



MR IMAGING OF TRANSITIONAL LUMBOSACRAL JUNCTION: CO-INCIDENTAL OR CAUSATIVE FACTOR FOR THE DISC DEGENERATION AND HERNIATION

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ABSTRACT

Lumbosacral transition vertebra (LSTV) is the most common congenital anomaly of the lumbosacral spine and may manifest either as sacralisation or lumbarisation. It is necessary to recognize and to describe about it in the report, so that it could avoid the operations or procedures performed at the wrong level. An association of low back pain with LSTV remains controversial. Some of the authors reported increased disk degeneration to the level above the LSTV. This study aims at determining the prevalence of lumbosacral transition vertebra (LSTV) and also to study its significance with respect to clinically significant spinal symptoms, disc degeneration and herniation.

KEYWORDS

Sacralization, Lumbarization, LSTV, Castellvi classification, Pfirrmann grading, Disc degeneration, disc herniation

INTRODUCTION:

Lumbosacral transition vertebra (LSTV) is the most common congenital anomaly of the lumbosacral spine and can be seen in ~25% (range 15-35%) of the general population^{1-3,8}. Non-recognition and/or poor description in the report can lead to operations or procedures performed at the wrong level.

It may manifest either as sacralisation of L5 vertebra or lumbarisation of S1 vertebra. There can be a varying degree of transition, from partial to complete fusion⁷.

An association of low back pain with LSTV remains controversial^{3,4,9}. Some of the authors reported increased disk degeneration to the level above the LSTV⁴

Castellvi classification of lumbosacral transitional vertebrae⁵:

Type I: enlarged and dysplastic transverse (at least 19 mm)

- Ia: unilateral
- Ib: bilateral

Type II: pseudoarticulation of the transverse process and sacrum with incomplete lumbarisation/sacralisation; enlargement of the transverse process with pseudoarthrosis

- IIa: unilateral
- IIb: bilateral

Type III: transverse process fuses with the sacrum and there is complete lumbarisation or sacralisation, enlarged transverse process with complete fusion

- IIIa: unilateral
- IIIb: bilateral

Type IV: type IIa on one side and type III on the contralateral side

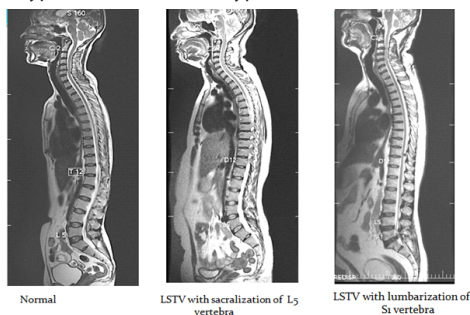


Fig 1: MRI T2 spin-echo weighted images of the whole spine showing

- A. Normal curvature with counting
- B. LSTV with sacralization of L5 vertebra
- C. LSTV with lumbarization of S1 vertebra

Disc degeneration can be graded on MRI T2 spin-echo weighted images using a grading system proposed by Pfirrmann^{4,6}.

Grade I: Homogeneous with bright hyperintense white signal intensity and normal disc height

Grade II

- disc is inhomogeneous, but keeping the hyperintense white signal
- nucleus and annulus are clearly differentiated, and a gray horizontal band could be present
- disc height is normal

Grade III

- disc is inhomogeneous with an intermittent gray signal intensity
- distinction between nucleus and annulus is unclear
- disc height is normal or slightly decreased

Grade IV

- disc is inhomogeneous with a hypointense dark gray signal intensity
- there is no more distinction between the nucleus and annulus
- disc height is slightly or moderately decreased

Grade V

- disc is inhomogeneous with a hypointense black signal intensity
- there is no more difference between the nucleus and annulus
- the disc space is collapsed



Figure 2: Disc degeneration grading on MRI T2 spin-echo weighted images using a grading system proposed by Pfirrmann.

A. Grade I: Homogeneous with bright hyperintense white signal intensity and normal disc height.

B. Grade II: Disc is inhomogeneous, but keeping the hyperintense white signal.

C. Grade III: Disc is inhomogeneous with an intermittent gray signal intensity.

D. Grade IV: Disc is inhomogeneous with a hypointense dark gray signal intensity.

E. Grade V: Disc is inhomogeneous with a hypointense black signal intensity.

AIMS AND OBJECTIVES:

- a. To determine the prevalence of lumbosacral transition vertebra (LSTV).
- b. To study its significance with respect to clinically significant spinal symptoms, disc degeneration and herniation.

METHODS AND MATERIALS:

Type of study: Retrospective study.

The Study was carried out at SSIMS & RC, Davangere, India. Study was given ethical clearance from the ethical committee of the above mentioned institution. 600 cases, over a period of 18 months, who were referred to the department of diagnostic radiology for MRI of Lumbosacral spine, from the department of Orthopaedics, Neurosurgery and other departments, were retrospectively studied in the study.

All images presented in this article were obtained using GE 1.5T MRI scanner.

Inclusion Criteria:-

- Patients of all age groups will be included in the study.
- Patients with history of low back pain.

Exclusion Criteria:-

- Patients with metallic implants, cardiac pacemakers, cochlear implants.
- Patients who are claustrophobic.
- Patients who are unwilling for imaging.
- Patients for with history of discectomy/laminectomy.

The last three mobile discs were numbered A, B, and C from a caudal to cephalad direction as shown in the next image.

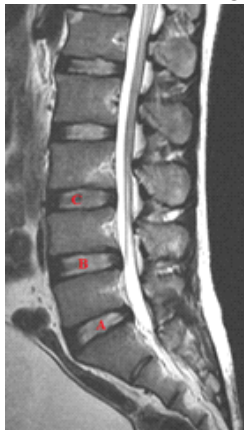


Fig 3: The last three mobile discs were numbered A, B, and C from a caudal to cephalad direction.

RESULTS:

- Total number of cases: 600 cases
- The prevalence of LSTV in patients referred to the radiology department for MRI of spine was 13%.
- In our review of 600 cases, who were referred for MRI of the lumbosacral spine to the department of radiology, 78 cases were having transitional lumbosacral junction.
- The overall prevalence of sacralization was 10% (60 cases) and lumbarisation was 3% (18 cases).
- Females had about 1.1 times higher prevalence of LSTV as

compared to males. (Females: 42; Males: 36)

- LSTV patients showed a higher Pfirrmann's grade of degeneration of the disc at "A" level.
- The type IIB pattern was found to be the commonest followed by type IIIB.

Table 1: No of cases and prevalence of LSTV
P – Prevalence; S – Sacralization; L - Lumbarization

No of cases	No of LSTV	P	S	L	IIA	IIB	IIIA	IIIB	IV
600	70	13%	66	12	4	35	3	30	6

Table 2: Gender specific prevalence of LSTV

Total cases	LSTV in males	Prevalence
600	36	6%

Total cases	LSTV in males	Prevalence
600	42	7%

Table 3: Prevalence of LSTV in patients with disc herniation at A, B, and C (Prevalence of LSTV in patients with disc herniation at A: 21.4%; Prevalence of LSTV in patients with disc herniation at B: 9%; Prevalence of LSTV in patients with disc herniation at C: 16%).

Level of herniation	Total No of cases	LSTV	Prevalence
A	289	62	21.4 %
B	143	13	9 %
C	18	3	16 %

DISCUSSION:

The prevalence of LSTV in patients referred to the radiology department for MRI of spine was 13%.

In our review of 600 cases, who were referred for MRI of the lumbosacral spine to the department of radiology, 78 cases were having transitional lumbosacral junction. The overall prevalence of sacralization was 10% (60 cases) and lumbarisation was 3% (18 cases).

Number of males with LSTV were 36 and number of females with LSTV were 42 Cases (M:F ratio = 1: 1.1). Females had about 1.1 times higher prevalence of LSTV as compared to males.

LSTV patients showed a higher Pfirrmann's grade of disc degeneration as well as herniation at "A" level.

The type IIB pattern of LSTV was found to be the commonest followed by type IIIB.

Level A showing greater degeneration in the LSTV groups with the B and C levels showing a similar pattern between the LSTV and non-LSTV groups.

CONCLUSION:

The prevalence of LSTV in patients referred to the radiology department for MRI of spine was 13%.

Females had about 1.1 times higher prevalence of LSTV as compared to males.

Patients with transitional lumbosacral junction, showed a higher Pfirrmann's grade of degeneration of the disc at "A" level.

There was a definite causal relationship between the transitional vertebra and degeneration as well as herniation of the disc immediately cephalad to it.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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