FUNCTIONAL ANATOMY AND CLASSIFICATION OF MEDIAL COLATERAL LIGAMENT INJURIES:
OUTLINE

ALEX VAISMAN, MD, CHILE.

Although most of the current literature has its focus on knee ligament injuries and their repairing/reconstructing techniques, a thorough knowledge of their functional anatomy may provide baseline knowledge for surgical management and further research.

ANATOMY:
The medial collateral ligament (MCL) is one of four major ligaments that supports the knee and is the primary static stabilizer against valgus rotation of the joint. It consists of two components, the superficial (sMCL) and deep MCL (dMCL).
The sMCL has one femoral and two tibial attachments. The femoral attachment is situated on the medial epicondyle. The proximal attachment blends into the semimembranosus tendon and the insertion of the distal attachment is at the posteromedial crest of the tibia.
The anatomy of the medial side of the knee has been further defined quantitatively with exact attachment locations and relative distances between structures. LaPrade and colleagues reported that the sMCL has one femoral attachment, 3.2 mm proximal and 4.8 mm posterior to the medial epicondyle, and two tibial attachments, a proximal attachment connecting to soft tissue and a distal attachment blending in with the pes anserinus bursa 61.2 mm distal to the knee joint.
The dMCL is divided into two: the meniscofemoral and meniscotibial ligaments. The origin of the meniscofemoral comes from the femur just distal to the superficial medial collateral, inserting into the medial menisci. The meniscotibial ligament is thicker and shorter with an attachment forming on the distal edge of the articular cartilage of the medial tibial plateau, coming from the medial meniscus.

FUNCTION OF THE MCL:
The MCL is recognized as being a primary static stabilizer of the knee and assists in passively stabilizing the joint. When stress is applied, this ligament aids in giving control to the joint through a normal range of movement. The MCL also prevents an anterior translation of the tibia limiting the hyperextension of the knee. Another role of the MCL includes joint proprioception: when stretched or exposed to an excessive load, the proprioceptive feedback generates a muscle
contraction. The sMCL resists valgus forces applied to the knee through all degrees of flexion with the dMCL acting as a secondary restrain. Specifically the primary valgus stabilizer is identified as the proximal division of the sMCL. The dMCL adds rotational stability primarily in knee extension.

CLASSIFICATION OF INJURIES TO THE MCL:

In 1976, Hughston standardized MCL injury classification, with further clarification in 1994, into two related systems: The severity system (grade I, II, III) and the laxity system (grade 1+, 2+, 3+). Under this combined classification system, grade I, a first-degree tear, involves a few fibers resulting in localized tenderness but no instability. Grade II, a second-degree tear, is a disruption of more fibers, with more generalized tenderness but still no instability. Grade III, a third-degree tear, is a complete disruption of the ligament, with resultant instability. Grade III injuries are subdivided according to the extent of laxity as determined by the amount of absolute joint separation from valgus stress with the knee in 30 degrees of flexion. Grade 1+, 2+, and 3+ laxities indicate 3-5 mm, 6-10 mm, and more than 10 mm of absolute medial separation respectively.

Fetto and Marshall defined their grade I injuries as those without valgus laxity in both 0 and 30 degrees of flexion, grade II injuries as those with valgus laxity in 30 degrees of flexion but stable in 0 degrees of flexion, and grade III as those with valgus laxity in both 0 and 30 degrees of flexion. Of note, the authors emphasized the importance of performing the test in 0 degrees of flexion, which is different from in full extension. In full extension, there is recruitment of ACL function that can mask the laxity of the complete medial-sided injury. There is a high incidence of associated ligamentous injuries with ACL injuries in grade III cases using this classification system. We prefer this classification because it documents the instability from loss of all medial-sided structures, which may affect the treatment options. Unfortunately, the validity and reliability of any of the classification systems have not been described in the English literature.

The severity of MCL injuries can also be divided into three grades based on the MRI appearance; however, grades assigned by MRI often differ from the clinical grade. Injury of the MCL is classified at MR images as a strain with only surrounding edema (grade 1), partial rupture of fibers (grade 2), and total rupture (grade 3). MRI grade 1 injury involves microscopic tears of individual fibers and is characterized by subcutaneous edema adjacent to an intact MCL. MRI grade 2 injury involves macroscopic partial tears and is characterized by high intrasubstance signal within, or morphologic change of the MCL. A wide spectrum of injuries from microscopic to near-total ligamentous tears are designated as grade 2, making this the most heterogeneous and difficult-to-characterize
group. MRI grade 3 injuries are complete tears, characterized by complete ligamentous discontinuity with laxity or waviness. Meniscocapsular separation can also complicate a grade 3 injury.

As the treatment trend moves toward conservative treatment for all grades of isolated MCL injuries, interest in classifying this ligamentous injury has declined. We believe that MCL injuries should, at the minimum, be classified as isolated or combined with other pathologies, which will help with treatment planning.

REFERENCES: