Patellar malalignment is a common issue in patients with knee arthroplasty. According to Dr. Thomas S. Thornhill, a rheumatologist at Brigham and Women’s Hospital in Boston, malaligned knees are thought to be associated with less susceptible to the development of osteoarthritis. Patellar malalignment can be measured easily on standard knee x-rays. Thornhill notes that although MRI of the knee is most commonly acquired with the knee extended in the supine position, cross-sectional studies could be used to evaluate several indices of patellofemoral (PF) malalignment.

"We want to take of patellofemoral alignment, we would not be able to get them from radiographic films alone," said Dr. Hunter, an assistant professor of medicine at Boston University. "The resolution of the different planes that can be acquired with MRI do provide advantages over standard x-rays."

The researchers measured patellar alignment in the sagittal and transverse (axial) planes. They measured the patellar length ratio (PLR). To do so, they used the slice with clearly recognizable patellar margins and in which patellar bone volume appeared to be maximal. PLR was calculated as the ratio of patellar length to patellar ligament length. Patellar length was measured from the upper to the lower point of the inner surface of the patella—excluding osteophytes. Patellar ligament length was measured from the lowest inner point of the patella to the highest point of the tibial tuberosity.

"For some of the measures, we had a series of x-rays. Those with a definite osteophyte on any view in the symptomatic knee were eligible for the study. The researchers evaluated 213 patients—a total of 426 knees (average age 68 years) and 87 women (average age 65 years). MRI studies were performed with a 1.5 T magnet, and a positioning device was used to ensure uniformity of the extended knee position. The imaging protocol included sagittal spin-echo proton density-weighted and T1-weighted images and coronal and axial spin-echo fat-suppressed proton density-weighted and T1-weighted images.

Use of MRI allowed the researchers to evaluate several indices of patellofemoral alignment. For some of the measures that we wanted to take of patellofemoral alignment, we would not be able to get them from radiographic films alone," said Dr. Hunter, an assistant professor of medicine at Boston University. "The resolution of the different planes that can be acquired with MRI do provide advantages over standard x-rays."

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In the transverse plane, the researchers measured the trochlear depth (trochlear sulcus angle) and two indices describing patellar position (lateral patellar tilt angle and intersect offset of the patella). Sulcus angle (SA) is an indicator of femoral trochlear dysplasia, which is associated with PF OA and patellar instability. To measure SA, the researchers used the axial slice that referred to the proximal one-third of the femoral trochlear curve.

SA is the angle between two lines: one radiating from the lowest point of the trochlear sulcus along the lateral border of the patella and the other from the lowest point of the trochlear sulcus along the medial border of the patella.

For measurements of patellar alignment, the researchers used the axial slice that refers to the middle of the patella. The LPTA, which is the angle between the posterior condylar line and a line through the deepest part of the femoral sulcus. For the BO of the patella, the researchers used a line perpendicular to the posterior condylar line that runs through the lowest point of the femoral sulcus and up through the patella.

This study suggests that alignment of the patella may be an important factor influencing PF joint degeneration, due to the aberrant distribution of forces with activity. "I think that the important message for clinicians here is that to date, the majority of people really haven't considered problems of malalignment of the patellofemoral joint as important features in patellofemoral osteoarthritis. This study suggests that they're strongly associated," said Dr. Hunter.

The fact that MRI was performed with the knee placed in a supine position likely means that the findings from this analysis are conservative for measures that could potentially change with weight bearing (LPTA and BO).

"Our study has implications for patient selection," he said. "By identifying patients at high risk of failure, we can better tailor treatment options to individual patients."

UKA is indicated for degenerative arthritic patients who are not good candidates for osteotomy or total knee replacement. Thornhill notes that UKA is the first option to consider in a younger patient because "it's much easier to convert to a UKA to a total knee arthroplasty than to a total knee replacement".

He estimates that the revision rate for UKAs at his facility is about 1% per year. Most problems are related to wear and progression of disease in the lateral compartment. UKA can be performed with a small incision, involves a shorter hospital stay, lower cost, and more rapid rehabilitation than does a total knee replacement.

"In our defense, TKAs procedures that are cruciate sparing have good to excellent results at 10-15 years," he said. "The major problems with failure of TKAs still are related to wear, loosening, and infection. I would submit to you that most of these failures can be attributed to technical issues and patient selection," said Dr. Thornhill.

The most common cause of failure is instability. Surgeons think they need to put the knee in loosely so it will bend and flex better. Instead the looseness creates shearing when the knee moves, he said.

Dr. Thornhill disclosed that he receives royalties from DePuy Inc. He also has received research grants from DePuy Inc., Biomet Inc., and Smith & Nephew. ■

—Kerr Wachter