Study: Altered Gait May Flag Early Knee OA

BY KERRI WACHTER

FROM ARTHRITIS & RHEUMATISM

Unilateral hip arthritis may cause alterations in the joint loading of the contralateral knee before the onset of symptomatic osteoarthritis in that knee, a small study has shown.

This finding could open up the possibility of interventions that could prevent or slow the progression of knee osteoarthritis (OA) in those with unilateral hip arthritis.

The results come from a study of 55 participants, who underwent gait analysis of dynamic joint loading and dual-energy x-ray absorptiometry (DXA) to determine bone mineral density (BMD) of the tibial plateau (Arthritis Rheum. 2011 30 Aug. [doi:10.1002/art.30626]).

"This study demonstrates that in unilateral hip OA, the contralateral knee is subjected to significantly higher dynamic joint loading, as assessed by PAddM [peak external knee adduction moment] and by total medial compartment loads, relative to the ipsilateral knee. Importantly, this asymmetry of knee loading is observed even though the knees are asymptomatic and do not have clinical evidence of OA," wrote Dr. Najia Shakoor and her coinvestigators at Rush Medical College, Chicago.

Asked to comment on the findings, Dr. Nancy E. Lane noted that "it is not a surprise that changes in gait are present before the disease becomes clinically symptomatic.

"The more we can study gait to provide early detection of OA, we might be able to provide an intervention that might slow the progression of the disease," noted Dr. Lane, professor of medicine and rheumatology at the University of California, Davis, and director of the

center for healthy aging at UC Davis.

While no interventions are approved yet, there are braces and special shoes that may support the knee. In addition, ongoing research is evaluating gait interventions. "They may be efficacious if the interventions are initiated earlier in the disease state," according to Dr. Lane.

Individuals were included if they had symptomatic OA of the hip, as defined by the American College of Rheumatology's Clinical Criteria for Classification. They also had to have at least 30 mm of pain (on a 100-mm scale) while walking – which corresponds to question 1 of the visual analog format of the hip-directed WOMAC (Western Ontario and McMaster Universities Arthritis) Index. OA was confirmed radiographically.

Exclusion criteria included symptomatic OA of the contralateral hip or either knee with the presence of pain defined as 30 mm (on a 100-mm scale) while walking. They were also excluded if they had radiographic evidence of OA of the contralateral hip or either of the knees, in excess of grade 3, according to the modified Kellgren-Lawrence (KL) scale.

A total of 62 individuals met the study criteria and completed the study. The mean age was 62 years, and more women (60%) were included than men. A total of 55 individuals had both appropriate gait data and evaluation of bone density at bilateral knees.

All individuals had anterior-posterior radiographs of the pelvis, which were evaluated for KL grade at the hips. They also underwent anterior-posterior standing knee radiographs that were evaluated for KL grade at the knees. All participants completed the WOMAC visual analog scale for pain at both knees and both hips. The WOMAC scores were normalized to a 100-mm scale.

Participants also underwent gait analysis to collect three-dimensional kinematics and ground reaction forces using optoelectronic cameras with passive markers and a multicomponent force plate. Passive markers were placed at the lateral-most aspect of the superior iliac crest, the superior aspect of the greater trochanter, the lateral knee joint line, the lateral malleolus, the lateral calcaneus, and the head of the fifth metatarsal.

DXA was used to scan the bilateral proximal tibia and determine BMD. Software was used to determine the subpe-

Continued on following page

Continued from previous page

riostial surface of the tibia. Cortical bone of the subchondral plate was excluded from the measurements, as sclerosis in this region can alter BMD. Therefore, the medial and lateral regions of interest include subchondral trabecular bone.

The primary end point was the PAddM, which is a validated gait parameter that reflects the load at the medial compartment of the knee. This measure has been associated with pain, radiographic severity, and progression of knee OA. The PAddM was defined as the external adduction moment of greatest magnitude during the stance phase of the gait cycle in this study. The coprimary end points were total loading of the medial compartment and medial compartment BMD.

Both primary gait outcomes at the knees – the PAddM and the total medial knee load – were significantly greater for the contralateral knee relative to the ipsilateral knee. Lateral compartment load was also greater for the contralateral knee. In addition, the medial tibial plateau BMD was significantly greater at the contralateral knee relative to the ipsilateral knee, though there were no significant differences at the lateral tibial plateau.

Interestingly, the ratio of the contralateral-to-ipsilateral medial compartment knee BMD was directly correlated with contralateral-to-ipsilateral knee PAddM and contralateral-to-ipsilateral knee medial compartment load, the investigators noted.

In addition, the significant asymmetries observed in the proximal tibial BMD of the contralateral vs. ipsilateral knees provide evidence of substantially altered load history in the knees as well.

"The current study demonstrates that loading asymmetries at the knees begin early in the disease course of hip OA to end-stage disease. These results may have implications for interventional strategies targeted in those with unilateral hip OA in order to prevent or minimize these asymmetries early in the disease course," the researchers concluded.

The authors and Dr. Lane reported that they have no relevant financial disclosures. The study was sponsored by the National Institutes of Health and the Schweppe Foundation. ■