

ACL Graft Metabolic Activity Assessed by 18FDG PET-MRI

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Summary:

Metabolic activity of ACL grafts as assessed with PET-MRI was significantly lower in grafts greater than two years post-reconstruction relative to those grafts in place for shorter periods of time.

Abstract:

Background: For an ACL graft to function in the long-term, it must undergo ligamentization. The rate at which this process occurs in humans is not well delineated and difficult to assess in vivo. Combined 18F-Fluorodeoxyglucose positron emission tomography (PET) - magnetic resonance imaging (MRI) imaging has the capability to quantify tissue metabolic activity with sufficient resolution to evaluate a healing ACL graft.

Hypothesis: 18FDG PET signal intensity decreases with time from ACL reconstruction.

Study Design: Case Series

Methods: Twenty-one knees with intact ACL grafts in 19 patients at multiple time points following ACL reconstruction were recruited to participate. PET-MRI imaging was performed using a custom device to place the knees in the same position for both studies and images were co-registered for quantification of the 18FDG-PET standardized uptake value (SUV) for specific structures within the knee. Signal in the proximal, middle, and distal ACL and extra-articular muscle tissue was quantified and signal from each location was compared based on the time each was knee from ACL reconstruction (less than 6 months, 6 to 12 months, 12 to 24 months, or greater than 24 months).

Results: Significant differences in 18FDG PET SUV between the 4 time points were observed in the proximal ($p=0.02$), middle ($p=0.004$), and distal ($p=0.007$) portions of the ACL graft. The greater than 24 months group was noted to be different from other groups in each case. No difference in PET 18FDG SUV was noted in the extra-articular muscle in the index knee in each time group ($p=0.61$).

Conclusion: 18FDG PET-MRI imaging has been demonstrated to assess the metabolic activity of ACL grafts in vivo. Metabolic activity was noted to be significantly lower in grafts that were imaged greater than 2 years post-reconstruction relative to those grafts that had been in place for shorter periods of time.

Clinical Relevance: 18FDG PET-MRI can provide insight into the process of graft ligamentization in patients following ACL reconstruction. A better understanding of this process may impact graft selection and return to play decisions that could influence graft tear risk.