

**MORPHOLOGICAL STUDY ON LUMBOSACRAL TRANSITIONAL VERTEBRA IN ADULT
INDIAN SACRA AND ITS CLINICAL IMPLICATIONS**Kosuri Kalyan Chakravarthi^{1*}, Nelluri Venumadhav², Siddaraju KS², and Pandey S.N³^{1,3} Department of Anatomy, Mayo Institute of Medical Sciences, Faizabad Road, Gadia, Barabanki-225001 (UP) India.² Department of Anatomy, Melaka Manipal Medical College (MMMC), Manipal University, Manipal, Karnataka, India² Department of Anatomy, KMCT Medical College, Manassery, Calicut, Kerala, India.*Corresponding Author: Email Id: kalyankosuric@gmail.com

ABSTRACT: Lumbosacral transitional vertebra (Sacralization) is the fusion of 5th lumbar vertebra with the first segment of the sacrum it may be complete or incomplete. In complete sacralization body of the 5th lumbar vertebra completely fuses with the sacrum, where as in incomplete sacralisation shows a well defined joint line between the transverse process and the sacrum. Both forms may be either unilateral or bilateral. Such kind of abnormalities are importance while reporting the X ray, CT and MRI films, during surgical procedures at the Lumbosacral region and making a differential diagnosis for the low back ache patients. Accordingly the present study was designed to evaluate the incidence and morphological study of Sacralization (Lumbosacral transitional vertebra) in adult Indian sacra and its clinical significance. This study was carried out on 150 dry human sacra irrespective of age and sex at Mayo Institute of Medical Sciences- Barabanki,-UP, Melaka Manipal Medical College-Manipal University and Department of Anatomy, KMCT Medical College, Manassery-Calicut. It was observed that out of 150 sacra, 57 (38%) sacra showed sacralization. Out of 57 sacralized bones, 38 (25.33%) bones showed bilateral sacralization, whereas 19 (12.67%) bones showed unilateral sacralization. Such Lumbosacral transitional vertebra may increase the risks of Disc bulge / herniation or pseudarthrosis (nonunions) with the ilium, degenerative sclerosis around the false joint, compression of lumbar nerve roots, low back pain, and false administration of epidural or intradural anaesthetics in lumbosacral region. Its sound knowledge is not only enlightening for the orthopaedic surgeons, also vital for the clinical anatomists, forensic experts and morphologists.

Key words: Lumbar vertebra, lumbar nerve, pseudarthrosis, Sacralization, sacrum.

INTRODUCTION

Sacrum is a wedge shaped bone between two iliac bones normally it is formed by fusion of five sacral vertebrae. Lumbar vertebra is irregular, having large body, stout pedicles and thick lamina the main function of lumbar vertebra is to support the upper body, transfer weight from axial to appendicular skeleton, and provide mobility in the lower back. Lumbosacral transitional vertebrae are congenital anomalies of the lumbosacral region, which includes sacralisation of fifth lumbar vertebra, which occurs because of defect in the segmentation of the lumbosacral spine during development. Lumbosacral transitional vertebrae will affect the biomechanics of the lumbar spine. Such lumbosacral transitional vertebral anomalies may confuse or failure to recognize during spinal surgery which may leads to serious complications. Aihara T et al (2005) and Leboeuf C et al (1989) reported that, patients with lumbosacral transitional vertebrae are to have increased risk for advanced disc degeneration or disc herniation above the lumbosacral transitional vertebrae. Therefore, the aim of this study was to investigate the incidence and morphological study of sacralization (Lumbosacral transitional vertebra) in adult Indian sacra and discuss its clinical implications.

METHODS AND MATERIALS

In the present study 150 dry human sacra were examined in the Department of Anatomy Mayo Institute of Medical Sciences- Barabanki, Department of Anatomy, Melaka Manipal Medical College-Manipal University and Department of Anatomy, KMCT Medical College, Manassery-Calicut. All sacra were macroscopically inspected

and it was recorded whether the sacralization (Lumbosacral transitional vertebra) of the 5th lumbar vertebra was unilateral or bilateral and whether it was complete or incomplete. Photographs of the Lumbosacral transitional vertebra were taken for proper documentation.

RESULTS

- It was observed that out of 150 sacra, 57 (38%) sacra showed sacralization.
- Out of 57 sacralized bones, 38 (25.33%) bones showed bilateral sacralization (Fig 1 and 3), whereas 19 (12.67%) bones showed unilateral sacralisation (Fig 2 and 4).
- Incomplete with a narrow gap non fusion of body of 5th lumbar vertebra with sacrum were noted in 30 sacra (20%) (Fig 1).
- Unilateral fusion of body of 5th lumbar vertebra with sacrum was noted in 11 sacra (7.33%) (Fig 2 and 4).

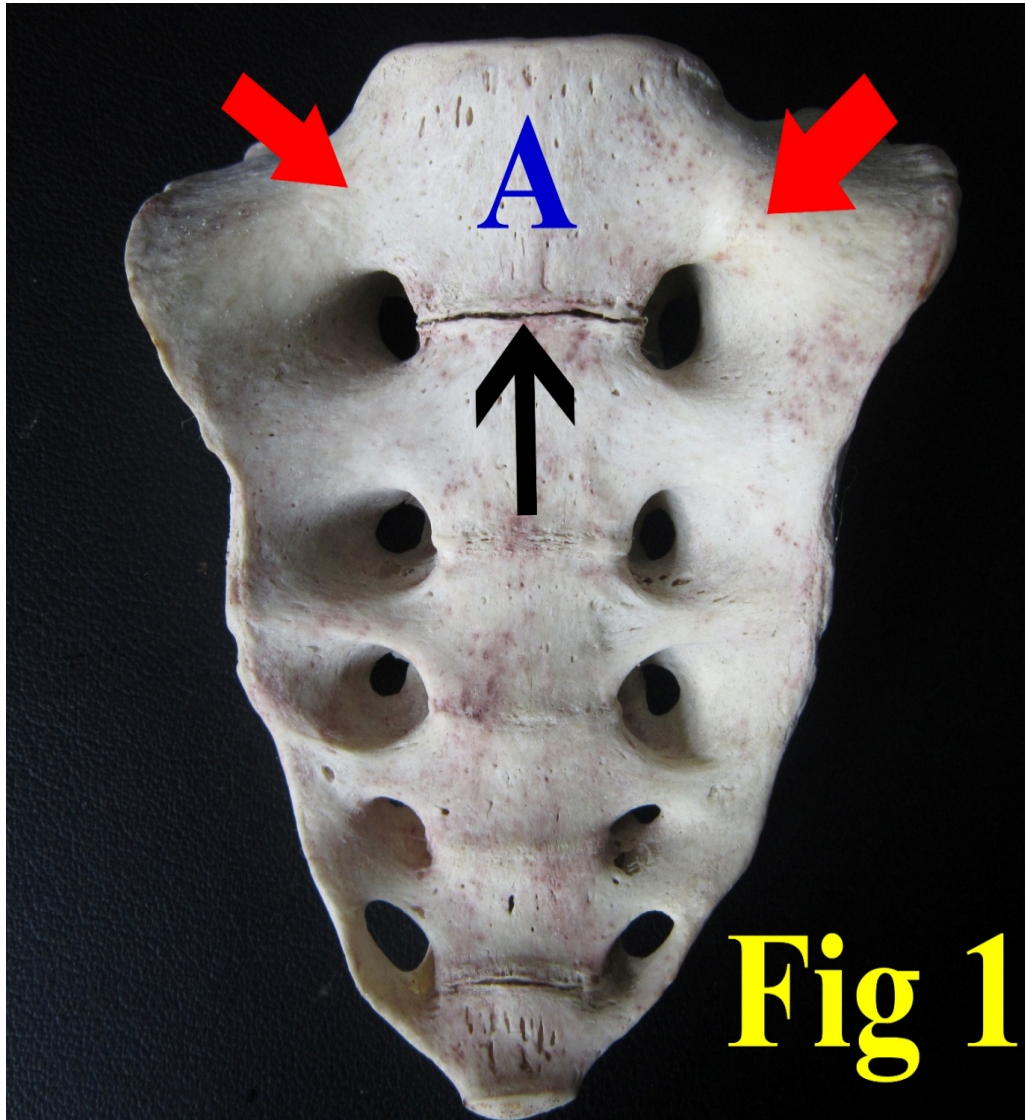


Fig 1: Showing bilateral sacralization.

A- 5th lumbar vertebra; Red Colour Arrows- Transverse process of 5th lumbar vertebra both side is completely fused with sacrum; Black Arrow- A narrow gap showing incomplete non fusion of body of 5th lumbar vertebra with sacrum.

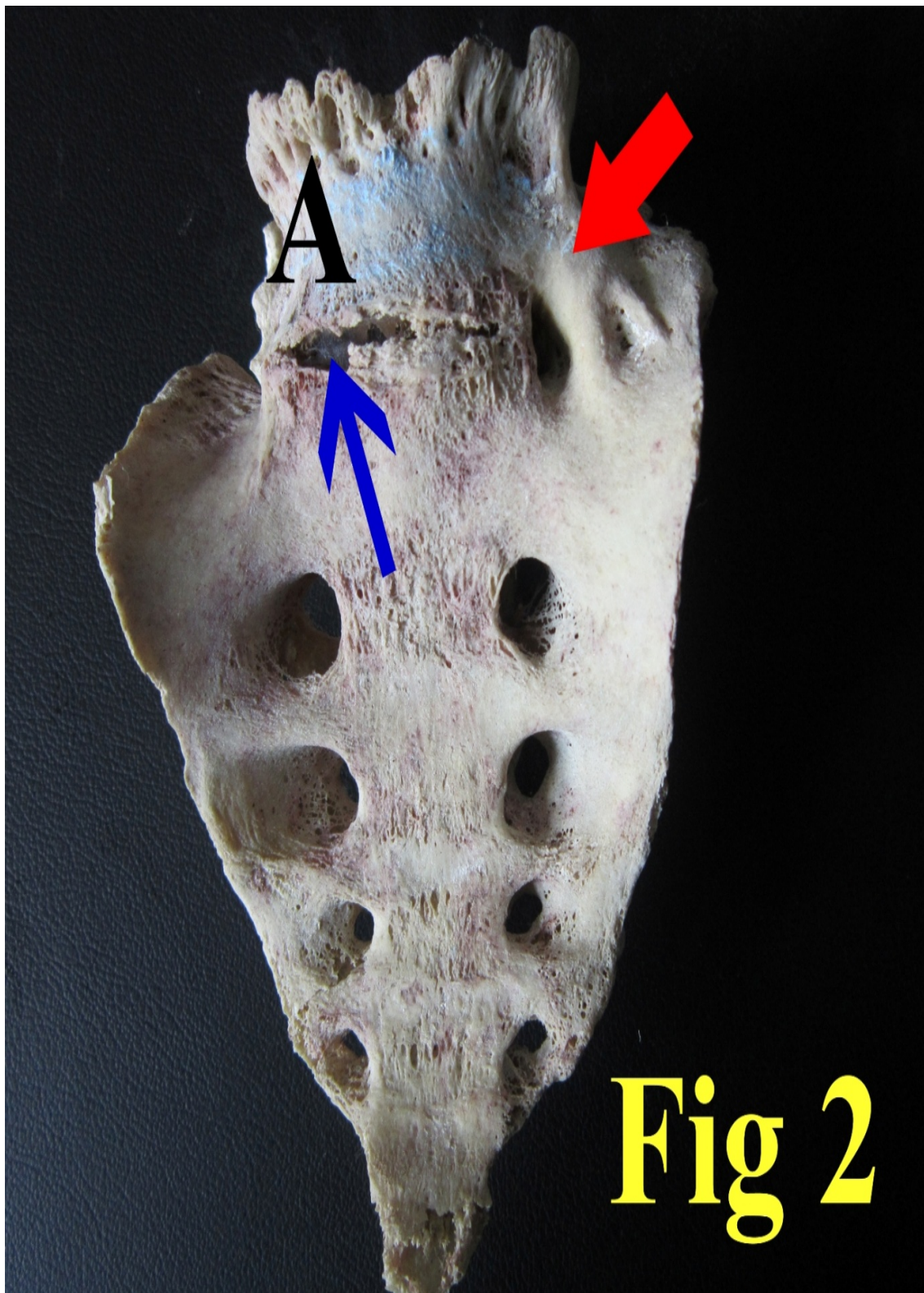


Fig 2

Fig 2: Showing unilateral sacralization.
A- 5th lumbar vertebra; Red Colour Arrow- Transverse process of 5th lumbar vertebra on right side is completely fused with sacrum; Blue Arrow- Unilateral non fusion of body of 5th lumbar vertebra with sacrum.

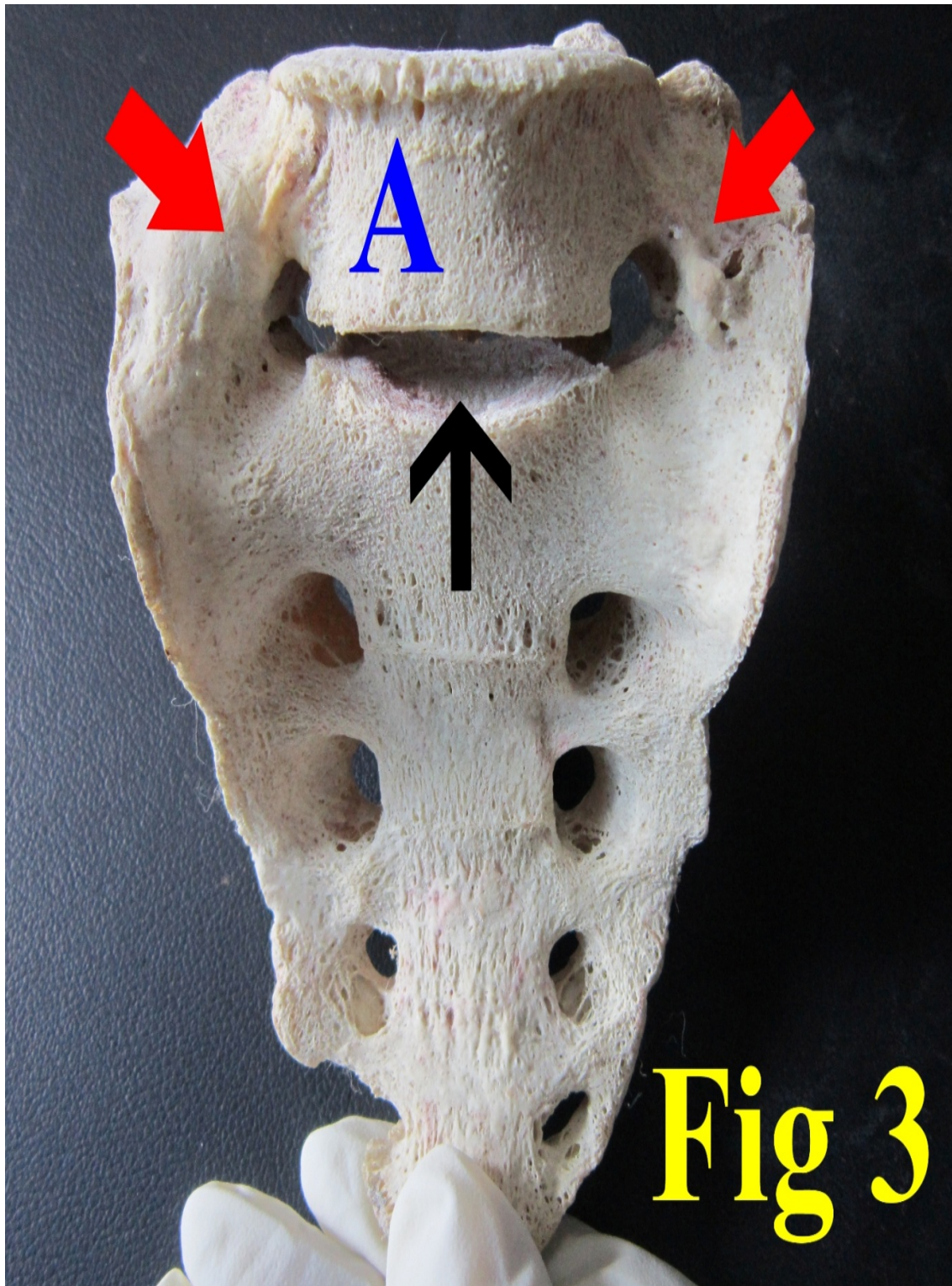


Fig 3: Showing unilateral sacralization.
A- 5th lumbar vertebra; Red Colour Arrows- Transverse process of 5th lumbar vertebra both side is completely fused with sacrum; Black Arrow- Non fusion of body of 5th lumbar vertebra with sacrum.

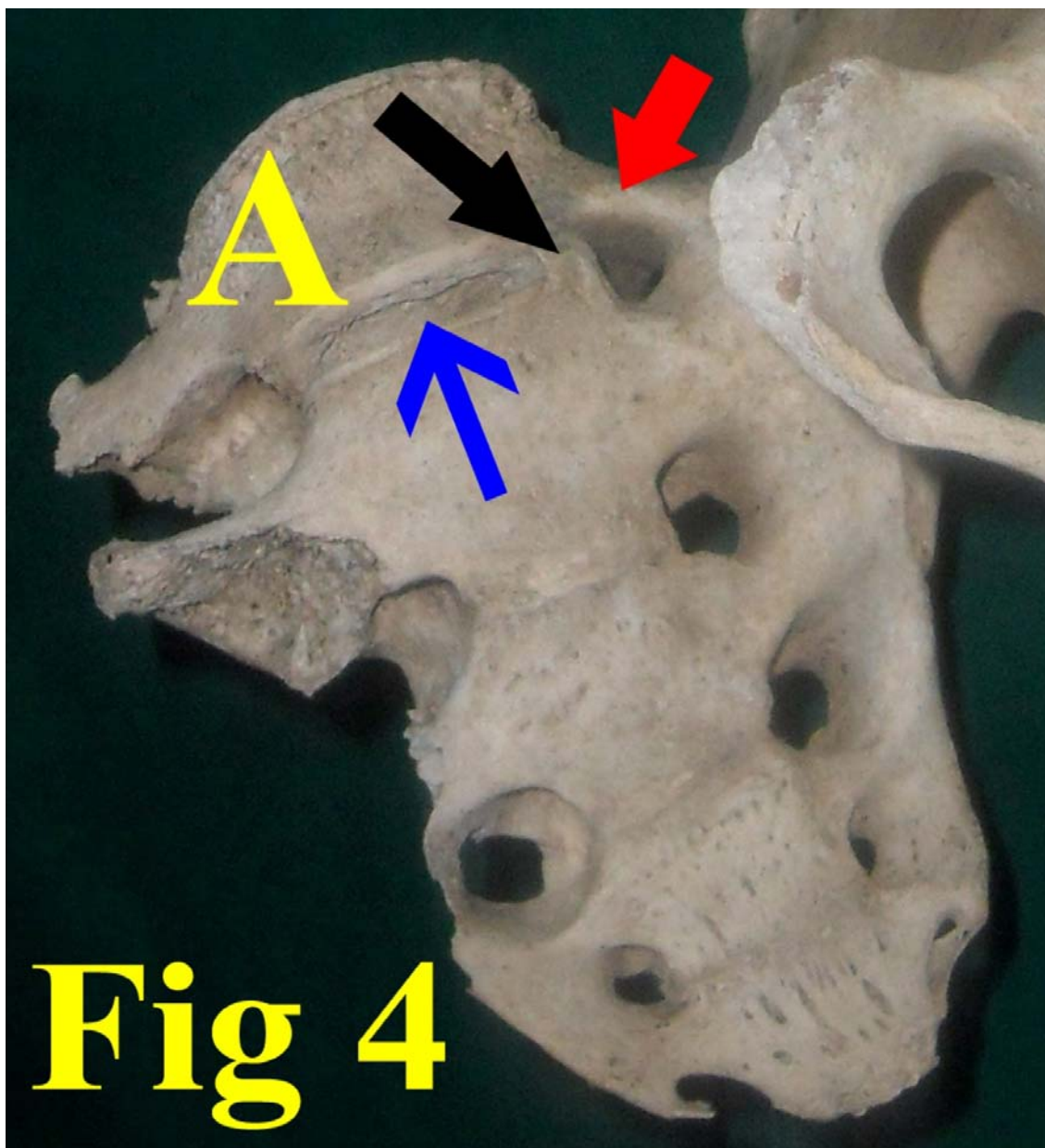


Fig 4: Showing unilateral sacralization.

A- 5th lumbar vertebra; Red Colour Arrow- Transverse process of 5th lumbar vertebra on right side is completely fused with sacrum; Black Arrow- Unilateral fusion of body of 5th lumbar vertebra with sacrum; Blue Arrow- Unilateral non fusion of body of 5th lumbar vertebra with sacrum.

DISCUSSION

Disordered ossification or calcification of cartilages or ligamentous structures in various parts of the body is frequently observed which may seriously hamper clinical and diagnostic procedures such as compression to neighbouring structures or complications in the regional surgery (Kosuri Kalyan Chakravarthi 2013), (Kosuri Kalyan Chakravarthi 2013) (Kosuri Kalyan Chakravarthi 2012). The occurrence of lumbosacral transitional vertebra is linked to its embryological development and osteological defects. sacralization of 5th lumbar vertebra may causes pain are actual pressure on fifth lumbar nerve, ligamentous strain around the sacralization or compression of soft tissues between bony joints resulting in pain along the sciatic nerve distribution. The present study shows that the incidence of sacralization of the fifth lumbar vertebra is 38 %. Based on the literature, sacralization varied by race and incidence the prevalence of Lumbosacral transitional vertebra in our study was much higher than the previous Indian study and the other reports reported in the literature (Table-1).

Table 1: Incidence of Lumbosacral transitional vertebra (Sacralization) as reported by various Research Workers.

Research Workers	Year	Incidence of Sacralization (%)
Karan Bhagwan Khairnar	2013	6.6
Kubawat	2012	11.1
Hughes	2006	9.2
Steinberg	2003	14
Kim	2003	1.7
Chithriki	2002	5.0
Santiago	2001	11.6
Peh	1999	6.2
Hald	1995	7.8
Hahn	1992	7.5
Bustami	1989	10.0
Moore BH	1925	3.6
Present Study	2013	38

Such Sacralization (Lumbosacral transitional vertebra) of 5th lumbar vertebra may misguide or confuse in recognizing correct numbering can theoretically lead to problems with the administration of epidural or intradural anaesthetics or wrong level surgery (Malanga GA 2004) in patients with Lumbosacral transitional vertebra. Lumbosacral transitional vertebra affects the position of the intercrestal line (Tuffier's line) which corresponds to the level L4/L5 and is used as a landmark for needle insertion (Kim JT 1997). Sacralization of fifth lumbar vertebra may cause greater difficulty during labour because of less mobile pelvis and it may result in low back pain problem, Bertolotti (1917) reported the relationship between the low back pain and sacralisation of fifth lumbar vertebra. The sacralized transverse process of 5th lumbar vertebra may form a pseudarthrosis (nonunions) with the ilium and may result in degenerative sclerosis around the false joint. In such cases lumbar nerve roots may be altered and results in low back pain. Sacralization may also may leads to spondylolisthesis. Such occurrence of lumbosacral transitional vertebra is linked to its embryological development and osteological defects.

CONCLUSION

Lumbosacral transitional vertebra may increase the risks of Disc bulge / herniation, pseudarthrosis (nonunions) with the ilium, degenerative sclerosis around the false joint, compression of lumbar nerve roots, low back pain, and false administration of epidural or intradural anaesthetics in lumbosacral region. We believe that the present study has provided some important data which will contribute to the scientific literature, providing the anatomical data of Lumbosacral transitional vertebra in the Indian adult population. Sound knowledge of sacralization is not only enlightening for the orthopaedic surgeons, also vital for the clinical anatomist, Radiologists, Forensic experts Architectures and morphologists.

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