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Injuries of Kaplan fibers in ACL deficient and reconstructed knees – redefining the structure and risk

assessment on MRI using injury patterns

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Objectives: To determine an injury pattern of knee structures along torn Kaplan fibers in ACL deficient knees and to observe the healing process of Kaplan fibers in ACL reconstructed knees.

Methods: A total of 101 knee MRIs obtained between January 2004 and April 2020 with full-thickness ACL tears were retrospectively assessed for visibility and impairment of three Kaplan bundles (proximal, distal and epicondylar band) and for associated injuries by two fellowship-trained independent musculoskeletal radiologists. A subgroup of 33 follow-up knee MRIs after ACL reconstruction was assessed to observe the natural evolution of Kaplan fibers injury. Descriptive statistics and Spearman correlation coefficients (P<.05) were used to determine injury patterns. **Results:** Kaplan fibers were injured in 43 of 101 (43%) acute ACL deficient knees. Proximal Kaplan fibers were visible in less than 48 of 101 (50%) knees as opposed to the distal Kaplan fibers and epicondylar Kaplan band which were both visible in 98 of 101 (97%) knees. Injury to the Kaplan complex was significantly associated with anterolateral (rho, 0.36; P<.001) and lateral collateral ligament impairment (rho, 0.21;P<.05) and medial femoral bone marrow edema (rho, 0.21;P<.05). After ACL reconstruction, only two of 33 (6%) patients showed torn Kaplan and 13 of 33 (39%) distal Kaplan fibers were scarred.

Conclusion: Torn Kaplan fibers are associated with anterolateral and lateral collateral ligament injuries in ACL deficiency, indicating a more severe anterolateral and rotatory instability. Injury patterns in ACL deficient knees can eliminate the uncertainty of proximal Kaplan fibers identification. Kaplan fiber tears tend to heal following ACL reconstruction.

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