

Relationship of limb length inequality with radiographic knee and hip osteoarthritis

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Y.M. Golightly P.T., M.S., K.D. Allen Ph.D., J.B. Renner M.D., C.G. Helmick M.D., A. Salazar M.D. and J.M. Jordan M.D., M.P.H.

FROM ABSTRACT

Objective

This study examined the relationship of limb length inequality (LLI) with radiographic hip and knee osteoarthritis (OA) in a large, community-based sample.

Methods

The total study group comprised 926 participants with radiographic knee OA, 796 with radiographic hip OA, and 210 (6.6%) with LLI ≥ 2 cm.

Multiple logistic regression models were used to examine the relationship of LLI with hip and knee OA, while controlling for age, gender, race, body mass index, and history of hip or knee problems (joint injury, fracture, surgery, or congenital anomalies).

Results

Participants with LLI were more likely than those without LLI to have radiographic knee OA (45.1% vs 28.3%) and radiographic hip OA (35.2% vs 28.7%).

Knee OA was significantly associated with presence of LLI by 80% and with hip OA with LLI by 20%.

Among participants with LLI, hip OA was 30.3% more common on the short leg side v. 17.5% on the longer limb side.

Conclusion

LLI was associated with radiographic knee OA, controlling for other important variables.

THESE AUTHORS ALSO NOTE:

“Osteoarthritis (OA) is one of the most common chronic conditions in the United States and a leading cause of disability among older adults.”

OA of the knee affects 6% of the U.S. adult population.

OA of the hip affects 3% of the U.S. adult population.

“Recent studies have shown that some mechanical factors, including joint instability and malalignment, contribute to the progressive degeneration that characterizes radiographic OA.”

“Limb length inequality (LLI), a condition in which paired lower extremities are of unequal length, alters gait symmetry and joint mechanics during weight bearing, potentially contributing to the development of radiographic knee and hip OA.”

“Individuals with LLI often modify their movement patterns to functionally minimize the inequality, i.e., increasing knee flexion or hip adduction of the longer limb. These compensatory mechanisms may amplify forces across a smaller joint contact area, thus acting as a biomechanical precursor to lower extremity OA.”

“With the participant supine, a tape measure was used to determine right and left lower extremity lengths (in centimeters) between two defined bony landmarks: the anterior superior iliac spine (ASIS) and the medial malleolus.” “To account for potential measurement error in this clinical measurement, LLI was defined conservatively as a 2.0 cm or greater difference in length between limbs.”

RESULTS

“Participants with LLI were significantly more likely than those without LLI to have radiographic knee and hip OA.”

“Both mild and moderate-to-severe radiographic knee OA were more common in individuals with LLI.”

“In adjusted models for covariates, those with LLI were 80% more likely than those without LLI to have radiographic knee OA and 20% more likely than those without LLI to have radiographic hip OA.” **[Key Point]**

DISCUSSION

“The prevalence and severity of knee OA was higher in participants with LLI than without LLI, even when adjusted for key risk factors.”

“LLI may lead to altered or amplified joint forces, resulting in accelerated degeneration of joint structures and increased OA severity.”

“In the present study, radiographic hip OA was more common in participants with LLI than without LLI.”

This study and others found that hip OA occurred more frequently on the short leg side because “the shorter limb may sustain greater forces through the hip compared to the longer limb.”

However, other studies found more hip OA in the longer limb, up to 84% more frequent.

This is the largest study to date to examine LLI and radiographic knee and hip OA.

“Tape measurement of leg length (which was used in this study) is highly accurate between testers when compared to supine radiography, this method may be less reliable compared to standing radiographs.”

Even though these authors used the tape measurement method of leg length, their “definition of ≥ 2 cm is conservative and would include only individuals with a clinically meaningful inequality.”

In this study, LLI was associated with radiographic knee OA.

“These results may have important clinical implications for patients seeking treatment for knee or hip OA. Evaluation of LLI should be incorporated into physical examinations for these patients.”

“Treatment of LLI in patients with knee or hip OA, with heel or shoe lifts, may aid in reducing joint stresses, pain, and disability.”

KEY POINTS FROM DAN MURPHY

- 1) “Osteoarthritis (OA) is one of the most common chronic conditions in the United States and a leading cause of disability among older adults.”
- 2) OA of the knee affects 6% and of the U.S. adult population.
- 3) OA of the hip affects 3% and of the U.S. adult population.
- 4) “Recent studies have shown that some mechanical factors, including joint instability and malalignment, contribute to the progressive degeneration that characterizes radiographic OA.” **[Important, notice “malalignment”]**
- 5) “Limb length inequality (LLI), a condition in which paired lower extremities are of unequal length, alters gait symmetry and joint mechanics during weight bearing, potentially contributing to the development of radiographic knee and hip OA.”
- 6) “Individuals with LLI often modify their movement patterns to functionally minimize the inequality, i.e., increasing knee flexion or hip adduction of the longer limb. These compensatory mechanisms may amplify forces across a smaller joint contact area, thus acting as a biomechanical precursor to lower extremity OA.”

- 7) "Participants with LLI were significantly more likely than those without LLI to have radiographic knee and hip OA."
- 8) "Both mild and moderate-to-severe radiographic knee OA were more common in individuals with LLI."
- 9) "In adjusted models for covariates, those with LLI were 80% more likely than those without LLI to have radiographic knee OA and 20% more likely than those without LLI to have radiographic hip OA." **[Key Point]**
- 10) "The prevalence and severity of knee OA was higher in participants with LLI than without LLI, even when adjusted for key risk factors."
- 11) "LLI may lead to altered or amplified joint forces, resulting in accelerated degeneration of joint structures and increased OA severity."
- 12) "In the present study, radiographic hip OA was more common in participants with LLI than without LLI."
- 13) This study and others found that hip OA occurred more frequently on the short leg side because "the shorter limb may sustain greater forces through the hip compared to the longer limb."
- 14) However, other studies found more hip OA in the longer limb, up to 84% more frequent.
- 15) "Tape measurement of leg length (which was used in this study) is highly accurate between testers when compared to supine radiography, this method may be less reliable compared to standing radiographs."
- 16) "These results may have important clinical implications for patients seeking treatment for knee or hip OA. Evaluation of LLI should be incorporated into physical examinations for these patients."
- 17) "Treatment of LLI in patients with knee or hip OA, with heel or shoe lifts, may aid in reducing joint stresses, pain, and disability."