

BLOCK VERTEBRAE OF 5TH LUMBAR AND 1ST SACRAL VERTEBRA

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ABSTRACT

Introduction: Vertebral column is centrally placed structure in the body providing stability, posture, motility and transmission of weight of the body. Disruption during development leads to congenital abnormalities. Fusion of Fifth lumbar vertebra with first sacral can be a congenital abnormality or acquired.

Materials and Methodology: The present study was conducted on 100 dried adult human sacrum of both sexes obtained from Department of anatomy, Deccan College of Medical Sciences, Kanchanbagh, Hyderabad in May-June 2018.



Result: In the present study out of 100 sacra there were 24 fusion of last lumbar vertebra with sacrum. In all cases sacralisation was found to be complete and bilateral. The body, spines, transverse processes, laminae, pedicles and the articular processes were all fused. All the fused vertebrae observed belonged to males.

Discussion: In the present study there is blocking of vertebrae in about 24% of cases. All the fused vertebrae belonged to males showing higher incidence of blocking of vertebrae in males. Magora and Schwartz in 1978 found sacralisation in 20.8% of cases. 1.7% to 14% of sacralisation was reported by Castellvi et al in 1983.

KEY WORDS: congenital, vertebrae, sacralisation, blocking.

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INTRODUCTION

Vertebral column is centrally placed structure in the body providing stability, posture, motility and transmission of weight of the body. Disruption during development leads to congenital abnormalities. Fusion of Fifth lumbar vertebra with first sacral can be a congenital abnormality or acquired. Associated vertebral canal defect if present can lead to compression of spinal nerves. Sacrum is a normal block vertebra. Congenital inseparation of the vertebrae in transition from lumbar to sacral vertebra during

development can occur in 3.5% of cases [1]. Block vertebra occurs due to improper segmentation of the vertebrae leading to parts of or entire vertebrae being fused. Intervertebral disc fuses leading to narrowing of intervertebral foramina and blocking or compression of the exiting nerve roots causing neurological problems and radicular pain [2].

Lumbosacral transitional vertebrae consist of the process of the last vertebra fusing with first sacral segment [3]. Sacralisation can lead to narrowing of intervertebral disc causing disc

prolapse or disc degeneration [4].

MATERIALS AND METHODS

The present study was conducted on 100 dried adult human sacrum of both sexes obtained from Department of anatomy, Deccan College of Medical Sciences, Kanchanbagh Hyderabad in May-June 2018. Any abnormal fusion between adjacent bodies, pedicles, spines, laminae or transverse processes, number of dorsal and ventral sacral foramina, sacral cornua and sacral hiatus was studied.

Inclusion criteria: All intact adult vertebrae were included.

Exclusion criteria: Neonatal and broken vertebrae excluded.

OBSERVATIONS

In the present study out of 100 sacra there were 70 males and 30 females' sacra. 24 vertebrae are found to be fused. Hence sacralisation was found in 24 percent of cases.

In some cases sacralisation was found to be complete and bilateral. The body, spines, transverse processes, laminae, pedicles and the articular processes were all fused. All the fused vertebrae observed belonged to male (fig.no:1 &2). In one of the case spine and body is not fused rest of the parts were fused (fig. no: 3). In another case unilateral fusion of lamina was found (fig.no:4). In 2 vertebrae laminae were not fused, but spines, bodies, transverse processes and pedicles were fused. In one case, both L4 and L5 were found to be fused with sacrum (fig.no:5). In another case only the tip of spine is fused and the rest of spine is not fused (fig.no:6). The whole vertebra was found to be fused with sacrum except the laminae. In 76 cases, sacrum was found to be normal having 4 intervertebral foramina on each side (Fig.no:7). In the fused vertebrae, instead of 4 intervertebral foramina on both sides, i.e. dorsal as well as ventral, there were 5 foramina due to blocking of the last lumbar vertebra with the first sacral vertebrae.

Fig. 1: foramina (ventral view). All parts of vertebrae fused.



Fig. 2: Dorsal view. All parts of vertebrae fused.



Fig. 3: Spine not fused.



Fig. 4: white arrow: fused lamina; black arrow: Lamina not fused).

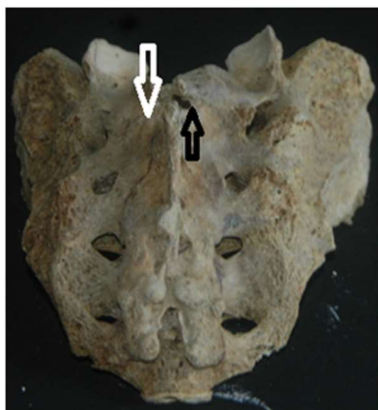


Fig. 4a: White arrow: fused lamina.



Fig. 5: L-4, L-5-Fused with sacrum.

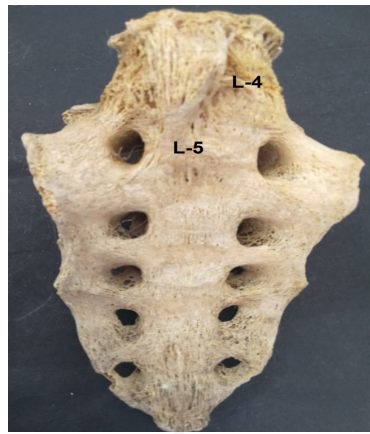


Fig. 5b: L-4, L-5-Fused with sacrum.

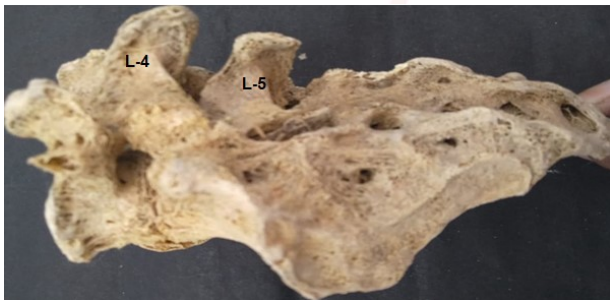


Fig. 6: only, tip of the spine fused



Fig. 7: Normal sacrum with 4 foramina.



RESULTS AND DISCUSSION

In the present study there is blocking of vertebrae in about 24% of cases. All the fused vertebrae belonged to males showing higher incidence of blocking of vertebrae in males. The relationship between lower back pain and

sacralisation of lumbar vertebra was described by Bertolotti in 1917; hence the name Bertolotti syndrome was given to the patients with lower back pain associated with partial sacralisation of lumbar vertebra [5] where a pseudoarthrosis is formed when the transverse process of L5 nudges permanently with the sacrum. Lower back pain in sacralisation occurs due to compression of nerve trunks. Magora and Schwartz in 1978 found sacralisation in 20.8% of cases [6]. 1.7% to 14% of sacralisation was reported by Castellvi et al in 1983 [7]. 6.2% of sacralised vertebrae were reported in the study by Peter et al in 1999 [8]. The ratio of sacralisation to lumbarisation was 2:1 and common in males in the study done by Eyo et al (2001) [9]. 7% of sacralisation was reported by Chet Savage in 2005 [10].

Iliolumbar ligament is found to be weaker and thinner in cadavers with transition of vertebrae with blocking than in the cadavers without blocking as in the study done by Aihara et al in 2005 [4]. The mean prevalence of sacralisation was found to be 12.8% as reviewed by J.L.Brow from 1986 to 2006 [11]. Sharma et al reported 14.1% cases of sacralisation in central India in the year 2011 [12] and 11.1% by Dharati K et al [13] in the year 2012. The present study correlates with the study of Magora and Schwartz with 20.8% of cases [6] reported in 1978. Blocking of vertebrae can lead to disc prolapse, disc herniation, sciatic pain and scoliosis. In pregnant woman during labour, it can cause difficulty in delivering the baby.

Castellvi has classified the blocking of sacral vertebrae with lumbar accordingly, whether the fusion is complete or partial, or only on one side or both sides [7].

Type 1 - fusion of at least 19mm in width only on one side or both sides.

Type 2- incomplete fusion with pseudo joint created on one side or both sides.

Type 3- complete fusion of L 5 to the sacrum on one side or both sides.

Type 4 - combination of type 2 & type 3.

Blocking or sacralisation usually occurs during development. Paraxial mesoderm present on either side of notochord starts forming somites at 3rd week of intrauterine life, which further

differentiate into dermomyotome and sclerotome. Mesenchymal cells of sclerotome surrounding the neural tube forms neural arch where as densely packed mesenchymal cells of sclerotome anterior to the neural tube fuse with loosely arranged cells to form the body of the vertebrae. The improper formation and union of somites can cause vertebral abnormalities including block vertebrae, cleft vertebra or hemi vertebrae. When fusion or sacralization with the body of sacrum occurs, it is central sacralisation. When fusion occurs on the sides it is transverse sacralisation, it can be unilateral or bilateral. When there is bilateral complete fusion occurs, it commonly causes degenerative breakdown of L 4 disc above. Unilateral fusion causes strain on the contra lateral joint at the same level. Partially sacralised vertebrae causes more pain than the fully fused vertebrae. Apazidis et al found type 1 with fusion on only one side most common with a prevalence of 14.7% [15] which does not require any treatment in clinical practice⁷. Nardo et al found 40% of sacralisation is due to type 1 & type 2. Whereas type 3 & type 4 accounted for 11.5% & 5.25% respectively [16]. Sacralisation of lumbar vertebrae is more common in males where as lumbarisation of sacral vertebra is more common in females.¹⁷ The body weight is transmitted through sacrum, lumbosacral ligament, sacroiliac joint and bony pelvis to the lower limb. The transmission of weight functionally depends on the area of sacrum articulating with the ilium. Sacrum fused with the L5 possesses smaller height than the normal sacrum, if L5 is excluded from measurements. Hence a small sacrum with small surface area of sacroiliac joint needs to incorporate L5 to increase the weight bearing capacity of the joint [18]. The range of blocking of lumbar and sacral vertebrae has been estimated to be 4% to 35% in the literature as reported by Bron et.al in 2007 [19] and Konin and Walz in 2010 [20]. Paik et.al in 2013 found the frequency of existence of sacralisation of L5 as 16% [21].

CONCLUSION

A careful study has to be done by the anesthesiologist, neurosurgeons and the orthopaedicians before any procedure on the vertebral column. Knowledge of blocking of any vertebrae should

be noted and specifically reported by the radiologist in X-ray, CT scan or MRI to avoid any complications during surgical procedures on the vertebral column and also to rule out any complications which is present before surgery due to the blocking of vertebrae like herniation, prolapse, degeneration, arthritis etc.

Conflicts of Interests: None

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