8-7-2016

Lumbar lateral shift in a patient with interspinous device implantation: a case report

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Case Report

Lumbar lateral shift in a patient with interspinous device implantation: a case report

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Background: Lumbar lateral shift (LLS) is a common clinical observation but has rarely been described in a patient with a history of lumbar surgery. The purpose of the current case report was to describe the use of the McKenzie Method of Mechanical Diagnosis and Therapy (MDT) in the multi-modal treatment of a patient with an LLS and a history of multiple surgical procedures in the lumbar spine, including interspinous process device (IPD) implantation.

Case description: A 72-year-old female with chronic low back pain (LBP) and a surgical history in the lumbar spine was referred to physical therapy for radiating leg pain and presented with a right LLS. Her chief complaints included sitting for long periods, vacuuming and ascending stairs into her home.

Outcomes: The patient was treated during eight visits over 30days. Treatment interventions included manual shift correction, self-correction and management, joint mobilisation below the level of IPD implantation, neurophysiology education, and development of a home exercise programme. At discharge, her leg pain was resolved and all goals had been met. The patient reported maintenance of gains at 6-month follow-up.

Discussion: Utilisation of the MDT approach, including LLS correction, produced positive outcomes in a complex patient with previous IPD implantation. Future research should investigate treatment and outcomes after invasive spinal procedures in similar patient populations to better inform clinical management.

Level of evidence: 4.

Keywords: Lateral shift, Interspinous process device, McKenzie method, Mechanical diagnosis and therapy, Lumbar surgery, X-Stop

Background

A lumbar lateral shift (LLS) is a common clinical observation often associated with radiating leg pain and is defined as a lateral displacement of the trunk in relation to the pelvis.[1] This posture has been repeatedly associated with discogenic pathology.[1–3] Porter and Miller[2] found that patients with this condition do not respond as favourably to conservative treatment, but McKenzie[3] reported that 90% respond rapidly to manual correction. When using the McKenzie Method of Mechanical Diagnosis and Therapy (MDT), the presence of an LLS is initially determined by visual inspection and verified by performing a side glide of the pelvis with the patient in standing while the clinician assesses for a symptomatic response. If the desired symptomatic response is elicited, the LLS is considered relevant and guides the initial treatment approach.[1,3] The prevalence of LLS is difficult to establish, but estimates range from 5.6 to 80% of patients with low back pain (LBP).[2,4] Poor reliability of detecting an LLS[5,6] may contribute to this wide range and, as a result, patients with more subtle presentations may be undiagnosed.[6]

Numerous surgical procedures have been developed to treat LBP. Lumbar spinal fusion, perhaps the most invasive of these procedures, is increasingly common in the United States.[7] However, its effectiveness is questionable because of the risk of adjacent segment degeneration.[8,9] The interspinous process device (IPD) is a newer, less-invasive procedure designed to distract the spinous processes while limiting motion in a specific direction, most commonly extension.[10] Although originally developed to treat lumbar spinal stenosis, IPDs have recently been used for the treatment of discogenic LBP via unloading of the posterior annulus.[11]

A subgroup of patients presenting with an LLS may have a history of surgical procedures in the

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DOI 10.1179/2042618615Y.0000000019

lumbar spine. However, these patients are often excluded from clinical studies investigating LBP, making evidence-based clinical management difficult.[12] Therefore, the purpose of the current case report was to describe the use of MDT in the treatment of a patient with an LLS and a history of multiple surgical procedures in the lumbar spine, including IPD implantation. Progressions in treatment are outlined, including return to self-management and adoption of an exercise routine.

Case Description

Patient characteristics and history of current complaint

The patient of the current case was a 72-year-old retired female with previous careers in nursing and postal work. She was referred by her primary care provider to a private physical therapy practice in November 2014. The diagnosis on the referral was 'sciatica and lumbar spinal stenosis'. At her initial physical therapy evaluation, she presented with right-sided hip pain and leg pain radiating to the right dorsal foot. She characterised the leg pain as 'deep and burning'. Additionally, she reported no LBP but multiple regions of joint pain during the evaluation. The patient was most concerned with pain in the region of her right posterior hip, which had developed gradually about 3 months previously and had since extended to the foot. Leg pain intensity was measured using an 11-point numerical pain rating scale, where 0 represented no pain and 10 represented the worst pain imaginable.[13] The patient rated her current pain intensity as 6, her worst pain as 9 and her lowest pain as 3. The pain was aggravated by reaching for objects on the floor, sitting for longer than 15 minutes, vacuuming and ascending stairs into her home. The pain was improved with standing and walking. For the previous 3 months, the patient felt as though she had been 'walking crooked'. When asked about the irritability of her leg pain, the patient reported that it would take up to 1 minute for the pain to diminish after it was provoked. She denied any changes in bowel or bladder habits, recent changes in weight or any symptoms of fatigue or sickness.

The patient reported a long history of LBP, which began when she was about 30 years old and was working at a postal loading dock. Magnetic resonance imaging conducted approximately 2 years prior to her current case revealed that stenosis and degenerative disk disease were present. As a result, the patient had an L2–L5 laminectomy and partial facetectomy with IPD implantation at L2–L3 and L3–L4. The IPD device (X-Stop device, Medtronic, Tolochenaz, Switzerland) was titanium with an oval spacer, one fixed wing, one adjustable wing and a tissue expander (Figure 1). This particular device is used for cases of neurogenic claudication secondary to spinal stenosis and is the only IPD with U.S. Food and Drug Administration approval.[14] The patient reported 2 months of pain relief after this surgery. She subsequently had intradiscal electrothermal therapy (IDET) at L4–L5. This procedure involves the insertion of an intradiscal catheter and heating element at the inner annulus and is thought to improve symptoms through collagen shrinkage, stabilisation of annular fissures and thermocoagulation of native nociceptors and in-grown nerve fibres.[15] After the IDET procedure, the patient experienced pain relief for 10 months. When her pain returned, she had a second IDET procedure at L3–L4, which resolved her symptoms for 2 months. Her second IDET procedure occurred approximately 6 months prior to the initial physical therapy evaluation.

In addition to an extensive surgical history in the lumbar spine, the patient reported a complex medical history. She had experienced four transient ischaemic attacks and had undergone bilateral total knee replacements. She had been diagnosed with asthma, diabetes, osteoarthritis, fibromyalgia, hypertension, hypothyroidism, depression, anxiety, migraines and sleep apnoea. She was taking 22 medications, including narcotics for pain management. At the time of her initial evaluation, the patient was not participating in an exercise routine. The patient's primary goal for physical therapy was to resume previous functional activities, which included sitting for 60 minutes, vacuuming and ascending stairs without pain.

Examination

The patient's perceived activity and participation restrictions were measured using the Oswestry Disability Index (ODI). Her initial score was 26 of 50 possible points, indicating 52% disability.[16] The Fear Avoidance Belief Questionnaire (FABQ) was administered to evaluate for maladaptive thoughts or behaviours that could influence her expected prognosis[17] and consists of physical activity (FABQ-PA) and work (FABQ-W) subscales, where higher numbers indicate greater fear avoidance beliefs. She scored 15 of 24 on the FABQ-PA and 36 of 42 on the FABQ-W. Scores >15 of 24 on the FABQ-PA subscale and 34 of 42 on the FABQ-W subscale are associated with poorer outcomes.[18,19] Even though the patient was retired, the FABQ-W was considered relevant to her case because she was the primary caregiver for her ill husband.

During postural examination, the patient appeared to present with a right LLS and a reduced lumbar lordosis. Sensation, myotomal testing and reflexes were all present and equal bilaterally. Active range of motion (AROM) testing was not measured

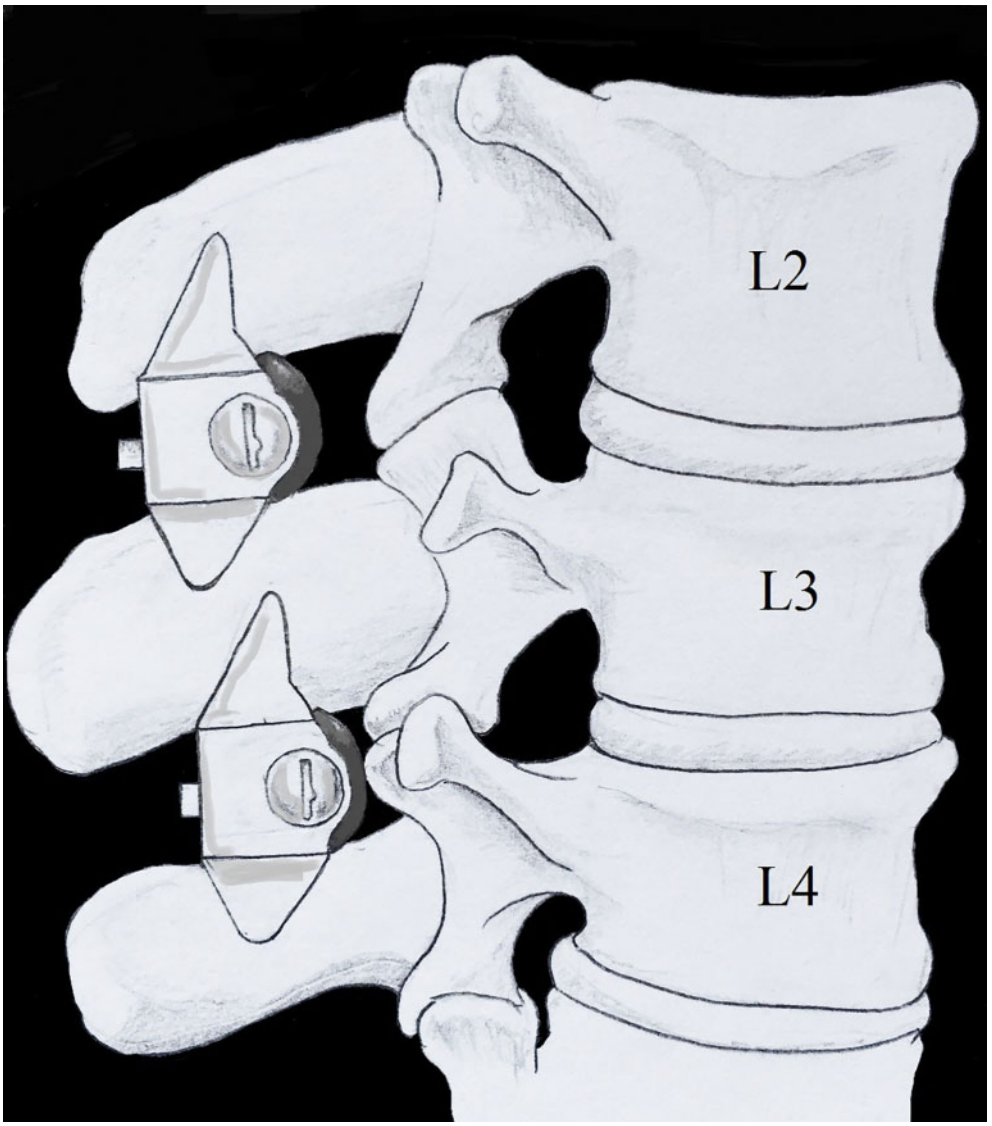

Figure 1 X-Stop interspinous process device. Devices are placed between the interspinous processes of adjacent vertebrae to restrain extension and distract the posterior elements

goniometrically, but was visually estimated. The patient's AROM in forward bending and left lateral bending were estimated at 75% limited. Right lateral bending and backward bending were estimated at 90% limited and increased the patient's lower extremity pain. Passive side-glide testing in standing revealed hypomobility and LBP when moving to the left. Passive side-glide testing to the right was neither painful nor limited. A sustained side glide moving towards the left was repeated and led to a reduction of the patient's pain below the knee after approximately 30 seconds.

Clinical impression

The patient's response to correction of the LLS seemed to suggest a centralisation phenomenon. The centralisation phenomenon is said to occur when the patient's apparent radiating symptoms travel from a distal location towards its proximal origin.[1] In the present patient, her symptoms below the knee were diminished after 30 seconds of a sustained side glide, whereas her more proximal symptoms remained unchanged. According to McKenzie,[1] rapid centralisation would necessitate classifying the patient in the mechanical derangement category of MDT. The phenomenon of centralisation is considered to be highly specific to discogenic pain, making zygapophyseal and sacroiliac joint involvement unlikely.[20] The presence of normal sensation, reflexes and myotomal testing ruled out nerve root compression.

The patient's longstanding history of LBP in the context of her other comorbidities, including migraines and fibromyalgia, also suggested a central neurophysiological component to her pain.[21] In addition, maladaptive psychosocial factors appeared to be present, as evidenced by her scores on the FABQ-PA[18] and FABQ-W.[19]

Treatment

The patient was seen for four visits to correct the LLS and centralise symptoms. Another four visits focussed on improving general strength and motor control while transitioning the patient to an appropriate home exercise programme. The patient's maladaptive beliefs regarding her pain were addressed throughout the entirety of her care.

Interventions

After the initial physical therapy examination, the physical therapist chose to immediately introduce a manual LLS correction as detailed by others[3,22] and presented in Figure 2. Because the patient's symptoms were provoked with sustained positions, the therapist performed a sustained hold. After approximately 2 minutes, symptom centralisation from the right foot to the right upper glutaeal region had occurred with an improvement in pain intensity from six of 10 to one of 10. This technique restored pain-free right lateral bending AROM to 50% when tested again in standing. For home exercise, the patient was instructed on replicating the shift correction while standing against a wall. Dosage was initially set at four times per day for 10 repetitions or when she noticed her 'crooked' posture returning. To address maladaptive pain beliefs, approximately 15 minutes was spent educating the

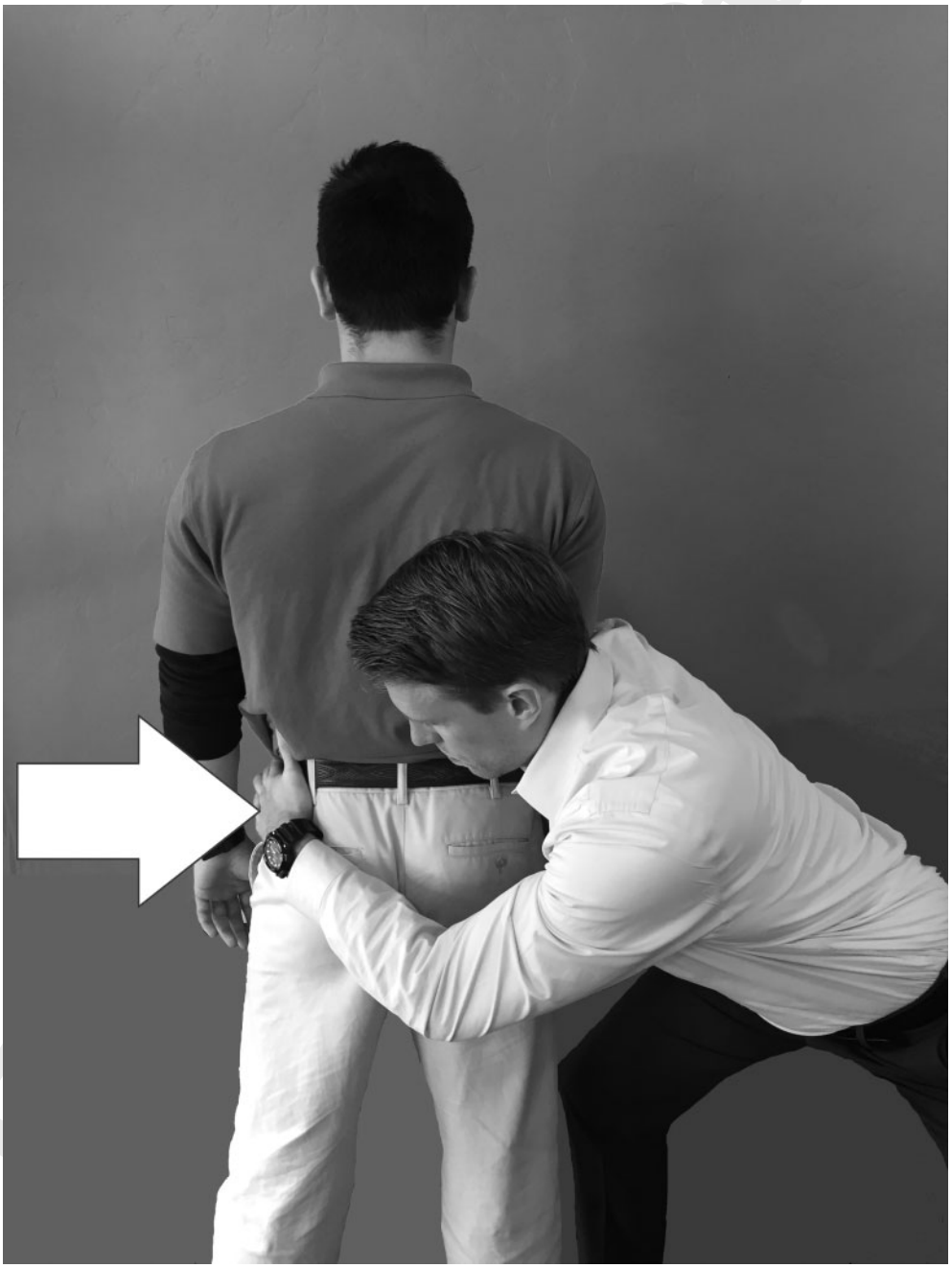

Figure 2 Technique used in the current case report for manual correction of a right lateral shift. The arrow depicts the direction of force applied by the physical therapist

patient about pain neurophysiology, including pain centralisation. The patient was given the Pain Neurophysiology Questionnaire[23] to complete prior to her second visit.

The patient returned 7 days later with a partial maintenance of the shift correction and no pain below the right glutaeal fold. The pain had increased to six of 10 in the right glutaeal region. To continue addressing maladaptive pain beliefs, 15 minutes was spent reviewing the patient's responses to the Pain Neurophysiology Questionnaire. Frequent cognitive–behavioural questioning was used to challenge the patient's perceptions about the safety of exercise, as described in the study by Nijs *et al.*[24] After repeating the manual shift correction, her pain was completely resolved. Her lateral bending remained much improved; however, her backward bending remained limited to approximately 90%. Therefore, the therapist elected to assess segmental mobility below the level of IPD implantation during the second visit. Segmental mobility at vertebral levels L2–L5 was not assessed to avoid disturbing the IPD implants. Posterior–anterior pressure centrally at L5 was hypomobile and generated pain rated at two of 10 in the right glutaeal region. Treatment commenced as centrally directed grade III rhythmic oscillations at L5 until the resistance appeared to soften. Afterwards, the patient's backward bending AROM was judged to be only 50% limited. The patient was instructed on pelvic tilts as an additional home exercise to maintain this improvement in range.

At visits 3 and 4 (9 and 13 days after the initial physical therapy visit), the patient indicated that she was able to maintain her right glutaeal pain at three of 10 when she performed her home exercise programme three to four times per day. To improve maintenance of the shift correction, manual resistance was added to the movement. This progression in treatment was carried over to her home exercise programme by instructing the patient to perform the shift correction into a pillow against the wall. The patient was also instructed on activation of transversus abdominus and multifidus muscles to improve maintenance of the shift correction.

Over the final four visits (18, 24, 26 and 30 days after the initial visit), the patient's pain was no longer provoked with lumbar AROM, and an LLS was no longer present. She continued to report LBP when ascending the stairs into her home. Manual muscle testing of hip abduction indicated a strength grade of 3+ of 5 on the right side and four of five on the left side. Consequently, trunk and glutaeal strengthening became the focus of her final four visits. Supine bridges and side lying hip abduction were added to her home exercise programme and then progressed to a standing hip flexion exercise to elicit a glutaeal contraction in the stance leg. All exercises were performed for two sets of 10 repetitions, with 3-second isometric holds. Low-intensity aerobic cycling for 5 minutes was added on the fifth visit and progressed by 2 minutes for each remaining visit (11 minutes by final visit) to improve general fitness and provide a means for future exercise engagement.

Outcomes

The patient was seen for eight visits over 30 days. At discharge, she had not experienced leg pain in 3 weeks. Her posture was notably improved compared with her initial visit (Figure(3), and lumbar AROM was no longer painful. Hip abduction had improved to four of five on the right side and 4+ of 5 on the left side. She denied pain with vacuuming or ascending stairs into her home, activities she had initially selected as personal goals. She reported her worst LBP as one of 10. Her LBP increased when sitting for longer than 60 minutes, which was an improvement from her baseline of 15 minutes. Furthermore, the patient had initiated an independent endurance exercise programme for 'the first time in years' and felt capable of self-management.

On her final visit, the patient scored 20 of 50 on the ODI, which indicated 40% disability and suggested a clinically important change from her baseline of 52% disability.[25] At discharge, the patient reported a+6 score on the Global Rating of Change scale. This scale ranges from (7 (a very great deal worse) to +7 (a very great deal better), and scores of +6 or +7 indicate a large improvement.[26] At her 6-month follow-up visit after discharge, the patient scored 18 of 50 on the ODI, indicating 36% disability and maintenance of her functional gains. She denied a return of leg symptoms; however, she also admitted mostly discontinuing her endurance exercise programme.

Discussion

The current case report describes the use of the McKenzie Method of MDT in a patient with an LLS and a surgical history in the lumbar spine, including IPD implantation. She responded quickly to LLS correction and had complete resolution of radiating leg symptoms after the second physical therapy visit. Subsequent manual therapy and exercise were intended to correct her postural deformity, improve her lumbar extension below the level of IPD implantation and facilitate self-management. After eight visits, the patient no longer experienced leg pain and had met all her personal goals. The follow-up period for this patient was 6 months, at which time she reported maintenance of gains.

The rapid centralisation of symptoms observed in this patient is similar to that reported in previous

Figure 3 Change in the patient's lumbar lateral shift posture. (A) Patient posture at the initial physical therapy evaluation with a right lumbar lateral shift. (B) Patient posture at discharge

case reports describing a lateral shift correction.[22,27] Centralisation or peripheralization during repeated movement testing has been positively correlated with pain provocation during lumbar discography.[28] Because our patient had an apparent directional preference towards extension and positive response to her first IDET procedure, an initial hypothesis of discogenic pain was adopted for subsequent treatment. However, studies have shown that repeated spinal movements producing centralisation are an effective treatment for LBP and radiating pain regardless of correlation with discography.[29,30]

To the author's knowledge, the current case is the first to describe the existence and treatment of an LLS in a patient with any surgical history to the lumbar spine. Because these patients are often excluded from investigations of LBP,[12] few studies have investigated this population. Further, although the IPD is often used as a less-restrictive alternative to spinal fusion surgery, it alters the lumbar spine's normal biomechanics.[31,32] One laboratory study found a significant decrease in lumbar spinal extension after IPD implantation and a significant increase in lateral bending and rotation.[31] Because these devices do not restrain lateral bending or rotation, manual intervention to correct the LLS was considered appropriate and safe in the current case. The patient's rapid response to this intervention provides some evidence for discretional use of the MDT approach when a patient has undergone IPD implantation.

Education and cognitive–behavioural questioning were also used in the current case to address a secondary psychosocial contribution to the patient's LBP. Her maladaptive beliefs were identified as a potential obstacle to recovery through her high FABQ subscale scores and diagnosis of fibromyalgia. Evidence suggests that cognitive-behavioural interventions are effective in reducing disability in some patients with non-specific LBP,[33] but only a small subgroup of patients seem to have psychosocial factors as a primary cause of their LBP.[34] Patient education and manual therapy were used during the initial visits with the patient, but the final four visits consisted of an active exercise approach, including low-intensity aerobic cycling. Graded exercise is known to have a positive effect on physical functioning and pain associated with fibromyalgia,[35] and has been supported by clinical practice guidelines for LBP.[36] This treatment

approach was used to facilitate greater improvements in function and self-efficacy on discharge, and at discharge, the patient had adopted an independent endurance exercise programme with the goal of improving her overall health.

The current case report has several limitations. Generalisations for patient care cannot be made based on the results of a single case report. Further, although the patient's pain was resolved and she met her treatment goals, her ODI score at discharge still indicated 40% disability. However, this score is likely a reflection of her longstanding history of LBP and fibromyalgia. Her Global Rating of Change score, attainment of treatment goals and reported readiness for discharge suggested that her current LBP episode had resolved and resulted in her ability to return to a previous level of functioning. Even though the patient responded positively to LLS correction and centralisation was seen, we cannot unequivocally determine that the patient's pathology was discogenic.

Conclusion

The current case report describes the treatment approach of a patient with previous IPD implantation and an observable LLS deformity. Because patients with IPD implantation may be seen increasingly more often by physical therapists, studies investigating the biomechanical and biopsychosocial consequences of these procedures are necessary. Future large-scale studies of the clinical management of patients with recurrent LBP-related leg pain after invasive spinal surgeries may provide evidence to inform clinical management of an often excluded population.

Disclaimer Statements

Contributors SP treated the patient, drafted and revised the paper. He is guarantor. CH critically revised the paper multiple times and provided guidance on the paper's direction.

Funding The authors have no financial disclosures to report. This case report was not funded.

Conflicts of interest The authors have no conflicts of interest to report.

Ethics approval Ethics approval is not applicable for this study.

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