INTRODUCTION
The superficial medial collateral ligament (sMCL) and the posterior oblique ligament (POL) offer primary and secondary static stability to the medial knee [1, 2]. It is well accepted that medial knee injuries are the most common knee injuries, and that chronic or severe acute medial knee injuries may require operative treatment [3]. The purpose of this study was to describe and biomechanically validate an anatomic medial knee reconstruction technique based on quantitative anatomy and biomechanic studies [4, 5]. Our hypothesis was that an anatomic reconstruction technique would restore normal stability to a knee with a complete sMCL and POL injury.

METHODS
Ten non-paired cadaveric knees were tested in the intact, sMCL and POL sectioned, and anatomically reconstructed states. Each knee was tested at 0, 20, 30, 60, and 90 degrees of knee flexion with a 10 Nm valgus load and 5 Nm external and internal rotation torques. A six-degree-of-freedom electromagnetic tracking system was used to measure the motion of the tibia with respect to the femur [6]. Statistical analysis was performed using a 2-way ANOVA and statistical significance was defined by p < .05.

An anatomic reconstruction of the sMCL and POL was performed using an autogenous semitendinosus graft (Figure 1). The graft was sectioned into 15 cm and 11 cm sections and each graft was tubularized on both ends. Tunnels were drilled at the anatomic attachment points of the sMCL and POL [4]. The 15 cm graft was used for the sMCL reconstruction and the 11 cm graft was used for the POL reconstruction. The grafts were secured into position using bioabsorbable screws with the MCL tensioned at 30 degrees of knee flexion and the POL tensioned at 0 degrees of knee flexion. The sMCL graft was sutured to soft tissues just distal to joint line to reconstruct the proximal sMCL insertion site.

RESULTS
With an applied valgus load, we found significant increases in valgus rotation following sectioning of the sMCL and POL throughout all knee flexion angles, which improved to near normal stability following anatomic medial knee reconstruction (Figure 2). External rotation torques produced a significant increase in external rotation throughout all knee flexion angles following sectioning of the sMCL and POL (Figure 3). This was recovered completely following anatomic medial knee reconstruction. Statistical significance was denoted in the figures as a) sectioned significantly different from intact, b) reconstructed significantly different from sectioned, and c) reconstructed significantly different from intact.

DISCUSSION
To our knowledge, no biomechanically validated anatomic reconstruction technique to reconstruct sMCL and POL injuries exists. Anatomic knee ligament reconstruction techniques are preferred since they have been shown to better approximate normal knee biomechanics [7]. Our results show that an anatomic medial knee reconstruction can recover to near normal stability for a knee with a complete sMCL and POL injury. This reconstruction technique provides improved valgus, external, and internal rotational stability for patients with chronic or severe acute medial knee injuries. A limitation of this study is that it is an in-vitro cadaveric study and in the future an outcomes study is planned to assess patient outcomes for this anatomic reconstruction.

REFERENCES

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