INTRODUCTION

The posterolateral knee houses some of the more complicated musculoskeletal anatomy and, as a result, injuries to this region represent challenging problems in diagnosis and treatment for clinicians. Further, rehabilitation from these injuries is arduous for patients to undertake. Thus, much research has been devoted to delineating anatomic and radiographic features of posterolateral corner structures and injury patterns [1,2]. Further, many different reconstructions have been described. Our focus is on the applied functional anatomy and reconstruction of the three main stabilizers of the posterolateral knee: 1) the fibular collateral ligament, 2) the popliteus tendon and, 3) the popliteofibular ligament. The popliteofibular ligament’s role in an anatomic reconstruction of a Grade III posterolateral corner injury was the focus of this study. To our knowledge, no study has validated the importance of the popliteofibular ligament in an anatomic reconstruction, as much debate has arisen in the literature regarding the importance of its inclusion in the reconstruction. Some have described the popliteofibular ligament as detrimental to the restoration of an intact knee function, citing overconstraint in internal rotation and subsequent limitation in external rotation [3,4]. Thus, the purpose of our study is to assess two reconstructions, one with and one without the popliteofibular ligament, in comparison to the intact state.

METHODS

Six paired, fresh-frozen cadaveric knee specimens were used in this study, each without evidence of prior injury. The femur was sectioned 20 cm from the joint line and the tibia 13 cm from the joint line. The specimens were then potted in polymethylmethacrylate (PMMA) to ensure secure fixation. A customized knee testing apparatus, previously described, was used to firmly hold the femur while allowing movement of the tibia and biomechanical testing at various knee flexion states [5].

External forces were applied at 0°, 20°, 30°, 60° and 90° of knee flexion. For each test state, applied forces used were 10 Nm varus-valgus load, 5 Nm internal/external rotation torques and 88 N anterior/posterior drawer loads. Load and motion data were recorded in synchrony using the Motion Monitor software (Innovative Sport Training, Chicago, IL). Each knee in a matched pair underwent one of two anatomic posterolateral knee reconstructions. Group 1 knees had all three major posterolateral knee stabilizers reconstructed in a method previously described [1]. The matched knee, in Group 2, was reconstructed in the same way, except here the popliteofibular ligament was left out of the reconstruction (Figure 1). Instead of reconstructing it through a tibial tunnel, as in Group 1, the fibular collateral graft exiting the tibial tunnel was sutured on itself, leaving the popliteofibular ligament not reconstructed.

RESULTS

For an applied external rotation torque, we found significant changes in comparing the sectioned to intact knees at all degrees of knee flexion tested for both groups of knees (p < .05). In analyzing the data for the two reconstruction techniques, we found no significant differences in reconstructing the fibular collateral ligament, popliteus tendon and popliteofibular ligament (group 1 reconstruction) or the modified reconstruction (group 2) compared to the intact state for external rotation.

We found significant increases in varus rotation when comparing the sectioned to intact knees at all degrees of knee flexion tested for both groups (p < .05). There were no significant differences between the intact state and group 1 reconstructions at any flexion angle. There were significant increases in varus gapping between the group 2 reconstructions and the intact knee at 0° (p < .05), 20° (p < .05) and 60° (p < .05) degrees of knee flexion.

DISCUSSION

Our results show the importance of the popliteofibular ligament in anatomic posterolateral knee reconstructions, because its inclusion more closely reproduced intact knee biomechanics. Further, our data did not show abnormal restriction of knee motion with the popliteofibular ligament placed through a tibial tunnel. We recommend that reconstructing the popliteofibular ligament through a tibial tunnel should be included in anatomic reconstructions of the posterolateral knee.

REFERENCES


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