



SACRALIZATION OF FIFTH LUMBAR VERTEBRA –A CASE REPORT

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ABSTRACT

Lumbosacral transitional vertebra refers two types of anomaly i.e. Sacralization and Lumbarization. Sacralization refers to the fusion of fifth lumbar vertebrae with the sacrum. The lumbosacral spine supports and transmits body weight to the lower limb and help in maintenance of the upright posture. A typical sacrum consist of five sacral vertebra fused together. Sacralization of fifth lumbar vertebrae refers to fusion of the fifth lumbar vertebra with first sacral vertebra whether partially or completely. Bilateral Sacralization is common than the unilateral. It is the most common anomaly which is associated with low back pain, spinal or radicular pain, disc herniation, spondylolisthesis, and difficulty during labor in female etc.

KEYWORDS: Sacralization, Low back pain, Herniation, Radicular pain etc.

INTRODUCTION

Lumbar vertebrae are five in number and sacrum consist of five sacral vertebrae fused with each other. The sacrum provide strength and stability to the pelvis and also transmit the body weight to the lower limb via pelvic girdle through sacroiliac joint and also plays an important role in upright posture.^[1] Human sacrum is wedge shaped bone with base directed upward and apex downward. It has two surfaces. The pelvic surface is concave forward and smooth while the dorsal surface is rough and convex backward. The upper surface of the body of first sacral vertebrae articulate with the lower surface of body of fifth lumbar vertebrae to form secondary cartilaginous joint i.e. lumbosacral joint in presence of fibrocartilage in between called intervertebral disc. The sacrum also articulates with the auricular surface of ilium to form the sacroiliac joint which is plane variety of synovial joint. The body weight is transformed through these joints to the lower limb.^[2,3,4]

Sacralization of fifth lumbar vertebra is most common compared with lumbarization. The incidence between these anomalies is 2:1.^[5] Sacralization may be due the congenital anomaly or traumatic or age related change which affects the normal biomechanics of the spine.^[6] The consequences of the Sacralization may be the degenerative spondylolisthesis, disc herniation, low back pain, disc degeneration.^[7] Defect in articulation and

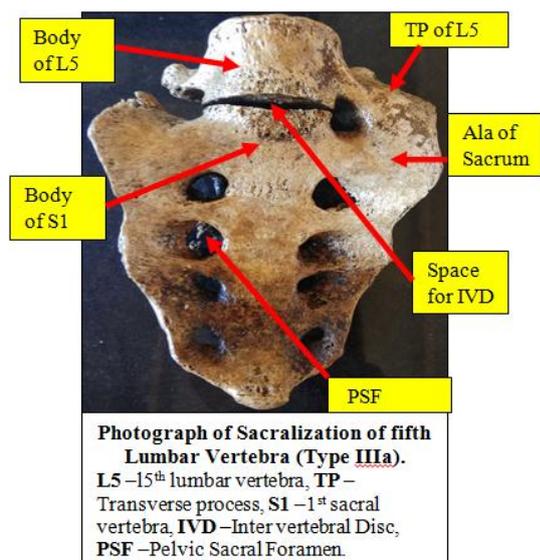
anatomical anomaly between the lumbar and sacral spine lead faulty biomechanics of spine which is associated with low back pain.^[8,9]

Bertolotti 1st observed the lumbosacral transitional vertebra and classified spine anomalies depending on the type of articulation between the transverse process and the sacrum.^[10] Later Castellvi et.al classified the Lumbosacral transitional vertebra under 4 types, depending upon the morphology; Type I includes unilateral (Ia) or bilateral (Ib) dysplastic transverse process, with a measured width of at least 19 mm. Type II includes incomplete unilateral (IIa) or bilateral (IIb) sacralization/lumbarization with an enlarged transverse process which has pseudarthrosis with adjacent sacral ala. Type III includes unilateral (IIIa) or bilaterall (IIIb) lumbarization/sacralization with enlarged transverse process which is completely fused with the adjacent sacral ala. Type IV is mixed which include Type IIa with Type IIIa on other side.^[11]

CASE REPORT

The female sacral bone was obtained in the Anatomy Museum of Department of Rachana Sharir, Sri Dharmasthala Manjunatheshwara College of Ayurveda and Hospital, Hassan. When it was observed there was unilateral Sacralization of the fifth lumbar vertebra with

the first sacral vertebra. On keen observation the following findings was noted.



1. Transverse process of left sided of L5 was completely fused with that of S1 vertebra. But right transverse process was not fused.
2. Left ala of sacrum is formed by contribution of L5 and S1 transverse process. The part of pelvic brim is not clear in left ala.
3. Left pedicle, left lamina, left inferior articular process of L5 vertebrae was fused with corresponding parts of S1
4. Right pedicle, right lamina, right inferior articular process of L5 was not fused with that of S1 vertebrae.
5. Body of L5 was not fused with the body of S1 it was completely free from side to side and Antero-posteriorly. There was gap between the bodies of L5 and S1, which was for the intervertebral disc.
6. Sacrum had 5 pelvic sacral and 5 dorsal sacral foramen on the left side but on the right side the upper foramen does not have complete boundary.

DISCUSSION

Lumbosacral transitional vertebra are referred as congenital anomalies of the lumbosacral region which include the Sacralization of fifth lumbar vertebrae and lumbarization of first sacral vertebrae.^[12,13]

Defect in formation, migration, differentiation, segmentation and union of somites result in anomalous spine. During the development, the vertebra receives contribution from caudal half of one sclerotome and from the cranial half of the succeeding sclerotome.^[14,15]

The cells of the sclerotome get converted into loose mesenchyme. The mesenchyme migrates medially and surrounds the notochord. The mesenchyme then extends backward on the either side of the neural tube and surrounds it. Extension of mesenchyme also takes place lateral in the position to be subsequently occupied by the

transverse process and ventrally in the body wall in the position to be occupied by ribs.

The mesenchymal cells of each segment are first uniformly distributed. However the cells soon become condensed in the region that runs transversely across the midline of e segment. The condensed region is called perichordal disc. Above and below there are less condensed part. The mesenchymal basis of the body (centrum) of each vertebra is formed of the adjoining less condensed part of two segments. The perichordal discs become the intervertebral disc. The neural arch, transverse process and costal element are formed in the same way as the body. So the vertebra, transverse processes are the intersegment structure made up of the two somites. The portion of the center of the somite is represented by the intervertebral disc. Two or more vertebra that are normally separated may be fused with each other completely or partially. The fifth lumbar vertebra may be partially or completely fused to sacrum called Sacralization of fifth lumbar vertebra.^[16,17,18,19]

The transverse process of the L5 vertebra become longer on either of the side and fused with the sacrum or ilium or both. It may be unilateral or bilateral.^[20,21]

The ossification defect and developmental defect both lead to the LSTV. Genetic factor plays major role in segmental development of the lumbosacral spine. Hox-11 function is essential for genesis of sacral and caudal vertebra but their over expression is expected to produce signs of sacralization or caudalization at their level of axial skeleton.^[22] and these genes are among the major players in the specification of morphological identity of the vertebrae.^[23,24] Mutation of Hox-II and Pax 1 or Pax 9 genes lead to anomalous in embryo development like; deformed knee joint, fore limb and hind limbs also alter the morphology of thymus, parathyroid gland, absence of teeth, cleft secondary palate, supernumerary digits etc.^[25]

On the basis of Castellvi et.al. classification of lumbosacral transitional vertebra, the present case is Type III(a) forms of Sacralization. There was unilateral enlargement of transverse process of L5 vertebra and was completely fused with the adjacent sacral ala. The incidence of Sacralization of L5 (1.7 to 14%) is more than Lumbarization of S1 (3% to 7%). In the study of Khalid G. Khashoggi et.al. (2017) the incidence of lumbarization of S1 is 5(3.2%) & Sacralization of L5 was 153(96.3%) out of 158 LSTV Patient.^[26] Sharma et.al (2011) the neural arch, pedicles and costal elements develop almost entirely from the dense caudal half of a somite and thus attach to the upper half of the vertebral body. Thus caudal shift results in Sacralization of last lumbar vertebra.^[27] Cranial shift are dominant over caudal shifts, so sacralization is more common than lumbarization.^[28] Wunne Chaijaroon Khanarak et. al (2006) study shows that the incidence of Sacralization was more in male(6.1%) than in female (2.2%). In the study of Khalid G. Khashoggi et.al. (2017) the

prevalence sacralization in male is 81% & in female is 18%.^[29]

CONCLUSION

Understanding the pattern in variation of the spine is important for understanding the surface landmark for the anatomist, orthopedics, neurosurgeons, and radiologist in performing various interventional techniques to avoid unwanted damage and consequences. The intercrestal plane lies at level of L4 & L5 spine which is the guide line for lumbar puncture. The Sacralization may affect the guideline in identification of the vertebral spine leading to failure in the procedure.^[30]

The knowledge to the Sacralization is also helpful for the forensic experts, anthropologists to differentiate the gender, sacral index etc. knowledge of Sacralization of 5th lumbar vertebra help to understand the possible complication such as low back pain, spinal or radicular pain due to pressure on the spinal nerve, strain of ligament around the lumbosacral joint, compression of the soft tissue. There is the chance of the reduction of the disc space between the L5 & S1 and have higher chance of disc herniation leading to sciatic pain. In females the LSTV causes greater difficulty during labor because of less mobile pelvis (lumbosacral joint) and may cause low back pain and disc herniation.^[31] Repeated flexion and extension exert stress over the lumbosacral transitional vertebra and more stress is observed in the superior disc space and articulation between the transitional transverse process and sacrum.^[32] It may also lead to spondylolisthesis.^[33]

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