Chiropractic management of a patient with low back pain and Castellvi type II lumbosacral transitional vertebrae

Jeffrey M. Muir MSc, DC*

Chiropractor, Private Practice, Hamilton, Ontario, Canada

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Abstract

Objective: The purpose of this study is to report the chiropractic management of a patient with low back pain and Castellvi type II lumbosacral transitional vertebrae (LSTV).

Clinical Features: A patient with previously undiagnosed LSTV presented with moderate low back pain.

Interventions and Outcome: Manual therapy, soft tissue therapy, and exercise/stretching were included in the initial treatment plan. Following a short course of treatment, the presenting symptoms resolved; however, they returned after 3 symptom-free months. At that time, radiographs were ordered and the LSTV were identified. Following another course of chiropractic care, the patient's symptoms resolved.

Conclusions: Chiropractic management resulted in resolution of symptoms for this patient with LSTV.

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Introduction

Congenital variations of vertebrae can take various forms. Transitional vertebrae are a common variant, with lumbosacral malformations relatively common.^{1–6} Lumbosacral transitional vertebrae (LSTV), which may be sacralization or lumbarization, depending on morphology, occur at a prevalence of from less than 1% to more than 20% in various studies.^{2,4–6} Castellvi

et al⁷ proposed a classification system for LSTV based on the radiographic characteristics of each specific malformation. They identified 4 variations involving the L5/S1 vertebral junction, subdivided based on unilateral or bilateral presentation. Although well classified, the ultimate role of such transitional vertebrae in low back pain remains unknown. Some studies suggest that these spinal anomalies increase the likelihood of low back pain and are reliable predictors of low back pain.^{3,8–10} However, others suggest that there is no greater prevalence in those patients with transitional vertebrae when compared with the rest of the population.^{5,11}

Although 2 studies in the chiropractic literature have reviewed radiographic prevalence of anatomical

* Corresponding author. 18-550 Fennell Ave East, Hamilton, Ontario, Canada L8V 4S9. Tel.: +1 905 962 6362; fax: +1 905 574 8699.

E-mail address: drjeffmuir@gmail.com.

variants,^{12,13} it is not clear if these variants are associated with symptomatic findings. Of the back pain case reports¹⁴⁻¹⁹ with Castellvi-type variations, the majority were treated with surgical intervention. However, there are few documented cases of conservative management of low back pain for patients with these anatomical variants.²⁰ The purpose of this case study is to report the chiropractic management of a patient with low back pain and a Castellvi type II LSTV.

Case report

A 29-year-old man presented with moderate, idiopathic low back pain (numeric pain scale, 5/10) of 1 day's duration. No specific event preceding the onset of pain was reported. He described his back pain as "stiff." There was no radiation, and the pain was localized to the central low back. Sitting was an aggravating factor, whereas rest was relieving. No other associated signs or symptoms were noted, and no history of significant similar low back pain was reported. Consent for publication of this clinical information was provided by the patient, provided that anonymity was maintained.

Postural examination revealed normal curvatures of the thoracolumbar spine. Lumbar spine range of motion was limited to 70° in flexion but was otherwise normal. Pain was noted at the end range of flexion. Orthopedic testing included straight leg raise bilaterally at 90°, eliciting lower back pain at the area of the chief concern, whereas result of sacroiliac compression testing was positive bilaterally for local pain. Result of neurological examination was unremarkable. Spinal joint fixations were noted in the lumbar spine at L1/2/3 and L4/5/S1 bilaterally, with tender points noted bilaterally in the erector spinae musculature at the level of L4/5/S1 and the gluteal musculature. Right-sided trigger points in the gluteus medius muscle caused referred pain to the lateral foot. A preliminary diagnosis of lumbar facet syndrome with right gluteus medius myofascial pain syndrome was made. Treatment plan, including spinal manipulative therapy (SMT) and trigger point and soft tissue therapy (STT), was begun at a frequency of 3 treatments per week for 4 weeks.

Following the second treatment, the patient reported feeling improved; however, the next morning, he had right-sided gluteal pain, pain referring to the posterior right knee, and a sensation of "numbness" at the right gastrocnemius muscle and lateral foot. Neurological

examination was repeated, and the result was again unremarkable. Straight leg raise was limited to 45° on the right and elicited pain in the right low back and gluteals. The patient was treated with SMT, STT, and myofascial release therapy (MRT) to the right gluteus medius and was instructed to stretch the lower back and gluteal muscles and apply ice and/or heat as necessary. Treatment followed, as outlined above, 3 times per week for 3 additional weeks, with complete resolution of back pain and referred symptoms to the lower extremity.

Following a symptom-free period of 3 months, the patient experienced a recurrence of his previous right gluteal pain, this time described as "worse than the first time." Again, no precipitating event was reported. Orthopedic testing revealed no alterations from the prior assessment; palpation of the sacroiliac joints and the right gluteus medius and piriformis muscle resulted in reproduction of the pain. Because of the recurrence of the symptoms, radiographs of the lumbar spine and sacroiliac joints were ordered. A second course of treatment was begun, with more aggressive MRT directed at the right gluteus medius and piriformis muscles.

The radiographic report showed a large transverse process at the L5 vertebral body that had formed pseudoarthrosis with sacral wings bilaterally. Also noted was disk space loss at L4-5 and L5-S1,

Fig 1. Anterior-posterior plain film of the lumbar spine. Arrows indicate the large transverse processes on the L5 vertebra.

Fig 2. Lateral plain film of the lumbar spine. No anomalies in the transverse processes are visible.

suggesting degenerative disk disease (Figs 1–3). Upon receiving the radiographic report, SMT was discontinued in favor of spinal mobilizations as an adjunct to STT and MRT, which were performed 3 times per week for 3 weeks. A follow-up period of once-weekly treatments was maintained for approximately 4 weeks. The patient reported no adverse reactions to care. Following this second course of treatment, the patient reported resolution of pain.

Discussion

The variant described in this case is among those listed by Castellvi et al⁷ in their study cataloguing partial sacralization of L5. Castellvi et al described 4 specific types of LSTV: type I: unilateral (Ia) or bilateral (Ib) malformed transverse processes measuring at least 19 mm in width; type II: incomplete

unilateral (IIa) or bilateral (IIb) lumbarization/sacralization with enlarged transverse process(es) that has(ve) diarthrodial joint(s) between itself (themselves) and the sacrum; type III: unilateral (IIIa) or bilateral (IIIb) lumbarization/sacralization with complete osseous fusion of the transverse process(es) to the sacrum; and type IV: a unilateral type II transition with a type III on the contralateral side.^{7,21} This case represents a type IIb variant, which Castellvi et al noted was often associated with disk herniations either at the level of the malformation or at the level directly above.⁷ Although referred pain accompanied the initial presentations, no evidence of disk herniation was noted in this case.

In this case, the presentation of low back pain was initially unremarkable, although there was some associated symptom referral. Orthopedic testing revealed no significant deficits, and no disk provocation tests had positive results. The initial course of manual therapy was initially successful at relieving the symptoms, although a reoccurrence 3 months following led to plain film imaging, which revealed the skeletal anomaly. Radiographs revealed the accessory articulation between the L5 transverse processes and the sacrum, a joint that displayed very little mobility on subsequent motion palpation and retesting.

It is unknown whether decreased mobility associated with LSTV and accessory articulations in the lumbosacral region contributed to the patient's low back pain. In a series of articles, Mahato^{22–27} described the anatomical characteristics of LSTV and noted that transitional states at the lumbosacral junction are associated with an altered morphology at the joint and hence associated with an altered mechanics of weight transmission across the L5-S1 articulations.^{23–25} These findings, plus the resulting decrease in lateral flexion at the L5-S1 joint in this case, suggest that a decrease in functional mobility would accompany these particular LSTV. Biomechanical compensation may have therefore played a role in the presentation of symptoms in this case. Why idiopathic pain presented without a precipitating event is unknown. The patient in this case had, in the months before presenting for treatment, begun training for work in law enforcement. It is possible that the increased frequency and intensity of physical activity were at least partially a cause of the presentation of symptoms.

During the second trial of therapy, treatment was directed at the chief concern and the source of the pain, in this case the posterior pelvic musculature. Although spinal manipulation was well tolerated in the first phase of case, spinal manipulative therapy was not used in the second phase to avoid possible reactionary muscle

Fig 3. A and B, Bilateral plain films focusing on the L5/S1 junction. A, Right anterior-posterior view of the oversized L5 transverse process (white arrow). The sacroiliac joint space is well preserved. B, Left anterior-posterior view of the oversized L5 transverse process (white arrow). Note the accessory articulation visible between the L5 transverse process and the sacrum (black arrow). The sacroiliac joint space is well preserved.

spasm in the lumbopelvic region due to the lack of mobility at L5/S1.

The essential question regarding this case is this: what role, if any, did the skeletal anomaly play in the chief concern? Dai⁸ examined the relationship between LSTV and low back pain and noted that the incidence of Castellvi type II transitional vertebrae was significantly higher in patients with low back pain than in controls. Taskaynatan et al⁹ noted that LSTV increase the severity of the clinical picture whether or not they have a causal relationship. Several authors⁸⁻¹⁰ have also suggested a link between LSTV and early disk injury in the lumbar spine, although this case did not present as such. In contrast, Peterson et al¹¹ suggest that there is no association between low back pain prevalence and LSTV. Conservative treatment such as physiotherapy or chiropractic care for Castellvi-type variants is not well represented in the literature. Brenner²⁰ described a case of unilateral LSTV (Castellvi type IIa) that responded well to conservative care. In this case, manual therapies (spinal manipulation, soft tissue therapies) and exercise were successful in resolving the presenting symptoms, in much the same way as the symptoms of the current

case were resolved. It is possible that in the Brenner case, as with the current case, biomechanical alterations brought on by the skeletal abnormality, as hypothesized by Mahato,²³⁻²⁵ were responsible for the chief concern. With few examples in the literature, it is difficult to conclude decisively that conservative care is a viable treatment option for biomechanical sequelae to LSTV. The current case, however, adds to the literature and provides support for the role of conservative treatment in addressing the biomechanical compensations that may be associated with Castellvi variants. However, more work is needed to document both the secondary biomechanical deficits that may be associated with LSTV and the response of such patients to conservative care.

There is more literature¹⁴⁻¹⁹ that reports surgical interventions for LSTV. Weber¹⁸ described 2 patients with unilateral LSTV treated with selective nerve blocks, both of which were successful in eliminating radicular symptoms and low back pain. Earlier, Malawski et al¹⁶ had summarized 5 different cases (4 female patients, 1 male) all treated surgically. All patients in these cases presented with lower back pain of significant duration (years), in some cases

accompanied by radicular symptoms. In all cases, resection of the transverse process was performed; in 2 cases, discectomy at the affected level was also performed. The authors describe positive results at a median follow-up period of 3 years postsurgery.

Limitations

This report has several limitations. This is a report of only one patient; thus, patients with similar anomalies may respond differently. It is not clear if the anomaly contributed in any way to the patient's symptoms and may have been solely an incidental finding. The evidence linking this particular skeletal anomaly and low back pain is limited and inconclusive, which makes firm conclusions regarding a causal relationship between anomaly, condition, and resolution limited.

Conclusion

This case study discusses chiropractic management of a patient with low back pain and an incidental finding of Castellvi type II LSTV. The response from this patient showed that chiropractic management of back pain in the presence of this anomaly was well tolerated with no adverse effects.

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No funding sources or conflicts of interest were reported for this study.

References

1. Lu X, Hou C, Yuan W, Zhang Z, Chen A. Complete traumatic anterior dislocation of the lumbosacral joint: a case report. *Spine (Phila Pa 1976)* 2009;34(14):E488-92.
2. Lee CH, Park CM, Kim KA, Hong SM, Seol HY, Kim BH, et al. Identification and prediction of transitional vertebrae on imaging studies: anatomical significance of paraspinal structures. *Clin Anat* 2007;20(8):905-14.
3. Steinberg EL, Luger E, Arbel R, Menachem A, Dekel S. A comparative roentgenographic analysis of the lumbar spine in male army recruits with and without lower back pain. *Clin Radiol* 2003;58(12):985-9.
4. Kim NH, Suk KS. The role of transitional vertebrae in spondylolysis and spondylolytic spondylolisthesis. *Bull Hosp Jt Dis* 1997;56(3):161-6.
5. Leboeuf C, Kimber D, White K. Prevalence of spondylolisthesis, transitional anomalies and low intercrestal line in a chiropractic patient population. *J Manipulative Physiol Ther* 1989;12(3):200-4.
6. Magora A, Shwartz A. Relation between the low back pain syndrome and x-ray findings. 2. Transitional vertebra (mainly sacralization). *Scand J Rehabil Med* 1978;10(3):135-45.
7. Castellvi AE, Goldstein LA, Chan DP. Lumbosacral transitional vertebrae and their relationship with lumbar extradural defects. *Spine (Phila Pa 1976)* 1984;9(5):493-5.
8. Dai L. Lumbosacral transitional vertebrae and low back pain. *Bull Hosp Jt Dis* 1999;58(4):191-3.
9. Taskaynatan MA, Izci Y, Ozgul A, Hazneci B, Dursun H, Kalyon TA. Clinical significance of congenital lumbosacral malformations in young male population with prolonged low back pain. *Spine (Phila Pa 1976)* 2005;30(8):E210-3.
10. Bron JL, van Royen BJ, Wuisman PI. The clinical significance of lumbosacral transitional anomalies. *Acta Orthop Belg* 2007;73(6):687-95.
11. Peterson CK, Bolton J, Hsu W, Wood A. A cross-sectional study comparing pain and disability levels in patients with low back pain with and without transitional lumbosacral vertebrae. *J Manipulative Physiol Ther* 2005;28(8):570-4.
12. Beck RW, Holt KR, Fox MA, Hurtgen-Grace KL. Radiographic anomalies that may alter chiropractic intervention strategies found in a New Zealand population. *J Manipulative Physiol Ther* 2004;27(9):554-9.
13. Hsieh CY, Vanderford JD, Moreau SR, Prong T. Lumbosacral transitional segments: classification, prevalence, and effect on disk height. *J Manipulative Physiol Ther* 2000;23(7):483-9.
14. Arseni C, Maretsis M. Paralyzing sciatica caused by unilateral sacralization. Presentation of a case. *Neurol Psichiatr Neurochir* 1969;14(2):97-100.
15. De Bernardi E. A rare finding in the lumbar column (unilateral dysmorphism of the lumbar transverse apophysis with sacral characteristics of the IV without sacralization of the V). *Radiol Med* 1950;36(4):307-11.
16. Malawski S, Milecki M. Results of treatment of unilateral sacralization of transverse process of the fifth lumbar vertebrae. *Chir Narzadow Ruchu Ortop Pol* 1998;63(5):487-94.
17. Miyoshi Y, Yasuhara T, Date I. Posterior decompression of far-out foraminal stenosis caused by a lumbosacral transitional vertebra—case report. *Neurol Med Chir (Tokyo)* 2011;51(2):153-6.
18. Weber J, Ernestus RI. Transitional lumbosacral segment with unilateral transverse process anomaly (Castellvi type 2A) resulting in extraforaminal impingement of the spinal nerve: a pathoanatomical study of four specimens and report of two clinical cases. *Neurosurg Rev* 2010;34(2):143-50.
19. Abe E, Sato K, Shimada Y, Okada K, Yan K, Mizutani Y. Anterior decompression of foraminal stenosis below a lumbosacral transitional vertebra. A case report. *Spine (Phila Pa 1976)* 1997;22(7):823-6.
20. Brenner AK. Use of lumbosacral region manipulation and therapeutic exercises for a patient with a lumbosacral transitional vertebra and low back pain. *J Orthop Sports Phys Ther* 2005;35(6):368-76.
21. Konina GP, Walz DM. Lumbosacral transitional vertebrae: classification, imaging findings, and clinical relevance. *American Journal of Neuroradiology* 2010;31:1778-86.

22. Mahato NK. Facet dimensions, orientation, and symmetry at L5-S1 junction in lumbosacral transitional States. *Spine (Phila Pa 1976)* 2011;36(9):E569-73.
23. Mahato NK. Morphological traits in sacra associated with complete and partial lumbarization of first sacral segment. *Spine J* 2010;10(10):910-5.
24. Mahato NK. Morphometric analysis and identification of characteristic features in sacra bearing accessory articulations with L5 vertebrae. *Spine J* 2010;10(7):616-21.
25. Mahato NK. Complete sacralization of L5 vertebrae: traits, dimensions, and load bearing in the involved sacra. *Spine J* 2010;10(7):610-5.
26. Mahato NK. Association of rudimentary sacral zygapophyseal facets and accessory and ligamentous articulations: implications for load transmission at the L5-S1 junction. *Clin Anat* 2010;23(6):707-11.
27. Mahato NK. Variable positions of the sacral auricular surface: classification and importance. *Neurosurg Focus* 2010;28(3):E12.