Clinical Abnormalities Not Detected on MRI
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Knee Instability

Knee instability is a difficult clinical diagnosis even in the hands of an experienced orthopedic surgeon. The physical examination can be limited in the acute and post-operative setting due to pain or spasm. While MR imaging can support the clinical diagnosis of instability through the detection of structural abnormalities, unless gross alignment abnormalities are identified, the imager is blind to this important diagnosis that can lead to apprehension on the part of the patient, alteration of activities of daily living and ultimately degenerative joint disease. In the post-operative setting, particularly with ACL reconstruction, current objective evaluations have been limited to assessment of muscle strength, radiographic imaging, and laxity measurements. Anterior-posterior laxity measurements were originally developed to diagnose ACL insufficiency, but these measurements are now the primary means to judge the stability of ACL reconstructions without any consideration of meniscal kinematics. This is due in large part to the absence of a method to evaluate meniscal kinematics after ACL reconstruction. Recent work has highlighted the importance of new methods for evaluation of in vivo tibiofemoral and meniscal kinematics under dynamic conditions. In addition, techniques have been introduced that explore magnetic resonance analysis of knee kinematics under simulated weight-bearing conditions.

Detection of Post-Operative Meniscal Tears

Though MR imaging has proven accurate in diagnosing meniscal tears in the unoperated meniscus, the identification of tears in the post-operative meniscus at MR imaging in the clinically symptomatic patient has proven challenging. Linear areas of abnormal signal intensity are often present in the post-operative meniscus, making it difficult to distinguish the meniscal re-tear from post-operative change. Furthermore, as the importance of meniscal preservation for the maintenance of physiologic function has been emphasized, a variety of repair techniques including limited partial mensicectomy, primary meniscal repair and meniscal transplant have been introduced. As these techniques affect the appearance and, in some cases, the volume of meniscal tissue, the accuracy of conventional MRI in predicting recurrent tears has been further reduced. The detection of native joint fluid entering the meniscal remnant as identified on fluid sensitive sequences can increase the specificity of standard MR imaging studies for identification of retears. Due to variable degree of native fluid within the joint, among other things, this technique lacks sensitivity. Both MR arthrography and CT arthrography take this concept to an extreme, distending the joint with fluid and establishing an arthrogram effect in which fluid is introduced into the milieu of a potential retear with increased joint pressure.
Sensitivities and specificities for these techniques approach 90% in predicting recurrent meniscal tears.

References: