

## Case Report

# A CASE REPORT OF A VARIANT OF LUMBO-SACRAL TRANSITION VERTEBRAE: CASTELLVI TYPE IIA SACRALISATION

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## ABSTRACT

Lumbosacral transitional vertebra (LSTV) are congenital anomalies of the lumbosacral spine causing sacralisation or lumbarisation. Sacralisation has been defined as an abnormality where one of the transverse processes of L5 vertebra may articulate or fuse with the sacrum. The sacralisation has been studied for almost a century for its association with low back pain as "Bertolotti Syndrome", but there are studies for and against its association. Castellvi in 1984 had propounded a radiographical classification identifying sacralisation in four sub types. Out of this, the Type IIA, is the least prevalent wherein there is a unilateral articulation of the L5 transverse process with the sacral ala. In spite of the controversy, there is a high association of low back pain with disc degeneration, nerve root compression and degenerative facet joints observed with this condition. It is a widely researched vertebral anomaly for its anatomical, developmental and clinical ramifications.

**KEY WORDS :** Lumbosacral vertebra, Sacralisation, Low back pain.

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## INTRODUCTION

Lumbosacral transitional vertebrae (LSTV) are congenital anomalies of the vertebrae where the fifth lumbar vertebra (L5) may articulate with the sacrum producing sacralisation or the highest sacral vertebra may show a transition to a lumbar type causing lumbarisation [1,2]. One of the earliest to describe these anomalies was T. Manners Smith in 1909 where he explained the articulation or fusion of the costal element of the L5 transverse process (TP) with the sacrum producing sacralisation. The etiology explained referred to a mechanical force in utero [3]. In 1917, Bertolotti explained the relationship of LSTV with low back pain, which subsequently came to be known as "Bertolotti Syndrome" [4].

Since then, this condition has been researched over a century for its anatomical and clinical implications. Castellvi in 1984 [5], devised a radiographic classification system under which the sacralisation was identified into four types:

Type IA: A unilateral dysplastic TP with cranio caudal dimension of 19 mm

Type IB: Both TPs cranio caudal height greater than or equal to 19 mm

Type IIA: Presence of unilateral articulation between the enlarged TP and the sacrum.

Type IIB: Presence of bilateral articulation between the TP and the sacrum.

Type IIIA: Unilateral osseous fusion of the TP and the sacrum.

Type IIIB: Bilateral osseous fusion of the TP and the sacrum.

Type IV: Unilateral Type II transition (articulation) with a Type III (fusion) on the contralateral side.

LSTV are common in the general population and its prevalence may vary from 4-30% [1,2] while its association with low back pain ranges from 6-37% [6,7,8]. Other studies have mentioned the overall prevalence of sacralisation to be 1.7%-11.6% [2] with Castellvi type II prevalent in 2.7% of the population, especially amongst young males [9,10,11]. The wide variability in its prevalence has been explained due to different diagnostic criteria, observer error and imaging techniques utilized by various researchers in its identification [1,9]. There are studies which support the association of low back pain with LSTVs [5,12,13] while others do not agree to any correlation [6,7,14]. This debate on low back pain and LSTV with a diverse prevalence rate and a difficult diagnostic criteria has kept studies on LSTVs alive since Bertolotti explained it almost a century ago. The case report here is of a type IIA Castellvi sacrum extracted from a cadaver in the Department of Anatomy.

### MATERIALS AND METHODS

A sacrum of Indian origin of an unknown age was retrieved from the departmental burial ground. It was washed with soap water and exposed to 6% hydrogen peroxide in 50:50 concentration for 72 hours. The specimen was subsequently dried and studied for its anatomical presentation. The TP dimension in its cranio-caudal axis was measured by a digital vernier caliper. It was documented by photographs at various angles to exhibit its features.

### OBSERVATIONS

On examination, the L5 transverse process of the right side presented an articulation with the ala of the sacrum, while the transverse process of the left side presented a cranio-caudal length of 9.38mm with no abnormal broadening or elongation (Fig. 1,2,3 & 4). The sacral hiatus was normal (Fig.5). There was no other bony abnormality observed.

The sacrum presented here is of Type IIA as per Castellvi's classification on sacralisation. It describes a sacrum of type IIA as having a

unilateral articulation of the L5 transverse process with the sacral ala with a normal TP on the contralateral side.

**Fig. 1:** Anterior View of L5 and sacrum. The Lumbosacral transition vertebra showing Castellvi IIA type of Sacralisation with unilateral articulation of L5 transverse process with the sacral ala. The sacrum does not exhibit any other abnormal presentation.



**Fig. 2:** Superior view of L5 and sacrum. The Lumbosacral transition vertebra showing the articulation of the L5 right transverse process with sacral ala. The transverse process of the left side is normal.



**Fig. 3:** The cranio caudal height of the transverse process of L5 on the left side is 9.38 mm. This suggests that there is no abnormal broadening or elongation of the transverse process. A cranio caudal dimension of more than 19mm is abnormal.



**Fig. 4:** Lateral view of L5 and sacrum. The nerve roots may get compressed between the transverse process and the sacral ala.





**Fig. 5:** The posterior view of L5 and sacrum. The Lumbo-sacral transition vertebra showing the articulation of the L5 transverse process to sacral ala on the right side while there is no such articulation with the sacrum in the left side. The transverse process on the left side is normal.



## DISCUSSION

Among sub types of sacralisation, Castellvi's Type IIA is least prevalent at 1.6% [6] while the highest prevalence of 5.5-14.7% is seen in Castellvi type IA [6,10]. The Type II sacrum has been studied for association with back pain as a part of Bertolotti syndrome [4,11] however many authors do not see any correlation. This controversy is due to an incomplete understanding of the variations in the lumbosacral anatomy and an absence of a comprehensive classification system [6]. The dysplastic transverse processes in the Type I is generally considered to be of no clinical significance, but the etiologies behind the low back pain associated with type II sacralisation maybe due to nerve root compression between the hypertrophic TP of L5 and the sacral ala, may arise from an abnormal articulation between the TP and the sacral ala or may present in the opposite side of the lower back as a facetogenic pain due degenerative changes in the joint [2]. Type IIA sacralisation exhibits an accelerated disc degeneration and disc protrusion above the transitional vertebra due to an abnormal torque and hypermobility, with a protective action on the disc below due to restriction in the rotational and bending movements as a result of stabilization provided by the anomalous articulation [1,2,5,14,15,16]. Castellvi in his observations had associated the Type II with presence of disc herniation at the level of transition with a greater incidence at a level just above the transition vertebra [5]. Extraforaminal stenosis is more often observed in type I.

Vergauwen [16] has observed that the abnormal vertebra is in itself not a risk factor for spinal degenerative changes but if it does occur, it is at the suprajacent level of the transition vertebra. Significant association have also been found with presence of cervical ribs in the presence of sacralisation suggesting developmental anomalies [17]. Recent studies have hypothesized presence of mutations in the HOX genes which are involved with the normal patterning of the lumbosacral vertebrae to be one of the factors for LSTVs [2].

As LSTV with associated low back pain is still under debate, the presence of the abnormal vertebral morphology is diagnosed as a coincidental finding in many instances. The correct diagnosis of the condition is important for spinal surgeries [2]. Reliable diagnosis is done by imaging in Ferguson position using anteroposterior view angled cranially at 30 degrees collated with the Castellvi's radiographic classification. CT and sagittal MRI images study the height and morphology of the disc for various sub types of LSTVs but type IIA sacralisation is best diagnosed by radiographs and coronal MR images [1]. The treatment is conservative in nature with local injection of corticosteroids at the abnormal articulation and at the contralateral facet joint. Surgery is envisaged for cases with failed conservative treatment involving radiculopathies, degenerated discs and intransigent facetogenic pain [1].

## CONCLUSION

Castellvi's type IIA is a type of LSTV prevalent in 1.6% of the population. The condition has been studied by various authors over the years and no concrete explanation has been given for its relationship with low back pain. However, the condition has been associated with nerve compression, degenerative joint or presence of disc pathology which is postulated as the reasons for the pain or as a coincidental finding. The treatment is conservative with surgery indicated only for the most intractable pain.

## List of Abbreviations:

LSTV : Lumbo Sacral transition vertebra  
TP: Transverse process

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### Conflicts of Interests: None

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