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Unilateral Hip Rotation Range of Motion Asymmetry in Patients With Sacroiliac Joint Regional Pain

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Study Design. A cross-sectional study was used to determine whether limited range of motion in the hip was present in 100 patients—one group with unspecified low back pain and another group with signs suggesting sacroiliac joint dysfunction.

Objectives. To determine whether a characteristic pattern of range of motion in the hip is related to low back pain in patients and to determine whether such a pattern is associated with and without signs of sacroiliac joint dysfunction.

Summary of Background Data. The sacroiliac joint is often considered a potential site of low back pain. Problems with the sacroiliac joint, as well as with the low back, have often been related to reduced or asymmetric range of motion in the hip. The correlation between sacroiliac joint dysfunction and hip range of motion, however, has not been thoroughly evaluated with reliable tests in a population of patients with low back pain.

Methods. Passive hip internal and external rotation goniometric measurements were taken by a blinded examiner, while a separate examiner evaluated the patient for signs of sacroiliac joint dysfunction. Patients with sacroiliac joint dysfunction were further classified as having a left or a right posteriorly tilted innominate.

Results. The patients with low back pain but without evidence of sacroiliac joint dysfunction had significantly greater external hip rotation than internal rotation bilaterally, whereas those with evidence of sacroiliac joint dysfunction had significantly more external hip rotation than internal rotation unilaterally, specifically on the side of the posterior innominate.

Conclusions. Clinicians should consider evaluating for unilateral asymmetry in range of motion in the hip in patients with low back pain. The presence of such asymmetry in patients with low back pain may help identify those with sacroiliac joint dysfunction. [Key words: hip external and internal rotation, hip motion, low back pain, sacroiliac joint] **Spine 1998;23:1009–1015**

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Investigators have proposed that low back pain may be related to hip pain secondary to limited range of motion (ROM) in the hip.[1,4,18,26,28] Friberg[18] showed that hip pain is often associated with low back pain. Offierski and Macnab[28] reported frequencies and correlation between hip disease and low back pain. Barbee–Ellison et al,[1] in a study on patients with unspecific low back pain, showed that patients who have more external hip rotation than internal hip rotation, are more likely to have low back pain. Mellin[26] studied hip mobility in 476 patients with recurrent low back pain and observed that internal hip rotation was less than external rotation ROM, although no differences were found between the left and right sides. Chesworth et al[4] also noted greater external than internal hip rotation bilaterally in patients with unspecified low back pain. Therefore, in patients with unspecified low back pain, external hip rotation often exceeded internal hip rotation on both left and right sides.

Despite differences in internal and external hip rotation ROM in subjects who are symptomatic for low back pain, symmetry usually exists between the left and right sides:[1,4,16,26] Left internal rotation equals right internal rotation and left external rotation equals right external rotation. Therefore, even though external rotation may often exceed internal rotation in patients with unspecified low back pain, specific movements such as external rotation or internal rotation usually show bilateral symmetry between the left and right sides.[1,4,16,18,26,28]

Unilateral limitation of hip rotation ROM, in which a specific movement such as external rotation is unequal between the left and right sides, has been observed in patients with disorders of the sacroiliac joint,[13,19,24] which is often considered a component of low back pain.[2,6,34] LaBan et al[24] noted asymmetry in unilateral hip rotation—*i.e.*, abduction and external rotation were limited unilaterally—in patients with inflammation of the sacroiliac joints. Dunn et al[13] reported limited hip

mobility in patients with infection of the sacroiliac joint, however no mention was given to which movements were limited. Others have described cases in which patients with low back pain had unilateral, limited internal hip rotation and excessive external hip rotation and also exhibited signs of sacroiliac joint dysfunction.[6,19] A controversy therefore exists about whether hip rotation is limited in patients with signs of sacroiliac joint dysfunction. Also, no investigators have examined a group of patients with reliable tests to determine whether ROM is limited in hips of patients with sacroiliac joint dysfunction.

The purpose of this study was first to determine whether a characteristic pattern of hip rotation ROM existed in patients with low back pain and second to determine whether those classified as having sacroiliac joint dysfunction have a different pattern of hip ROM compared with those with unspecified low back pain. The first hypothesis is that those who have signs and symptoms of sacroiliac joint dysfunction and have not been further classified into a left or right posteriorly tilted innominate groups have greater external rotation than internal rotation on both sides. The second hypothesis is that those with signs and symptoms of sacroiliac joint dysfunction who have been classified into a posteriorly tilted group have greater asymmetry in external rotation between the left and right sides than do those without sacroiliac joint dysfunction.

■ Method

A group of 100 patients (56 males, 44 females), with an average height of 167 cm and weight of 66 kg and whose primary reported symptom was low back pain, participated in the study. All patients were referred to Jefferson County Rehabilitation and Sports Clinic, a private practice physical therapy clinic. All patients were undergoing treatment for low back pain at the time of the study. Patients ranged in age from 13 to 69 years (39 ± 14 years [mean ± SD]). All patients had low back pain of not more than 3 weeks' duration. None exhibited signs of symptom magnification as described by Waddell et al.[35] All patients were referred by physicians and had medical diagnoses including low back strain, low back pain, or sacroiliac joint dysfunction.

Patients described their low back pain by completing a pain drawing on the initial visit. Most reported pain that was confined to the low back region (77%), whereas 23 had low back and leg pain (23%). Forty-four patients (44%) described the location of their low back pain as either the left or right side, 26 patients (26%) indicated central low back pain, and 30 patients (30%) described pain radiating across the low back from left to right side. Fifty-eight patients (58%) had an insidious onset of low back pain, whereas 42 patients (42%) reported an incident of injury induced by bending, twisting, or lifting. None of the patients had signs suggesting nerve root involvement—*i.e.*, low back or leg pain with straight leg raising below 45°, muscle weakness involving more than one muscle with the same nerve root innervation in the ipsilateral lower extremity, diminished patellar or Achilles tendon reflexes, or diminished or absent sensation to pinprick in the ipsilateral lower extremity. Any patient who could not tolerate measurement of passive hip rotation because of pain was excluded from the study. None of the patients had primary symptoms of anterior or lateral hip pain or had an antalgic gait. Informed consent was obtained from all patients or their legal guardians. The study was approved by the Human Studies Committee of Washington University School of Medicine, St. Louis, Missouri.

All patients were evaluated for signs of sacroiliac joint dysfunction. The cause of pain arising from the sacroiliac joint is a controversial topic. Pain in and surrounding the sacroiliac joint is commonly described by many patients. Also, many clinicians describe a cluster of signs and symptoms in low back pain patients that are often attributed to the sacroiliac joint.[2,5,10,29] Because of the controversy surrounding the sacroiliac joint, the term sacroiliac joint regional pain was used, as described by Delitto et al,[12] that describes a collection of signs (if positive) that direct successful treatment techniques, presumably to restore sacroiliac joint symmetry.

All patients were also measured for passive internal and external hip rotation ROM on the same day. Internal and external rotation motions were used because results of previous studies have shown that these movements are often limited in patients with low back pain.[1,4,26]

Determination of Sacroiliac Joint Regional Pain. All patients were screened for sacroiliac joint regional pain. In previous studies,[5,12,15] the current investigators have had good success in predicting those patients who are likely to respond favorably to treatments designed to restore innominate rotation asymmetry and to reduce low back pain. Therefore, it is thought that the use of a combination of sacroiliac joint tests can effectively distinguish between those with and without sacroiliac joint problems. In the current study, the investigators used the same combination of common tests (which purportedly implicate sacroiliac joint regional pain) as a basis for suspicion of sacroiliac joint regional pain and to classify patients with low back pain and sacroiliac joint regional pain.[5,12,15] Sacroiliac joint regional pain was considered present if at least three of four commonly used sacroiliac joint test results were positive. All four tests for sacroiliac joint regional pain were performed by the same investigator (MTC). The four tests included the standing flexion test, palpation of posterior superior iliac spine heights while sitting, the supine and long sitting positions test, and the prone knee flexion test.

Potter and Rothstein[31] have reported that individual tests for the sacroiliac joint general yield poor intertester reliability. Knowing this it is unlikely that a clinician would use only one test to determine the presence of sacroiliac joint regional pain, a combination of tests was used. Positive findings in three of four tests raised suspicion of a problem with the sacroiliac joints, and patients so diagnosed were classified into groups.[5] The (interrater) reliability of measurements obtained using a combination of tests for the sacroiliac joint has been shown to be good.[5]

Observer variability tests were performed by one of the investigators (MTC) for the four sacroiliac joint tests to determine intratester reliability. Intratester reliability was established for the combination of sacroiliac joint tests and was established on a sample of 35 of the 100 patients selected for the study. The testing was performed on separate days to eliminate recall bias. The weighted κ for the combination of sacroiliac joint tests was 0.86, which is comparable with findings in

an earlier study.[5] A combination of tests was used because seldom can a single test be sensitive and specific.[17] When a combination of tests is used, the individual tests results become contributory rather than surrogate.[17] Therefore, because few studies, if any, have been performed on the sensitivity or specificity of sacroiliac joint tests and no gold standard has been adopted for confirmation, combining tests improves the clinician's ability to determine who is more likely to have sacroiliac joint regional pain. The assessment of test accuracy requires the existence of a gold standard. Because none exists, the accuracy of sacroiliac joint tests could not be determined.

The standing flexion test was performed by palpating the posterior superior iliac spines (PSIS) while the subject was bending forward bending. A superior movement of one PSIS compared with the other indicates a positive finding in a standing flexion test. A positive result in a standing flexion test purportedly indicates limited movement of the ilium on the sacrum, displaying limited sacroiliac joint motion on the side of the superior PSIS.[3,5,36] The minimum criteria used in the current study for PSIS movement was an observable difference of at least 2.54 cm between sides.

Palpation of the patient's PSIS was performed with the patient sitting on a level surface. A positive test result was obtained when one PSIS appeared lower when compared with the opposite side. The presence of the lower PSIS while sitting suggests that the ilium is rotated posteriorly on the sacrum, whereas the opposite ilium concomitantly may be anteriorly rotated.[3,5,36] An observable visual positive finding of at least 2.54 cm between sides was used to establish a difference.

The supine/long sitting test is a sacroiliac joint test that compares apparent leg lengths in the supine and long sitting positions. With the patient in the supine position, the lengths of the inferior aspects of both medial malleoli are compared. In the supine position, the finding of a shorter leg when compared with the opposite side is suggestive, but not confirmatory, of a posteriorly rotated innominate. While the clinician holds the medial border of the medial malleoli with the thumbs, the patient is asked to come to a long sitting position. Any apparent lengthening of the short leg implied to us the presence of sacroiliac joint dysfunction and a posteriorly rotated innominate. In the supine and long sitting positions test, the apparent short lower extremity in the supine position suggests the ilium is rotated posteriorly on the sacrum; the apparent lengthening of the same lower extremity during long sitting also suggests the ilium is rotated posteriorly on the sacrum.[5,36] An observable difference of at least 2.54 cm between the supine and long sitting positions was used to establish a positive result.

The prone knee flexion test is purportedly a sacroiliac joint test in which apparent leg lengths are compared with the patient prone with both knees flexed to 90°. The leg lengths are compared by visually examining the left and right soles of the heel (shoes on) in the prone *versus* knees flexed position. A finding of a shorter leg when the patient is prone is suggestive but not confirmatory of a posteriorly rotated innominate. While the clinician holds both heels of the patient's shoes, the patient's knees are passively flexed to 90°. An apparent lengthening of the short leg implies the presence of sacroiliac joint dysfunction and a (hypothesized) posteriorly rotated innominate. In the prone knee flexion test, the apparent shorter lower extremity indicates that the ilium is rotated posteriorly on the sacrum.[5] An observable difference of at least 2.54 cm between the prone and knee flexed position was used to establish a positive result.

Based on the results of the sacroiliac joint examination, patients were classified into one of two groups. The first group contained those with low back pain who did not have signs suggestive of sacroiliac joint regional pain and the second group consisted of those who had low back pain with signs suggestive of sacroiliac joint regional pain. Patients with sacroiliac joint regional pain were further classified by the side on which they exhibited posterior innominate tilt. This method of classification appears appropriate in light of previous work with results that show that patients with signs of sacroiliac joint regional pain exhibit asymmetry between the left and right innominate bones in two ways—*i.e.,* one innominate is rotated posteriorly, whereas the other is rotated anteriorly.[5,9] Therefore, the two types of sacroiliac joint dysfunction that may develop are those in which the left innominate tilts posteriorly and the right tilts anteriorly and those in which the right innominate tilts posteriorly and the left tilts anteriorly.

On evaluation, 76 patients were classified with sacroiliac joint regional pain, with positive results in three out of four tests. Twenty-four patients showed no significant sign of sacroiliac joint regional pain: They had positive results in only one of four or in no tests. These patients were classified as having low back pain without sacroiliac joint regional pain. Patients who had positive results in at least two out of four tests were excluded from the study, because it was not possible to detect accurately whether they had sacroiliac joint dysfunction. Their inclusion in the study would have increased the possibility of contamination. Eight patients met this criterion and were excluded from the study.

Hip Range of Motion Measurements. Observer variability tests were first performed by one of the investigators (GSC) for passive hip rotation ROM to determine intratester reliability. Intrarater reliability was established for goniometric measurements by measuring hip rotation ROM on a sample of 29 of the 100 patients selected for the study. The procedure for measuring passive hip rotation has been described previously.[1] Briefly, patients were placed prone on the treatment table. The prone position was used because passive hip rotation measurements are reportedly more reliable, presumably because of better pelvic stabilization in the prone position compared with that in the sitting position.[1] All patients wore nonrestricting clothing while having their hip joints measured. The hip to be measured was placed in 0° of abduction while the contralateral hip was abducted approximately 30°. The knee was flexed to 90°, and the leg was passively moved to produce hip rotation. A strap was placed around the posterior superior iliac spines to prevent movement of the pelvis. Passive ROM was stopped at the end of movement, when a firm feeling of resistance was felt. None of the patients complained of low back or hip pain with movement. The goniometer was aligned vertically along the shaft of the tibia. The rater was blind to the amount of movement measured by the goniometer and the measurements were read and recorded by a different examiner. An intraclass correlation coefficient (ICC) were determined for intraexaminer reliability for passive internal hip rotation and for external rotation (ICC 1,3 = 0.97 and 0.98 for internal and external rotation ROM measurements, respectively).

One trial consisting of three measurements of passive external hip and internal rotation ROM was performed on all re-

Table 1. Hip Rotation Range of Motions (°) Obtained by Goniometry in Patients With Low Back Pain and With or Without Evidence of a Unilateral Posteriorly Rotated Innominate (PI)*

Group (n)	Left Internal Rotation	Left External Rotation	Right Internal Rotation	Right External Rotation
All (100)	44.4 (14.7)	55.8 (9.8)	46.7 (13.3)	56.8 (11.3)
Left +PI (33)	38.9 (16)	60.2 (9.4)	53.3 (10.4)	50.5 (7.2)
Right +PI (43)	47.6 (13.4)	52.0 (8.5)	40.9 (13.6)	62.5 (11.4)

* Values are mean (SD).
+PI = unilateral posteriorly rotated innominate.

maining patients, as just described. The investigator (GSC) performing all of the ROM measurements was blind to the results of the sacroiliac joint dysfunction testing. Similarly, the sacroiliac joint examiner (MTC) was unaware of the hip rotation ROM measures before data analysis when findings were tabulated.

In a pilot study of 10 patients without low back pain with a mean age of 30 years, subjects were examined for passive external and internal rotation. Passive ROM measures showed symmetric left internal and right internal rotation and symmetric left external and right external rotation. The mean ROM values obtained were 62° during left external rotation and 62.7° during right external rotation. Passive internal rotation measured 51°, whereas right internal rotation measured 51.7°. Even though the sample size was extremely small, the differences between the left and right sides for the same motion (*i.e.*, internal rotation) were negligible. Therefore, patients who had no low back pain were not included in the current study. The results of the pilot study are consistent with those in other other studies[4,32] and with information in the literature[1,4,7,8,11,16,18,20–23,25–27,32,33] that shows symmetry between left and right sides for a specific movement, such as internal hip rotation.

Data Analysis. Hip rotation ROMs were analyzed with multivariate analysis of variance (MANOVA).[37] Two MANOVAs were performed. The first was a 2 × 2 × 2 analysis with repeated measures using three factors: group as a factor that consisted of two independent groups, one with sacroiliac joint regional pain and one without; side as a second factor (goniometric measurements taken from both the right or left hip); and hip rotation ROM as a third factor (external or internal rotation). The other (2 × 2 with repeated measures on two factors) MANOVA was performed only on the subjects classified as having sacroiliac joint regional pain. The side factor defined the side of the posterior innominate (involved or uninvolved), and the hip rotation ROM factor indicated either external or internal hip rotation. Alpha level for all main effects and interactions was set at 0.05.

■ Results

The means and standard deviations (SD) of all the subjects' hip rotation ranges of motion are summarized in Table 1. Classification of patients with low back pain showed that 24 of 100 (24%) did not have signs suggestive of sacroiliac joint regional pain. The means (±SD) of hip rotation ROM of these patients are shown in Figure 1. Of the 76 patients who exhibited signs suggestive of sacroiliac joint regional pain, 33 patients (43.4%) were classified as having a left posteriorly rotated innominate (PI), whereas 43 (56.6%) were classified as having a right PI. In Figure 2, the mean values (±SD) are shown for left and right internal and external hip rotation ROM among those patients with low back pain and sacroiliac joint regional pain before designating the side of the posteriorly rotated innominate. Figure 3 shows the means (±SD) of internal and external hip rotation in the 76 patients with low back pain after designating the side of the posteriorly rotated innominate. The involved side in this figure includes hip ROM for left and right classified PIs. In Table 1, the mean (±SD) of hip rotation ROM is

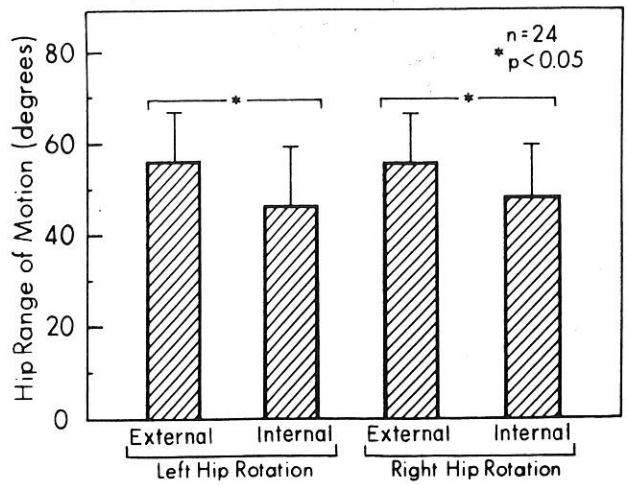

Figure 1. Hip range of motion (in degrees) in patients (n = 24) with low back pain but without evidence of sacroiliac joint dysfunction. Bars denote mean; lines denote standard deviation.

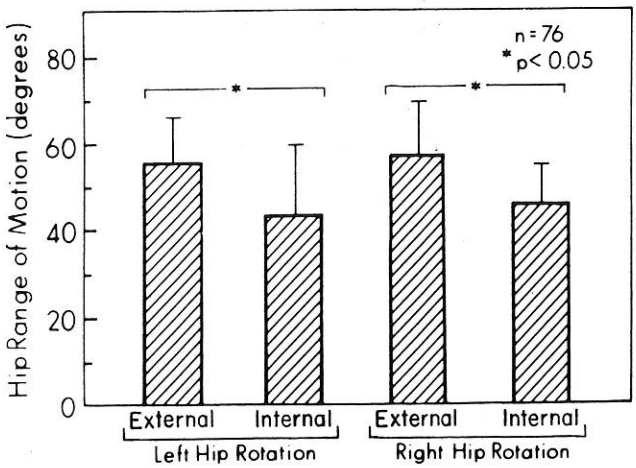

Figure 2. Hip range of motion (in degrees) in patients (n = 76) with low back pain and sacroiliac joint dysfunction before designating the side of the posteriorly rotated innominate. Bars denote mean; lines denote standard deviation.

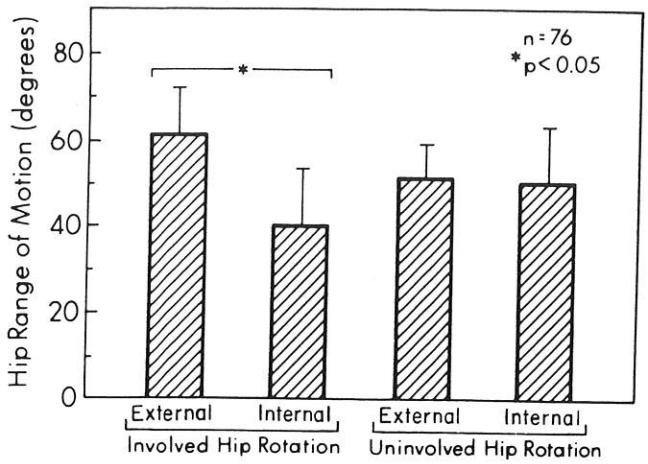

Figure 3. Hip range of motion (in degrees) in patients (n = 76) with low back pain and sacroiliac joint dysfunction after designation of the side of the posteriorly rotated innominate. The side of the posteriorly rotated innominate is indicated by the involved side, whereas the anteriorly tilted innominate is indicated by the uninvolved side. Involved and uninvolved sides include left and right sides. Bars denote mean; lines denote standard deviation.

shown for those patients separated according to a left or right posteriorly rotated innominate.

The results of the initial MANOVA demonstrated no significant differences in the main effects of group or side when all subjects were analyzed. However, a significant overall main effect was recorded for hip rotation ($F = 48.7$; $P < 0.05$) in which external rotation exceeded internal rotation (Figure 1; row 1 of Table 1).

When only the patients classified as having sacroiliac joint regional pain were analyzed, results of MANOVA showed a significant main effect of hip rotation ROM ($F = 43.55$; $P < 0.05$) and a significant side of PI by hip rotation ROM interaction ($F = 122.87$; $P < 0.05$). These results are shown in Table 2.

Among those patients with evidence of a posteriorly rotated innominate, there was significantly greater external hip rotation compared with internal rotation on the side of the posterior tilted innominate (Figure 3). This was confirmed by the finding of a significant interaction between the side of the posterior innominate and the direction of hip rotation (Table 1). The finding of a significant interaction indicates that hip rotation ROM asymmetry in patients with low back pain may be related to the side of the posteriorly rotated innominate in patients classified as having sacroiliac joint regional pain.

Table 2. Results of 2 × 2 Analysis of Variance on the 76 Patients With Low Back Pain and Suspected Sacroiliac Joint Regional Pain

	SS	*df*	MS	*F*	*P*
Side of PI	1.45	1	1.45	0.035	0.852
Error	3,123.8	75	41.65		
Hip rotation ROM	9,970.66	1	970.66	43.55	0.00
Error	17,171.6	75	228.955		
Side × rotation	7,690.266	1	7,690.26	122.87	0.00
Error	4,693.98	75	62.586		

SS = sum of squares; MS = mean square; PI = posteriorly rotated innominate; ROM = range of motion.

■ Discussion

According to the results of this study, hip rotation asymmetry is present in patients classified as having sacroiliac joint regional pain. When patients with low back pain were classified as having evidence of sacroiliac joint regional pain, external rotation was uniformly greater than internal rotation on the side of the posterior innominate (Table 1, Figure 2). In patients with low back pain who did not exhibit sacroiliac joint regional pain, left and right hip rotations were somewhat more symmetric between sides, although external rotation exceeded internal rotation (Figure 1).

The results support the finding that in patients with low back pain without evidence of sacroiliac joint regional pain, external rotation exceeds internal rotation bilaterally. However, those patients with low back pain who were classified as having signs suggestive of sacroiliac regional pain had demonstrably more external rotation than internal rotation on the posterior innominate side, indicating greater asymmetry between the left and right sides (Figure 3). Before patients with low back pain and sacroiliac joint regional pain could be classified into one of two groups, a left or a right PI group, external hip rotation had to exceed internal rotation in both hips to a similar extent (Figure 2). However, when patients were further classified by evidence of sacroiliac joint regional pain as having a left PI or a right PI, external rotation ROM always exceeded internal rotation on the posteriorly rotated innominate (+PI; Table 1), whereas the anteriorly tilted side showed far less asymmetry (Figure 3).

Hip rotation ROM values in healthy individuals and in patients with low back pain vary within the literature.[1,4,8,11,16,20–23,25–27,32,33,37] In all studies, however, little to no difference (5° or less) was found when comparing left to right sides during a specific movement, such as internal rotation.[1,14,16,26] Also, the variation in the measurements of the movements among study results were not between left and right sides for a specific movement, but between internal and external rotation. The differences in results for internal and external rotation were most likely attributable to the use of different methods for determining the endpoint of movement, to different patient populations, and to whether motion was passive or active.[1,4,16,26,32] Therefore, differences would be expected between internal and external rotation values among results of different studies. However, values for specific hip rotation movements showed consistency within results of each study, but not among results of all studies reviewed.

Because a comparison group is not used in cross-sectional studies, a detection bias may develop.[17] A problem associated with the current study was in accu-

rately detecting all patients who do or do not have sacroiliac joint regional pain. Because no gold standard currently exists for detecting sacroiliac joint regional pain, palpatory tests remain the most common method. Palpatory tests, however, rely on the skill of the clinician. Therefore, their results may be less reliable because of such factors as excessive adipose tissue, excessive pain with palpation, and the skill of the examiner. Clinicians therefore are challenged to improve the reliability of current tests or to find new ones. Finding new tests to detect sacroiliac joint regional pain that are reliable, valid, sensitive, and specific remains a goal for future study.

The results of this study show a correlation between sacroiliac joint regional pain and unilateral hip rotation asymmetry, especially on the side classified as the posteriorly tilted innominate. An interesting, unexpected finding was that little or no asymmetry was present between internal and external hip rotation on the anteriorly tilted innominate side. It can be hypothesized that habitual sleeping or sitting unilaterally with the hip in extreme external hip rotation may have promoted excessive external hip rotation on the posteriorly tilted side,[6] allowing the opposite side to have symmetric ROM.

Another unexpected finding was the large number of patients with low back pain and signs suggesting sacroiliac joint regional pain. The prevalence of sacroiliac joint regional pain in patients with low back pain is presently unknown. In two studies, the incidence of sacroiliac joint regional pain in patients with low back pain was estimated at 55%[15] and 61.5%.[12] The high proportion of patients with sacroiliac joint regional pain in the current study may be attributed to selection bias, in that the patients chosen were homogeneous without signs of nerve root involvement, were ambulatory, had no signs of a lateral shift, and had primarily low back pain of acute or insidious onset and of no more than 3 weeks' duration. Future studies to determine the incidence and prevalence of sacroiliac joint regional pain in patients with low back pain are needed.

Few investigators have reported limited hip rotation in patients with disorders of the sacroiliac joint.[13,19,24] Some have suggested that disorders of the sacroiliac joint are the result of hip muscle imbalances that restrict sacroiliac joint motion.[30,34,38] Woerman[38] and Porterfield and DeRosa[30] have postulated that hip rotation asymmetry develops because of muscular imbalances between the hip rotator muscles. Woerman[38] has reported that shortening of the piriformis muscle can produce excessive external rotation and restricted internal rotation, which may produce sacroiliac joint problems. In the current study, the exact reason for the observations cannot be stated, but it is doubtful that unilateral piriformis syndromes alone account for the findings. Similar unilateral limitation in internal hip rotation was observed, whether the patient was prone or sitting. Unilateral (contracted) piriformis syndrome most often involves more limitation in internal hip rotation in the sitting position because of additional stretch placed on the piriformis muscle by flexion of the hip.[38] Therefore, it is doubtful that unilateral (contracted) piriformis syndrome is the sole cause in the current observations. Further studies are planned to explore the correlation between hip joint ROM and sacroiliac joint regional pain.

■ Conclusions

Patients with low back pain in this study had more external hip than internal rotation ROM. Patients with low back pain who had signs suggesting sacroiliac joint regional pain had significantly more external than internal rotation ROM on one side. Clinicians should consider evaluating unilateral hip rotation ROM asymmetry in patients with low back pain. Identifying unilateral hip ROM asymmetry in patients with low back pain may help in diagnosing sacroiliac joint regional pain.

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