Experimental Analysis of Medial Structures on Kinematics of PCL-Deficient Knees

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## Disclosures

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<td>Alireza Moslemian</td>
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<td>Philip Peter Roessler</td>
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| Alan Getgood                  | **Speaker**: Conmed  
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| Ryan Willing                  | No financial conflicts to disclose.                                     |
Introduction

• PCL injuries account for 3% to 20% of knee injuries [1]

• Often combined with other soft tissue damage

• The roles of the **posterior oblique ligament (POL) and deep medial collateral ligament (dMCL)** in stabilizing the PCL-deficient knee are not well characterized

Fig. 1: the superficial Medial Collateral Ligament (sMCL), deep Medial collateral ligament (dMCL), and Posterolateral Ligament (POL). Knee as viewed from medial side[2][3].
Hypothesis: POL or dMCL dissection in a PCL deficient knee will increase posteromedial laxity beyond that of the isolated PCL injury
Methods

Six cadaver knees tested on VIVO joint motion simulator

Joint reduced with 50 N quadriceps & 50 N hamstrings loads

Baseline kinematics recorded during passive flexion (0 – 90 degrees)

Flexion trials repeated with additional loads applied to the tibia

Changes in medial tibial condyle motion were measured (wrt Baseline)

67 N posterior-directed force

2.5 Nm internal torque

50 N posterior force + 2.5 Nm internal torque
Primary outcome: Posterior displacement of medial tibial condyle

→ Measured with respect to flexion axis of femur, defined as an axis intersecting the center of spheres fit to the posterior femoral condyles
Flexion trials with superimposed tibial loads were repeated, and posteromedial translations were recorded between staged dissections:

- Intact
- PCL dissected (arthroscopically)
- POL dissected (3 specimens) (medial exposure)
- dMCL dissected (3 specimens) (medial exposure)
Results

Medial tibial condyle translations with 67 N posterior-directed force applied to the tibia

- The POL dissection did not have significant effect on posterior translation of medial plateau
- After the dMCL was dissected, the center of medial plateau translated significantly more posterior at 0 and 30 degrees
Results

Medial tibial condyle translations with 2.5 Nm internal torque applied to the tibia

- When the internal torque was applied, POL dissection only increased the posterior translation at full flexion.
- dMCL dissection resulted in significantly more posterior translation of medial plateau.
Results

Medial tibial condyle translations with 50 N posterior force and 2.5 Nm internal torque applied to the tibia

• when internal loading was combined with posterior loading, POL dissection increased the posterior translation significantly only at 90 degrees
• dMCL dissection, however, increased the posterior translation of the medial plateau at 0, 30 and 60 degrees
• Increased posterior translations of the medial tibial condyle were observed after the dMCL was dissected, but not at full flexion

• POL dissection increased posterior translation, but only when the knee was flexed to 90 degrees with an internal torque applied

• As we hypothesized, injury to either of dMCL or POL in a PCL-deficient knee will result in more posteromedial laxity

• The dMCL and POL appear to be secondary stabilizers to posteromedial displacements in the PCL deficient knee; however, further studies with more specimens under more varied loading is warranted
