

Lumbosacral Transitional Vertebrae and Sacroiliac Joint Fusion - A Dual Case Report

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Abstract: *Low backache is a very common clinical presentation. Many rare bony anomalies are the hidden causes behind these sometimes unexplainable clinical scenarios, the knowledge about the same and awareness aided with proper imaging techniques may enhance a correct diagnosis and effective treatment. Hereby reporting two rare cases associated with pelvis that may present as a low backache.*

Keywords: sacroiliac joint, sacralisation

1. Introduction

The Sacroiliac joints (SIJs) are essential for effective load transfer between the spine and legs. The sacrum, pelvis and spine, and the connections to the arms, legs and head, are functionally interrelated through muscular, fascial and ligamentous interconnections [1]. Sacroiliac joint is located in the pelvis, and links the iliac bones to the sacrum. It is essential for shock absorption and also for flexibility.

2. Case Report

During routine osteology classes, we came across 2 pelvic bones showing the following abnormalities. In one of the specimens, the sacroiliac joint has been ossified partially on the right side. There is bony synostosis between the ala of sacrum and the auricular surface of ilium, in the upper 1/4th of the sacroiliac joint.(fig.1)In another specimen, we noted a partial sacralisation of 5th lumbar vertebra, mostly on the left side where the transverse process of L5 had fused with the ala of sacrum. On the right side, this lateral fusion is noted however, only on the posterior aspect. The fusion also extends into the posterior aspect of the bodies of the vertebrae.(fig.2)

3. Discussion

SI joint fusion can be associated with joint pathologies such as diffuse idiopathic skeletal hyperostosis (DISH), osteoarthritis of spine, and ankylosing spondylitis (AS). SI joint fusion could be a result of acquired pathologies such as osteoarthritic changes in relatively immobile joints, instead of a factor included in the aging process. Age and degeneration of joints could also promote SI joint fusion in an individual, especially if that individual suffered an injury. An injury to joint would also cause degeneration of the cartilage and amorphous debris to fill the joint space. Then SI joint would develop fusion or other degenerative symptoms. The ilium is abnormal and is found to be thicker. The sacrum shows abrupt curve almost at right angle.

Congenital fusion is due to failure of segmentation of sclerotomes at certain levels at the time of organogenesis [4]. It has also been hypothesised that decreased local blood

supply during 3rd to 8th week of development results in inappropriate segmentation. Though rare, acquired fusion of vertebrae is secondary to trauma, tuberculosis or other infections and juvenile rheumatoid arthritis [3]. Vertebral fusion anomalies are likely to be associated with disturbance of Pax-1 gene expression in developing vertebral column [4].

This may cause restricted movements, premature degenerative changes and associated neurological deficits. The incidences reported regarding the sacroiliac joint abnormalities are as follows, Isolated SI synostosis 1%, Unfused apophysis 0%, Accessory SI joint 11%, Iliosacral complex 11%, Sacral defect 13%, Dysmorphic changes 17%, ligamentous ossifications, inflammatory diseases involving articular cartilage.

Sacroiliac Joint Fusion (SI Joint Fusion) is a minimally invasive surgery that uses highly engineered and specialized devices along with non-cadaveric bone graft to encourage bone growth over the sacroiliac joint, creating one immobile unit. Inhibiting movement stabilizes the sacroiliac joint and reduces inflammation, resulting in less pain.

Lumbosacral transitional vertebrae (LSTV) are most common congenital anomalies of the lumbosacral spine. Lumbosacral transitional vertebrae (LSTV) occur as a congenital anomaly in the segmentation of lumbosacral spine [9]. 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 (lumbarisation). The lumbosacral spine, besides protecting the spinal cord and spinal nerves, also plays an important role in posture and locomotion [6].

LSTV is linked to its embryological development. Vertebra receives contribution from caudal half of one sclerotome and cranial half of succeeding sclerotome. LSTV are caused by border shifts.

Sacralisation of fifth lumbar vertebra is due to cranial shift and the lumbarisation of first sacral segment is due to caudal shift [7].

Complete transition results in numerical abnormalities of the lumbar and sacral segments. LSTV, in most cases, however, is incomplete or unilateral but can also be bilateral and complete.

Literature is unclear about exact origin of LSTV; it is likely a product of both genetic predisposition (Hox10 gene mutation) and developmental. Wellik et al., showed that in absence of Hox 11 function, sacral vertebrae are not formed and instead these vertebrae assume a lumbar identity. Again in absence of Hox 10 function, no lumbar vertebrae are formed. Thus these studies showed that, the normal patterning of lumbar and sacral vertebrae as well as the changes in the axial pattern, such as Lumbosacral transition vertebrae, result from mutations in the Hox10 and Hox11 paralogous genes [8].

LSTV can cause low back pain which may result from the pressure on nerve trunks, ligamentous strain or compression of soft tissues between bony joints [9]. Bertolotti syndrome, the association between an LSTV and low back pain, is a controversial topic that had been both supported and disputed since Bertolotti first described it in 1917. The incidence of disc herniation is also found to be higher in LSTV [24].

Lumbarisation of first sacral vertebra is reported with a very low incidence of 2%, as compared to sacralisation of fifth lumbar vertebrae [10]. Complete lumbarisation of first sacral vertebrae, leading to increase in the number of lumbar vertebrae, is a rare occurrence.

4. Conclusion

Awareness of vertebral anomalies is of interest to clinical anatomist, forensic experts and also to clinicians. Knowledge of such abnormality is important for radiologists during diagnostic imaging studies. Awareness of this abnormality is a prerequisite for a neurosurgeon to prevent complications during and after the spinal manipulations. Incorrect numbering may create complication during administration of anaesthetics in patients with LSTV [11].

Abbreviations Used

SIJ: Sacroiliac joint,

LSTV: Lumbosacral transitional vertebrae

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References

- [1] The sacroiliac joint: an overview of its anatomy, function and potential clinical implications, A Vleeming 1, J Anat. 2012 Dec;221(6):537-67.
- [2] Sacroiliac joints: anatomical variations on MR images, Mazen El Rafei et al Eur Radiology 2018; 28: 5328-5337.

- [3] Wazir S, Mahajan A. Fusion of axis with third cervical vertebra-a case report. Indian J Fundamental ApplSci 2011; 1 (4): 164-166.
- [4] Erdil H, Yildiz N, Cimen M. Congenital fusion of cervical vertebrae and its clinical significance. Journal of Anatomical Society of India 2003; 52(2): 125-127.
- [5] Sherekar SK, Yadav YR, Basoor AS, Baghel A, Adam N. Clinical implications of alignment of upper and lower cervical spine. Neurological society of India 2006; 54: 264-267.
- [6] Adibatti M, Asha K. Lumbarisation of the first sacral vertebra a rare form of lumbosacral transitional vertebra. Int. J. Morphol. 2015; 33(1):48-50.
- [7] Sharma VA, Sharma DK, Shukla CK, Osteogenic study of lumbosacral transitional vertebra in central India region. J. Anat Soc India. 2011; 60(2):212-17
- [8] Wellik DM, Capecchi MR. Hox 10 and Hox 11 genes are required to globally pattern the mammalian skeleton. Science 2005; 301(5631): 363-367.
- [9] Williams, PC. The lumbosacral spine, emphasizing conservative management. New York, McGraw-Hill Book Company 1965. 27-32.
- [10] Cheng JS, Song JK. Anatomy of the sacrum. Neurosurg. Focus 2003; 15(2):3
- [11] Prabahitabaruah, Krishna Kanta Biswas, Pradipta Ray Choudhury. A SPECTRUM OF VERTEBRAL FUSION DEFECTS. Int J Anat Res 2018;6(3.3):5667-5671. DOI: 10.16965/ijar.2018.307(a)
- [12] Saha DK, Dasgupta H, Biswas S, Paul M, Ghosh R. et. al. Sacralization of the 5th lumbar vertebra and elongated sacral hiatus. Indian Journal of Basic and Applied Medical Research 2014; 3(3):95-99



Figure 1: Specimen showing sacroiliac joint fusion



Figure 2: Specimen showing partial sacralisation