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**Significance:** The significance of this research lies in the fact that a young athlete who has had multiple recurrent ACL injuries by their mid-20's will be at significantly increased risk for developing premature knee osteoarthritis which will have a lifetime impact on their ability to remain active. Efforts must be made to reduce recurrent ACL injuries in younger patients with particular attention paid to the danger of returning to high risk sports.

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**Keywords:** Anterior cruciate ligament, Reconstruction, Graft rupture, Reinjury, Return to sport, Young patients

## Knee - Ligament > ACL

OP-092

### PROXIMAL TIBIAL BONY AND MENISCAL SLOPES ARE HIGHER IN ACL INJURED SUBJECTS THAN CONTROLS. A COMPARATIVE MRI STUDY

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**Background:** Increased tibial slope is a reported risk factor for non-contact anterior cruciate ligament (ACL) injury as well as failure after ACL reconstruction. The impact of the soft tissues, particularly the menisci, on the functional tibial slope remains unclear.

The primary aim of this study was to compare the proximal tibial bony and meniscal slope in patients with and without ACL injury, and to investigate the relationship between the bony slope and meniscal slope. Our hypothesis was that both the bony and meniscal slopes would be increased in ACL injured subjects, and that inclusion of the meniscal horns would reduce the observed slope, correcting the functional slope towards the horizontal.

**Materials & methods:** Using Magnetic Resonance Imaging (MRI), we measured the lateral and medial bony tibial slopes (LBS, MBS), and lateral and medial meniscal slopes (LMS, MMS) in 100 patients with isolated ACL injury, and compared these to a control group of 100 patients with an intact ACL. Inter- and intra- observer reliability were assessed using repeated measures analysis of variance. Slope measurements were compared using independent-samples t-tests.

**Results:** Inter- & intra-observer reliability were good for measurement of both the bony and meniscal slopes (ICC 0.78-0.91 and 0.88-0.93 respectively). The LBS and MBS were greater in the ACL injured group than in the control group (LBS 10.48°±3.15 vs 7.33°±3.45, MBS 9.47°±3.34 vs 7.05°±3.72, p<0.05). The LMS and MMS were also greater in the ACL injured group than in the control group (LMS 4.76°±4.74 vs 0.91°±4.85, MMS 6.06°±3.49 vs 3.72°±3.68, p<0.05). In both groups, the lateral bony tibial slope was greater than the medial bony tibial slope (LBS>MBS), but the medial meniscal slope was greater than the lateral meniscal slope (MMS>LMS). The meniscal slopes were less than the bony slopes in both compartments for both groups.

**Discussion:** The most important findings of our study are that the bony and meniscal slopes in both compartments are greater in ACL injured

subjects than controls, and that these differences are more pronounced in the lateral compartment. Furthermore, as the LBS was greater than the MBS, but the LMS was less than the MMS, the lateral meniscus has a greater impact on the observed slope than does the medial meniscus. The greatest observed difference was between the LBS and the LMS.

These findings support the notion that lateral compartment slope in particular is a significant risk factor for non-contact ACL injury. Under load, the lateral femoral condyle may "slide down" an increased lateral slope, pivoting about the more stable medial femoral condyle. The resultant rotational moment would increase the strain in the ACL, potentially leading to injury. Loss of the posterior horn of the lateral meniscus would increase the functional slope and potentially magnify this effect.

As a risk factor for failure after ACL reconstruction, tibial slope is potentially modifiable by osteotomy. Such intervention may be considered in cases of excessive slope, especially after the loss of the meniscus, however the precise indications for this significant intervention are unclear.

Limitations of this study include the use of recumbent MRI scanning, and a control group with MRI performed for patello-femoral pain, who may have different slope characteristics to a true normal population.

**Conclusion:** Increased tibial slope is a risk factor for ACL injury and can be reliably measured using an MRI based method. The meniscus corrects the observed slope towards the horizontal, particularly in the lateral compartment. As such, loss of the posterior meniscus may potentiate the risk of injury, or failure of ACL reconstruction, by increasing the functional tibial slope.

**Keywords:** ACL, Tibial slope, Meniscal slope

## Knee - Ligament > Anterolateral ligament

OP-093

### AN ANATOMICAL AND MRI ASSESSMENT OF THE OF ANTEROLATERAL LIGAMENT

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**Objectives:** Characterize the anatomy of the ALL in fresh cadaver knees and as viewed using MRI imaging within cadaver knees and those of healthy volunteers.

**Methods:** The anterolateral ligament (ALL) was dissected from the knees of 8 fresh cadavers. Both dissections of fresh cadaver knees and MRI imaging of cadavers and healthy volunteers were used to provide a description of the anatomical features and projections of the ALL as well as the conditions for optimal imaging of this structure.

**Results:** The ALL was identified in all but one of the 8 (87.5%) fresh cadaver knees. It originates from the fibular condyle of the femur and courses anterolaterally to the tibial plateau. The ALL width within the tibial plateau was 7.42±0.80mm, 8.56±0.59mm and 10.53±0.51mm within the different in footprints of the ALL in the femur and tibia. The thickness within the tibial plateau was 1.29±0.03mm. With the knee flexed at 60°, the length of the ALL was 33.93±1.81mm. When using 3.0T MRI, the ALL could be clearly identified within coronal and anteroposterior positions of the 7 fresh cadaver knees and the 3 healthy volunteers.

**Conclusion:** With the use of 3.0 MRI, the ALL could be identified in the anterolateral region of the knees in cadavers and healthy volunteers. It appears that a 0° flexion of the knee may provide an optimal orientation for viewing the ALL with MRI.

**Keywords:** anterolateral ligament, MRI, anatomy

## Knee - Ligament > Anterolateral ligament

OP-094

### RESTORATION OF ROTATIONAL KNEE LAXITY FOR ANTERIOR CRUCIATE LIGAMENT DEFICIENCY: ANTEROLATERAL LIGAMENT RECONSTRUCTION VERSUS ANTEROLATERAL TENODESIS

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