Knee

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Matthew Egan and David Spinner

Many of the vascular, bony, and soft tissue structures in the knee can be readily evaluated with point-of-care ultrasound. Point-of-care ultrasound can assist in initial diagnostic evaluation in the setting of direct or indirect traumatic injury to the knee or in undifferentiated knee effusion. The objective of knee ultrasound is to evaluate the normal muscular, ligamentous, cartilaginous, and bony structures of the knee, looking for irregularities in these structures. For atraumatic swollen knees, ultrasound can detect bursitis and can give information regarding the degree of joint effusion. For functional injuries (like those typically related to athletics) or traumatic injuries to the knee, ultrasound can detect a fractured patella or tears of the menisci, medial collateral ligament (MCL), lateral collateral ligament (LCL), patellar tendon, and muscles of the quadriceps. Ultrasound has been found to be more sensitive than radiographs in assessing for lipohemarthrosis, which can be evidence of occult intra-articular knee fracture [1, 2]. For individuals with lower extremity swelling, knee ultrasound can help determine the existence of a Baker's cyst or deep vein thrombosis. Determining the etiology of knee pain or dysfunction at the bedside may prevent unnecessary imaging, invasive procedures like arthrocentesis, and delay to care. If invasive procedures are needed, however, ultrasound may be used to guide aspiration or therapeutic injection of the knee joint. It is important to note that ultrasound has limited ability to evaluate the deeper ligamentous structures such as the cruciate ligaments, so any clinical suspicion that a patient has further underlying ligamentous damage will warrant further workup with other imaging modalities (Figs. 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7, 5.8, 5.9, 5.10, 5.11, 5.12, 5.13, 5.14 and 5.15).

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Fig. 5.1 A linear probe should be used to evaluate the suprapatellar knee. Sagittal views should be obtained with the probe marker facing the patient's head and the distal edge of the probe overlying the proximal aspect of patella in the midline of the knee. Transverse views should also be obtained with the probe marker to the patient's right and the probe placed slightly proximal to the patella with the middle of the probe at centered at the midline of the knee

Fig. 5.4 A linear probe is again used to evaluate the infrapatellar knee. Sagittal views should be obtained with the probe marker facing towards the patient's head. The proximal edge of the probe should overlie the distal aspect of the patella in the midline of the knee. Scan distally, terminating with the distal edge of the probe overlying the tibial tuberosity

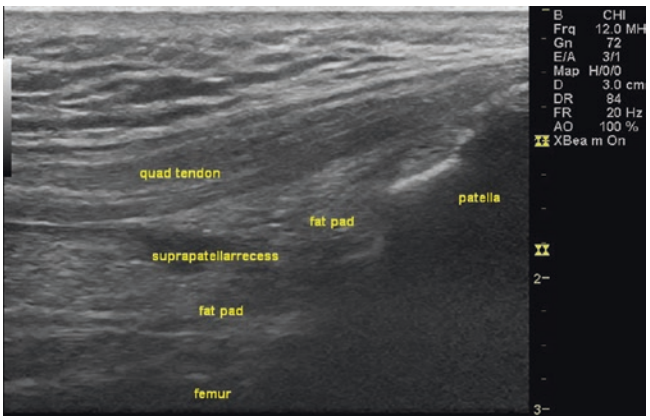

Fig. 5.2 A longitudinal view of the suprapatellar region should reveal the quadriceps tendon, proximal patella, suprapatellar recess or bursa, suprapatellar fat pad, and anterior portion of the femur

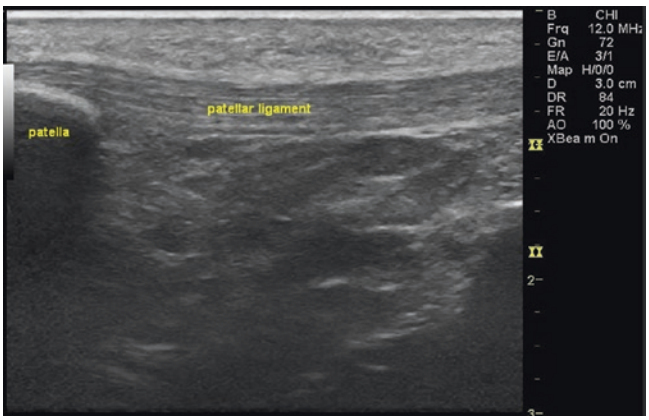

Fig. 5.5 A longitudinal view demonstrates the distal patella and the patellar ligament extending distally

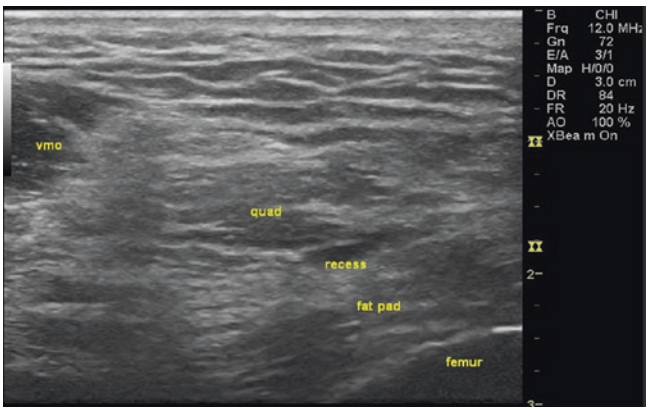

Fig. 5.3 A transverse view of the suprapatellar region demonstrates the vastus medialis oblique muscle (vmo), quadriceps muscle, suprapatellar recess or bursa, suprapatellar fat pad, and femur

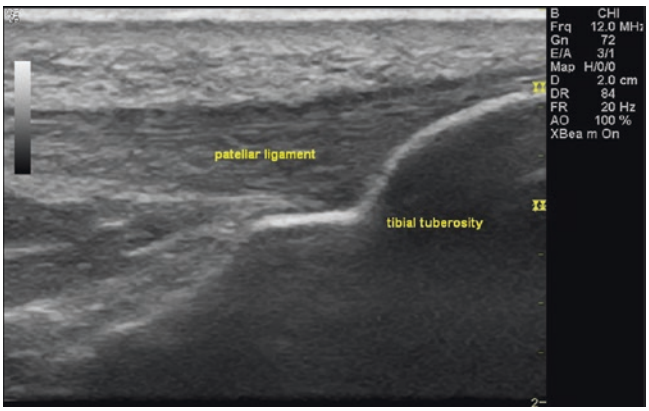

Fig. 5.6 A longitudinal view demonstrates the patellar ligament inserting into the tibial tuberosity

Fig. 5.7 A linear probe is again used to evaluate the pes anserine tendons and associated bursa. The probe marker is directed cephalad. The probe is angled obliquely, with the distal aspect of the probe directed laterally and the proximal portion of the probe directed medially, with the proximal aspect of the probe medial to the patella and beginning at the inferior line of the patella

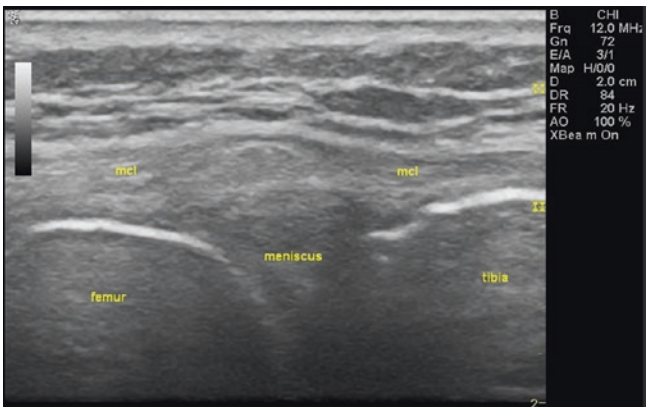

Fig. 5.10 This long-axis view demonstrates the medial collateral ligament (mcl), meniscus, femur, and tibia

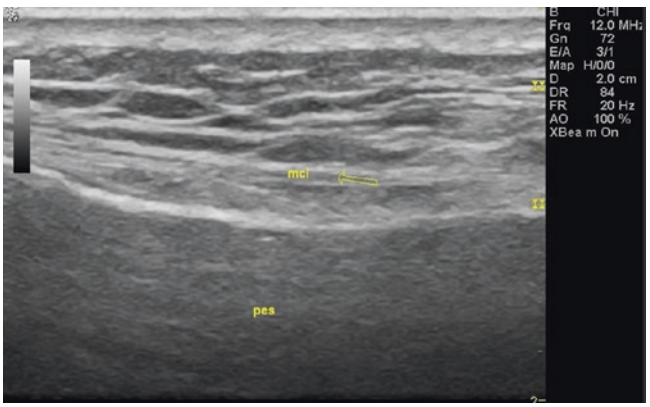

Fig. 5.8 A longitudinal view demonstrates the pes anserine tendons (pes) and medial collateral ligament (mcl)

Fig. 5.11 A linear probe is again used to evaluate the lateral structures of the knee. Sagittal views should be obtained with the probe marker facing the patient's head. The probe is oriented at the lateral aspect of knee, approximately midline in the anterior-posterior dimension. The middle of the probe should overlie the joint space

Fig. 5.9 A linear probe is again used to evaluate the medial structures of the knee. Sagittal views should be obtained with the probe marker facing the patient's head. The probe is oriented at the medial aspect of knee, approximately midline in the anterior-posterior dimension. The middle of the probe should overlie the joint space

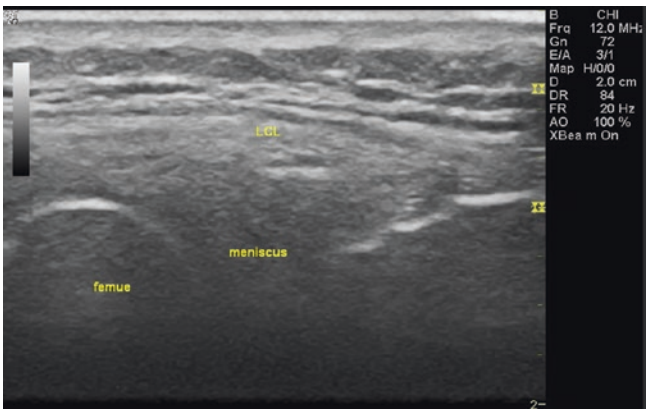

Fig. 5.12 This long-axis view demonstrates the femur, meniscus, lateral collateral ligament (LCL), and fibula

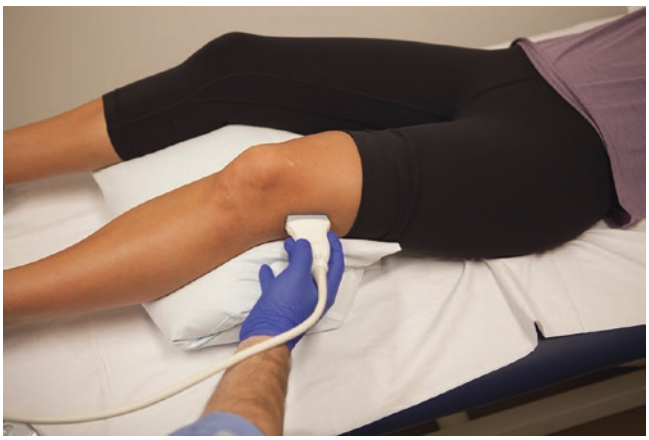

Fig. 5.13 A linear probe is used to evaluate the Iliotibial band. Sagittal views should be obtained with the probe marker facing the patient's head. The probe is oriented on lateral aspect of leg at about midline in the anterior-posterior dimension with the distal aspect of the probe terminating at proximal patellar line

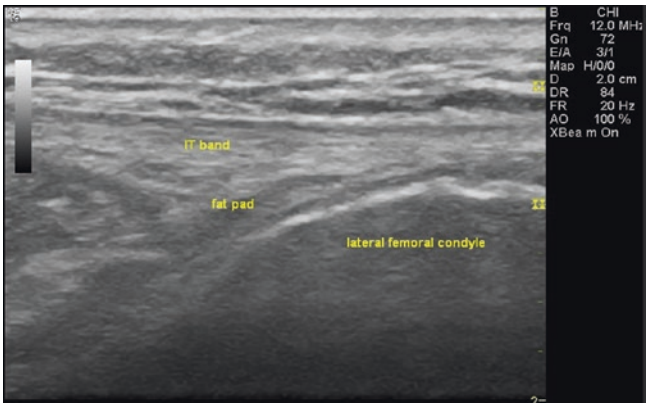

Fig. 5.14 This long-axis view demonstrates the iliotibial band (IT band), fat pad, and lateral femoral condyle

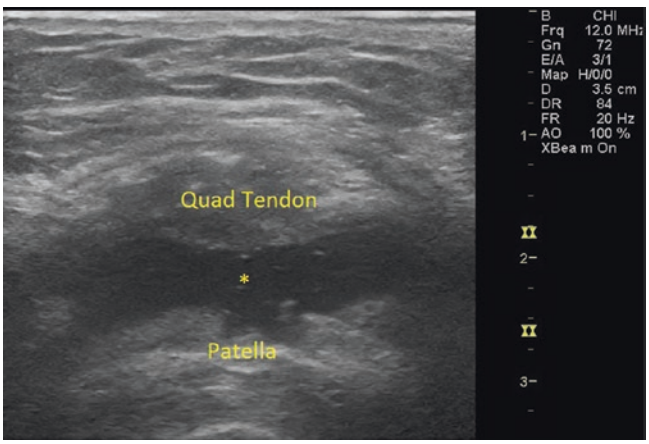

Fig. 5.15 A suprapatellar effusion is evident in this image, as indicated by the anechoic structure (*asterisk*) underneath the quad tendon and above the patella

References

1. Alves TI, Girish G, Kalume Brigido M, Jacobson JA. US of the knee: scanning techniques, pitfalls, and pathologic conditions. Radiographics. 2016;36:1759–75.
2. Bonnefoy O, Diris B, Moinard M, Aunoble S, Diard F, Hauger O. Acute knee trauma: role of ultrasound. Eur Radiol. 2006;16:2542–8.