



Original Research Article

A Study of Sacralisation of Fifth Lumbar Vertebrae in Saurashtra Region

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ABSTRACT

The present study was done to study the Incidence of sacralisation of fifth lumbar vertebrae in Saurashtra region. In modern life backache is common complaint. One of the causes is Sacralisation of lumbar vertebra. Sacralisation means addition of sacral elements by the incorporation of fifth lumbar vertebra. In Sacralisation of fifth lumbar vertebra, the transverse process of fifth lumbar vertebra (L5) becomes larger than normal on one or both sides, and fuses to the sacrum, or ilium and or both. In the present study 96 dry human sacra of Saurashtra region, 68 male & 28 female were studied. It was found that typical sacrum consisting of five segments in 85 (88.5%) specimens, while sacralisation of fifth lumbar vertebrae was seen in 11 (11.5%) sacra. Out of 11 cases 8(11.7%) were of male and 3 (10.7%) were of female sacra. Sacralisation of fifth lumbar vertebrae is well-known anomaly of Lumbosacral spine and is associated with low backache, disc herniation and with cervical rib. So, Knowledge of Sacralisation is not only useful for the orthopaedic surgeons, but also vital for the clinical anatomist, radiologists, forensic experts and morphologists.

Key words: Lumbosacral spine, Sacralisation, Transitional vertebrae, Spondylolisthesis.

INTRODUCTION

Lumbosacral transitional vertebrae (LSTV) are common congenital anomalies of the Lumbosacral region; it includes sacralisation of fifth lumbar vertebrae and lumbarisation of first sacral vertebrae observed for the first time by Bertolotti in 1917. The incidence ratio of Sacralisation to lumbarization was reported as 2:1. ^[1] This condition occurs due to defect in segmentation of the Lumbosacral spine during development. ^[2]

When the L5 vertebrae is fused to the sacrum completely (sacralisation of L5),

there are only four lumbar vertebrae, whereas when S1 is separated from the sacrum (Lumbarisation of S1), there are six lumbar vertebrae and many intermediate variations are also reported. Complete sacralisation consists of a complete bony union between abnormal transverse process and the sacrum. Incomplete sacralisation shows a well defined joint line between the process and the sacrum. Both forms may be either unilateral or bilateral. ^[3] Sacralisation is observed in about 3.6% to 18% of people and is usually bilateral. It was reported that there is a strong relationship between the

LSTV and low back pain (LBP). Probably low back pain occurs due to chronic faulty biomechanics. It is possible that sacralisation of L5 contributes to the developments of degenerative spondylolisthesis, lumbar disc degeneration and disc herniation. [4] Investigations to diagnose such condition in clinical practice are plain x-rays, CT scan & MRI.

The present study was carried out to know the incidence of Sacralisation of L5 vertebrae in Saurashtra region and to understand morphological changes associated with it which in turn help management of illness around Lumbosacral region.

MATERIALS AND METHODS

In present study 96 dry human sacra were studied in the Department of Anatomy, Shri M.P. Shah Govt. Medical College, and Jamnagar. Non-pathological sacra of both sexes were included (68 male & 28 female). All the sacra were of adult but precise age was not known. Any increase in the number of elements of the sacrum was examined. The sacra consisting of six vertebrae, by incorporation of fifth lumbar vertebrae were selected. We classified sacralisation under two subdivisions

- 1) Uni-lateral sacralisation and
- 2) Bi-lateral sacralisation.

Bi-lateral sacralisation (PHOTOGRAPH -1) shows a bony union between the abnormal transverse process and the sacrum on both sides. Uni-lateral sacralisation (PHOTOGRAPH-2) shows a bony union between the abnormal transverse process and the sacrum either on right or on left side.

Sacralisation was studied in both sexes and its incidence was noted.

PHOTOGRAPH 1: Bilateral Sacralisation
Anterior View



Posterior View



PHOTOGRAPH 2: Unilateral Sacralisation
Anterior View



Posterior View



OBSERVATION AND RESULTS

In the present study of 96 dry human sacra, 68 (69.4%) were male and 28 (29.5%) were female sacra.

A typical sacrum consisting of five segments was observed in 85 (88.5%) specimens, while sacralisation of fifth lumbar vertebrae was seen in 11 (11.5%) sacra. Out of 11 cases 8(11.7%) were of male and 3 (10.7%) were of female sacra.

Table-1 Sex wise distribution of sacralisation

	MALE	FEMALE	TOTAL
Sacra studied	68	28	96
Sacralisation	8(11.7%)	3 (10.7%)	11 (11.5%)

Table -2 Classification of Sacralisation of fifth lumbar vertebrae

Sex	Uni-lateral Sacralisation			Bi-lateral Sacralisation
	Right	Left	Total	
Male	1	2	3	5
Female	0	1	1	2
Total	1	3	4	7

DISCUSSION

The present study shows that the incidence of sacralisation of L5 in Saurashtra region is 11.5%, which is more in males (11.7%) than female (10.7%). Sacralisation was found in 11.1% cases by Kubavat D et al (2012) [5] among Gujarati Population. Peter et al (1999) [6] reported sacralisation in 6.2% of cases. The incidence of sacralisation of our study (11.5%) was much higher than that 3.6% reported by

Moore BH & Illinois C (1925) [3] the range of finding may be due to different in the population studied.

According to Castellvi et al (1984) [7] classification there are four types of Lumbosacral transitional vertebrae

Type I	Dysplastic transverse process
Type II	Incomplete lumbarisation/Sacralisation
Type III	Complete lumbarisation/Sacralisation with complete fusion with the neighbouring sacral basis
Type IV	Mixed type

When we look at the development of lumbar vertebra, it commences at 3rd week of intrauterine life. All vertebrae originate from somites that form along the cranial-caudal axis, on either side of the notochord, from presomatic mesoderm. These somites differentiate further into dermomyotome (future inner dermis and muscle) and sclerotome. Each sclerotome consists of loosely packed cells cranially and densely packed cells caudally. Some densely packed cells move cranially apposite the center of myotome where they form intervertebral disc. The remaining densely packed cells fuse with the loosely arranged cells of immediately caudal sclerotome to form mesenchymal centrum, body of vertebra. The mesenchymal cells surrounding the neural tube form neural arch. Ossification of vertebra begins in 8 though week & ends by 25th year. There are two primary centers & five secondary centers present in each vertebra. Secondary centers are one for the tip of spinous process, one for the tip each transverse process & two each for annular epiphyses. [8]

The primary cause of LSTV is cranial shifts that mean sacralisation of L5 and partial shifts which mean unilateral fusion of the transverse process. Literature is unclear about exact origin of LSTV. Genetic factors are probably responsible. Wellic DM et al (2003) [9] reported that normal

patterning of lumbar and sacral vertebrae as well as changes in the axial pattern like LSTV results from mutations in the Hox-10 and Hox-11 paralogous genes. Erken et al (2002) [10] had found significant association between sacralisation and cervical rib. The mechanism responsible for the development of the Lumbosacral spine may therefore influence the development of the cervical spine and vice versa.

Bertolotti (1917) [1] described the relationship between the low back pain and Sacralisation of fifth lumbar vertebra. In young patients with back pain the possibility of Bertolotti's syndrome should always be taken in account. Sacralisation may remain asymptomatic for many years. Low back pain may occur due to following:

1. Actual pressure on nerves or nerve trunks.
2. Ligamentous strain.
3. Compression of soft tissue between bony joints.
4. By an actual arthritis if a joint is present.
5. By a bursitis if a bursa is present.

In the present study we have discussed sacralisation of L5 vertebrae with various authors. But literature regarding cause of sacralisation was unclear. It may be because of genetic factor, developmental influences, environmental factor, races & geographical variation.

CONCLUSION

After detailed study we have found that incidence of Sacralisation of L5 in Saurashtra region was 11.5%. Incidence of Sacralisation of L5 in male was 11.7% and in females was 10.7%. So, it concludes that incidence of Sacralisation of L5 was more in male.

Sacralisation of fifth lumbar vertebrae is well-known anomaly of Lumbosacral spine and it is associated with following clinical problems:

- Incorrect numbering of vertebrae lead to problems with administration of epidural or intradural anaesthetics during the planning of spinal surgery in patients of LSTV.
- LSTV does affect the position of the intercrestal line (the line connecting the highest points of the iliac crests, also called 'Tuffier's line') and on the location of the conus medullaris. The intercrestal line normally corresponds with the level of L4/L5 and is therefore useful as a landmark for needle insertion.
- Sacralisation is commonly associated with cervical rib and spondylolisthesis.
- In sacralisation, fusion of Lumbosacral joint may cause difficulty during labour because of less mobile pelvis.

Knowledge of Sacralisation is not only useful for the orthopaedic surgeons, but also vital for the clinical anatomist, radiologists, forensic experts and morphologists. There is no evidence that specific surgery is indicated in patients with symptomatic LSTV.

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