

Unilateral Sacralisation - A Case Report.

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Abstract: Lumbosacral transitional vertebrae (LSTV) are congenital anomalies of the lumbosacral region, which occurs due to the defect in the segmentation of the lumbosacral spine development. One of the causes is sacralisation of fifth lumbar vertebra (L5). The transverse processes of the L5 vertebra become larger than the normal on one side or the both sides. The abnormal fusion of the transverse processes to the sacrum causes sacralisation. Complete or bilateral sacralisation consists of a bony union between the abnormal transverse processes and the sacrum on both sides whereas partial or incomplete or unilateral sacralisation shows fusion of a transverse process of one side to sacrum. The sacralisation is one of the causes of low backache. It may be asymptomatic in case of bilateral type but may present with symptoms. Unilateral sacralisation tends to make the lumbar region more susceptible to damage because of the asymmetry in the articulations causing faulty biomechanics. During the routine osteology class in the Department of Anatomy, Tripura Medical College & Dr. B. R. A. M. Teaching Hospital, a dry human sacrum of unknown sex and age was observed. The sacrum was with partial fusion with left sided transverse process of fifth lumbar vertebra. This case has been highlighted to help clinicians to rule out LSTV and unilateral sacralisation in diagnosing a case of low backache.

Key words: Lumbosacral transitional vertebra, Sacrum, Unilateral Sacralisation.

I. Introduction

The lumbosacral spine protects spinal cord and also supports and transmits weight of the body to the inferior extremity, thus, plays an important role in posture. Lumbosacral transitional vertebrae (LSTV) are congenital anomalies of the lumbosacral region, which occurs due to the defective segmental development of the lumbosacral spine.¹ The primary cause of LSTV is sacralisation, means addition of sacral elements by the incorporation of the fifth lumbar vertebra due to cranial shifts of the fifth lumbar vertebra.^{2,3}

It may be unilateral or bilateral producing partial or complete sacralisation. Complete or bilateral sacralisation consists of a bony union between the abnormal transverse processes and the sacrum.^{1,2} Unilateral sacralisation shows a bony union between the abnormal transverse process and the sacrum either on right side or left side.¹ Unilateral sacralisation tends to make the lumbar region more susceptible to damage because of the asymmetry in the articulations. They are commonly recognised as causes of backache.⁴

In modern life low back pain is common complaint. Low back pain (LBP) is quite a common ailment affecting about 80% of the population in their life time.⁵ It may be asymptomatic in case of bilateral type but may present with symptoms. So, this case has been highlighted to help clinicians to rule out LSTV and unilateral sacralisation in diagnosing a case of low back pain.

II. Case Report

During the routine osteology class in the Department of Anatomy, Tripura Medical College & Dr. B. R. A. M. Teaching Hospital, Hapania, a dry human sacrum of unknown sex and age was observed. The sacrum was with partial fusion of fifth lumbar vertebra along with sacralisation of first coccygeal vertebra.

The sacrum was triangular shaped, composed of five sacral vertebrae indicated by the regions of fusion as ridges on the pelvic surface. The fusion of the wide base was articulated with the fifth lumbar vertebra on the left side with the pars lateralis or the ala. The body of the fifth lumbar vertebra was fused with the base of the sacrum. Posteriorly, it was fused with the sacrum by both inferior articular processes. On left side, the vertebra was fused to the ala of the sacrum by large transverse process, pedicle and partially by superior articular processes. On the right side there was non-fusion of transverse process with the ala. The pedicle and superior articular process were free. The tip of the lower end of the fifth lumbar spinous process and laminae were not fused with the median sacral crest and the laminae of the sacrum respectively, causing a gap in between the sacral canal and the fifth lumbar vertebral canal. Five dorsal and ventral sacral foramina including incomplete non-fused fifth sacral foramen were found on the left side where as similar were found four in numbers on right side, instead a deep notch was observed on the right side due to non-fusion of the pedicle and transverse

processe to the ala. The intervertebral space was narrow. The space was wider anteriorly comparing to posterior side and on left side the margins of the vertebrae was fused.



Figure 1: Pelvic surface of the sacrum; Figure 2: Dorsal surface of the sacrum.

III. Discussion

All vertebrae originate from sclerotome portion of the somites along the cranio-caudal axis on either side of the notochord. With continuous development, the somites undergo a process of resegmentation where the caudal half of each sclerotome grows into and fuses with the cephalic half of the subjacent sclerotome to form a definitive vertebra.^{6,7} Though the ossification of vertebra begins in the 8th weeks and ends by 25th years, but the development of the lumbar vertebra commences at 3rd week of intrauterine life.⁶ So, the process of formation and rearrangement of segmental sclerotome into definitive vertebra is complicated.⁷ These processes are considered to be regulated by the respective homeobox and paired-box genes (Pax 1 and Pax 9) in the control of cell proliferation during early sclerotome development. As revealed in mice, there were deficiency for one functional copy of Pax 1, heterozygosity and homozygosity of the Pax 9 mutation which result in vertebral malformations in the lumbar region, such as fused vertebrae.⁸ This may occur as congenital anomaly causing lumbosacral transitional vertebrae³ where the cartilage between L5 and S1 vertebrae calcified to become a sacralisation of the fifth lumbar vertebra.⁸ This is due to the cranial shift of the last lumbar vertebra.³ It is fairly common to have two successive vertebrae fuse asymmetrically⁷ causing partial shift by unilateral fusion of transverse processes.³ Literature suggests that, sacralisation varied by race and incidence. An increased incidences of lumbosacral transitional vertebrae was found occurring within families.⁸

So, various studies had been done to find out the causes, factors responsible for it, incidents among different races and families, and clinical features of sacralisation of fifth lumbar vertebra. Khairnar KB et al. observed 6.6% of cases of sacralisation. Dharati K et al. found a higher percentage (11.1%) in Gujrati population.

Wazir S observed a case of unilateral sacralisation of fifth lumbar vertebrae with sacrum, where the bodies of the vertebrae were fused but the transverse process of the left side was completely fused with ala of the sacrum. On right side it was not fused.² These observations were similar with the present case report. In transitional lumbosacral segmentation, it was observed that the lumbosacral intervertebral disc is significantly narrowed.^{3,8} This was also found in present case.

So, LSTV therefore may be one of the causative factors for low backache.² Unilateral defect types gave rise to increased intensity of pain due to uneven weight-bearing. The incidence of disc herniation was found to be higher and can occur even at young ages.⁹ The discs immediately above the transitional vertebra were significantly more degenerative causing disc protrusion or extrusion, compared with the disc found between the transitional vertebra and the sacrum.¹⁰ Complications of sacralisation of 5th lumbar vertebra causes pain were actual pressure on nerves or nerve trunks, ligamentous strain around the sacralization, compression of soft tissues between bony joints, due to arthritis of a joint is present and a bursitis if a bursa was present. This was associated with disc herniation, sciatic pain in some individuals with LSTV. Pelvis might fail to expand in sacralisation during delivery of baby.²

Anatomically and architecturally, the sacralised formation appeared stronger and more able to resist strain than the usual arrangement.¹ Shift from the normal vertebral formula where a vertebra was subtracted from the region to which it belongs and added to an adjacent region was more common than numerical variation in the vertebrae. The most common change from normal was the addition of a coccygeal vertebra to the sacrum. The fusion of coccygeal vertebra to the sacrum was of no practical importance. However, fusion of the fifth lumbar vertebra with the sacrum decreased the length and adds to the strength of the thoracolumbar column, while lumbarisation increased the length and mobility and weakness of this portion of vertebral column.⁴

IV. Conclusion

Sacralisation is one of the important factors for lumbar disc herniation (LDH) in patients with low backache, which frequently occurs at the level above the lumbosacral transitional vertebra due to altered facet morphology. The sacralisation, existing from the time of development deserves attention of orthopaedic surgeons, obstetrician, clinical anatomist, radiologists, forensic experts and morphologists. Knowledge of sacralisation is not only enlightening for the low backache or lumbar disc herniation, but also vital for differential diagnosis of other developmental anomalies of lumbosacral vertebrae. Hence, we had presented this, as a case report to emphasize on its clinical relevance and during the planning of spinal surgery to avoid serious consequences due to faulty counting of vertebrae.

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