

EFFECT OF AUTOGRAFT TYPE ON RECOVERY OF KNEE EXTENSOR MECHANISM FUNCTION FOLLOWING PEDIATRIC ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION

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INTRODUCTION

While multiple studies have shown clear benefits of autograft over allograft for anterior cruciate ligament reconstruction (ACLR) in young athletes, disagreement remains regarding the optimal autograft choice [1]. Recovery from ACLR may be influenced by the type of autograft used, which is typically based on skeletal maturity, surgeon preference and the athlete's post-surgical goals. This study compared knee joint function, specifically in the sagittal plane, among pediatric athletes with different ACLR autograft types, including iliotibial band (IT), hamstring tendon (HT), quadriceps tendon (QT), and patellar tendon (PT).

CLINICAL SIGNIFICANCE

In the return to sport timeframe following ACLR, young athletes with IT band autografts exhibited the greatest engagement of the knee extensors during dynamic loading among all autograft types studied, supporting the use of IT band as a viable autograft option in young athletes undergoing ACLR.

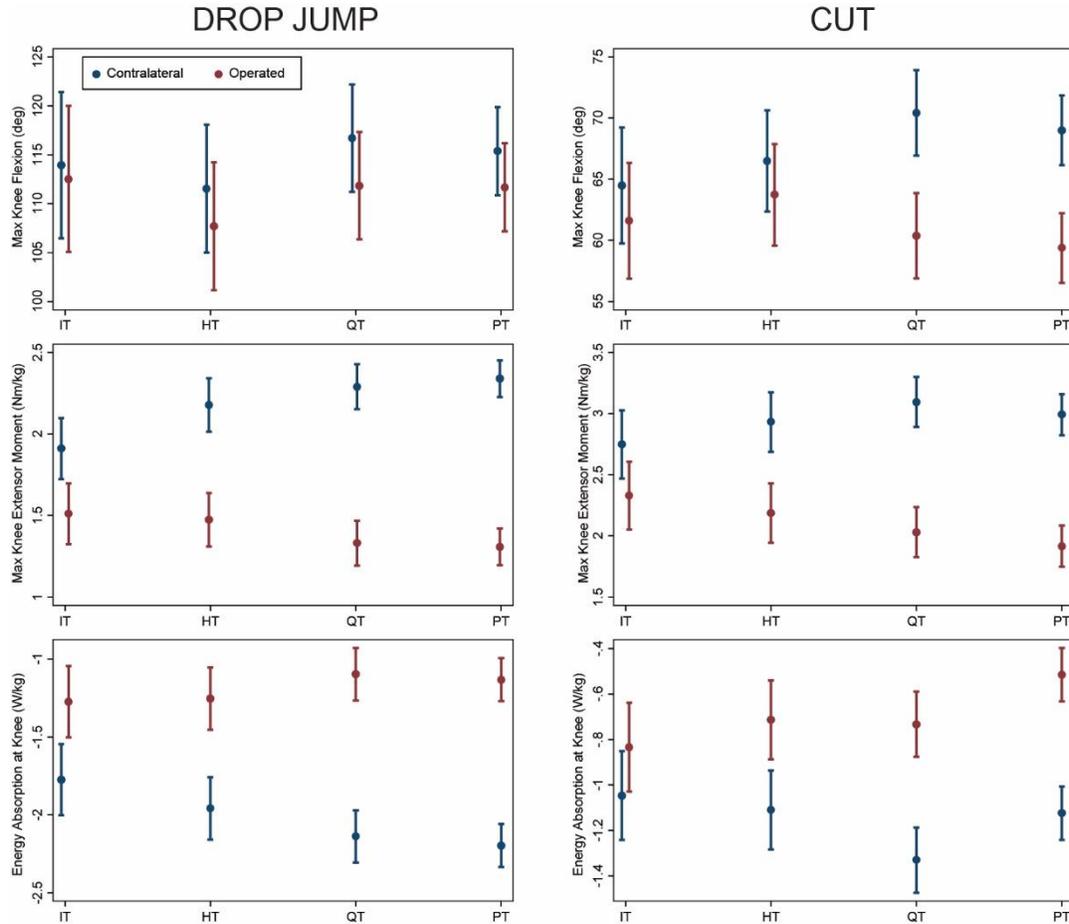
METHODS

145 pediatric athletes (76 female; mean age at surgery 15.0, SD 2.2, range 7-21 years) with recent (3-18 months) unilateral ACLR performed drop-jump landing (41 cm box) and 45° cutting. Kinematics and kinetics were collected using a 6-degree of freedom model [2] and an 8-10 camera Vicon motion capture system with AMTI force plates. Knee extensor mechanism function (maximum knee flexion angle, maximum internal knee extensor moment, energy absorption at the knee) during the loading phase (foot contact to peak knee flexion) was compared among graft types (20 IT, 29 HT, 39 QT, 57 PT) and sides (ACLR or contralateral) using linear mixed models with sex, age, and time since surgery as covariates.

RESULTS

Of all graft types tested, dynamic knee extensor function was greatest in the IT band group. Knee flexion was significantly lower on the operated vs. contralateral side for HT, QT, and PT during both drop jump ($p \leq 0.02$) and cutting ($p \leq 0.006$). All graft types exhibited lower knee extensor moments and energy absorption on the operated side during both movements ($p < 0.001$). This asymmetry was most pronounced for QT and PT and least pronounced for IT (Figure 1). Loading on the operated limb decreased in order from IT to HT to QT and PT, while loading on the contralateral limb increased similarly. Asymmetry of kinetics was significantly lower for IT compared with both QT and PT during both movements ($p \leq 0.005$). Similar patterns were observed for HT but were less pronounced and not always statistically significant ($p \leq 0.07$). Few differences in asymmetry were observed between IT and HT or between QT and PT.

FIGURE 1: Comparison of operated (red) and contralateral (blue) limbs by graft type (model predicted average and 95% confidence interval)



DISCUSSION

In the return to sport timeframe following ACLR, young athletes with IT band autografts exhibited the greatest engagement of the knee extensors during dynamic loading among all autograft types studied. This was evidenced by both higher loading of the reconstructed knee and lower loading of the contralateral knee, resulting in decreased asymmetry. Interestingly, these effects were much more prominent for kinetics compared with kinematics. This highlights the importance of objective, quantitative assessment using motion analysis technology since the kinematic asymmetry could be difficult to discern visually.

REFERENCES: [1] Engelman (2014) Am J Sports Med 42: 2311-2318. [2] Wren et al. (2020) Gait Posture 80: 228-233.

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