

“SACRALIZATION OF LUMBAR VERTEBRA”

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ABSTRACT:

Introduction: In modern life backache is common complaint. One of the causes is sacralization of lumbar vertebra. Sacralization means addition of sacral elements by the incorporation of Fifth lumbar vertebra. The incorporation of the fifth lumbar vertebra with the sacrum may be unilateral or bilateral producing partial or complete sacralization. Complete sacralization consists of complete bony union between the abnormal transverse process and the sacrum. Incomplete sacralization shows a well defined joint line between the process and the sacrum

Methods: We developed a simple score system helpful for clinical purposes and based upon anatomical changes.

Observations: In the present study 60 sacra were examined. The sacralization was seen and studied. For this study only non pathological sacra of both the sexes were included.

Results &Conclusions: Our study shows sacralization in 6.6 % cases. The present study is under taken because of its clinical significance due to the following reasons. In sacralization, the fifth lumbar nerve may be compressed resulting in pain along the distribution of L4-L5 nerve roots. Degenerative spondylolisthesis commonly develops at L4-L5. Back pain also reported in sacralization, possibly due to pressure on nerves or nerve trunks.

Key words: Sacralization, Nerve roots, Spondylolisthesis.

INTRODUCTION:

Lumbo-sacral transitional vertebrae (LSTV) are common congenital anomalies which include lumbarization and sacralization and observed first time by Bertolotti ¹. In LSTV, either the fifth lumbar vertebra may show assimilation to the sacrum (sacralization), or the first sacral vertebra may show transition to a lumbar configuration (lumbarization). Sacralization of 5th lumbar vertebra is congenital anomaly². Low back pain (LBP) is quite a common ailment affecting about 80% of the population in their life time.³Lumbosacral transitional vertebrae occur as a congenital anomaly in the segmentation of the lumbosacral spine. Investigations to diagnose such condition in clinical practice are plain x-rays, CT scan, and MRI. In order to understand sacralization of lumbar vertebra it is necessary to

to first understand the normal anatomy of lumbar and sacral vertebrae as well as the embryological development of the human vertebral column and the factors that can lead to developmental variation. Further, it is necessary to review the ossification process in order to identify possible defects that can arise at that stage. Lumbar vertebra is irregular, having large body, stout pedicles and thick lamina It shows slender transverse processes, short, thick, square spinous processes. Lumbar vertebrae are known for their characteristic biomechanics. Biomechanics and function of lumbar vertebra is to support the upper body, transfer weight from axial to appendicular skeleton, and provide mobility in the lower back. Lumbar vertebra strong enough to support the upper body and yet flexible enough to allow

the needed mobility. But at the same time if anything subject to failure, which may cause low back pain. The aim of our present study was to study relationship between lumbosacral transitional vertebrae (Sacralisation) and low back pain (LBP)

MATERIAL & METHODS:

In the present study 60 sacra were examined in the Department of Anatomy, KIMS, Karad (West Maharashtra) with naked eye. For this study adult sacra of both sexes were included. Any case which deviates from the definition sacralization is excluded. We developed a simple score system helpful for clinical purposes and based upon anatomical changes. In our score system, the six structures assessed were the left and right inferior articular facets, left and right transverse processes, and the left and right sides of the vertebral body. A score given in such way that 1 point is awarded for

- a) Unilateral fusion of vertebral body (rt or lt half)
- b) Unilateral fusion of transverse process (rt or lt half)
- c) Unilateral fusion of inferior articular process (rt or lt half)

So ultimately 2 points are awarded for bilateral fusion i.e. rt half-1 + lt half-1=2. Here fusion means bone had grown together preventing any motion between segments.

OBSERVATION & RESULTS:

Sacralization was found in 4 specimens (6.6 %). Due to the problems associated with the classification systems, it is necessary to develop a simple score system that takes the morphological aspects of sacralization into account. So according to our score system two of them shows 5 & two of them shows 3 score.

Figure no. 1: Sacralization of 5th Lumbar Vertebra

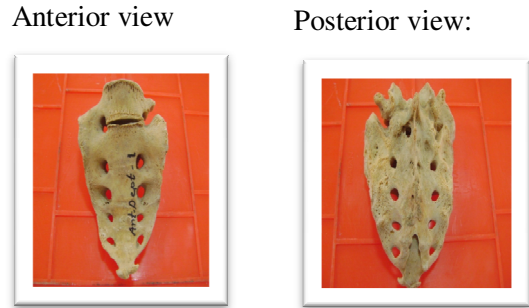


Figure no.2: Sacralization of 5th Lumbar Vertebra

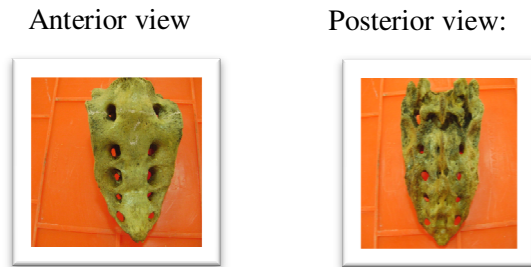
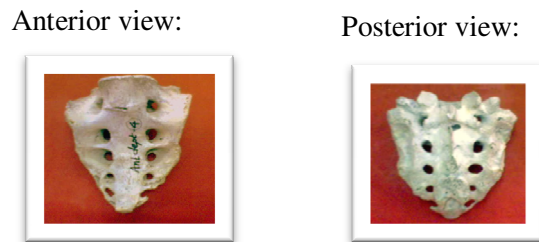


Figure no.3: Sacralization of 5th lumbar vertebra



Figure no.4: Sacralization of 5th lumbar vertebra



SCORE SYSTEM:

Specimen no.	VERTEBRAL BODY		TRANSEVERSE PROCESS		INFERIOR ARTICULAR FACETS		TATAL SCORE
	Rt	Lt	Rt	Lt	Rt	Lt	
<input type="checkbox"/> 1.	0	0	1	0	1	1	3
<input type="checkbox"/> 2.	1	1	1	1	0	1	5
<input type="checkbox"/> 3.	0	1	1	1	0	0	3
<input type="checkbox"/> 4.	0	1	1	1	1	1	5

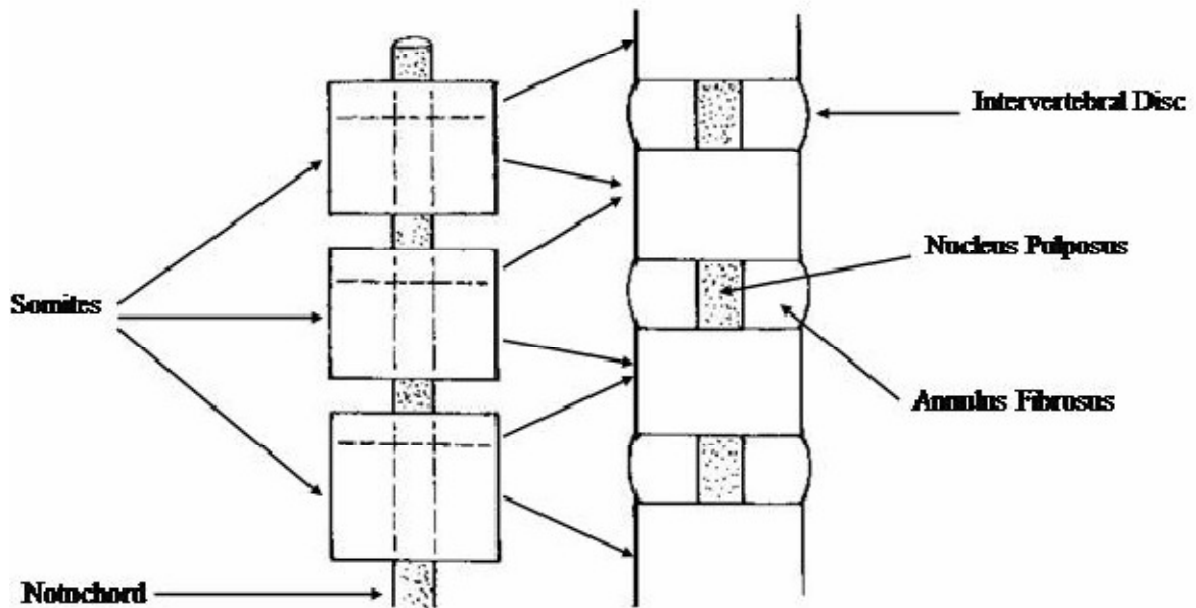


Figure no.5. Showing the cranial half of the lower somite joining with the caudal half of the upper somite forming the vertebral body and the notochord becoming the nucleus pulposus.

DISCUSSION:

Our study shows sacralization in 6.6 % cases. Which Correlate with the observations done by Chet Savage (7%, 2005)⁴. Magora & Schwartz found 20.8% sacralization in his study⁵; Sacralization was found in 11.1% cases by Kubavat dharati et al⁶. Peter et al reported 6.2% sacralisation.⁷ 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. (figure no.5) Ossification of vertebra begins in 8 th week & ends by 25 th year. There are two primary centers & five secondary centers present in each vertebra.⁸ Secondary centers are one for the tip of spinous process, one for the tip each transverse process & two each for annular epiphyses. The primary cause of LSTV is cranial shifts that mean sacralization of the last lumbar vertebrae & partial shifts which mean unilateral fusion of the transverse processes. Literature is unclear about exact origin of LSTV; it is likely a product of both genetic predisposition (Hox gene product concentration) developmental influences.

For long time, the clinical significance of this condition has been debated, and it has usually been associated with neurological deficit & low back pain, however there have

been studies reporting no relationship between lumbar sacralization and back pain. Complications of sacralization of 5th lumbar vertebra which causes pain are actual pressure on nerves or nerve trunks, ligamentous strain around the sacralization, compression of soft tissues between bony joints, by an actual arthritis if a joint is present, by a bursitis if a bursa is present. Failure to recognize & to number LSTV during spinal surgery may have serious complications. LSTV is associated with disc herniation, sciatic pain in some individuals. During delivery of baby, pelvis fails to mobile in sacralization. Pain erupts 1st time in young age & frequently history given is pain for few years. The improper formation and union of somites can cause vertebral abnormalities, including block vertebrae, cleft vertebra, and unilateral and bilateral hemivertebrae⁹. Lumbar spine experiences more abuse from normal functions than any other part of human skeleton.¹⁰ According to M.U. Eyo et al¹¹ to be able to give support to and bear the weight of the body, the integrity of all the vertebrae in the spine, particularly in the lower back must be maintained. It is expected that jeopardy of this integrity by any pathology, either congenital or acquired, will affect the stability of the spine and therefore its biomechanics. It is on this basis that the presence of LSTV is believed to be associated with an increased liability for a patient to develop low back pain.

CONCLUSIONS: Clinically in LSTV lumbo-sacral inter-vertebral disc is significantly narrowed mainly in young patients. It may cause spondylolisthesis. Unilateral defect types give rise to increased intensity of pain due to uneven weight-bearing. There is controversy in the available literature whether or not lumbosacral transitional vertebrae cause low back pain. This confusion may result from conflicting classifications. So an author feels to answer this by doing the study on osteological specimens in simple,

dynamic & conclusive manner. Study may helpful to orthopaedicians, neurosurgeons, physiotherapists to know correlation between LSTV & low back pain. While it is necessary to study more samples to expose the correlation between LSTV & low back pain & to resolve controversy.

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