ORIGINAL ARTICLE

# LUMBOSACRAL TRANSITIONAL VERTEBRAE IN PATIENTS VISITING TERTIARY CARE HOSPITAL OF KHYBER PAKHTUKHWA: A RADIOLOGICAL STUDY

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**Background:** Lumbosacral transitional vertebra is a common anatomical variant of the spine that possibly is related to low back pain. The objective is to determine the frequency of Lumbosacral Transitional Vertebrae on lumbosacral radiographs in patients with low back pain visiting Neurosurgery OPD of Khyber Teaching Hospital Peshawar Khyber Pakhtunkhwa (KP). **Method:** This cross-sectional study was conducted on radiographs of lumbosacral spine in patients visiting for low back pain to the Neurosurgery OPD of Khyber Teaching Hospital Peshawar. A total of 300 anteroposterior (AP) and lateral lumbosacral plain radiographs were studied for the variation in lumbosacral spinal segment. The transition was classified according to the scheme used by Castellvi. **Results:** Among a total of 300 patients, normal anatomy of lumbosacral segments was observed in 215 patients (72%). About 85 cases (28%) showed Lumbosacral Transitional Vertebrae. The relationship of vertebral variation with age and gender was not observed. With regard to morphology, 29 (34.1%) patients had Castellvi type I, 26 cases (30.5%) were observed with Castellvi type II and 12 patients (14.1%) had type III while 18 cases (21.2%) had type IV transitional morphology. **Conclusion:** Lumbosacral Transitional Vertebrae are commonly found in patient with low back pain. Identification of Lumbosacral Transitional Vertebrae is clinically important to prevent an intervention at an incorrect vertebral level.

**Keywords:** Lumbosacral Transitional Vertebrae; Low back pain; Lumbosacral radiographs

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## INTRODUCTION

Lumbosacral transitional vertebra (LSTV) is common anatomical variant of the spine observed at L5–S1 vertebral level.[1,2] It is a common congenital anomaly of spine, and the mutation in Hox gene is responsible for LSTV characterized by elongation of transverse process of the lower lumbar vertebra with some degree of fusion to the upper sacral segment.[3,4] It involves both lumbarization of upper sacral segment and sacralisation of the lower (Fifth) lumbar vertebrae.[5] The incomplete or unilateral transition is seen in majority of the cases.

Lumbosacral transitional vertebra is commonly found in the general population with low back pain.[6] The transition is also observed with high risk of degenerative changes of the disc.[7] Patients with LSTV are likely to be more prone to numerous secondary pathologic spinal conditions such as stenosis of spinal canal, facet joint arthrosis and intervertebral disc herniation.

The manifestation of LSTV is best recognised on Ferguson view which is taken at 30° angle with anteroposterior view of the lumbosacral junctions.[8] Moreover, the anteroposterior view of the thoracolumbar junctions also helps in evaluation of the spine.[9] The identification of iliolumbar ligament on magnetic resonance imaging (MRI) which usually arises from the L5 vertebra may help in identification of LSTV. However, this method is not recommended in cases having anomalies of thoracolumbar junction.[10]

It is essential to adopt a reliable technique not only to detect LSTV but also to define the accurate site and type of the pathology caused by the transitional segment. A classification scheme for LSTV was suggested in 1984 by Castellvi *et al*[11], that was established on morphologic characteristics on radiographs. Furthermore, it is mandatory to identify the LSTV in patients recommended for surgical or interventional procedures.[12] The vertebral variation may responsible for improper documentation of vertebral segments which can lead to surgery at incorrect spinal level.[13] The purpose of this study is to determine frequency of Lumbosacral Transitional Vertebrae on lumbosacral radiographs in patients with low back pain visiting Neurosurgery OPD of Khyber Teaching Hospital Peshawar Khyber Pakhtunkhwa (KP).

## MATERIAL AND METHODS

The current study was conducted in a Tertiary Care Hospital (Khyber Teaching Hospital) in Peshawar. The duration of study was 4 months. A total of 300 radiographs of lumbosacral spine in patients visiting for low back pain to the Neurosurgery OPD of Khyber Teaching Hospital Peshawar were reviewed. Their age ranged between 17 and 60 years. The Anteroposterior (AP) and lateral lumbosacral radiograph was studied for the variation in lumbosacral spinal segment.

Patients with severe spinal deformity, spinal trauma, severe infections and malignant vertebral lesions were excluded from the study. Moreover, any incomplete scans, scans with major artefacts or poor visualization were also excluded from the study. The morphology of lumbosacral transitional vertebrae was classified by applying system used by Castellvi (Table-1).[11] Data was analysed using SPSS 20.0.

## RESULTS

The study group included 170 (56.7%) females and 130 (43.33%) males. Normal anatomy of lumbosacral segments was observed in 215 patients (72%). About 85 cases (28%) showed Lumbosacral Transitional Vertebrae. The relationship of vertebral variation with age and gender was not observed. With regard to morphology, 29 (34.1%) patients had Castellvi type I, 26 cases (30.5%) were observed with Castellvi type II and 12 patients (14.1%) had type III while 18 cases (21.2%) had type IV transitional morphology.

**Table-1: Castellvi Classification for LSTV**

| Castellvi Type | Description |
|---|---|
| Type I | Dysplastic transverse processes, measuring 19 mm in width |
| Type II | Enlargement of transverse process with false joint with sacrum (incomplete lumbarization/ sacralisation) |
| Type III | Enlargement of transverse process with complete fusion with sacrum (complete lumbarization/ sacralisation) |
| Type IV | Type II on one side and type III on contralateral side |

Type a = unilateral and Type b = bilateral

**Table-2: Frequency of LSTV based on Castellvi classification. (n= 85)**

| Observed LSTV | Frequency | Percentage |
|---|---|---|
| Type I | 29 | 34.1 |
| Type II | 26 | 30.5 |
| Type III | 12 | 14.1 |
| Type IV | 18 | 21.2 |

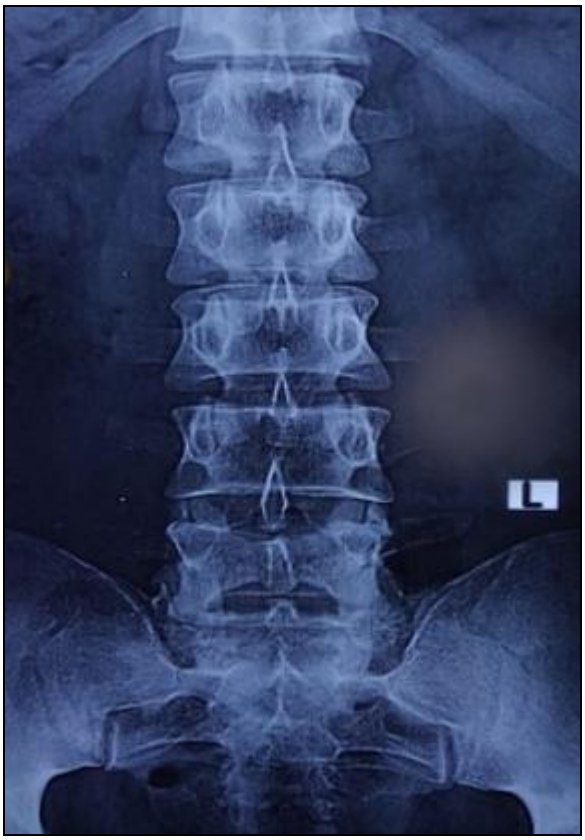


**Figure-1: Normal Radiograph of Lumbosacral spine**

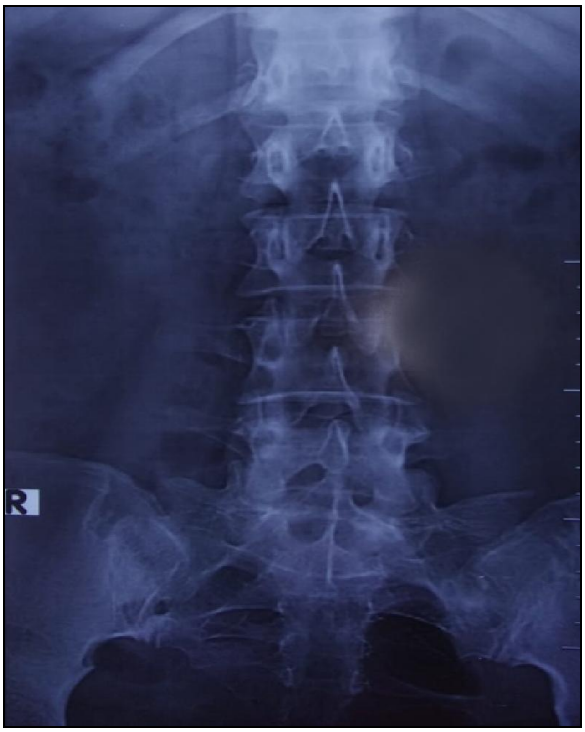


**Figure-2: Fusion of right and left sides of transverse process of L5**

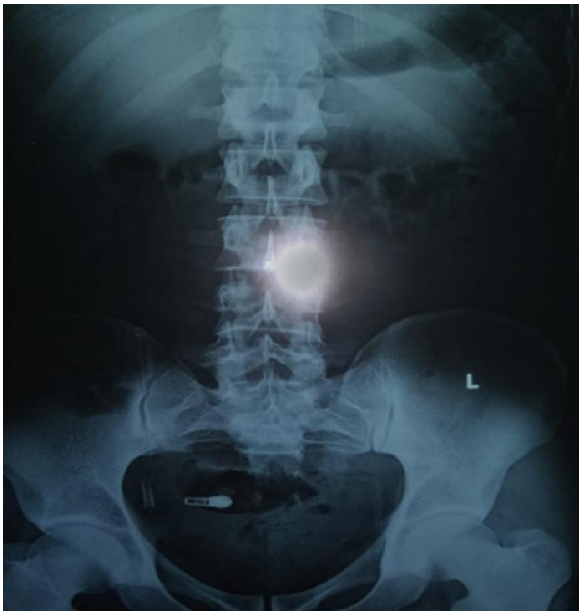


**Figure-3: Fusion of right-side transverse process of L5**

## DISCUSSION

This study has been undertaken to assess the lumbosacral congenital anomaly LSTV (lumbosacral transitional vertebra) with the plain radiographs of spine. In this context, patients visiting the Neurosurgery OPD of Khyber teaching hospital with complaint of low back pain were studied to get our objective. The incidence of LSTV is seen worldwide in association with low back pain. The prevalence of LSTV was 28% out of 300 patients in the present study. The reported prevalence of LSTV in the literatures differs and has ranged from 4–30%.[14,15] This wide difference could be due to differences in individual classification and diagnostic measures or difference in imaging techniques.[13]

Our study is in line with study carried out by Alexios Apazidis in 2011 that reported the common anatomical variant of LSTV was the Castellvi Type I. It is inconsistent with a study done by Vijay Sekharappa in 2014, reported high occurrence of type II pattern in their study.[16]

The relationship of vertebral variation with age and gender was not observed in our study, These findings were in accordance with the observations of Bekir Yavuz Uça *et al*[17] but not in consonance with study by Magora A, Schwartz A[16] who reported significantly low incidence of LSTV in females.

Numerous causes have been recognised for low back pain, among which (LSTV) is the most common cause. Several studies have supported the association of LSTV with back pain; the reason could be degeneration of adjacent segments leading to faulty joint which can disturb the biomechanics of weight transmission at the affected segment of spine [18]. The current study also shows the remarkable relationship of the LSTV and low back pain as all patients included in the study came with the same complaint, which is in agreement with study done by Bekir Yavuz Uça *et al* done in 2014, reported that lumbosacral transitional segment is commonly found with pain in lower segments of spine.

Our study demonstrates that LSTV is fairly found in our local population. The outcome of the spinal surgeries influenced by identification of the accurate level of vertebrae. Documenting type of spinal variation will assist to avoid wrong site surgery and also has forensic implications.

## CONCLUSIONS

Lumbosacral Transitional Vertebrae are frequently found in patient with low back pain. Identification of Lumbosacral Transitional Vertebrae is clinically important to prevent an intervention at inappropriate vertebral level.

## AUTHORS' CONTRIBUTION

SA: Concept of main theme, study design and write up. HI: Data collection, analysis and interpretation. ZR: Literature search. SA: Proof reading. FG: Assist in data collection. AN: Minimizing plagiarism.

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