Bertolotti's Syndrome: Lumbosacral Transitional Vertebrae (LSTV): Case Report and Article Review

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Abstract

Background: Bertolotti's syndrome is an anatomical variant occurring at the lumbosacral junction between the 5th lumbar vertebrae (L5) and the 1st sacral vertebrae (S1). Bertolotti's syndrome, as well as lumbosacral transitional vertebrae (LSTV), is a frequently encountered source of low back pain for physicians in rheumatology practice.

Case Description: A 28-year-old single female presented to the rheumatology clinic in December 2022 with complaints of lower back pain. The pain was continuous but increased with daily activities. Plain radiographic studies demonstrate elongation of the L5 transverse process and sacralization of L5 vertebrae. Magnetic resonance imaging (MRI) was performed, which revealed a fusion of the transverse process of L5 to the sacrum with uncomplicated two-sided pseudoarticulations, which confirmed a diagnosis of Bertolotti's Syndrome. She was treated with a short course of NAIDS and with ideal benefit. In June 2024, she suffered again from low back pain with the same character, but she added left lower limb paresthesia. Magnetic imaging study of the lumbosacral spine now shows symmetrical central posterior disc at the level of L4 & L5, causing indentation of the ventral aspect of thecal sac and mild bilateral neural foraminal narrowing and nerve root compression. A conservative approach with analgesia and home physiotherapy was advised. Pregabalin was administered in escalating doses was in progress.

Conclusion: Bertolotti's Syndrome is not precisely linked to the patient's complaints, making it a diagnostic and therapeutic challenge.

Keywords: Bertolotti syndrome, Low back pain, Lumbarization, Sacralization, Lumbosacral transitional vertebra

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Introduction

Lumbosacral transitional vertebrae (LSTV), which are common anatomical variations occurring at the lumbosacral junction between the 5th lumbar vertebrae (L5) and the 1st sacral vertebrae (S1), share the structural features of both sacral and lumbar vertebrae and encompass both lumbarization of the uppermost sacrum and sacralization of the lowermost lumbar vertebrae.

Lumbarization of the 1st sacral vertebrae consists of an anomalous joint that has fully established facet joints similar to lumbar spine type, but with more square-shaped vertebrae, and with an established, normally appearing and functioning disk. Again, when the 5th lumber vertebrae sacralized, depicted by expanded lengthened transverse processes that completely fused to the bones of the sacral area, nevertheless, more commonly, lumbosacral transitional vertebrae (LSTV) are partial or one-sided. (1)

Bertolotti's syndrome, as it is considered part of lumbosacral transitional vertebrae (LSTV), is frequently

encountered as a source of low back pain facing physicians during rheumatology practice. Since it is not precisely linked to the patient's complaints, it is a diagnosis of exclusion and may challenge the planned therapeutic course. (2)

Bertolotti's syndrome is considered an anomaly of the fifth lumbar vertebra characterized by a bulky transverse process which either articulated (pseudo-articulation) or fused with the sacrum or iliac crest, subsequently causing long-lasting, persistent low back pain. (3) This is illustrated in Figure 1, which shows a 3-dimensional CT scan for this peculiarity.

It was first described in 1917 by Mario Bertolotti, and it's present in about 4% to 30% of the population in most series, but only 4%-8% of those are diagnosed. About 13% of them are asymptomatic, with merely one-fifth of them below 30 years. (4,5)

Bertolotti's syndrome is frequently recognized after the 2nd decade of life. Despite its first definition nearly a century ago, till now a little is yet recognized about the biomechanics of these congenital vertebral anomalies and their association with low back pain. (6)

The causes of low back pain in Bortolotti syndrome are still elusive and a matter of debate, but multi-factorial presumptive mechanisms could be blamed, including deterioration of the adjacent intervertebral disks or opposite facet joints to a unilateral fused or partially articulating vertebrae, and foraminal stricture due to enlarged transverse processes. (7)

In 1984, Castellvi et al designated a radiographic classification system that categorizes lumbosacral transitional vertebrae (LSTV) depending on the association between the transverse process and the sacral bones on the unilateral or bilateral sides. The lumbosacral transitional vertebrae (LSTV) are divided into 4 categories as shown in Figure 2.

1. The 1st type displays an engorged transverse process (>19 mm) on one or both sides
2. The 2nd displays a joint-like structure (JLS) in one or both sides associated with sclerosis (s)
3. The 3rd Type displays a bony union structure (BUS) in one or both sides
4. The 4th Type comprises a combination of the 2nd type transition in one side with 3rd type in the other side (8,11,13,21)

Classification Design

The Castellvi classification system is grounded on the coronal views of lumbosacral transitional vertebrae (LSTV) but not on the sagittal or axial views. (9)

Bertolotti Syndrome is usually diagnosed with the conventional modalities, such as plain radiograph of the lumbosacral spine (using lateral and Ferguson radiographs), but CT scan or MRI can be utilized from now and then for this purpose. (10,11)

Treatment modalities for low back pain due to Bertolotti Syndrome include the following, separately or in combination

1. Analgesics, including NSAIDs
2. Physiotherapy& stabilization, and strengthening home exercises
3. Lumbosacral and pseudoarticulations local injections commonly use the combination of lidocaine/triamcinolone acetate
4. Surgical interventions
5. Radiofrequency ablation (RFA) (22)

Lumbosacral transitional vertebrae (LSTV) may be complicated by accelerated disc degenerative changes at the level of lumbar vertebrae above the defect due to changed biomechanics or ascribed due to augmented movement at the section above the LSTV, although the normal range of motion remains intact due to compensation from the remaining normal lumbar movements. In general. The occurrence of transitional lumbar vertebrae has been connected to an increased risk for degenerative spine disorders, disc herniation, and low back pain. (12,18)

Case Description

A 28-year-old single female presented in December 2022 with lower back pain that was deep, dull in character, non-radiating, and localised to the lower back. The pain was continuous but increased with daily home activities. At all, there was no previous history of trauma. Her past medical history is not significant apart from sickle cell trait.

At that time, the examination was not conclusive, with minimal low back left paraspinal tenderness. Plain radiographic studies demonstrate elongation of the L5 transverse process and sacralization of L5 vertebrae. Otherwise, both hips, sacrum, ilium, sacroiliac joints, and other lumbar spines are normal.

Magnetic resonance imaging (MRI) was performed, which revealed a fusion of the transverse process of L5 to the sacrum with uncomplicated two-sided pseudoarticulations, which confirmed a diagnosis of Bertolotti's Syndrome. This pain initially responded to NSAIDs with complete resolution of her symptoms.

In June 2024, she suffered again from low back pain with the same character, but she added left lower limb paresthesia. On initial evaluation, she was vitally stable. On physical examination, spinal movement produced pain on forward flexion, with negative straight leg raise tests on both sides. The reflexes, sensations, and lower limb power examination were intact.

Magnetic imaging study of the lumbosacral spine at the recent visit shows symmetrical central posterior disc at the level of L4 & L5, causing indentation of the ventral aspect of thecal sac and mild bilateral neural foraminal narrowing and nerve root compression.

Again, conservative management with analgesia and home physiotherapy was advised. Pregabalin in escalating doses was in progress, waiting for the response, and if no undoubted improvement was achieved, then subsequently, the next step was to send her to a specialized pain clinic, planned to commence local steroid injection.

Discussion

While sacralization of the L5 vertebra is thought to be one of the potential causes of low back pain, other congenital or acquired spinal pathologies (like disc prolapse) can aggravate the pain of the associated Bertolotti and cause considerable confusion. (14)

Various degenerative disc diseases are often seen at the disc space immediately above and next to the anatomically anomalous vertebrae. Consequently, an LSTV is considered a risk factor for premature degenerative disc disease at that level. (15)

Otani et al. in 2001 anticipated that most patients with an LSTV had a symptomatic disc disease at the suprajacent level to the LSTV (as in this case) and at an earlier disc degeneration and herniation than their counterparts without transitional vertebrae. It suggests that this may be due to altered biomechanics that exacerbate the tension in the segment above. (16)

As in another similar case, Alonzo et. al, the cause of our patient's complaint was not clear and may be related to the pseudoarticulations of L5 to the sacrum or the degenerative disc at the superjacent level to the LSTV. Additionally, the patient's neurological signs may diverse from the MRI results, increasing the risk of an inappropriate medical act or performing a spinal procedure at the incorrect anatomical segments. At this point, local steroids may represent a valuable diagnostic implementation to discriminate between these two possibilities by complete pain resolution if pseudoarticulations was injected, but with remnant pain if the pain originated from degenerative disc disease and the consequential nerve root irritations. (17,18)

Despite all the previous evidence, only borderline indicators exist about the cause of pain in Bartoletti syndrome, so meaningful knowledge about these vertebral anatomical anomalies is vital for various specialists in different medical and surgical fields who deal with many clinical conditions, such as atypical low back pain, among others. (19,20)

Conclusion

Bertolotti's syndrome is not an infrequent cause of low back pain that may present early in life, causing early spinal disc degeneration with consequent disc herniation and other spectrum of degenerative disc disease. It is sometimes a diagnostic challenge and a step away from the proposed approaches.

References

1. French DH, Somasundaram AJ, Nathan R, Schaefer NR. Laherty RW. Lumbosacral Transitional Vertebrae and Their Prevalence in the Australian Population. Global Spine J. 2014; 4:229–232.
2. Aebi M. Transition anomalies at the lumbosacral junctions. Eur Spine J. 2012; 21:1223–24
3. Paraskevas G, Tzaveas A, Koutras G, Natsis K. Lumbosacral transitional vertebra causing Bertolotti's syndrome: a case report and review of the literature. Cases Journal. 2009; 2:8320
4. Barkhane Z, Belaaroussi S, Foudail M. Bilateral Bertolotti's Syndrome: A Case Report of an Uncommon Presentation of Chronic Low Back Pain in an Elderly Patient. 2022. July.05; Cureus 14(7): e26569.
5. Alinda NO, Mugarura R, Malagala J, Kisembo H. Prevalence, patterns, functional disability of Bertolotti syndrome among patients with low back pain at Mulago National Referral Hospital. Afri Health Sci. 2022;22(4):168-177.
6. Almeida et al. Transitional low back pain. Arq Neuropsiquiatr 2009;67(2-A):268-272

7. Adams et al. Surgical Treatment of a Rare Presentation of Bertolotti's Syndrome from Castellvi Type IV Lumbosacral Transitional Vertebra: Case Report and Review of the Literature. J Neurol Surg Rep.2018; 79:70 74.
8. Mahmoodkhani et al. Lumbosacral transitional vertebra in spondylolisthesis: frequency, demographic findings, and clinical characteristics. BMC Musculoskeletal Disorders. .2024; 25:243
9. Tatara et al. Changes in Lumbosacral Anatomy and Vertebral Numbering in Patients with Thoracolumbar and/or Lumbosacral Transitional Vertebrae. The Journal of Bone and Joint Surgery 2021;6(3) e20.00167.
10. Karki S, Paudel R, Phuyal A, Bhandari A. Lumbosacral Transitional Vertebrae amongst the Individuals Undergoing Magnetic Resonance Imaging of the Whole Spine in a Tertiary Care Hospital: A Descriptive Cross-sectional Study. J Nepal Med Assoc 2021;59(242):975-8
11. Konin GP, Walz DM. Lumbosacral Transitional Vertebrae: Classification, Imaging Findings, and Clinical Relevance. AJNR Am J Neuroradiol.2010; 31:1778–86
12. Verhaegen JCF et al. Prevalence of Lumbosacral Transitional Vertebral Anomalies Among Healthy Volunteers and Patients with Hip Pathology. The Journal of Bone and Joint Surgery Open Access d 2023: e22.00095.
13. Hou et al. Lumbar plain radiograph is not reliable for identifying lumbosacral transitional vertebra types according to Castellvi classification principles. BMC Musculoskeletal Disorders. 2020; 21:333
14. Evgeny G. Skryabin. Sacralization of the L5 vertebra (Bertolotti syndrome): literature review. Genij Ortopedii, 2022; 28,726- 33.
15. Vergauwen S et al. Distribution and incidence of degenerative spine changes in patients with a lumbo-sacral transitional vertebra. Eur Spine J.1997; 6:168-172
16. Crane J et al. A Comprehensive Update of the Treatment and Management of Bertolotti's Syndrome: A Best Practices Review. Orthopedic Reviews. Orthopedic Reviews. 2021;13(1).
17. Alonzo1 F, Cobar A, Cahueque M, Prieto JA. Bertolotti's syndrome: an underdiagnosed cause for lower back pain. Journal of Surgical Case Reports, 2018;10: 1–4
18. Krenn et al. The morphological consequences of segmentation anomalies in the human sacrum. Am J Biol Anthropol. 2022; 177:690 707
19. McGrath K et al. Clinical assessment and management of Bertolotti Syndrome: a review of the literature. The Spine Journal. .2021; 21:1286−96
20. Naznin R, Moniruzzaman M, Sumi S, et al. Sacralization of Coccygeal Vertebra: A Descriptive Observational Study in Bangladesh. 2022; Cureus 14(7): e27496
21. Faiz N, Anuar S, Khairuddin K, et al. Prevalence and severity of Bertolotti's syndrome in Malaysia: A common underdiagnosis. Malays Fam Physician. 2022;17(3):121–127
22. Nolan J. Brown, BS, Pennington Z. et al. Techniques for restoring optimal spinal biomechanics to alleviate symptoms in Bertolotti syndrome: illustrative case. J Neurosurg Case Lessons.2023; 6(25): CASE23467

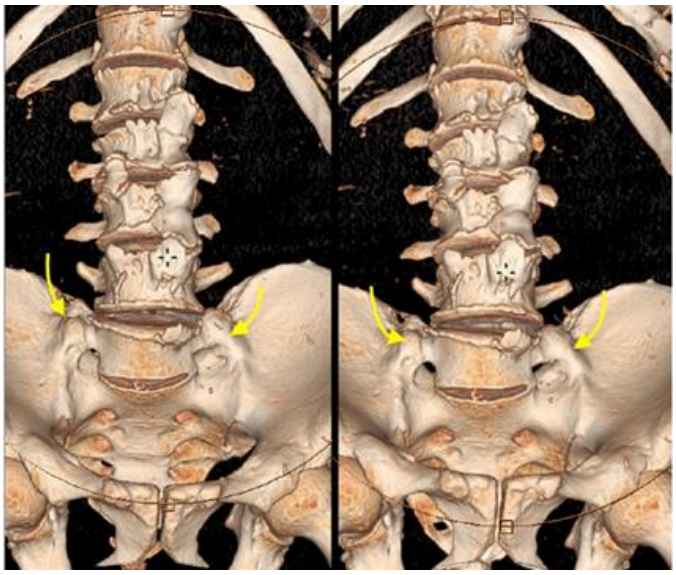

Figure 1: A 3-dimensional CT Scan section showing bilateral elongated transverse processes of L5 (yellow arrows) fused with the sacrum and ilium. (4)

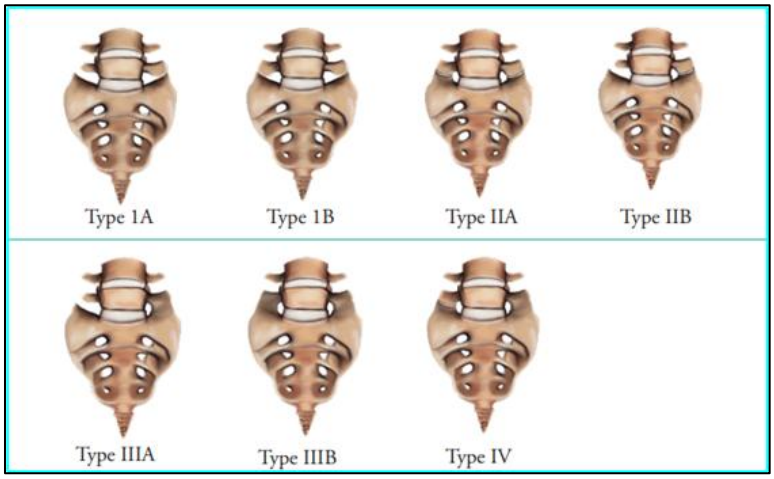

Figure 2. The Castellvi Classification Design