Knee: Collateral Ligament Complexes
R. Kent Sanders

Axial and coronal sequences best depict the medial and collateral ligaments and their neighboring structures that constitute the collateral complexes. The medial collateral complex includes the crural fascia, the longitudinal and oblique medial collateral ligaments (MCL), the medial capsule, and to a lesser extent the meniscal and capsular attachments of the semimembranosus tendon. The investing fibers of the extensor retinaculum, particularly the medial patellofemoral ligament, are well shown with axial proton density sequences. Figures 74–1A and 74–1B are fat-saturated axial proton density images through the superior and middle third of the medial complex, respectively. Figure 74–1A shows the relationship of the medial patellofemoral ligament component of the patellar retinaculum (large arrow) to the longitudinal (superficial) medial collateral ligament (large arrowhead) as well as the crural fascia continuation of the retinaculum (small arrow) and the underlying oblique (deep) medial collateral ligament (small arrowhead). Figure 74–1B shows the more distinct divisions of the MCL (the large arrowhead indicates the longitudinal component and the small arrowhead indicates the oblique component) and the extremely thin middle retinaculum (arrow).

Figures 74–2 through 74–2C are coronal T1 images through the medial collateral complex progressing from anterior to posterior. In Fig. 74–2A, the medial patellofemoral ligament (arrow) passes superficial to the anterior margin of the longitudinal component of the MCL (arrowhead). The adductor magnus tendon (small arrow) attaches to the medial femoral epicondyle proximal to the MCL origin. In Fig. 74–2B, the crural fascia continuation of the medial patellofemoral ligament (large arrow) and middle patellar retinaculum (small arrow) are indicated superficial to the thick anterior margin of the longitudinal MCL (arrowhead). The large arrow in Fig. 74–2C shows the crural fascia separated from the MCL by fat. The large arrowhead
shows the posterior extent of the longitudinal component of the MCL. The small arrow shows the deeper anterior margin of the oblique component. **Figure 74–2D** is a fat-saturated coronal T2 that shows a fine T2 signal stripe that marks the boundary between the longitudinal (small arrow) and oblique (large arrow) components of the MCL. The arrowhead indicates the meniscofemoral ligament component of the medial capsule. Its attachment to the femur forms the superior medial gutter and forms the deepest ligamentous layer of the medial collateral complex.

Because of their intimate proximity and possible interconnection to the MCL, medial patellofemoral ligament and retinaculum tears are frequently associated with injury to the underlying anterior and proximal fibers of the MCL. **Figure 74–3A** is a 1.5 T fat-saturated axial proton density image showing an extensive medial collateral complex injury that includes rupture of the medial patellofemoral ligament with delamination from the rest of the retinaculum (large arrowhead), rupture of the longitudinal component of the MCL with intraligamentous hemorrhage (small arrow), and rupture and
retraction of the oblique component of the MCL (large arrow). The small arrowhead indicates the medial patellar plica that appears more conspicuous as it is separated from the retinacular fibers by intracapsular edema. **Figure 74–3B** is a 1.5 T fat-saturated coronal T2 image of the same case that shows discontinuity of the meniscofemoral capsular ligament (small arrowhead), longitudinal (small arrow) and oblique (large arrow) MCL fibers, and laxity/delamination of the crural fascia continuation of the retinaculum (large arrowhead). **Figures 74–3C and 74–3D** are 3 T images from a nonsurgical focal grade-2 tear of the proximal anterior fibers of the longitudinal component of the MCL. In **Fig. 74–3C**, the large arrow indicates edema and enlargement of the anterior 50% of the longitudinal fibers. The small arrow shows the normal-appearing posterior half. The arrowhead indicates the displaced but intact retinaculum. **Figure 74–3D** is a fat-saturated coronal T2 from the same case obtained just posterior to the swollen portion of the anterior longitudinal fibers. The small arrowhead indicates adjacent bone edema. The arrow shows a small amount of edema tracking posteriorly between the longitudinal fibers and the intact crural fascia (large arrowhead).
The lateral collateral ligament (LCL) and the biceps femoris are the most superficial and largest components of the posterolateral corner ligamentous complex of the knee. The convergence of the biceps and LCL as they attach to the lateral proximal tibia forms the conjoined tendon. The conjoined tendon is far from simple, being formed from the anterior and direct arms of the long head of the biceps, the direct arm of the short head of the biceps, and fibular attachment of the LCL. The anterior arm of the short biceps attaches to the anterolateral tibial metaphysis just below the joint line. This constitutes the anterior oblique fibers of the conjoined tendon and is responsible for the Segond fracture that accompanies ACL tears. **Figures 74–4** through **74–4C** are sagittal oblique proton density images of the superficial lateral knee. **Figure 74–4A** shows the anterior oblique fibers of the anterior arm of the short head of the biceps femoris attaching to the tibia (black arrow). The anterior arm (white large arrow) and direct arm (small white arrow) of the long head of the biceps femoris have a more vertical path and attach more superficially on the lateral fibular head. The small arrowhead indicates the deep and superficial branches of the common peroneal nerve. These are usually well demonstrated at 3 T on both axial and sagittal proton density sequences. **Figure 74–4B** is 2 mm medial to the image in **Fig. 74–4A** and shows the deeper layers of the biceps tendons. The black arrowhead shows a few remaining fascicles of the anterior arm of the long head of the biceps. The black arrow indicates the direct arm of the short head of the biceps while the white arrow shows the proximal portion of the LCL reaching toward the deep surface of the short head. **Figure 74–4C** is a fortuitous image through the entire length of a
robust, and possibly fibrotic, LCL (arrow) in a different knee. Note the lack of striations and layering in the conjoined tendon part of the lateral collateral ligament in this individual. The arrowhead shows the transversely oriented fibers of the anterior proximal tibiofibular ligament.

The tip of the fibular styloid gives rise to the thin capsular ligaments of the posterolateral corner. From superficial to deep these are the fabellofibular ligament, arcuate ligament, popliteofibular ligament, and popliteomeniscal fascicles that form the lateral anchor of the popliteus hiatus of the lateral meniscus. The latter fascicles are contiguous with the meniscocapsular fascicles or struts that form the medial extent of the popliteus hiatus. Figure 74–5 is a panel of sequential sagittal oblique proton density images through the posterolateral corner of a knee with a fabella. The images progress from lateral to medial and begin at the deep margin of the LCL and biceps tendon (B). The proximal tibiofibular ligament (TFL) marks the sagittal oblique plane between the large superficial collateral ligaments and the deeper capsular ligaments. The path of the popliteus tendon (PT) is paralleled by the popliteofibular ligament (PFL) that shares a common attachment...
to the fibular styloid process with the inferior popliteomeniscal fascicle (PMFi). **Figures 74–5F to 74–5I** show how the superior popliteomeniscal fascicle (PMF) becomes the meniscocapsular fascicle (MCF) and meniscocapsular junction medial to the popliteus sheath (PS). The fabellofibular ligament (FFL) shares a common posterior attachment to the fibular styloid with the arcuate ligament (AL). The arcuate ligament has a vertically oriented lateral component (ALl) and a more proximal medial component (Alm) that forms the posterior capsular layer of the knee joint deep to the fabellofibular attachment to the fabella (F).

The fabellofibular ligament and its closely allied arcuate ligament are routinely visible on sagittal 3 T images but are rarely resolved at 1.5 T. **Figures 74–6A and 74–6B** are sagittal proton density and coronal T1 images of particularly prominent fabellofibular ligaments found with routine internal derangement protocol imaging. Arrows indicate the fabellofibular ligaments whereas the arrowhead shows the medial tract of the arcuate ligament. In the absence of a fabella, the fabellofibular ligament fibers appear to get incorporated into the arcuate ligament and posterolateral corner joint capsule, making the arcuate ligament more conspicuous. **Figure 74–6C** is a sagittal proton density image of a skeletally immature girl where the combined fabellofibular-arcuate ligament (white arrow) is well demonstrated in the absence of a fabella. The arrowhead shows the thin divergent fibers of the proximal fabellofibular ligament coursing toward the deep surface of the lateral gastrocnemius. The black arrow shows the popliteofibular ligament.

The popliteus tendon and its meniscal hiatus and posterolateral extension of the knee joint capsule complete the LCL and posterolateral corner complex.
muscle strains are far more common than injury to the popliteus tendon and like most posterolateral corner injuries occur with rotational subluxation and ACL tears. Figures 74–7A and 74–7B are sagittal proton density and fat-saturated T2 images of a large avulsion fracture of the intercondylar eminence of the tibia as the result of a violent ACL tug injury. Note the laxity of the anterior band of the ACL as the result of the elevation of its insertion point (large arrow). There is a strain of the popliteus muscle with intrafascicular edema/hemorrhage (small arrows).