery During Simulated Landings Leading up to ACL Failure**

The paper was published recently in the Journal of Applied Biomechanics and is full open access. The group, namely Nathaniel A. Bates, Nathan D. Schilaty, Ryo Ueno and Timothy E. Hewett, aimed to investigate the effects of a simulated landing event with a following injury of the ACL. The group mainly focused on the development of strain over time, seeking to understand the temporal aspects of the injury.

For this purpose, the group instrumented 35 lower-extremity specimens with strain gauges on their ACLs and medial collateral ligaments (MCL) and fixated the specimen in a dynamic impacting device. The group was able to simulate different landing profiles, each associated with a distinct injury-risk. Have a look at their setup on the image below!
The Group stated that videos of ACL injuries allow the estimation that ruptures occur within 50 milliseconds of initial impact. Obviously, videos are quite an imprecise way to identify the exact temporal parameters of an injury, and data acquisition is indirect. Using the described setup, the group found that mean time to peak strain was 53 ms for the ACL and 58 ms for the MCL, so the first estimation based on video was quite close. Peak strain was reached in a range from 48 to 61 ms, while different risk-profiles did not result in different times to peak strain.

The group concludes that noncontact ACL injuries most likely will occur in the first 61 ms after the initial impact, independent from knee abduction moment or relative injury risk. Furthermore, the group was not able to include data from rupture trials since the strain gauge did not deliver unequivocal data in such an event. Also, the group states that during a
landing event in a living specimen, muscle contractions might dynamically change the forces acting upon ACL and MCL.

We think that understanding the temporal parameters of this injury pattern is key when it comes to prevention. The development of footwear or smart orthotics that might lower the risk of injury needs exactly this kind of data, and the group did a great job in gathering that data. Plus it’s full open access – so give it a read here!