

Albert Trillat Young Investigator's Award

The Effect of Meniscectomy and Meniscal Allograft Transplantation on Knee and Anterior Cruciate Ligament Biomechanics

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Background:

Limitations exist in the current understanding of the biomechanical effects of meniscal allograft. The relationship between the medial meniscus and the anterior cruciate ligament is important, but not fully understood.

Hypothesis:

Meniscectomy would increase strain on the anterior cruciate ligament while meniscal allograft transplant return cruciate strain to normal values.

Study Design:

Controlled laboratory study

Methods:

A differential variable reluctance transducer was placed in the anterior cruciate ligament of ten human cadaveric knees to record strain. Tibial displacement from a neutral reference was recorded relative to the position of the femur. Testing was performed at 30⁰, 60⁰ and 90⁰ of knee flexion. Six cycles of anterior-posterior loads were applied to the limit of 150N. After a testing cycle a meniscectomy was performed cycle was repeated. A meniscal allograft transplant was performed and a final cycle was repeated. ACL Strain and tibial displacement in the meniscectomy and meniscal allograft states were compared to the intact knee.

Results:

Tibial displacement after meniscectomy significantly increased at all angles. The meniscal allograft transplant restored tibial displacements to normal values at 30⁰ and 90⁰. Anterior cruciate ligament strain increased significantly after meniscectomy at 60⁰ and 90⁰ of flexion, and meniscal allograft transplant returned the strain values to normal at 60⁰ and 90⁰.

Conclusions:

Meniscectomy produced a significant increase in tibial displacement relative to the femur and meniscal allograft transplantation restored displacement values to normal. Meniscectomy increased ACL strain and meniscal allograft transplant restored strain values to normal.

Clinical Relevance:

The absence of the medial meniscus exposes the anterior cruciate ligament to higher strains. This may affect patients with anterior cruciate ligament replacement grafts.