Patterns of Knee Cartilage Thickness Loss after Posterior Crucial Ligament Injury

Cotofana S[1], Boeth H.[2], Diederichs G.[3], Wirth W.[1], Hudelmaier M.[1], Jung T.[4], Duda G.N.[2], Eckstein F.[1]

[1]Institute of Anatomy, Paracelsus Medical University, Salzburg, Austria
[2] Julius Wolff Institute, Charité – Universitätsmedizin Berlin, Center for Sports Science and Sports Medicine Berlin, Germany
[3]Department of Radiology, Charité - Universitätsmedizin Berlin
[4]Department of Traumatology, Charité - Universitätsmedizin Berlin

Objective: The magnitude and pattern of knee cartilage thickness change after posterior cruciate ligament (PCL) injury and reconstruction has not been previously reported. Detailed knowledge on such changes may, however, be potentially useful in monitoring the success of therapeutic intervention by surgery, medication, and/or physiotherapy.

Methods: 20 participants who had sustained PCL injury and consecutive reconstructive surgery had MR images acquired at baseline, i.e. 3-38 months after PCL surgery. To date, 9 participants had one-year follow-up imaging on the same scanner (6 men, 3 women; age 37±10 yrs.). Changes in cartilage thickness between baseline and one year follow-up were computed after manual segmentation of the cartilage surfaces and the bone cartilage interfaces in the medial and lateral femorotibial, and in the femoropatellar compartment.

Results: Cartilage thinning was observed in all femorotibial cartilage plates, with a greater annual percent change in the medial tibia (-4.7% [95% confidence interval -8.9;-0.5%]) and medial femur (-5.1% [-10.2; ±0.0%]) than in the lateral tibia (-1.2% [-3.4; 0.9%]) and lateral femur (-1.8% [-3.3; -0.3%]). Cartilage thinning also occurred in the femoropatellar compartment, with a greater observed annual percent change in the patella (-3.5% [-5.4;-1.7%]) than in the femoral trochlea (-0.9% [-2.2; +0.3%]).

Conclusion: The rates of cartilage thinning observed after PCL rupture and reconstruction were greatest in the medial femorotibial compartment and in the patella, and exceed those typically seen in primary knee osteoarthritis. They also differ from those in patients with anterior cruciate ligament rupture (and repair), in whom cartilage thickening was observed after injury.