The Influence of Leg Length Discrepancies on 2-Year Outcomes After Hip Arthroscopy:

A Matched Case-Control Study

Jonathan S, Lee[1], Stephen M. Gillinov[1], Bilal S. Siddiq[1], Kaveh Torabian[1], Kieran S. Dowley[1], Michael C. Dean[1], Nathan J. Cherian, Christopher T. Eberlin, Michael P. Kucharik, Paul F. Abraham, Mark R. Nazal, Scott D. Martin[1]

[1]Massachusetts General Hospital, Boston, MA

Email of Presenting Author: jlee376@mgh.harvard.edu

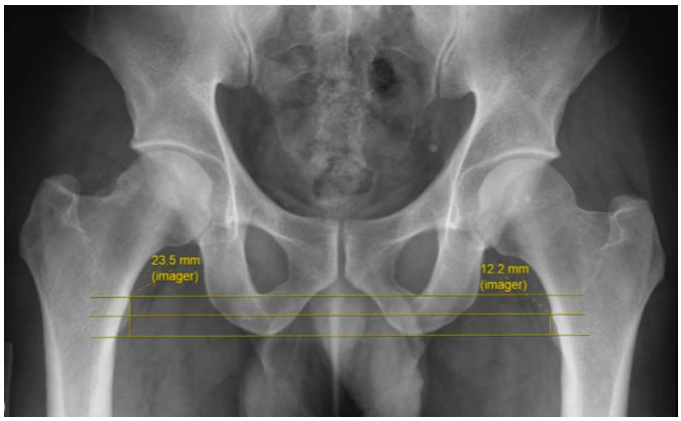
INTRODUCTION: Leg Length Discrepancy (LLD) is a common musculoskeletal condition defined by lower extremities of unequal length. Prior literature has reported that LLD affects 90% of the general population, with the majority having a discrepancy below 10 mm. Studies examining patients with LLD as minimal as 5 mm have reported greater rates of gait abnormalities, lower back pain, total knee arthroplasty, and degenerative joint disease in the hips, knees, and back. In general, a LLD < 10 mm is considered tolerable with a low risk for surgical intervention. LLD ≥ 10 mm has been widely explored in patients following total hip arthroplasty (THA) due to its high prevalence and potential for the severe, long-term complications. Currently, there remains a paucity of literature on the effects of preoperative LLD on short-term outcomes for patients undergoing hip arthroscopy.

METHODS: A retrospective review of a prospectively collected database was performed to identify patients with LLD who underwent hip arthroscopy for labral tears and FAI between April 2014 and June 2021. After failing conservative management, patients were treated at a large tertiary-care hospital by a single senior-surgeon and received the same capsular management technique and postoperative protocol. Patients with a minimum of 2 years follow-up, complete preoperative and 2-year patient-reported outcomes (PROs), and a LLD ≥ 10 mm were included. Patients with severe osteoarthritis (Tönnis grade > 2), any prior hip surgeries including hip arthroscopy and total hip arthroplasty on the ipsilateral or contralateral side, and severe hip dysplasia (lateral center-edge angle <18°) were excluded. Patients with LLD ≥ 10 mm represented the LLD cohort and were matched 1:1 by sex, age within 3 years, and body mass index (BMI) within 5 kg/m^2 to a matched control (MC) cohort. Patients in the MC cohort met the inclusion and exclusion criteria; they differed only in that they had a LLD < 10 mm. The measurement technique to assess LLD using pelvic radiographs was in accordance with previously published literature and the guidance of a board-certified musculoskeletal radiologist. A straight line was drawn to intersect the inferior aspects of the Ischial Tuberosity (IT) and was used to anchor the limb length measurements. Parallel lines were then drawn at the superior aspects of the ipsilateral and contralateral lesser trochanter (LT). The difference in height between the right and left LT lines represented the patient's LLD. Recorded PROs included mHHS, HOS-ADL, HOS-SSS, NAHS, iHOT-33, groin pain level, and VAS. Pearson's χ^2 test and Fisher's exact test were used to compare categorical variables; two-sample t-tests were used to compare continuous variables. The threshold for statistical significance was set to 0.05. All statistical analyses were performed using Stata software (version 18.0; StataCorp). All data collection received Institutional Review Board approval.

RESULTS: A total of 46 patients with LLD ≥ 10 mm were 1:1 matched with 46 MC patients with LLD <10. There were no differences in patient demographics including age, BMI, sex, symptom duration, α angle, lateral center edge angle, Tönnis angle, Tönnis grade, and type of FAI. At baseline, the LLD cohort reported significantly lower PROs for mHHS, HOS-ADL, NAHS, and groin pain level. At 1-year follow up, there was no statistical difference in the number of patients who achieved a minimal clinically important difference (MCID), substantial clinical benefit (SCB), and patient acceptable symptomatic state (PASS) between the LLD and MC cohorts. At 2-year follow up, there was similarly no difference in PROs and MCID, SCB, and PASS between either cohort.

DISCUSSION: Although patients with LLD display lower baseline scores, they benefit greatly from hip arthroscopy and achieve similar short-term results at 1- and 2-year follow up. This study is not without limitations. Measurement errors for LLD could introduce potential bias; however, pelvic radiographs were measured in accordance with the recommendations of a board-certified musculoskeletal radiologist and reviewers who were blinded to the 10 mm LLD threshold that dictated cohort grouping. Second, all findings pertain to that of the senior author and may not be generalizable to other surgeons.

SIGNIFICANCE: Patients with LLD benefit greatly from hip arthroscopy when compared to a matched cohort, reporting similar 1- and 2-year PROs and achieving similar rates of MCID, SCB, and PASS.



	LLD Cohort (n=46)	MC Cohort (n=46)	p-value
LLD, mm	12.4 ± 2.2	3.4 ± 2.4	<0.001
Age, y	37.5 ± 11.3	37.6 ± 11.3	0.963
BMI, kg/m^2	24.9 ± 3.5	24.9 ± 3.6	0.943
Sex			1.000
Male	27	27	
Female	19	19	
Follow-Up, mo	25.8 ± 4.3	24.5 ± 3.0	0.094
Symptom Duration, mo	31.9 ± 44.5	32.6 ± 34.2	0.932
Laterality			0.834
Left	20	21	
Right	26	25	
α angle	47.9 ± 13.7	51.2 ± 13.1	0.246
LCEa	34.8 ± 6.8	35.1 ± 6.0	0.847
Tönnis Angle	2.5 ± 6.2	2.1 ± 8.1	0.796
Tönnis Grade			0.528
0	21	19	
1	24	27	
2	1	0	
Type of FAI			0.560
No Deformity	1	2	
Pincer Only	19	23	
CAM only	1	0	
CAM and Pincer	25	21	

	LLD Cohort (n=46)	MC Cohort (n=46)	p-value
Preoperative			
mHHS	60.6 ± 14.3	69.4 ± 14.0	0.004
HOS-ADL	69.1 ± 19.1	78.1 ± 15.0	0.014
HOS-SS	41.9 ± 24.1	48.2 ± 22.2	0.195
NAHS	62.2 ± 18.1	69.6 ± 16.5	0.042
iHOT-33	38.7 ± 17.8	45.2 ± 18.0	0.084
Groin Pain Level	36.4 ± 23.5	47.3 ± 24.4	0.032
VAS	3.6 ± 2.6	3.6 ± 2.9	0.981
12 Month			
mHHS	87.6 ± 12.9	90.2 ± 10.5	0.302
HOS-ADL	91.1 ± 10.5	91.4 ± 9.5	0.890
HOS-SS	75.3 ± 23.5	74.0 ± 27.0	0.811
NAHS	89.1 ± 11.3	89.0 ± 10.5	0.990
iHOT-33	77.6 ± 19.8	78.0 ± 18.9	0.925
Groin Pain Level	79.6 ± 23.0	80.0 ± 22.9	0.923
VAS	1.7 ± 1.6	1.5 ± 1.5	0.737
24 Month			
mHHS	86.4 ± 13.4	88.9 ± 11.5	0.346
HOS-ADL	89.6 ± 12.5	92.5 ± 8.7	0.195
HOS-SS	76.0 ± 24.2	80.0 ± 22.0	0.402
NAHS	87.6 ± 12.7	90.6 ± 9.7	0.217
iHOT-33	76.9 ± 20.4	80.1 ± 19.6	0.439
Groin Pain Level	79.6 ± 18.5	82.3 ± 19.5	0.509
VAS	1.5 ± 1.3	1.7 ± 1.6	0.636