A Comprehensive Assessment of the effect of tibial slope on cruciate ligament reconstruction grafts: Tibial Slope Matters!

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Background

- Posterior tibial slope varies (0-18°)
- Flat slope (Closer to 0°) can be protective for ACL, steep for PCL
- Increased slope can increase risk of ACL injury, but protective of PCL, and the converse is true
Background

- Increased rates of ACL failure noted for slopes >12° (Salmon AJSM 2017) – 5X higher failure rate

- Canine knee

- Load on cruciate grafts have not been studied in a biomechanical model with varied slope
Objective

• To determine the effect of sagittal plane tibial slope on cruciate graft forces in a biomechanical model
Methods

- 20 cadaveric knees
- Slope assessed on Fluoroscopy
- ACL group – 10 knees
- PCL group – 10 knees
- External Fixator
- Single bundle ACLR, DB PCLR
Methods

- Slopes: -2°-20° for ACL
- Knee flexion angles: 0°-60°
- Slopes: -2°-16° for PCL
- Knee flexion angles: 45°-90°
- Axial Load 200N for ACL, 300N
Results – ACL - PCLR

Tibial Slope Effect Plot

Flexion Effect Plot

Graft Effect Plot
Discussion

- ACL - Slope <6° was protective of the graft at all flexion angles

- Slope >12° had larger increases in graft loading across all flexion angles, converse true for PCL
Discussion

- **Slope**
  
  - possible risk factor in ACL injury and linked in PCL injury as risk factor

  definite ACL reconstruction failure risk factor and contributes to SB PCL failure

- Previously reported failure 5x greater with slope $>12^\circ$ for ACL
Discussion

- Treat slope in revision reconstruction?

- Target slope for a slope decreasing osteotomy <6° for ACL

- Potentially steeper more protective for PCL
Conclusions

• **ACL- Less than 6 degrees** slope saw minimal increases in force

• **ACL - Greater than 12 degrees** tibial slope sees graft load at all flexion angles

• Increased tibial slope leads to increased graft force in a linear fashion; DB PCL has lower loads across all slopes and also less PCL force at higher slopes