

Challenges in Diagnosing Meniscal Tears in the Knee

Magnetic resonance imaging of the knee is one of the most commonly ordered MR examinations. It is a useful examination to assist the clinician in determining surgical treatment from non-surgical treatment. To that end, the radiologist plays an important role in assisting with patient management.

There are many structures within the knee that can be injured. The meniscus is one of those structures and because of its unique anatomic design, can be injured in many different ways. The role of the radiologist is to understand the unique imaging features of the normal meniscus in order to be able to identify the subtle, less obvious tears with imaging.

There is normal anatomy that can result in misdiagnosis as erroneous tears. These “pseudo tears” should be well known to the radiologist and include the interface between the meniscofemoral ligaments and the posterior horn of the lateral meniscus. The vertically oriented signal that can result may be erroneously misinterpreted as a vertical or peripheral tear of the posterior horn of the lateral meniscus. Understanding the anatomy of these normal structures will prevent an error in diagnosis. Similarly, the popliteus tendon as it passes intra articular between the struts of the lateral meniscus can mimic a tear of the posterior horn.

The anterior horn of the lateral meniscus has fibers of the ACL that insert into it. It can occasionally demonstrate a “speckled appearance” and resemble a macerated meniscus. Another pitfall that may suggest a tear of the anterior horn is the insertion of the transverse ligament. This ligament arises and inserts at the anterior horns of the meniscus and travels through Hoffa’s fat pad. It can result in a vertically oriented increased signal at the interface with the meniscus. The aforementioned pitfalls can all be recognized as such by evaluating consecutive sagittal images to recognize the anatomic structures resulting in the pitfalls. The meniscofemoral ligament can be followed to the origin on the posterior medial femoral condyle. The popliteus can be identified as a tendon oriented obliquely at the posterior knee. The transverse ligament can be seen extending from the anterior horns of the medial to the lateral meniscus.

The normal meniscus is C-shaped and uniformly low in signal intensity. The body of the meniscus is recognized by its rectangular shape. The normal complement of body segments to anterior/posterior horns is around 1/2-1/3. If the ratio is smaller, then there are too many anterior and posterior horns relative to the body of the meniscus (OR another way to think of it) too few body segments relative to anterior and posterior horns. This can happen as a result of the body of the meniscus being torn such as a vertical, longitudinal tear, commonly referred

to as a bucket handle tear. The torn meniscus can relocate (the handle of the bucket) in a variety of locations within the compartment of the knee. One common location is in the notch after a medial meniscus BHT. This is often referred to as the “double PCL sign”. An undersurface tear can also occur within the body of the meniscus. The meniscal tissue can flip into the gutter. These latter type of tears can be difficult for the arthroscopist to identify. The radiologist can recognize them confidently by recognizing the normal body of the meniscus is deficient (abnormal ratio of body to horns) and then look carefully at the appearance of the residual body. In the case of the undersurface tear of the body, there is often a “buckled” appearance to the body of the meniscus. This is a result of the absent meniscal tissue and infolding of the superior surface of the body.

An important tear to recognize are the peripheral tears of the meniscus. These result in injury to the vascular portion of the meniscus. If not recognized and treated appropriately to reestablish the vascular interface, this can lead to chronic joint line pain and morbidity. Peripheral tears in the posterior horn of the lateral meniscus may occur in association with anterior cruciate ligament tears. Careful inspection of the posterior horn of the lateral meniscus when the ACL is torn is warranted so as to not overlook this potentially problematic tear.

Similarly, meniscocapsular separations are peripheral tears that require intervention. Proper sequence design that will allow for the identification of fluid signal between the meniscus and capsule is imperative in making this diagnosis.

Finally, in the discussion today, are root attachment tears. These tears are radially oriented and are easily overlooked if the posterior horn is not recognized to insert at the notch. This images as a loss of the normal meniscal signal and there is typically extrusion of the meniscal tissue deep to the capsule medially or laterally. The extrusion of the meniscus can lead to disruption of the normal function of the meniscus and progression of cartilage loss.

In conclusion, the recognition of normal anatomy of the meniscus and associated structures, will allow for the recognition of the pathologic processes. The radiologist can be instrumental in providing assistance to the referring clinician, by identifying these more challenging appearances.