

# Interpretation and Therapeutic Intervention of Lumbosacral Transitional Vertebra (LSTV)

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## ABSTRACT

**Background:** The lumbosacral transition vertebra (LSTV) is a rare anatomical variation of the lumbar vertebra characterized by pseudo formation of the transverse process between the lumbar vertebra and the sacrum or ilium with or without various symptoms including pain at back or buttock, movement difficulties, range of motion limitations, postural problem, anatomical shifting or deviation, biomechanical alteration and leg pain.

**Case Presentation:** Here, Researcher describe the clinical presentation, diagnostic evaluation, and successful management of a case of symptomatic unilateral lumbosacral transitional Vertebra (LSTV) using evidence-based physiotherapy treatment. The case presented with lower back pain, was confirmed on clinical presentation and X-ray. The patient was managed with physiotherapy treatment as a gold standard treatment option & home advice with regular follow-up in relieving pain, improving flexibility and stability, improving function and prevention of recurrences with improvement of Quality of life.

**Conclusion:** The accuracy of diagnosis and evidence-based physiotherapy treatment is the golden standard for the management of LSTV.

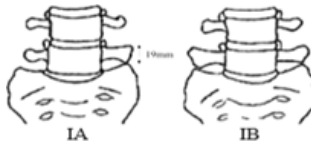
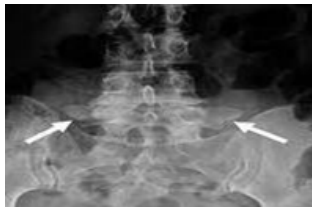
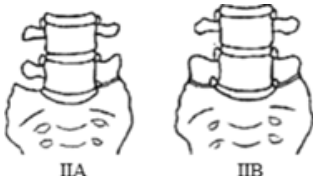

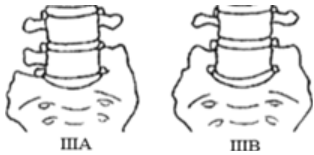
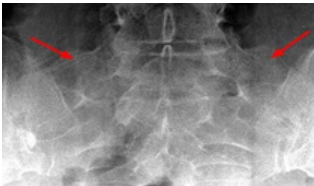
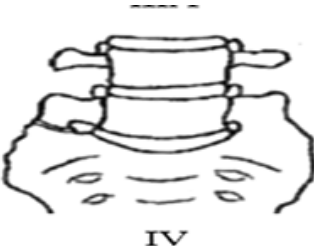
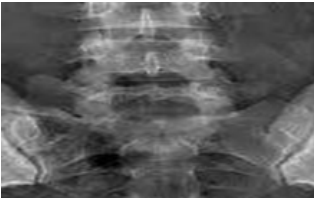
**Keywords:** Lumbosacral Transitional Vertebrae (LSTV); Diagnosis; Physical Therapy

## Introduction

Lumbosacral Transitional Vertebrae (LSTV) is the rare medical term used to describe congenital or acquired of the lumbosacral vertebral junction abnormalities associated with or without pain at the lower back (Almeida, et al. [1]). LSTV commonly presents as fusion of the transverse processes between the lumbar vertebra and the sacrum or ilium [2]. The incidence as low as 7% and 5.9%, respectively [3,4] and another study observed a rate of 30% of

LSTV among lower back pain patient (male>female) [5]. Bony palpation and reliable imaging (X-ray, MRI, CT scan) a crucial for analysis and management of patients with LSTV as it allows health specialists to appropriately investigate and diagnose the LSTV and its biomechanical or structural defect [5,6]. Early Identification, effective care, and treatment outcomes depend upon the diagnostic classification of LSTV. As a result, the LSTV divided into four categories [7] (Table 1).

**Table 1:** Diagnostic classification of LSTV [6].

Type	Description	Anatomical Feature	Example with Imaging
Type I	Dysplastic transverse processes	Unilateral (Ia) Bilateral (Ib) T. processes >19 mm in width	
Prevalence 41.72%		Prevalence with reports of low back pain 46 %	
Type II	Incomplete lumbarization /sacralization	Enlarged transverse Process unilateral (IIa) or bilateral (IIb) pseudoarthrosis with sacral ala	
Prevalence 41.40%		Prevalence with reports of low back pain 73%	
Type III	Complete lumbarization /sacralization	Enlarged transverse process unilateral (IIIa) or bilateral (IIIb) complete fusion with sacral ala	
Prevalence 11.50%		Prevalence with reports of low back pain 40%	
Type IV	Mixed type	Type IIa present on one side and IIIa present on another side	
Prevalence 5.20%		Prevalence with reports of low back pain 66%	

## Diagnostic Classification System of Lumbosacral Transitional Vertebrae

Castellvi, Goldstein & Chan (1984) found that 30% of individuals with sacralized LSTV had back pain with or without disc degeneration, difficulties in movement, patterns with limited range of motion, presented with abnormal posture and complained of leg pain or buttock pain. Patients with Low back pain (LBP) with or without an LSTV are conservatively managed at first with non-steroidal anti-inflammatory drugs (NSAIDs), exercise-based therapy (PT), spine stabilization interventions and manipulation [1]. To reduce the cost and burden of surgical management, physiotherapy is the gold standard for conservative treatment of LSTV-induced back pain. Hence, there is urgency to establish a comprehensive physical therapy guideline to manage patients with the LSTV induced back pain.

### Case Description

The patient was a 22-year-old male Bangladeshi garments worker referred to the physiotherapy department with chief complaints of LBP and decreased mobility. The LBP was of insidious onset, lasting 4 months while the patient was lifting an object at his workplace. He underwent conservative medical treatment by a village doctor who prescribed NSAIDs, muscle relaxants and

calcium. The patient was also relieved from work for 2 weeks. These interventions did not change the patient's LBP and complication. Upon returning from deployment, the patient was seen initially by a primary care physician for the same complaints. The physician ordered lumbar radiographs with routine examination which were reviewed by the radiologist. Physician prescribed more medication and referred the patient to physical therapy with a primary diagnosis of mechanical LBP.

At the time of the physiotherapy evaluation the pain was described as a moderate 6 out of 10 on the Visual Analog Scale (VAS) and was in the right lower back region just inferior to the right posterior superior iliac crest, radiating into the right lower buttock. Pain was aggravated by bending forward, sitting for longer than 20 minutes, and when carrying any heavy object. He denied any radicular pain or numbness and tingling into the lower extremities as well as bowel and bladder dysfunction. He had no other previous or current medical conditions that required further medical attention. The disability level was severe (68%) based on Oswestry Disability Index (ODI). Radiograph review revealed a right-sided elongation of the L5 transverse process resulting in a non-fused joint with the consistent with a Castellvi type IIA LSTV (Figure 1).

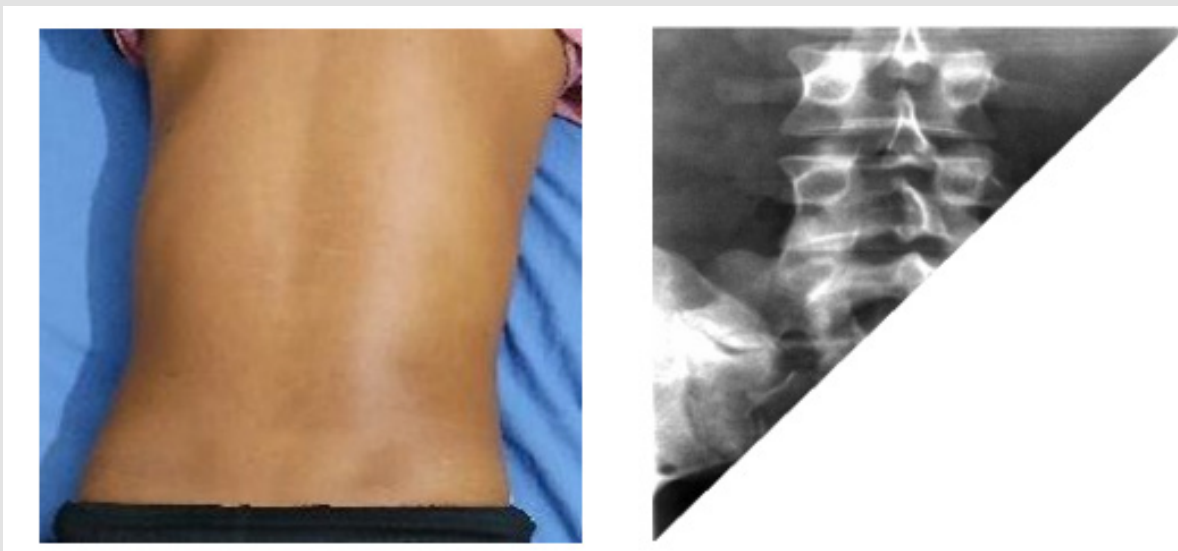


Figure 1: Castellvi type IIA LSTV.

### Diagnosis

Data was collected from the subjective and objective examination were used following impressions. The patient had a 4-month history of LBP that went unresolved since the initial onset despite pharmaceutical intervention. He had an initial pain rating of 6 out of 10 on the VAS, Postural abnormality, Decreased

lumbar range of motion and severe disability (ODI; 68%). It was hypothesized that the patient's LBP was associated with hypomobility in the lumbar spine because of Castellvi type IIA LSTV.

### Physiotherapy Intervention

The patient underwent outpatient physiotherapy treatment

every alternate day for six weeks. Each session was 30 minutes. Clinicians started the initial session with assessment for the diagnosis and management. The treatment of the case started with postural re-education for improving, coordination and adaptability [8]. The directional preference exercise (flexion) was primarily used as movement therapy. Pilates was also used to enhance core flexibility, strength, stability & conscious use of core muscles [9]. Clinicians applied unilateral posterior anterior mobilization as the manual therapy treatment for LSTV. A randomized study reports that performing unilateral posterior anterior mobilization 5 times per week for 2 weeks is an efficient treatment for reducing low back pain, improving ROM, and reducing related disability for patient

with LSTV [10]. Joint mobilization and PNF (40 min for three days in a week for four weeks) is effective on the spinal mobility, discomfort, and thickness of the multifidus muscle. A case reported that Lumbosacral region Manipulation, flexion exercises and caudal mobilization along with other usual care are also effective in sacralized LSTV to reduce back pain and increase mobility [11-15]. Manual therapy, soft tissue, and mobilization therapeutic exercise have also been proven beneficial in reducing pain in patients with LSTV and is usually tolerated well with no side effects. Patient was administered an impairment-based home exercise program (Figure 2).



Figure 2: Manual Therapy.

## Discussion

LSTV is a lumbosacral vertebral abnormality in which an elongated process of the last vertebra fused with varying degree to the sacrum. Several studies documented different treatment strategies to effectively reduce back pain and improve mobility. In this patient population both surgery and conservative treatment can be effective for treating LSTV. Patients who complain of back pain with or without LSTV usually complete conservative treatment including NSAIDs, and physiotherapy [1]. It was also recommended that positional changing exercise and spinal movement therapy can improve symptoms by increasing muscle strength, coordination, and adaptability [5]. Unilateral anterior-posterior mobilization has long been an efficient treatment to reduce back pain and improve range of motion in patients with type Ia and IIa LSTV [2]. Lumbosacral region manipulation, flexion exercises and caudal mobilization along with other usual care are also effective in interventions for patients with given the prevalence of LSTV to reduce back pain and increase mobility [3]. There's a need for the investigation of a structured guide related to LSTV (I, II, IIIa) to bring desired outcome. The successful resolution of patient's symptoms relies on accurate diagnosis. It can be incorporated in practicing to LSTV cases concentrating with diagnosis, exclusion of associated

factors, planning and progression of interventions. Further clinical observation related to physiotherapy management is needed with larger sample sizes and more standardized measurements of clinical outcomes to determine best comprehensive clinical practices. This case study will partially fulfill the continued demand of diagnosis and practice of physiotherapy in LSTV cases.

## Conclusion

Although LSTV was first described almost a century ago, discussions continue prevalence, clinical significance, radiographic identification, and treatment. The presence of LSTV has caused a lot of pain, dysfunction, reduced participation in activities, and quality of life. Conservative management continues to be a gold standard treatment option but successful intervention that depends upon the diagnosis and pattern of involvement. Physiotherapy plays an important role in relieving signs & symptoms, improving function, increasing flexibility, stability, and preventing of recurrences with a goal of improving quality of life.

## Declarations

### Ethical Approval and Consent to Participate

This report obtained the approval from the Institutional Review

Board (IRB) (CRP/BHPI/IRB/10/2022/675) on 25th October 2022, without any requirement.

### Consent for publication

Written Informed consent was taken from the patient for the publication and any accompanying images. A copy of consent is available for review by editor-in Chief of this journal.

### Availability of Supporting Data and Materials

The assessment and evaluation form are available of this case.

### Competing Interests

All the authors disclose no conflicts of interest relevant to this publication.

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The manuscript was developed with researcher's own resources.

### Authors Contribution

The conception and design of this publication, the data collection, medical record analysis and interpretation was the responsibility of Md. Ershad Ali and Golam Nobil. The other phase of process (reports writing, analysis and manuscript preparation) completed with the help of Prof. Dr. Md. Forhad Hossain & Samena Akter Kakuli. The total process was developed under the supervision of Mohammad Anwar Hossain.

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