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Posterior Cruciate Ligament with Posterior Meniscofemoral Ligament Reconstruction Improves Knee Stability

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Summary:
When considering doing posterior cruciate ligament reconstruction, the addition of posterior meniscofemoral ligament reconstruction improves posterior knee stability.

Abstract:
INTRODUCTION
Currently, outcomes of posterior cruciate ligament reconstruction (PCLR) have been less satisfactory than anterior cruciate ligament reconstruction. Improving knee laxity following PCLR may improve knee stability and decrease the risk of early osteoarthritis. Prior research has demonstrated that roughly 30% of posterior stability is attributed to the posterior meniscofemoral ligament (pMFL), when present. We sought to determine if adding pMFL reconstruction to arthroscopic single-bundle transtibial PCLR more accurately restores anterior-posterior and rotatory stability to that of the native knee.

METHODS
Ten fresh-frozen, cadaveric knees were screened arthroscopically for the presence of a pMFL. Four knees were excluded for absence of pMFL, leaving 6 male specimens (mean age 49.5 years, range 34-60 years). Each knee was secured in a custom-made knee simulator capable of provocative knee maneuvers. A 90 N posterior force was applied to the tibia and 5Nm of internal and external tibial torque was used to evaluate rotatory laxity. The tibia was allowed to return to its neutral position prior to each testing state. The following conditions were run for each knee at 30°, 60°, and 90° of flexion: Intact, pMFL deficient, PCL- pMFL deficient, PCL- reconstruction (PCLR), and PCL- pMFL reconstruction (PCL-pMFLR). PCLR was performed using an arthroscopic transtibial technique with Achilles tendon allograft. A gracilis allograft was chosen for the pMFL reconstruction.

RESULTS
Drawer testing of the PCL- pMFL deficient state exhibited statistically significant differences in tibial translation when compared all other testing conditions at all flexion angles ($p<0.05$). When comparing tibial translation of the PCL-pMFL reconstruction and PCLR, the MFL augmentation significantly improved tibial translation by 29% at 90° of knee flexion, (6.7±0.8mm, 8.6±0.7mm; $p=0.025$) and by 19% at 60° (7.2±0.8mm, 8.6±0.8mm; $p=0.059$). The PCL-pMFL reconstruction restored AP stability to within 1.5-1.6mm of normal tibial translation at 60° ($p=0.032$) and 90° ($p=0.095$). There was no difference in rotatory stability throughout all states at all flexion angles ($p>0.05$).

DISCUSSION & CONCLUSIONS
While arthroscopic single-bundle transtibial PCL reconstruction has become the standard of care in treatment of Grade III PCL injuries, deficiencies still exist in restoration of native AP stability in deep flexion.

Our study shows that augmenting the PCLR by adding a MFL reconstruction improves AP knee stability at 30°, 60°,

and 90° of knee flexion and more closely restores the normal AP stability of the knee in deeper flexion.

Future studies will focus on contrasting pMFL reconstruction with single bundle and double bundle PCLR.

SUMMARY
When considering doing PCLR, the addition of pMFL reconstruction improves posterior knee stability. Reconstruction of pMFL may be applicable in all patients and not just those with PCL/pMFL rupture.

KEY TERMS
Posterior cruciate ligament (PCL), meniscofemoral ligament (MFL), single-bundle, arthroscopic transtibial reconstruction, knee.