MR Imaging after Meniscal Surgery

Russell C. Fritz, M.D.
National Orthopedic Imaging Associates
San Francisco, CA, USA

-in this lecture, we will focus our attention on MR imaging after meniscal surgery

-linear increased signal extending to an articular surface is the hallmark of a tear

-tears of the medial and lateral menisci should be characterized with regard to the morphology and extent of the tears

-careful assessment of the meniscal tear morphology in all 3 planes of imaging is key to detect radial tears of the free edge or displaced fragments of meniscal tissue

-the morphology and extent of meniscal tearing on MRI predicts tear stability

-radial tears begin at the free edge and interrupt the circumferential hoop fibers of the meniscus resulting in progressively greater meniscal dysfunction with load transfer to the adjacent articular cartilage and subchondral cancellous bone in accordance with Wolf's law

-chondral defects, joint space narrowing, and osteoarthritis may result from meniscal dysfunction with progressive axial malalignment of the tibial and femur

-stress fractures with surrounding bone marrow edema are most commonly seen in the medial femoral condyle and medial tibia secondary to radial or complex tears of the medial meniscus; the bone cut off from its blood supply by the subchondral fracture is at risk to develop osteonecrosis, therefore a follow-up MRI is typically useful in this setting to ensure fracture healing and exclude the development of osteonecrosis

-radial tears of the posterior horn of the medial meniscus may occur at the posterior margin of the medial tibial spine near the posterior medial meniscal root attachment; these tears may be missed at arthroscopy due to difficult access to this region of the knee from standard viewing portals

-radial tears and displaced flap tears of the posterior horn of the lateral meniscus may occur at the posterior margin of the lateral tibial spine near the posterior lateral meniscal root attachment; these tears may also be missed at arthroscopy due to difficult access to this region of the knee from standard viewing portals; displaced lateral meniscal flap tears in this area are highly associated with tears of the anterior cruciate ligament

-radial and complex meniscal tears as well as bone marrow edema are more commonly seen in painful acutely symptomatic knees when compared with the asymptomatic
opposite knees; horizontal meniscal tears and osteoarthritis are present in a similar percentage of the asymptomatic opposite knees

-knowledge of the type of meniscal surgery (resection or repair) and comparison with a preoperative scan is quite useful when evaluating a postoperative meniscus. New tears and chondral defects can be diagnosed more easily when the prior scan is available for comparison. Fluid within the meniscus at the site of a repair indicates lack of healing. CT arthrography may be useful in assessing the degree of healing following meniscal repair. Radial tears of the remaining peripheral remnant of meniscus should be considered and looked for after a partial meniscectomy.

Technical considerations

-We routinely scan all joints with 3 FSE PD (3000/34) sequences and 3 FSE fat-suppressed T2-weighted (4000/50) sequences in the axial, oblique sagittal, and oblique coronal planes.

-We use these same sequences to evaluate postoperative joints. We use these routine sequences in most postop patients, especially if there has fixation with plastic materials such as PEEK or bioabsorbable implants. If there is titanium fixation, we typically will add or substitute a STIR sequence. If there is stainless steel, or if there is an arthroplasty with cobalt chromium resulting in prominent artifact, then we will do STIR in all 3 planes and we will modify all 3 of the FSE PD sequences using metal suppression technique. This metal suppression technique typically involves increasing the receiver bandwidth, increasing the echo train length (turbo factor), and increasing the frequency matrix

-CT, CT arthrography, IV gadolinium, and MR arthrography may be useful for problem solving after routine MR imaging in postoperative patients

-postop scans are typically more challenging to interpret. The interpreting radiologist should insist on having a good history of the current problem as well as the past surgeries that were performed. An operative note and preoperative scans should be available for review to aid in arriving at a useful interpretation in these more time consuming, difficult cases.

-new meniscal tears can be identified as such by comparison with a preoperative scan and operative note. Routine MR imaging may detect recurrent meniscal tears and can detect new areas of cartilage loss and loose bodies.

-MR arthrography and CT arthrography may be useful for evaluating a meniscal repair when the findings on routine MR imaging are not diagnostic; however in practice, we rarely do arthrography and will only do an arthrogram after performing a good quality noncontrast MRI.
REFERENCES


