JEFFREY MEADOWS, DPT, OCS, FAAOMPT[1] • **THOMAS DENNINGER,** DPT, OCS, FAAOMPT[2] • **SETH PETERSON,** DPT, OCS, FAAOMPT[3,4]
LESLIE MILLIGAN, DPT, OCS, FAAOMPT[5] • **JOHN ZAPANTA,** DPT, OCS, FAAOMPT[6]

Short-term Response to Treatment Targeting the Thoracolumbar Junction in Patients With Hip Pain: A Case Series

Hip pain and low back pain (LBP) are common conditions treated by physical therapists.[1,4] However, the treatment for many patients with these symptoms will be administered with a degree of diagnostic uncertainty, because of overlapping pain referral patterns and similar impairment findings that may delay diagnosis and treatment.[3,4] Differential diagnosis of LBP, hip pain, and groin pain can include numerous musculoskeletal and nonmusculoskeletal conditions (**TABLE 1**).

Recommended physical therapy interventions for patients with hip and groin pain include manual therapy and exercise directed at the hip joint and local soft tissue structures.[7,10] A rarely described treatment strategy for patients with hip pain is manual therapy and exercise directed at resolving coexisting impairments in the thoracolumbar junction (TLJ). This approach may be warranted when the differential diagnosis and evaluation point to the presence of a condition known as TLJ syndrome, spinal dorsal ramus–mediated pain, or Maigne syndrome.[21]

First described by Maigne in 1972,[28] evidence suggests that TLJ syndrome is an overlooked source of nociceptive input.[22,25,26,42] Patients with TLJ syndrome typically present with primary hip and groin pain, and less often have primary LBP (**FIGURE 1**).[22,25,26,42] Symptoms may also present in the lower abdomen, pubic region, iliac fossa, posterior iliac crest, buttock, and testicle or labia.[25,26,29,42] In a prior study, pain was referred to the abdomen in a series of patients.[37] Upon physical examination, patients with TLJ syndrome often present without impairments in the hip[25,34] and with normal lower-quarter neurological and neurodynamic examinations.[9,13,23,24,31,39,42] A lack of radiographic or other clinical diagnostic test findings in the TLJ further confounds the differential diagnosis.[13,15,20,21,25,27,39] Positive physical examination findings may be found at the TLJ or iliac crest. Upper lumbar joint hypomobility and tenderness may be present.[9,13,20,25-27,34,39,42] The physical therapist may also be able to recreate the patient's hip complaints by grasping and rolling the skin over the midpoint of the posterior iliac crest,

BACKGROUND: In patients presenting with hip and groin symptoms, evaluation and treatment of the thoracolumbar junction (TLJ) may be underutilized. The TLJ is less recognized as a source of pain referral in these regions. The purpose of this case series was to describe the management of 3 patients with primary hip and groin pain who were treated with interventions targeting the TLJ.

DIAGNOSIS: The 3 patients in this case series presented with subacute or chronic complaints of hip and groin pain that had failed to resolve with typical treatments. They had undergone several inconclusive clinical testing procedures. Each patient underwent a detailed physical therapy evaluation and was found to have pain and mobility deficits at the TLJ. Once the therapist had determined that the patients' symptoms were likely of musculoskeletal origin, treatment commenced. Joint mobilization and exercise directed at the TLJ were used in each case. Marked improvements in pain, thoracic range of motion, and functional deficits were observed within 3 to 4 weeks, after an average of 6 treatment sessions. All patients returned to prior activity levels. Patients in cases 1 and 3 had improvements in hip mobility and strength without direct treatment to the hip.

DISCUSSION: This case series describes the management of 3 patients with hip and groin symptoms who were successfully treated with interventions targeting the TLJ. In patients reporting primary hip or groin pain, physical therapists should consider the TLJ as a potential source of symptoms and include treatment strategies directed at the TLJ, as warranted, after a careful examination and clinical-reasoning process.

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[1]Antifragile Physical Therapy, Asheville, NC. [2]ATI Physical Therapy, Greenville, SC. [3]The Motive Physical Therapy Specialists, Oro Valley, AZ. [4]Department of Physical Therapy, Arizona School of Health Sciences, A.T. Still University, Mesa, AZ. [5]Naval Medical Center Portsmouth, Portsmouth, VA. [6]Colorado in Motion, Fort Collins, CO. The Institutional Review Board of Greenville Health System in Greenville, SC deemed that formal approval for publication of the cases was not required because of the retrospective nature of the study and the provision of standard clinical care. This case series had no funding. The authors certify that they have no affiliations with or financial involvement in any organization or entity with a direct financial interest in the subject matter or materials discussed in the article. Address correspondence to Dr Jeffrey Meadows, 959 Merrimon Avenue, Suite 103, Asheville, NC. E-mail: jeffmeadowspt@gmail.com

theoretically provoking the cluneal nerve.[3,13,20,21,25-27,29,34,39]

Proposed mechanisms of referral from the TLJ to the hip include referral from the T11-L1 facet joints via the dorsal ramus or cutaneous dorsal ramus dermatome patterns.[21,22,24,42] Previous reports have suggested that repetitive activity and sports that involve thoracic rotation, such as weightlifting, horseback riding, hockey, football, and golf, may contribute to these symptoms through excessive loading of this transitional zone of the spine.[13,26,34,42]

Several case studies have described treatment of TLJ syndrome.[2,13,20,34,39] Alptekin et al[3] compared the results of exercise, anesthetic injection, or both in the treatment of 30 patients with suspected TLJ syndrome. The authors found significant improvements in range, pain, disability, and depression for all 3 groups, with the best outcomes noted in the group that received progressive lumbopelvic strengthening exercise plus injection.[3] Previously published studies present the TLJ as a common source of LBP.[13,20,22,23,25-27,34,39,42] However, these studies have not described the clinical diagnosis of TLJ syndrome in patients with local hip and groin pain.

Surgical rates for patients with hip and groin pain have increased dramatically, despite a lack of evidence of superior benefit over nonoperative treatment[35] and evidence that comorbid conditions are more prevalent 2 years after surgical treatment.[36] Additionally, published cases of TLJ syndrome predominantly include corticosteroid[3,21,25,26] and anesthetic injections[13,25,29,42] as the primary treatment. Descriptions of treatments provided by physical therapists, such as manual therapy and exercise, are often incomplete or absent.[13,27,34] The purpose of this case series was to describe the management of 3 patients with primary hip and groin pain and TLJ impairments who were treated with interventions targeting the TLJ.

TABLE 1 Musculoskeletal and Nonmusculoskeletal Conditions That Refer Symptoms to the Low Back, Hip, and Groin

Musculoskeletal	Nonmusculoskeletal
• Thoracic segmental dysfunction (disc, facet, nerve root, foramen), including stenosis • Lumbar segmental dysfunction (disc, facet, nerve root, foramen), including stenosis • Sacroiliac dysfunction • Osteitis pubis • Intra-articular and extra-articular hip pathology, including labral tear, femoral acetabular impingement, avascular necrosis, fracture, and osteoarthritis • Bursitis (trochanteric, iliopsoas, gluteal, ischial) • Greater trochanteric pain syndrome • Inguinal hernia, sports hernia • Nerve entrapment (iliohypogastric, obturator, femoral, sciatic, genital, ilioinguinal, lateral femoral) • Muscular strain/dysfunction/tendinosis: quadratus lumborum, iliopsoas, gluteus maximus/medius/minimus, piriformis, tensor fascia latae, common adductor/rectus abdominis, pectineus, external rotators of the hip, sartorius, and gracilis • Piriformis syndrome • Iliotibial band syndrome • Snapping-hip syndrome	• Malignancy • Visceral (renal, appendix, ovary, ureter, colon) • Vascular (deep vein thrombosis, abdominal aortic aneurysm)

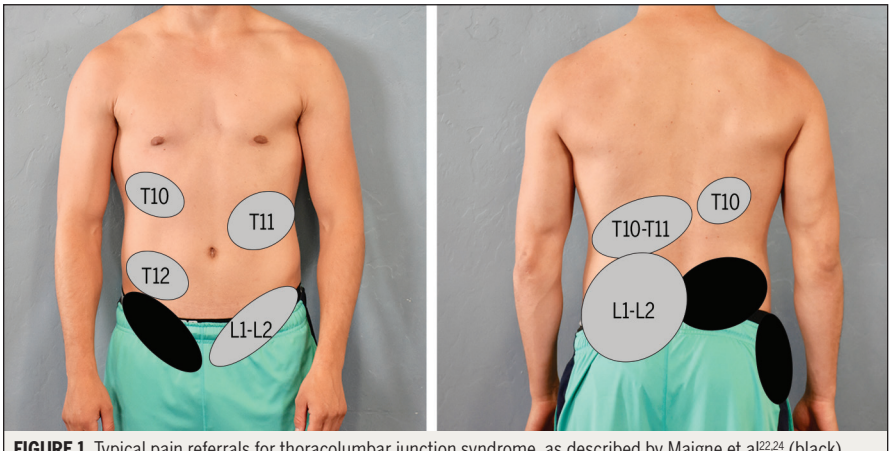

FIGURE 1. Typical pain referrals for thoracolumbar junction syndrome, as described by Maigne et al[22,24] (black), and segmental facet referral for T10-L2[12] (gray).

DIAGNOSIS

After consultation with the Institutional Review Board of Greenville Health System in Greenville, SC, this case series was deemed exempt from Institutional Review Board review because of the retrospective nature of the cases and the provision of standard clinical care. Each patient was informed that data concerning the case would be submitted for publication. Patient confidentiality was protected. Cases were nonconsecutive, and selection was based on clinician recollection of a positive outcome when treatment to the TLJ was included. Clinic sites were Oro Valley, AZ; Greenville, SC; and Fort Collins, CO.

Case 1

History The patient was a 69-year-old man who self-referred to physical therapy

for intermittent and variable "aching" left lateral hip pain that had been present for 3 months. He had a secondary complaint of intermittent and variable aching in the TLJ (**FIGURE 2**). This pain had been present for more than 12 months. His symptoms were worst in the first 30 minutes of the day, and both painful regions were often aggravated when donning or doffing socks on the left foot and by walking. The patient stated that both symptoms were worsening. He also reported a 10-year history of LBP, with excellent resolution after an L4-L5 fusion and postoperative physical therapy 12 months prior to the current presentation.

In addition to lumbar surgery, the patient had undergone a right total knee arthroplasty 9 months prior. The patient's medical history included hypertension and renal disease, but recent testing revealed normal function. The patient denied any change in bowel and bladder function, paresthesia, fever, chills, night pain, weight change, and past or present cancer. Using the numeric pain-rating scale (NPRS), where 0 represented no pain and 10 represented the worst pain possible, the patient reported a 24-hour average pain of 6/10 at baseline.[6] Disability was assessed with the Lower Extremity Functional Scale (LEFS), on which the patient scored 36/80, or 55% disability (**TABLE 2**).[32] The patient's primary goal for physical therapy was to be able to don socks and walk without pain.

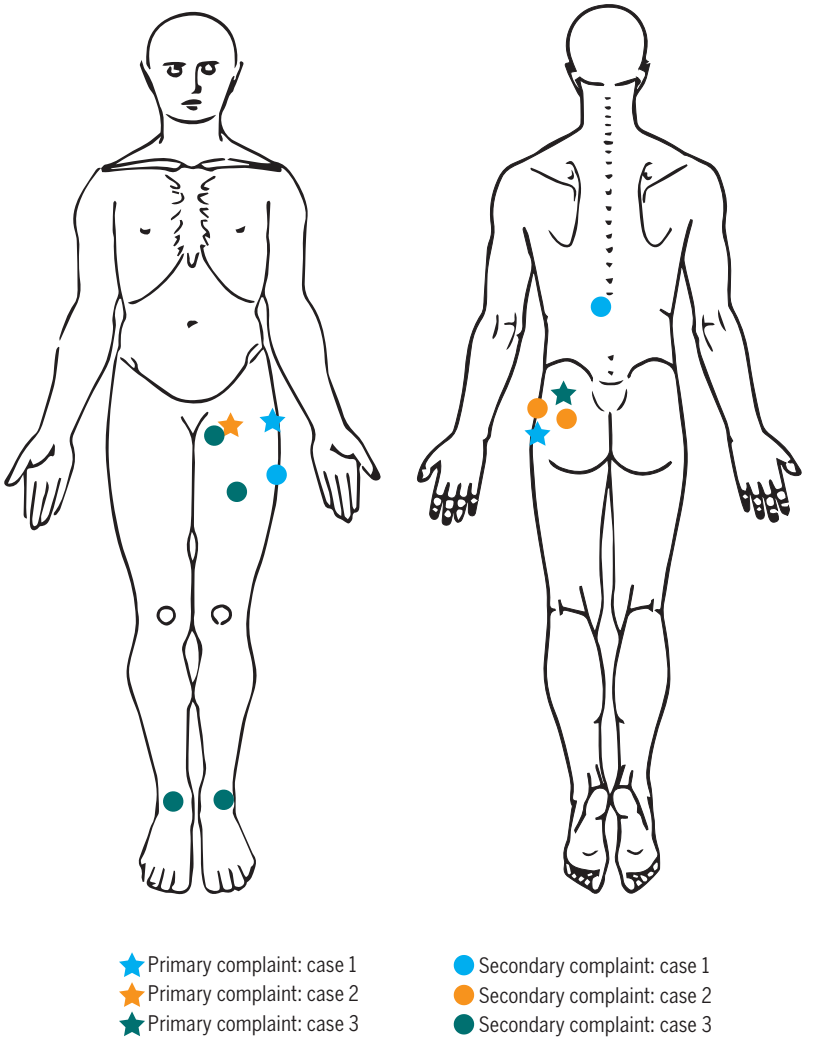

FIGURE 2. Body diagram depicting the regions of primary and secondary pain by case. Case 1 described his symptoms as "aching and variable." Case 2 described his symptoms as "sharp and intense." Case 3 described her symptoms as "burning, tired, achy, nagging, and annoying."

The primary hypothesis after the patient interview was hip osteoarthritis, because of the presence of hip pain that lasted less than 60 minutes in the morning and because he was older than 50 years of age and suspected to have decreased hip range of motion (ROM), potentially meeting criteria developed by Altman et al[4] for the clinical classification of hip osteoarthritis (positive likelihood ratio = 3.52; slight to moderate increase in posttest probability).[16] The presence of pain and his lack of mobility when donning or doffing socks were considered similar to a seated Patrick test, which is a mild predictor of osteoarthritis (positive likelihood ratio = 1.9).[40] Radiculopathy and myelopathy were considered unlikely, given his lack of distal symptoms, extremity weakness, or clumsiness with gait; however, these conditions could not be ruled out.[8] The apparent relationship between symptoms and mobility demands on the TLJ while donning or doffing socks kept TLJ syndrome as a possible diagnosis. Because of the mechanical nature of his symptoms, nonmusculoskeletal pathology was considered unlikely.

Examination Gait examination revealed left hip pain throughout the left stance phase of gait and a hard heel strike. Lumbar active ROM was visually estimated and assessed for symptom provocation in a standing position. Left lateral flexion was limited to 20° and reproduced left TLJ and lateral thigh pain; right sidebending was painless. Seated left rotation was limited to 35° and produced pain in the TLJ; seated right rotation was measured at 45° and painless. Hip physiological mobility was assessed visually in supine, and ROM (flexion, internal rotation, abduction, extension) was within normal limits, except for left

hip external rotation, which was limited to 45°, compared with 65° for right hip external rotation. Manual muscle testing of hip flexion, internal rotation, external rotation, abduction, and extension was measured at 5/5 and did not reproduce any complaints. The Patrick test on the left side was limited to approximately 50° from the frontal plane of the anterior pelvis and produced left hip pain rated as 3/10. The seated Patrick test, which simulated donning socks, produced hip pain rated as 4/10 and TLJ pain rated as 2/10.

The left hip was grossly tender to palpation. The skin-rolling test was negative, but pressure over the left iliac crest was painful. High paraspinal muscle tone was evident in the thoracolumbar spine. As one component of a comprehensive examination, central and unilateral passive intervertebral motion assessment from T7 to S1 was performed to assess for mobility and pain provocation.[1,18] Central posterior-to-anterior mobilization at T12 and L1 reproduced the patient's thoracolumbar complaint. Pain provocation is considered more reliable than mobility assessment for this test.[1,18] Left unilateral posterior-to-anterior pressure at these levels reproduced his familiar thoracolumbar pain and left hip pain. Although physical examination indicated impairments to hip and TLJ mobility, the finding of left thoracic rotation limitation in conjunction with the patient's primary complaint suggested that intervention to the patient's TLJ could be beneficial. As such, treatment commenced with the intent to improve left thoracic rotation.

Intervention The initial treatment consisted of a low-velocity, midrange left rotational force to the TLJ on the lumbar spine in right sidelying (**FIGURE 3**).[30] This technique increased seated left trunk rotation to 45° without symptoms. To reproduce and maintain these improvements in thoracic rotation, the patient was advised to perform the open-book trunk rotation exercise (**APPENDIX**, available at www.jospt.org) in right sidelying 10 times every 2 hours.

At his second visit 4 days later, the patient reported no pain with gait, although reaching for his left foot was still difficult and painful. The midrange technique from **FIGURE 3** was repeated, with minimal change. Therefore, the technique was repeated as an end-range technique, which led to a reduction in symptoms when reaching for his left foot. Afterward, a high-velocity, end-range left rotational force to the TLJ on the lumbar spine in sitting (**FIGURE 4**) was performed. Following this technique, the patient had 45° of left thoracic rotation and 0/10 pain when reaching for his left foot. Active seated thoracic rotation was added to the patient's home exercise program (**APPENDIX**), with instructions that it be repeated 10 times every 2 hours, based on patient response.

By the third visit, the patient had no pain with gait or reaching for his foot. Left thoracic rotation was 50° and painless. The Patrick test was no longer painful, and hip external rotation improved from 45° to 60° on the left side. The patient was able to increase his walking distance to 4.8 km. He was treated for an additional 2 visits to improve gross thoracic mobility. These visits consisted of sidelying and seated end-range joint mobilization techniques, as described above, and exercises to address impairments of trunk and scapulothoracic muscle performance.[33] All exercises in the **APPENDIX** were used and dosed based on the patient's response in the clinic.

TABLE 2 Patient-Reported Outcome Measures for the 3 Patients in This Case Series

Outcome Measure	Case 1	Case 2	Case 3
Baseline pain*	6/10	7/10	5/10
Discharge pain*	0/10	0/10	0/10
Baseline disability	36/80†	58/80†	5.3/10‡
Discharge disability	58/80†	74/80†	NA§
Global rating of change score	+7‖	+7‖	+6¶
Total treatments, n	6	8	4
Total weeks, n	4	4	3

Abbreviation: NA, not available.
**Measured as average pain in the past 24 hours with the numeric pain-rating scale, where 0 represents no pain and 10 represents the worst pain possible.*
†*Measured with the Lower Extremity Functional Scale, where higher scores indicate better functional ability.*
‡*Measured with the Patient-Specific Functional Scale, where higher scores indicate better functional ability.*
§*Patient moved away from the geographical area before discharge outcomes were completed.*
‖*"A very great deal better."*
¶*"A great deal better."*

Case 2

History The patient was a 65-year-old man referred to physical therapy for evaluation of left lateral hip and groin pain (**FIGURE 2**). The initial onset of hip pain was insidious and occurred 2 years earlier, and the onset of groin pain occurred 1.5 years prior from "a bad golf swing." The patient described a stroke where he struck the ground hard with the club. He described his pain as sharp, intense, and constant, with varying degrees of inten-

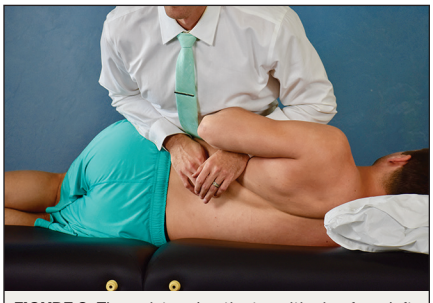

FIGURE 3. Therapist and patient positioning for a left rotational force to the thoracolumbar junction on the lumbar spine, with the patient in right sidelying.

sity. The patient's pain was aggravated by swinging a golf club, lifting, and prolonged sitting for more than 45 minutes. Pain was relieved with a change in position and avoidance of lifting and golf.

Medical history included previous lymphoma, hypertension, and hypothyroidism. Nine months prior to his physical therapy examination, the patient had undergone an unsuccessful inguinal hernia repair to relieve his hip pain. Hip radiographs and magnetic resonance imaging were negative for degenerative findings or other pathology. A pelvic computed tomography scan was negative for visceral pathology. At baseline, the patient rated his hip pain as 7/10 on the NPRS, and he scored 58/80 on the LEFS, or 27% disability (**TABLE 2**).

The primary hypothesis after the patient interview was early hip osteoarthritis because of the patient's description of symptoms, his age, and the lack of change with hernia repair. Radiographic evidence of osteoarthritis often occurs later in the disease process.[11] The lumbar spine was also considered a potential source of symptoms. A visceral origin of symptoms seemed unlikely because of the apparent mechanical nature of his symptoms. The patient's primary goal for physical therapy was to be able to resume playing golf and to sit for more than 60 minutes.

Examination Lumbar active ROM, measured with a bubble inclinometer, was limited and painful into flexion and measured at 50°. Left sidebending was 20° and painful, right sidebending was 28° and painless, and extension was full and painless. Seated thoracic rotation was restricted to 25° to the left, with the patient complaining of local back stiffness, and was restricted to 45° to the right, without complaints. All physiological hip motions (flexion, external rotation, internal rotation, abduction, extension) were assessed in supine and were within normal limits and unrestricted bilaterally, with no perception of restriction or provocation of pain. Joint accessory glides of the hip in inferior and lateral directions were unrestricted and painless. Combined motion testing of the hip (Patrick's test and the flexion, adduction, and internal rotation test) was full and unrestricted bilaterally. Central and unilateral passive intervertebral motion assessment of T10-L1 segments revealed stiffness and pain locally and into the patient's left groin. No stiffness or pain was present at lower lumbar levels. Bilateral gluteus medius, gluteus maximus, and psoas strength values were all 5/5 bilaterally, without reproduction of symptoms. Given the lack of impairments related to the hip, treatment was directed to the upper lumbar spine.

FIGURE 4. Patient and therapist positioning for high-velocity, end-range left rotational force to the right thoracolumbar junction on the upper lumbar spine, with the patient in sitting.

FIGURE 5. Hand placement over the contralateral T12 articular pillar, with the therapist's right hypothenar eminence producing a left rotational force to the thoracolumbar junction with the patient in sitting.

Intervention The initial treatment consisted of a high-velocity, end-range left rotational force to the right TLJ on the upper lumbar spine with the patient in sitting (**FIGURES 4** and **5**). Afterward, the patient could forward flex to 60° with less back pain, and could rotate in sitting to 45° with subjective complaints of stiffness. Given these clinical improvements, low-velocity, end-range, prone posterior-to-anterior joint mobilization (**APPENDIX**) was performed to the right of segments T11-L1. After the technique, the patient felt no discomfort with flexion and seated rotation and no symptoms at rest.

The patient was prescribed the open-book trunk rotation exercise, to be performed in right sidelying 10 times every 2 hours. The patient returned 48 hours later, noting a decrease in symptoms for approximately 24 hours, with a subsequent recurrence of symptoms to the previous level. Given the initial treatment response, the prone posterior-to-anterior joint mobilization technique was repeated. The patient had improved lumbar flexion and seated rotation in both ROM and comfort, but noted persistence of his left groin pain. The same high-velocity, end-range left rotational technique in sitting (**FIGURE 4**) performed on the first day was repeated. The patient had improved left thoracic rotation in sitting, without stiffness and with resolution of resting groin pain. The cat-cow exercise (**APPENDIX**) was added to the treatment and home program to maintain mobility gains throughout the spine, with instructions that it be completed 10 times every 2 hours. The interventions provided during the remaining sessions consisted of exercises included in the **APPENDIX**, which were dosed according to patient response. Interventions also included cardiovascular exercise and general strengthening of the trunk and scapulothoracic musculature, as described in previous research.[17,33]

Case 3

History The patient was a 76-year-old woman with a primary complaint of left upper lateral buttock pain and secondary

complaints of left anterior thigh pain, left groin pain, and bilateral ankle and foot pain (**FIGURE 2**). The symptoms began 9 months prior to the physical therapy examination and were related to participation in a group exercise class. Previous physical therapy and chiropractic care resulted in only minimal relief. She described her left buttock pain as "burning," "achy," "nagging," and "annoying." Aggravating factors included walking 0.8 km, lying on her left side, and prolonged sitting for several hours. Pain was improved with change of position and avoiding prolonged walking. Her anterior thigh pain was described as "deep" and "tingling." She reported a perceived decrease in left lower extremity strength and stability. Her left groin symptoms were described as deep pain and a "loose" feeling. Aggravating activities for anterior thigh pain and groin pain included sudden twisting movements. She had stopped hiking and gardening because of increases in pain.

Medical history included essential thrombocytosis and osteopenia, along with an L4-L5 fracture 10 years ago; she denied any LBP at the time of the examination. There were no reports or history of bowel or bladder issues, paresthesia, night pain, or weight change. Lumbar radiographs indicated a grade 1 anterolisthesis at L2-L3 but were otherwise unremarkable. At baseline, the patient rated her buttock pain as 5/10 on the NPRS. The patient completed the Patient-Specific Functional Scale and scored 5.3 (4/10 hiking, 6/10 walking, 6/10 gardening).

The primary hypothesis after the patient interview was L2-L3 radiculopathy, which was consistent with the patient's report of hip flexion weakness and imaging findings of an anterolisthesis at L2-L3.[38] The cause of her ankle symptoms was initially thought to be a referral from the lower lumbar spine, based on the region of symptoms, bilateral distribution, and prior L4-L5 fracture. Both the hip and ankle symptoms were near the distal aspect of the L2-L3 and L4-L5 dermatomes, respectively, although physiologic variation between individuals' dermatomal distributions was appreciated.[41] The patient's primary goal for physical therapy was to be able to walk 3.2 km without pain.

Examination The patient reported buttock pain during the terminal stance of gait. She denied symptoms at rest. Standing lumbar flexion was assessed with a bubble inclinometer and found to be limited to 45°, recreating her primary buttock symptoms. Left sidebending was limited to 25°, compared with 35° on the right side, and pain was present on return to neutral. A lower-quarter neurological examination from L1 to S1 was deemed appropriate because lumbar radiculopathy was part of the differential diagnosis. Myotomes, deep tendon reflexes, and light-touch sensation were within normal limits and symmetrical bilaterally. Passive ROM examination of the left hip provoked left groin pain with flexion, but overpressure did not increase this pain. Hip passive ROM in all other directions (internal rotation, external rotation, abduction, extension) was pain free, including combined motions. The bilateral straight leg raise and prone femoral nerve tensioning were negative.[5,12] Gluteus medius strength bilaterally was assessed at 3/5. Central and unilateral passive intervertebral motion assessment revealed stiffness throughout the mid-to-lower lumbar spine, and pain was elicited at T12-L1. Hypertonicity of the lumbar paraspinals was noted during unilateral posterior-to-anterior pressure assessment, particularly to the left of T12-L1, which was also hypomobile and painful. This hypertonicity was thought to indicate guarding of a sensitive structure. Although discomfort was elicited during passive hip flexion and there were impairments in hip strength, initial treatment targeted the lower thoracic spine and upper lumbar spine because of an apparent deficit in mobility and reproduction of patient symptoms.

Intervention Initial management consisted of low-velocity, midrange, posterior-to-anterior joint mobilization (**APPENDIX**) to T12-L1 centrally and unilaterally with the patient in prone. The techniques resulted in a noticeable decrease in bilateral lumbar paraspinal tone, with passive accessory mobility testing and less buttock pain with lumbar flexion but no change with left sidebending. The open-book trunk rotation exercise was used to address mobility and reinforce diaphragmatic breathing for neuromuscular control; it was added to her home exercise program, with instructions that 10 repetitions were to be completed 2 to 3 times daily (**APPENDIX**). Dosing was less frequent in this case (2 to 3 times daily versus every 2 hours) at the patient's request. At the end of visit 1, buttock pain was not present during lumbar flexion and during the terminal stance of gait. Although there was an increase in left sidebending, there was no change in her buttock pain.

At the patient's next visit, she reported feeling "cured" and having an increased walking distance. During the examination, only left sidebending still resulted in her primary buttock pain. The patient was treated with the same joint mobilization technique as used in visit 1, but at the end range of available motion, which resolved her chief complaint of buttock pain with left sidebending.

The patient was seen for 2 additional visits to address her other concerns of osteopenia and left foot pain. All improvements were maintained throughout the following 2 visits, and treatments were tailored for independence and prevention of the recurrence of pain by progressing positions and parameters of exercise, including holding times, repetitions, and frequency. Home exercises included those used in the **APPENDIX** and were self-selected by the patient and physical therapist, based on her clinical response.

OUTCOMES

Case 1

The patient was treated for 6 visits over 4 weeks. Pain and disability scores were collected at baseline and discharge (**TABLE 2**). At his final treatment

session, the patient reported a 6-point reduction on his NPRS score in the hip and TLJ; a 1.5-point change is considered the minimal clinically important difference (MCID) for the NPRS.[6] His LEFS score had improved by 22 points, exceeding the MCID of 9 points.[32] The global rating of change (GROC) was used to assess perceived level of improvement and has an MCID of 3 points, and a score of 6 or 7 is indicative of a large positive change in status.[19] The patient scored +7, which indicated that he was "a very great deal better." Left thoracic rotation had improved from 35° to 50°, and he was able to don socks without difficulty. At 12-month follow-up, the patient reported having no recurrence of thoracolumbar or hip symptoms.

Case 2

The patient was seen for 8 visits over 4 weeks (**TABLE 2**). At his final treatment session, the patient's NPRS score had decreased by 7 points. The LEFS score was 74/80, representing a 16-point positive change and indicating low residual disability. The patient's GROC score was +7 at discharge, which indicated that he was "a very great deal better" and surpassed the MCID for the GROC. The patient was followed up at 6 and 12 months and indicated that he was able to return to golf activity approximately 5 months after the beginning of treatment. At 12-month follow-up, he denied a return of symptoms.

Case 3

The patient was seen for 4 visits over 3 weeks but had to stop care because of an unexpected move (**TABLE 2**). At the patient's last visit, she rated her overall perceived improvement on the GROC as a +6, which indicated that she was "a great deal better" and surpassed the MCID. The patient reported being able to walk 4 km with no pain, and all spinal movements were judged to be within normal limits and painless. Unfortunately, because of the unexpected discharge, a follow-up Patient-Specific Functional Scale score was not obtained, and no long-term assessment was possible.

DISCUSSION

The purpose of this case series is to describe the management of 3 patients with primary hip and groin pain who were treated with interventions targeting the TLJ. All 3 patients in this case series had improved pain, thoracic ROM, and functional deficits after being exposed to a treatment approach consisting of joint mobilization and exercise. When physical examination procedures fail to reproduce familiar symptoms or typical patterns of impairment in patients complaining of hip pain, physical therapists should assess for nonmusculoskeletal pathology or pain referred from other musculoskeletal regions. In the 3 cases of this series, comprehensive medical history reviews and patient interviews were conducted to reduce the chance of missing nonmusculoskeletal pathology.

All patients were 65 years of age or older and had comorbidities along with worsening symptoms, which complicated diagnosis and eventual treatment selection. **TABLE 1** summarizes the medical conditions that can refer symptoms to the lumbar spine and hip. Careful consideration of the patient's medical history and presenting symptoms is necessary to sort through relative probabilities and determine the next step in patient care.

In this case series, there were similarities in patient presentations, consistent with previously published reports of patients who had hip pain referred from the TLJ.[22,25,26,42] All patients had unilateral symptoms that were primarily in their hip and groin. Although the presentation of TLJ syndrome is often described as lacking native hip findings,[22,25,26,42] we found this to be untrue for these patients, because each had some level of impairment in the affected hip. In cases 1 and 3, there were positive findings for Patrick's test, which is a combined motion test of hip flexion, abduction, and external rotation. The potential exists for patients to have separate local impairments and symptoms in both the hip and the TLJ. Interestingly, the patients had improved hip mobility and strength with no direct treatment to the hip.

Recognition of the TLJ as a potential area of treatment for hip and pelvic pain may be overlooked by physical therapists and other medical providers.[2,9,21] Extensive medical testing and even surgery (for the patient of case 2) may be avoided if clinicians are better able to recognize the possibility that TLJ syndrome can cause hip symptoms and intervene when appropriate.

There is very sparse literature on the use of manual therapy and exercise directed at the TLJ for patients with hip and groin pain. Although suggested in several reviews, no studies have specifically looked at the use of manual therapy directed to the TLJ for patients with hip pain.[13,25,27-29] The only study that examined the use of exercise in this patient population used trunk-strengthening exercises without other interventions, aside from injection. In contrast, the exercises used in our case series primarily focused on improving TLJ mobility.

The 3 patients in this case series responded favorably during their brief periods of physical therapy intervention. Collectively, their response preliminarily supports the idea that treatment directed to the TLJ may be valuable in some patients with hip and groin pain. Although a cause-and-effect relationship between the interventions and the resolution of symptoms cannot be established in case studies, the long duration of complaints combined with rapid resolution of symptoms appears to support the effectiveness of the care provided. Additional research should be conducted to establish best practices for individuals with suspected TLJ syndrome. Helpful research may include studies of diagnostic accuracy or comparative effectiveness.

There are several limitations to this case series. The 3 patients were treated by 3 different physical therapists, causing inconsistent outcome measures to be collected. Further, these cases were identified retrospectively, limiting consistency in treatment and outcomes tracking.

Additionally, patient 3 had a premature closure to her case and confounding bilateral foot pain, complicating the patient presentation. However, that case was representative of true clinical care, in which patients often have multiple complaints.

CONCLUSION

Treatment directed at the TLJ for patients with hip and groin pain may be an important consideration for clinicians. In this case series, we described 3 patient cases with primary hip and pelvic symptoms who responded well to physical therapy interventions directed to the lower thoracic and upper lumbar spine after comprehensive screening for nonmusculoskeletal pathology. These results may contribute to the existing literature for physical therapists' management of patients with hip and groin pain and, potentially, for the role of physical therapists in identifying and conservatively treating TLJ syndrome. ◉

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APPENDIX

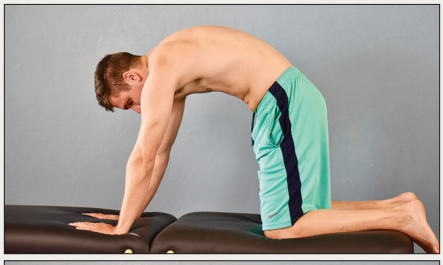
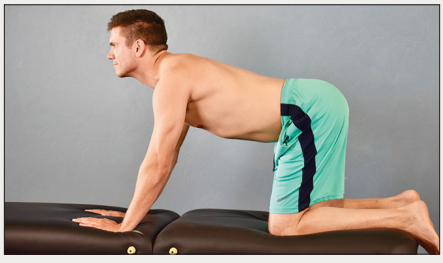
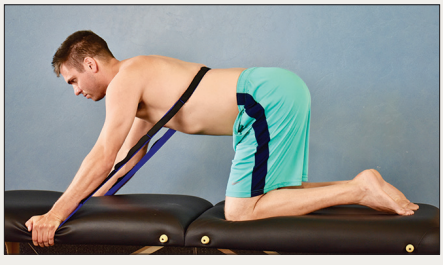
MANUAL THERAPY AND EXERCISE APPROACHES USED IN THIS CASE SERIES

The decision to utilize, progress, and discontinue specific interventions was based on the systematic use of test-treat-retest methodology. Continuation and progressions were based on improvement in patients' specific objective asterisks (painful and/or limited motions), and discontinuation was indicated when no further clinical progress was observed.

Intervention	Description	Illustration
Prone posterior-to-anterior joint mobilization	The patient is positioned in prone. The therapist makes contact with his or her hypothenar eminence and applies an anteriorly directed pressure to the segment. This can be done either centrally or unilaterally	
Open-book trunk rotation	The patient is positioned in sidelying, with the superior leg at 90° of hip flexion, supported by a foam roll, and hands together at 90° of shoulder flexion. The patient rotates the trunk, and the upper extremity moves in horizontal abduction	 
Thoracic extension over a bolster	The patient is positioned with the arms crossed in front of him or her and the foam roll positioned horizontally to a section of the thoracic spine. The patient actively moves into thoracic flexion and extension over the foam roll	

Table continues on page D2.

APPENDIX

Intervention	Description	Illustration
Cat-cow	The patient is positioned in quadruped and instructed to alternately move into spinal flexion and extension	 
Lion stretch	The patient secures a mobilization strap to the region of the thoracic spine that is stiff or painful, holding the ends of the strap in both hands while in a quadruped position. The patient maintains tension on the strap and sits back to lumbopelvic flexion	
Seated thoracic rotation	In sitting with arms across the chest, the patient rotates in 1 direction until resistance is encountered while fully exhaling. In that position, the patient inhales and then returns to the start position. This intervention is repeated on both sides