The Pathoanatomy of Medial Ligamentous Disruption in Multiligament Knee Injuries

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INTRODUCTION: Multiligament knee injuries (MLKIs) involving the medial-ligamentous structures of the knee pose significant challenges in terms of diagnosis and treatment. These include the superficial medial collateral ligament (sMCL), posterior oblique ligament (POL), and medial patellofemoral ligament (MPFL). Identifying and diagnosing posteromedial corner (PMC) injuries is critical to successful multiligament knee repairs and reconstructions. This retrospective study aimed to identify patterns of medial-sided injury, associated neurovascular complications, and fractures in acute MLKIs and knee dislocations (KD).

METHODS: Patients who underwent treatment for a MLKI or KD from two surgeons at two level-1 trauma centers were identified between January 2001 and May 2023. Only cases involving at least complete disruption of the sMCL were included. Demographic information, injury details, neurovascular status, laterality, and mechanism of injury were obtained.

RESULTS: A total of 92 patients with medial-sided knee MLKIs were included, with a mean age of 37.8 years. Documented knee dislocations were observed in 34.8% of cases, and fractures were present in 20.7% of patients. The most common combination of ligament injuries was ACL and sMCL (43.5%). Isolated sMCL tear occurred in 34.8% of patients, which included 12% that were proximal, 10.9% mid-substance, and 12% distal. Combined sMCL and MPFL tear was seen in 26% of patients, which included 14.1% proximal sMCL avulsions, 5.4% mid-substance injuries, and 6.5% distal avulsions. Combined sMCL and POL tear was seen in 12% of patients, including 1.1% that were proximal sMCL avulsions, 3.3% were mid-substance, and 7.6% distal. Combined sMCL, POL, and MPFL tear was seen in 27.2% of patients, which included 12% that were proximal sMCL avulsions, 9.8% mid-substance injury, and 5.6% tibial avulsions.

DISCUSSION: Overall, medial-sided injuries demonstrated a more balanced distribution of sMCL injury locations (proximal, mid-substance, distal) compared to previously investigated posterolateral corner injuries patterns, emphasizing the need for a meticulous evaluation of zone of injuries to these medially stabilizing structures. MPFL injury was associated with femoral avulsions more often than with mid-substance tears and patellar avulsions. This study provides valuable insights into the specific locations and patterns of medial-sided injuries in the MLKI which can aid in their diagnosis and management with an end goal of improved postoperative outcomes.

Limitations to this study include the fact that it relies on retrospective data and accuracy of this study assumes accurate documentation at time of injury. Furthermore, most of our patients experienced high- or low-velocity injuries, making conclusion about an ultralow-velocity injury difficult. However, our findings can still provide insight to clinicians at other level 1 trauma centers understand common patterns of injury in PMC injuries in MLKI patients.

SIGNIFICANCE/CLINICAL RELEVANCE: This retrospective describes the specific locations and patterns of medial-sided injuries in MLKIs which can aid in their diagnosis and management with an end goal of improved postoperative outcomes.