Systematic Review

The Hip-Spine Syndrome: How Does Back Pain Impact the Indications and Outcomes of Hip Arthroscopy?

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Purpose: Many patients presenting with hip disease also have coexisting lumbar spine disease (LSD). At present there is a paucity of literature examining the effect of arthroscopic hip surgery in patients with coexisting LSD. The purpose of this systematic review was to examine the relationship between the hip and lumbar spine to determine whether low back pain impacts the indications and outcomes for surgical intervention of the hip. **Methods:** A systematic review of the literature was performed by a search of PubMed using the following search terms: (1) hip, back, and motion; (2) hip, back, and pain; and (3) hip, lumbar spine, and pain. Two reviewers searched for relevant articles that met established inclusion criteria. We excluded review articles, technique articles, articles reporting on the same patient population, and articles without reported patient data. Kinematic data pertaining to the hip for patients with low back pain was collected. Preoperative and postoperative data were collected for patients treated for hip disease in the setting of LSD. **Results:** After examining 2,020 references and abstracts, 15 articles were selected for this review. Patients with low back pain consistently demonstrated decreased hip range of motion compared with controls. Patients undergoing hip surgery with coexisting LSD showed improvement in the modified Harris Hip Score (mHHS), Harris Hip Score (HHS), Visual Analog Scale (VAS), SF-36 scores, and the Owestry Disability Index. **Conclusions:** Patients with low back pain frequently have limited or altered hip range of motion, and these patients routinely improve after surgical intervention for hip disease. Surgical intervention for hip disease should be considered in the context of low back pain and LSD. **Level of Evidence:** Level IV, systematic review of Level III and IV studies.

Hip and lumbar spine disorders often coexist and can create significant disability. It is often challenging to determine whether a patient's symptoms are caused by the hip or lumbar spine because of symptom overlap.[1] The term *hip-spine syndrome* was introduced by Offierski and MacNab[2] in 1983 and has been used to describe patients with coexisting hip arthrosis and lumbar spine disorders. The true prevalence of the hip-spine syndrome is unknown; however, frequently there is more than one condition contributing to a patient's pain, particularly in the area of the hip and lumbar spine. Disorders of these structures have overlapping presentations and symptoms, which can create a delay in diagnosis and treatment. It is known that some patients treated with total hip arthroplasty continue to have pain that is later relieved by lumbar spine treatment.[3,4] Multiple studies have also shown low back pain to portend inferior results when treating hip disease.[5,6] Conversely, other studies have documented resolution of back pain after treatment of hip disease.[7] To date, the literature on treatment of hip pain in the setting of the hip-spine syndrome has focused on patients with hip arthrosis, leaving a scarcity of research on the implications for treatment of prearthritic hip disease.

Arthroscopic hip surgery has become a well-recognized treatment option for multiple pathologic processes in and around the hip joint. Improvement in patient-reported outcome scores have been routinely shown for labral tears, femoroacetabular impingement, psoas tendinopathy, chondral lesions, gluteus medius tears, and other conditions.[8-10] Just as patients with hip arthritis present with coexisting pathologic lumbar spine conditions, so too do patients with prearthritic conditions. It has been shown that hip and spine symptoms can and do occur before the onset of

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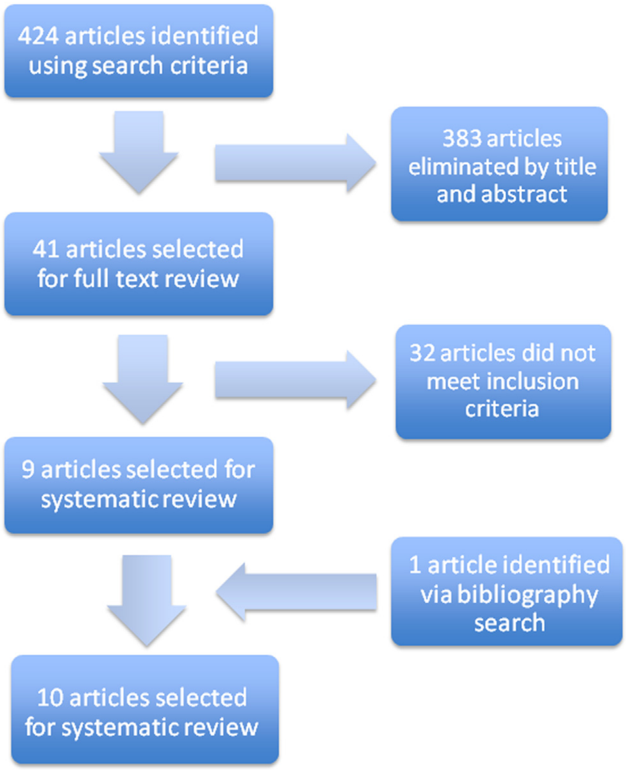

Fig 1. Flow diagram that depicts the study inclusion and exclusion criteria for the kinematic relationship between the hip and lumbar spine literature review.

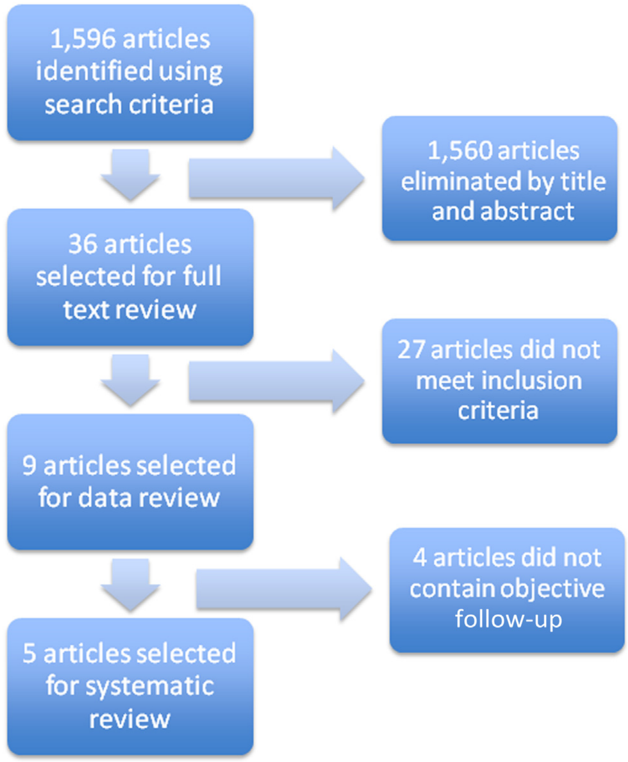

Fig 2. Flow diagram that depicts the study inclusion and exclusion criteria for the effect of hip surgery in patients with lumbar spine disorders.

degenerative changes, especially in the high-demand athletic population.[11,12] Whether these patients experience resolution of back symptoms from hip treatment has yet to be examined in the literature.

At present, there is a paucity of literature examining the effect of arthroscopic hip surgery in patients with coexisting lumbar spine disease (LSD). To understand the role of arthroscopic hip surgery in the setting of LSD, the current study evaluates the reported literature on hip and lumbar spine kinematics, as well as hip surgery in the setting of LSD. The purpose of this systematic review was to examine the relationship between the hip and lumbar spine to determine whether the presence of low back pain impacts the indications and outcomes for hip arthroscopy. To determine whether LSD potentially influences the indications and results of hip arthroscopy we designed a systematic review to (1) examine the kinematics between the hip and lumbar spine in patients with low back pain, (2) examine the effect of back pain on the outcomes of hip surgery, and (3) examine the effect of hip surgery on back pain in patients with hip-spine syndrome.

Methods

The systematic review was performed using PubMed and Medline literature databases for articles pertaining to coexisting pathologic hip conditions and LSD. Articles were identified using the following search terms: (1) hip, back, and motion; (2) hip, back, and pain; and (3) hip, lumbar spine, and pain. Two authors (J.M.R. and J.E.H.) independently reviewed titles and abstracts to identify articles for full text review. The resulting literature was divided into 2 categories. The first assessed the kinematic relationship between the hip and lumbar spine, and the second assessed the outcomes of hip surgery in patients with coexisting lumbar spine disorders. Articles for the first category were included if they met the following inclusion criteria: (1) were in the English language, (2) contained kinematic hip data on patients with low back pain, and (3) contained a control group. Articles for the second category were included if they met the following criteria: (1) were in the English language, (2) contained data on patients who underwent treatment for hip disease with coexisting LSD, and (3) contained objective outcomes data. We excluded review articles, technique articles, articles reporting on the same patient population, and articles without reported patient data. We then performed an additional search, using the same criteria, of the bibliographies of all identified articles.

For the first step, a full text review was performed to determine hip range of motion differences between a group of patients with low back pain and a control group without low back pain. The method of low back

Table 1. Kinematic Relationship Between the Hip and Lumbar Spine: Literature Review

				Patients Without Low Back Pain				Patients With Low Back Pain				
Study	Year	Patients	Low Back Pain Reporting	Patients	Average Age (y)	Male	Female	Patients	Average Age (y)	Male	Female	Methods
Almeida et al.[13]	2012	42	History of low back pain within the past 12 mo	21	16.3	11	10	21	16.7	11	10	Patients were tested for active medial and lateral rotation as well as passive medial and lateral rotation in the prone position. The evaluated limb was placed with the hip in neutral position on the frontal and sagittal planes, 90° flexion of the knee in resting position. During internal rotation assessment, the contralateral limb remained in neutral position on the frontal and sagittal planes. During external rotation, the contralateral limb was placed in neutral position on the sagittal plane, with 20° abduction on the frontal plane.
Ellison et al.[14]	1990	150	Undergoing treatment for back pain	100	26	25	75	50	374	21	29	Classified patients according to their range of motion for each hip based on their medial and lateral movements. With the patient prone, the hip to be measured was placed in 0° abduction, and the contralateral hip was placed in 30° of abduction. The reference knee was flexed to 90°. The measurements were also taken in the sitting position.
Esola et al.[15]	1996	41	History of low back pain below the 12th rib and above the greater trochanter that limited work, school, or recreational activities.	21	27.5	13	8	20	29.7	14	6	Established the amount, velocity, and pattern of lumbar spine and hip motion during forward flexion from a standing position. Hamstring flexibility was also assessed by the passive straight leg raise and active knee extension.
Porter and Wilkinson[16]	1997	32	Episode of low back pain within past 12 mo	17	26.0	17	0	15	28.8	15	0	Compare contribution of the hip and lumbar spine during the “toe touch,” a forward flexion from a standing position

(continued)

Table 1. Continued

Study	Year	Patients	Low Back Pain Reporting	Patients Without Low Back Pain: Patients	Average Age (y)	Male	Female	Patients With Low Back Pain: Patients	Average Age (y)	Male	Female	Methods
Scholtes et al.[17]	2008	91	Low back pain history questionnaire	41	27.9	22	19	50	28.2	32	18	Angular measures of limb movement and lumbopelvic motion were calculated across time during active knee flexion and hip lateral rotation in the prone position using 3-dimensional motion capture system
Shum et al.[22]	2005	80	History of back pain in past 6 mo lasting between 7 d and 12 wk	20	41.7	20	0	60	39.7	60	0	Electromagnetic tracking device was used to measure movements of the lumbar spine and hips while putting on a sock. Patients were seated on a stool that provided support from the ischial tuberosities to the middle of the thighs, with height adjusted to 110% of the apex of the fibular head to the floor. Patients lifted 1 foot to a height such that they could reach the foot and put on a sock using both hands at a comfortable speed.
Sjolie[18]	2004	88	Low back pain history questionnaire	38	–	27	11	50	–	23	27	Compared hip mobility for flexion (supine), hamstring flexibility (active knee extension test), extension (prone), internal rotation (prone) and external rotation (prone)
Sung[19]	2013	30	Lower back pain for more than 2 mo	15	41.82	–	–	15	37.15	–	–	Participants were asked to perform squatting activities 5 times repeatedly while holding a load of 2 kg in a basket. Measurements were recorded for the lumbar spine, right hip, and left hip along the sagittal plane, frontal plane, and transverse plane.
Van Dillen et al.[20]	2008	48	Low back pain history questionnaire	24	26.96	18	6	24	26.17	17	7	Measures of passive hip rotation of motion. Positioned prone with the hip in neutral and adduction, the knee flexed to 90°, and pelvis stabilized with a belt.
Wong and Lee[21]	2004	61	History of back pain in past 12 mo	20	42	–	–	41	38	–	–	Measured the effects of back pain on the relation between the movements of the lumbar spine and hip in 3 anatomical planes while standing: (1) forward then backward bending, (2) side-to-side bending, and (3) twisting left and right

Table 2. Effect of Hip Surgery on Patients with Lumbar Spine Disorders: Literature Review

					THA Without Low Back Pain						
Study	Year	Patients	Follow-up	Method of LSD Detection	Count	Average Age (yr)	Preop		Count	Postoperative	
Prather et al.[24]	2012	3,206	1 yr	ICD-9 codes	2,641	58.5	**VAS**	**7.5**	2,641	**VAS**	**1.4**
							mHHS	**49.4**		**mHHS**	**85.8**
							UCLA	4.0		UCLA	5.8
Hsieh et al.[25]	2012	113		Patient map	113	51.1					
Parvizi et al.[23]	2010	344	1 yr	Questionnaire	174	67.3	**HHS**	**50.2**	139	**HHS**	**85.6**
							LASA (EL)	5.1		LASA (EL)	7.8
							LASA (DA)	5.2		LASA (DA)	8.5
							LASA (QoL)	5.8		LASA (QoL)	8.3
							SF-36 (PH)	42.8		SF-36 (PH)	79.6
							SF-36 (MH)	58.5		SF-36 (MH)	84.5
Ben-Galim et al.[7]	2007	25	2 yr (17 patients)	Back pain							
McNamara et al.[4]	1993	14	2 yr	Patient's pain pattern	5	66	**HHS**	**44.6**	5	**HHS**	**87.8**

Bold font indicates data that were used to combine scores for the systematic review.

HHS, Harris Hip Score; ICD-9, International Classification of Diseases, Ninth Revision; LASA (DA), linear analog scale assessment (daily activity); LASA (EL), linear analog scale assessment (energy level); LASA (QoL), linear analog scale assessment (quality of life); LSD, lumbar spine disease; Preop, preoperative; SF-36 (MH), Short Form Health Survey 36 Mental Health; SF-36 (PH), Short Form Health Survey 36 Physical Health.

pain detection was extracted. Data points specifically extracted were hip rotation, hip flexion, and movement disorders. Demographic data such as age and sex were extracted. A summary of the methods and conclusion was obtained.

For the second step, a full text review was performed to determine several data points, including modified Harris Hip Score (mHHS), Harris Hip Score (HHS), Visual Analog Scale (VAS) score, SF-36 score, and Owestry Disability Index. Articles that included data on a control group without low back pain were also used for data extraction. Follow-up and method of LSD detection were extracted. When multiple study data could be combined, the data were pooled.

Results

The systematic review of PubMed and MEDLINE databases yielded 424 articles in the kinematic relationship category and 1,596 articles in the surgical outcomes category. After reviewing the titles and abstracts of these articles, we selected 41 articles for full review in the kinematic category and 36 articles for full review in the surgical outcomes category. Thirty-two articles were excluded from the kinematic relationship category because of lack of a control group or failure to report hip range of motion data. One additional article was identified through an examination of the bibliographies during full text review. The article was not listed in PubMed but did meet search criteria and was included. A total of 10 articles met the inclusion criteria for the kinematic relationship (Fig 1).[13-22] Thirty-one articles were then excluded from the second surgical outcomes search because of lack of objective data on patient-reported outcomes. A total of 5 articles met the inclusion criteria for the surgical outcomes category (Fig 2).[4,7,23-25]

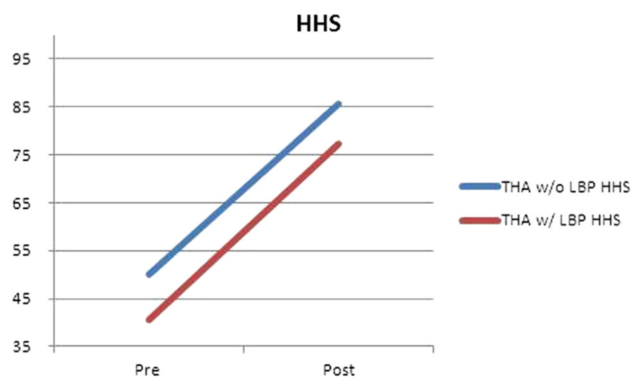

Fig 3. Comparison of preoperative and postoperative Harris Hip Score (HHS) data. (Pre, preoperative; Post, postoperative; THA, total hip arthroplasty; w, with; w/o, without.)

Table 3. Hip Flexion, Rotation, and Movement Summary Findings for Each Study on the Kinematic Relationship Between the Hip and Lumbar Spine Literature Review

Study	Year	Patients	Low Back Pain Patient Findings
Almeida et al.[13]	2012	42	Decreased internal rotation, decreased total rotation
Ellison et al.[14]	1990	150	Decreased internal rotation
Esola et al.[15]	1996	41	Decreased hamstring flexibility
Porter and Wilkinson[16]	1997	32	Decreased hip mobility
Scholtes et al.[17]	2008	91	Different pattern
Shum et al.[22]	2005	80	Decreased hip flexion velocity
Sjolie[18]	2004	88	Decreased hip flexion
Sung[19]	2013	30	Increased hip flexion
Van Dillen et al.[20]	2008	48	Decreased hip rotation
Wong and Lee[21]	2004	61	Decreased hip flexion

THA Without Low Back Pain			THA With Low Back Pain										
Score Change		P Value	Count	Average Age (yr)	Preop		Count	Post-Op		Score Change		P-Value
VAS	**−6.1**	**<.0001**	565	64	**VAS (Hip)**	**7.7**	565	**VAS (Hip)**	**2.2**	**VAS (Hip)**	−5.5	**<0.0001**
mHHS	**36.4**	**<.0001**			**mHHS**	**46.6**		**mHHS**	**79**	**mHHS**	32.4	**<0.0001**
UCLA	1.8	<.0001			UCLA	3.4		UCLA	4.7	UCLA	1.28	<0.0001
			24		VAS (Back)	3.7		VAS (Back)	0	VAS (Back)	-3.7	
HHS	**35.4**		170	62.7	**HHS**	**47.6**	**205**	**HHS**	**76.4**	**HHS**	**28.8**	
LASA (EL)	2.7				LASA (EL)	4.2		LASA (EL)	6.6	LASA (EL)	2.4	
LASA (DA)	3.3				LASA (DA)	3.9		LASA (DA)	7.7	LASA (DA)	3.8	
LASA (QoL)	2.5				LASA (QoL)	5.3		LASA (QoL)	7.6	LASA (QoL)	2.3	
SF-36 (PH)	36.8				SF-36 (PH)	39.9		SF-36 (PH)	68	SF-36 (PH)	28.1	
SF-36 (MH)	26				SF-36 (MH)	51.2		SF-36 (MH)	75.9	SF-36 (MH)	24.7	
			25	67.4	**HHS**	**45.7**	17	**HHS**	**86**	**HHS**	**40.3**	**<0.001**
HHS	**43.2**		4	68.5	**HHS**	**71.5**	4	**HHS**	**93.7**	**HHS**	**22.2**	**not reported**

Data Extraction

Ten articles compared the kinematic relationship between patients with and those without low back pain (Table 1). Of the 663 total patients, 346 patients reported low back pain, whereas 317 did not have low back pain. There were 4 different methods used to indicate low back pain: (1) history within the past 12 months (5 studies), (2) low back pain history questionnaire (3 studies), (3) current treatment (1 study), and (4) back pain lasting longer than 2 months (1 study). Six of the studies measured both external rotation and hip flexion, 5 studies measured internal rotation, 4 studies measured hip range of motion, 3 studies measured hip kinematics, and one study measured hip extension and hip abduction.

From the 5 available articles, there were a total of 3,702 THAs performed on patients with concomitant back pain (Table 2). The indication for back pain detection was a preoperative questionnaire in 4 studies, and ICD-9 billing codes in one study. Three of the studies used HHS, one used the mHHS, and one reported a UCLA activity score. Three of the studies reported with the VAS; 2 studies specified a VAS for the back and a VAS for the hip. To assess back pain, one of the studies used the Oswestry Disability Index. One study reported SF-36 scores.

Outcomes

There were 10 articles that reported kinematic data in patients with and those without low back pain. In 9 of the 10 studies, patients with low back pain had decreased hip range of motion compared with the control group. Table 3 summarizes the findings of movements that were analyzed in each study. Patients with low back pain had less hip rotation compared with controls in 3 studies (240 patients). Three of the studies (229 patients) concluded that patients with low back pain exhibit decreased hip flexion, whereas one study concluded that patients (30) with low back pain had increased hip flexion. Other types of hip movement were compared in 3 studies, and the authors concluded that patients with low back pain had a different movement pattern (91 patients), decreased hip mobility (32 patients), and decreased hamstring flexibility (41 patients).

There were 5 articles evaluating the effect of hip surgery in the setting of LSD. Three articles reported preoperative and postoperative HHS for patients undergoing hip surgery in the setting of LSD. This accounted for 199 patients, and the average HHS improved from 40.7 to 77.43 (Fig 3). Two of these studies had a control group without LSD, which accounted for 179 patients, and the HHS improved from 50.0 to 85.7. One article documented 565 patients with LSD who underwent THA, and the mHHS improved from 46.6 preoperatively to 79.0 postoperatively ($P < .01$) (Fig 4). This article also reported on 2,641 patients without LSD undergoing THA with improvement of mHHS from 49.4 preoperatively to 85.8 postoperatively ($P < .01$). Visual analogue scores (VAS) preoperatively and postoperatively for the hip were available for 2,641 patients with LSD and 590 patients without LSD, and results are displayed in Figure 5. Back-pain—specific VAS was available for 49 patients preoperatively and postoperatively and is shown in Fig 6.

Discussion

The hip-spine syndrome has been recognized for decades, and patients frequently present with coexisting hip and lumbar spine disorders.[2] Patients presenting with pathologic hip and lumbar spine disorders can be challenging to diagnose and treat. The overlap of symptoms between the hip and spine has been well

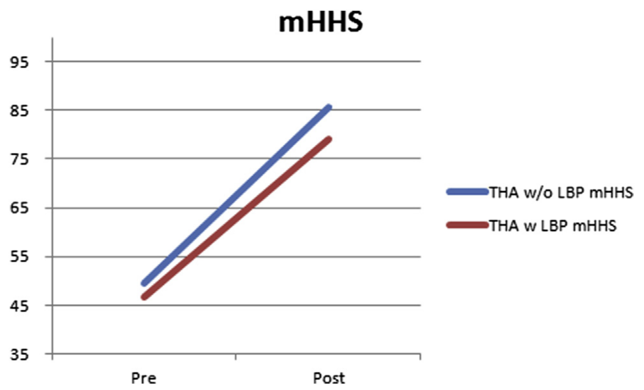

Fig 4. Comparison of preoperative (Pre) and postoperative (Post) modified Harris Hip Score (mHHS) data. (THA, total hip arthroplasty; w, with; w/o, without.)

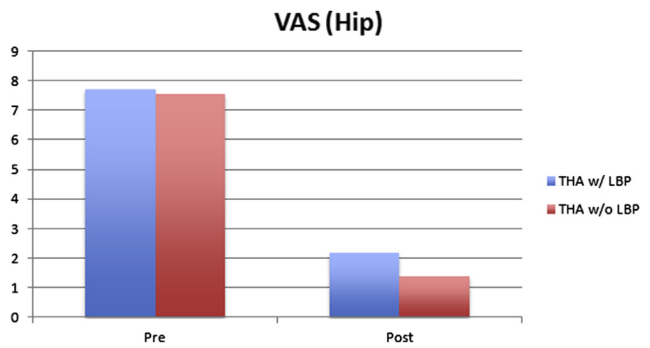

Fig 5. Comparison of preoperative (Pre) and postoperative (Post) Visual Analog Scale (VAS) scores related to the hip for patients with and those without lumbar spine disorders.

documented.[26-28] A thorough clinical assesment, including advanced imaging and diagnostic injections, can leave the surgeon and patient with uncertainty as to the true cause of pain. Patients in whom nonoperative management fails in the setting of hip and lumbar spine pain must decide whether or not to proceed with the intervention most likely to improve their discomfort. This clinical scenario can and does occur in patients before the onset of degenerative changes in the hip and lumbar spine. This systematic review found patients with low back pain frequently have limited or altered hip range of motion, and patients undergoing surgical treatment for hip arthritis with concomitant LSD routinely improved postoperatively. These results may be helpful when counseling patients considering arthroscopic hip surgery in the setting of LSD. After reviewing the results of this systematic review, the algorithm shown in Fig 7 may be helpful.

A common finding among kinematic articles in this review was decreased hip range of motion in participants with low back pain.[13-22] Many of these authors have hypothesized that alterations in hip range of motion can lead to increased stress on the sacroiliac joint and lumbar spine and the development of pain in these areas. A recent study by Kelly et al.[29] showed improvement in hip internal rotation after arthroscopic treatment of femoroacetabular impingement. Whether improvements in range of motion will translate to decreased lumbopelvic stress has yet to be evaluated. However, it is clear that a significant number of patients get relief from low back pain after THA.[7,23]

In the prospective study by Ben-Galim et al.[7] 25 adults with hip osteoarthritis and low back pain underwent total hip replacement to assess the effect of THA on low back pain. The patients were evaluated preoperatively, 3 months, and 2 years after THA. The clinical outcomes improved for both the hip and back. The HHS increased from 45.74 preoperatively to 81.8 at 3 months postoperatively and 86 at 2 years postoperatively. The Oswestry Disability Index for the back decreased from 36.72 before THR to 24.08 at 3 months postoperatively and 19.8 at 2 years postoperatively. Because all changes reached statistical significance, they concluded that both low back pain and spinal function improved after THA, showing that low back pain is not a contraindication for hip arthroplasty. Whether hip range of motion improvements after hip arthroscopy will yield improvements in low back pain will be the subject of future study.

Prather et al.[24] used International Classification of Disease, Ninth Revision (ICD-9) billing codes to retrospectively identify the prevalence of hip and lumbar spine disorders in a large patient group treated with THA to understand the impact on clinical outcomes. Of the 3,206 patients studied, 565 had concomitant LSD (231 male and 334 female patients). The 2,641 patients without ICD-9 billing codes that corresponded to LSD served as the control. Self-reporting for pain decreased in both the control and LSD groups, with scores decreasing from 7.55 to 1.40 and 7.73 to 2.23, respectively. The mHHS for the control group increased from 49.4 to 85.8 and from 46.6 to 79.0 in the concomitant LSD group. All scoring differences displayed statistical significance. Although patients without LSD who underwent THA displayed greater improvement than did patients with concomitant LSD, both groups displayed significant improvement in function and pain. Similar changes in mHHS have been documented after labral repair, and sports medicine patients may also realize similar gains in the setting of LSD.[30,31]

In a study of 113 patients, Hsieh et al.[25] distributed a map of the body on which patients could indicate pain before and after THA. The pain was quantified using a VAS and subsequently analyzed. Twenty-four patients expressed low back pain preoperatively, with a mean VAS of 3.7. Postoperatively, all 24 patients reported a VAS of 0.00 at 24 weeks, with 3 patients reporting being symptom free after 4 days. The authors concluded that 97.3% of patients reported complete pain relief after THA, including locations that are traditionally

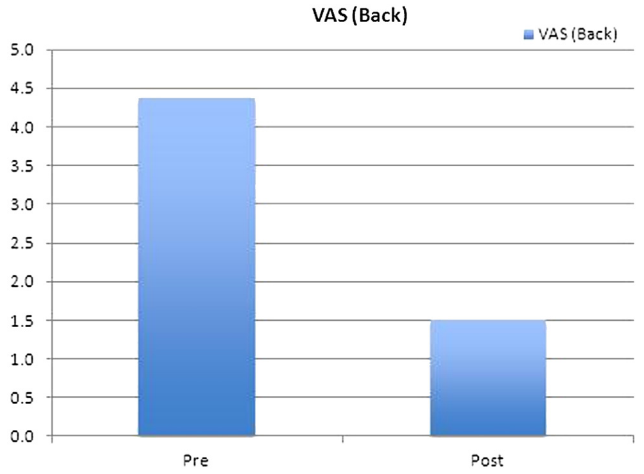

Fig 6. Comparison of preoperative (Pre) and postoperative (Post) Visual Analog Scale (VAS) scores related to the lumbar spine.

acknowledged as pain referral areas for lumbar spine disorders. Whether the pain is referred or originates in the low back is difficult to differentiate; however, hip treatment alleviated all low back symptoms in this group.

Parvizi et al.[23] administered a questionnaire to 344 patients undergoing THA both preoperatively and postoperatively, with 170 patients reporting low back pain. Postoperatively, 113 patients (66%) reported that low back pain had resolved. A known spine disorder was discovered in 37 of the remaining 57 patients. The HHS for patients exhibiting back pain before or after THA increased from 47.6 to 76.4 at 1-year follow-up, whereas the HHS for patients without back pain increased from 50.2 to 85.6. Consistent with the preceding reports, the authors concluded that patients presenting with hip arthritis and lower lumbar pain often experience resolution or improvement of their pain after THA.

Limitations

This systematic review is limited by a number of factors. The major limitation is drawing a comparison and extrapolating data from THA to arthroscopic hip surgery. There is currently no data available on the results of arthroscopic hip surgery in the setting of LSD. Previous articles on labral repair have shown improvement in HHS similar to that seen in arthroplasty patients; however, whether the findings in this review can be applied to arthroscopy patients will be the subject of further investigation.[30] The number of articles reporting objective data on THA in patients with concomitant low back pain is limited, and the articles identified use variable outcome scores (HHS, mHHS, VAS, and the UCLA hip questionnaire), which makes summarizing the results difficult. With the exception of one study, the patient populations are relatively small, with one study analyzing 14 patients and another comparing 25 patients. The method of low back pain

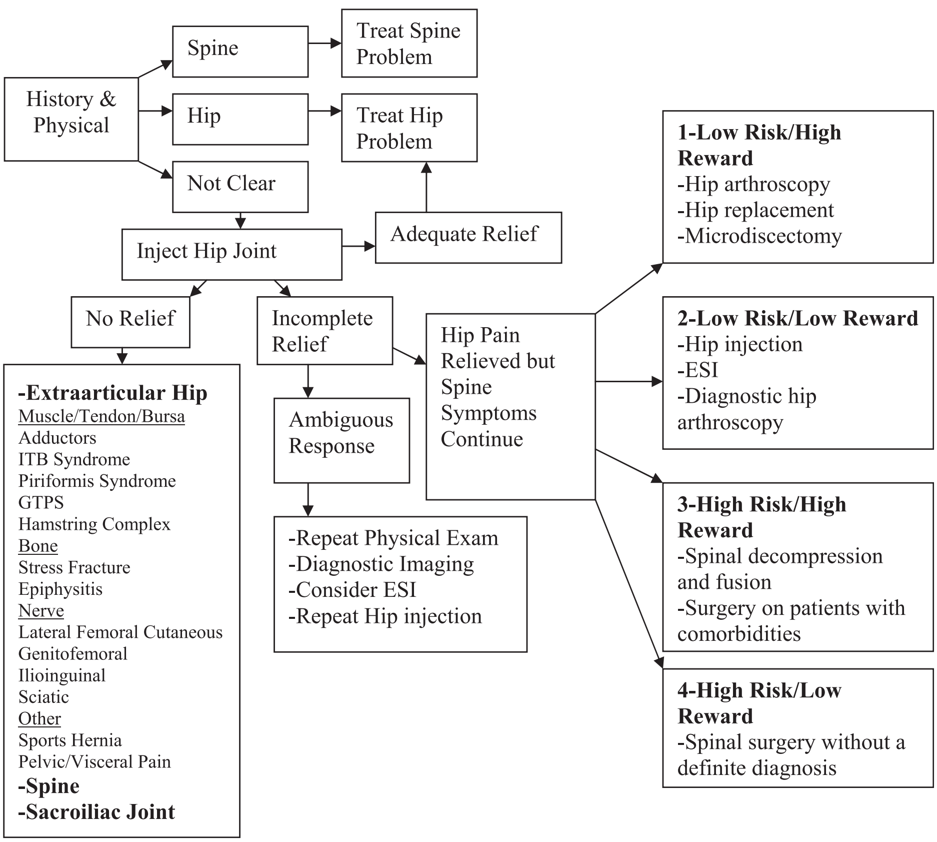

Fig 7. Algorithm for diagnosis and treatment of patients presenting with the hip-spine syndrome. (ESI, epidural steroid injection; GTPS, greater trochanteric pain syndrome; ITB, iliotibial band.)

and LSD detection also varied among the 15 studies. Pain diagrams, ICD-9 codes, questionnaires, and clinical notes were all used for detection. It is likely that some forms of low back pain are more likely to resolve after hip treatment, but these detection methods are unlikely to tease this out.

In light of these findings, we believe low back pain should not be considered a relative contraindication to the treatment of hip disorders, including hip arthroscopy. Rather, back pain may be secondary to a primary hip disorder. These data provide the clinician and patient a rationale for arthroscopic treatment of pathologic hip conditions in the setting of low back pain and LSD.

Conclusions

Patients with low back pain frequently have limited or altered hip range of motion, consistent with the relationship between the back and hip known as the hip-spine syndrome. These patients routinely improve after surgical intervention for hip disease. In addition to resolution of their hip pain, they may also experience improvement in their back symptoms. Surgical intervention for hip disease should be considered in the context of low back pain and LSD.

References

1. Birnbaum K, Prescher A, Hessler S, Heller KD. The sensory innervation of the hip joint—an anatomical study. *Surg Radiol Anat* 1997;19:371-375.
2. Offierski CM, MacNab I. Hip-spine syndrome: The effect of total hip replacement surgery on low back pain in severe osteoarthritis of the hip. *Spine (Phila Pa 1976)* 2007;32:2099-2102.
3. Bohl WR, Steffee AD. Lumbar spinal stenosis. A cause of continued pain and disability in patients after total hip arthroplasty. *Spine (Phila Pa 1976)* 1979;4:168-173.
4. McNamara MJ, Barrett KG, Christie MJ, Spengler DM. Lumbar spinal stenosis and lower extremity arthroplasty. *J Arthroplasty* 1993;8:273-277.
5. Quintana JM, Escobar A, Aguirre U, Lafuente I, Arenaza JC. Predictors of health-related quality-of-life change after total hip arthroplasty. *Clin Orthop Relat Res* 2009;467:2886-2894.
6. Bischoff-Ferrari HA, Lingard EA, Losina E, et al. Psychosocial and geriatric correlates of functional status after total hip replacement. *Arthritis Rheum* 2004;51:829-835.
7. Ben-Galim P, Ben-Galim T, Rand N, et al. Hip-spine syndrome: The effect of total hip replacement surgery on low back pain in severe osteoarthritis of the hip. *Spine (Phila Pa 1976)* 2007;32:2099-2102.
8. Polesello GC, Queiroz MC, Domb BG, Ono NK, Honda EK. Surgical technique: Endoscopic gluteus maximus tendon release for external snapping hip syndrome. *Clin Orthop Relat Res* 2013;471:2471-2476.
9. Larson CM. Arthroscopic management of hip pathomorphology. *Instr Course Lect* 2012;61:287-293.
10. Domb BG, Shindle MK, McArthur B, Voos JE, Magennis EM, Kelly BT. Iliopsoas impingement: A newly identified cause of labral pathology in the hip. *HSS J* 2011;7:145-150.
11. Murray E, Birley E, Twycross-Lewis R, Morrissey D. The relationship between hip rotation range of movement and low back pain prevalence in amateur golfers: An observational study. *Phys Ther Sport* 2009;10:131-135.
12. Vad VB, Gebeh A, Dines D, Altchek D, Norris B. Hip and shoulder internal rotation range of motion deficits in professional tennis players. *J Sci Med Sport* 2003;6:71-75.
13. Almeida GP, de Souza VL, Sano SS, Saccol MF, Cohen M. Comparison of hip rotation range of motion in judo athletes with and without history of low back pain. *Man Ther* 2012;17:231-235.
14. Ellison JB, Rose SJ, Sahrmann SA. Patterns of hip rotation range of motion: A comparison between healthy subjects and patients with low back pain. *Phys Ther* 1990;70:537-541.
15. Esola MA, McClure PW, Fitzgerald GK, Siegler S. Analysis of lumbar spine and hip motion during forward bending in subjects with and without a history of low back pain. *Spine (Phila Pa 1976)* 1996;21:71-78.
16. Porter JL, Wilkinson A. Lumbar-hip flexion motion. A comparative study between asymptomatic and chronic low back pain in 18- to 36-year-old men. *Spine (Phila Pa 1976)* 1997;22:1508-1513. discussion 1513-1514.
17. Scholtes SA, Gombatto SP, Van Dillen LR. Differences in lumbopelvic motion between people with and people without low back pain during two lower limb movement tests. *Clin Biomech (Bristol, Avon)* 2009;24:7-12.
18. Sjolie AN. Low-back pain in adolescents is associated with poor hip mobility and high body mass index. *Scand J Med Sci Sports* 2004;14:168-175.
19. Sung PS. A compensation of angular displacements of the hip joints and lumbosacral spine between subjects with and without idiopathic low back pain during squatting. *J Electromyogr Kinesiol* 2013;23:741-745.
20. Van Dillen LR, Bloom NJ, Gombatto SP, Susco TM. Hip rotation range of motion in people with and without low back pain who participate in rotation-related sports. *Phys Ther Sport* 2008;9:72-81.
21. Wong TK, Lee RY. Effects of low back pain on the relationship between the movements of the lumbar spine and hip. *Hum Mov Sci* 2004;23:21-34.
22. Shum GL, Crosbie J, Lee RY. Symptomatic and asymptomatic movement coordination of the lumbar spine and hip during an everyday activity. *Spine (Phila Pa 1976)* 2005;30:E697-E702.
23. Parvizi J, Pour AE, Hillibrand A, Goldberg G, Sharkey PF, Rothman RH. Back pain and total hip arthroplasty: A prospective natural history study. *Clin Orthop Relat Res* 2010;468:1325-1330.
24. Prather H, Van Dillen LR, Kymes SM, Armbrecht MA, Stwalley D, Clohisy JC. Impact of coexistent lumbar spine disorders on clinical outcomes and physician charges associated with total hip arthroplasty. *Spine J* 2012;12:363-369.
25. Hsieh PH, Chang Y, Chen DW, Lee MS, Shih HN, Ueng SW. Pain distribution and response to total hip arthroplasty: A prospective observational study in 113 patients with end-stage hip disease. *J Orthop Sci* 2012;17:213-218.
26. Lesher JM, Dreyfuss P, Hager N, Kaplan M, Furman M. Hip joint pain referral patterns: A descriptive study. *Pain Med* 2008;9:22-25.

27. Byrd JW. Hip arthroscopy: Patient assessment and indications. *Instr Course Lect* 2003;52:711-719.
28. Clohisy JC, Knaus ER, Hunt DM, Lesher JM, Harris-Hayes M, Prather H. Clinical presentation of patients with symptomatic anterior hip impingement. *Clin Orthop Relat Res* 2009;467:638-644.
29. Kelly BT, Bedi A, Robertson CM, Dela Torre K, Giveans MR, Larson CM. Alterations in internal rotation and alpha angles are associated with arthroscopic cam decompression in the hip. *Am J Sports Med* 2012;40:1107-1112.
30. Larson CM, Giveans MR, Stone RM. Arthroscopic debridement versus refixation of the acetabular labrum associated with femoroacetabular impingement: mean 3.5-year follow-up. *Am J Sports Med* 2012;40:1015-1021.
31. Espinosa N, Beck M, Rothenfluh DA, Ganz R, Leunig M. Treatment of femoro-acetabular impingement: Preliminary results of labral refixation. Surgical technique. *J Bone Joint Surg Am* 2007;89(suppl 2 pt.1):36-53.