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LUMBARIZATION OF FIRST SACRAL VERTEBRA: A CASE REPORT

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ABSTRACT

During routine study of vertebral column, we got lumbarization of first sacral vertebra in the department of anatomy, Al Ameen Medical College, Bijapur. This sacrum had four vertebrae instead of five vertebrae as in the normal sacrum, and there were, three sacral foramina, along with the pelvic and dorsal surface of sacrum. So we identified this variation to be absence of S1 vertebra *i.e.*, Lumbarization of sacrum and S2 vertebra was well developed as like S1. It had well developed sacral promontory and ala of sacrum. So this was lumbarised sacrum. These variations may be found in patients during radiological investigations complaining low back pain. Lumbosacral transitional vertebrae are due to its embryological origin. These variations may affect normal function because of compression of nerves, soft tissue and ligamentous strain between joints. Knowledge of this variation is important to diagnose lower back pain, sciatica, disc prolapse and is helpful in procedures like spinal anesthesia and lumbar puncture.

Key Words: *Sacrum, Lumbarization*

INTRODUCTION

The lumbosacral spine is important as it protects the spinal cord and spinal nerves. It supports and transmits weight of the body to the lower limbs and thus plays an important role in posture and locomotion. Adult human sacrum is a wedge shaped bone with its base uppermost and formed by fusion of five sacral vertebrae below the lumbar region. Its superior wide base articulates with fifth lumbar vertebra at lumbosacral angle and its blunted caudal apex articulates with coccyx. The anterior projecting edge of first sacral vertebra is sacral promontory. It has four pair of pelvic sacral foramina which communicates with the sacral canal. On convex dorsal surface, it has median sacral crest with three or four spinous tubercles representing fused sacral spines. Below the fourth tubercle, there is inverted U shaped gap in the posterior wall of the sacral canal; this is called the sacral hiatus. Lateral to the median crest, the posterior surface is formed by the fused laminae. Lateral to laminae in line with superior articular process of the first sacral vertebra there are four articular tubercles, representing the fused articular tubercles. Lateral to this there are four dorsal sacral foramina. Lateral to this there is lateral sacral crest, representing fused transverse processes. Coccyx is a small triangular bone formed by fusion of four rudimentary coccygeal vertebrae. Body of last sacral vertebra articulates with body of first coccygeal vertebra and coccygeal cornua articulates with sacral cornua. Reduction of sacral constituents is less common but lumbarisation of first sacral vertebra does occur. It remains partially or completely separate. The bodies of first two sacral vertebrae may remain unfused when the lateral masses are fused Gray (2005). It is expected that any sort of compromise in these skeletal features by any pathology either congenital or acquired, will affect the stability of spine and biomechanics Hollinshead (1961). The prevalence rate of lumbosacral transitional vertebrae varies from 4% to 35.9% based on diagnostic criteria, imaging techniques and on the clinical presentation of the patients. On the basis of systematic review of comparable studies the prevalence rate of lumbarisation varies from 3.4% to 7.2% Castellvi *et al.*, (1983); and Bron (2007).

CASES

During routine study of vertebral column, we got lumbarisation of the first sacral vertebra in the department of anatomy, Al Ameen Medical College, Bijapur. This sacrum had four sacral vertebrae instead of five sacral vertebrae as in normal sacrum. There were three sacral foramina along the pelvic and dorsal sacral surface. S5 vertebra was normal. So we identified this variation to be absence of S1

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vertebra and S2 vertebra was well developed as like S1. Transverse diameter of body of S2 vertebra was 27.7mm, transverse diameter of ala of sacrum was 31.3mm on both the sides. Straight length, of sacrum, on its pelvic surface was 88.7mm and curved length 92.4mm. On the pelvic surface, bodies of sacral vertebrae were partially fused and there was partial fusion between lower margin of ala of sacrum with the transverse process of S3 vertebra and also between S4 and S5 vertebrae on right side as in Figure 1. Along the right lateral aspect of dorsal surface of sacrum, there was partial fusion between S2 and S3 at auricular surface and S3 and S4 vertebrae as in Figure 2. Along the left lateral aspect of dorsal surface of sacrum, there was partial fusion near the upper margin of auricular surface, between S2 - S3 and S3 - S4 vertebrae as in Figure 3. Along the medial sacral crest, spine of S2 was well developed. Spine of S3 was less prominent and spines of S4 and S5 were unfused. So, sacral hiatus was elongated. As there were partial fusions at many sites on sacrum and S1 being completely separated from it, this may be due to developmental defect.



Figure 1: Pelvic surface of sacrum formed by four vertebrae, Arrows indicating partial fusion

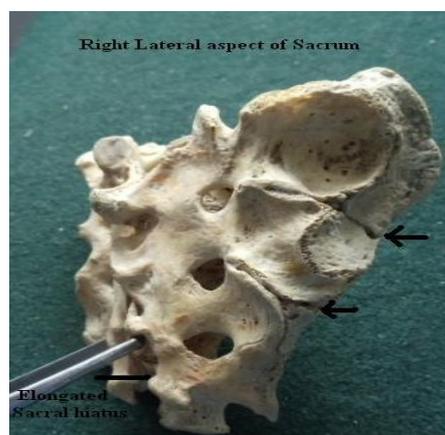


Figure 2: Arrows showing partial fusion on Right Lateral surface

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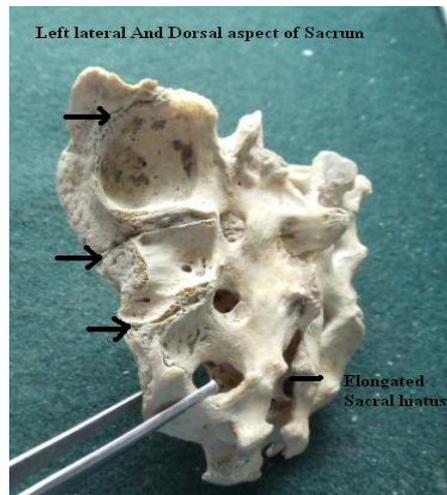


Figure 3: Arrows showing partial fusion on left lateral surface

DISCUSSION

The prevalence of Lumbosacral transition vertebrae reported in the literature ranges from 4 to 35%. This wide range may be explained by differences in diagnostic criteria, imaging techniques and confounding factors between the investigated population samples Bron *et al.*, (2007).

Genetic factors are being responsible for the segmental development of the lumbosacral spine Tini *et al.*, (1977). Welik *et al.*, (2003) showed that in the absence of Hox 11 function, sacral vertebrae are not formed and instead these vertebrae assume a lumbar identity. In addition they showed that in the 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 a Lumbosacral transition vertebrae, result from mutations in the Hox10 and Hox11 paralogous genes.

Ossification defects are other potential cause of variation but it is highly difficult to differentiate between ossification defects and developmental defects as both results in the same morphology Frazer JE (1958) and Hollinshed (1961).

Castellvi (1983) classified lumbosacral transition into four types. Type I includes dysplastic transverse process with width more than 19mm unilateral(a) or bilateral (b), type II includes incomplete lumbarization/ sacralization with enlarged transverse process unilateral (a) or bilateral (b) and pseudoarthrosis of adjacent ala, type III includes complete lumbarization/ sacralization with complete fusion of the transverse process of fifth lumbar vertebra to the sacral ala, unilateral (a) or bilateral(b). Type IV includes mixed variety of type IIa on one side and type IIIa on other side. According to this classification our sacrum was of type III b.

The association of lumbosacral transitional vertebra and low back pain is known as Bertolotti's syndrome. This syndrome was characterized by the presence of a variation of the fifth lumbar vertebra having a large transverse process, either articulated or fused with sacral base or iliac crest and producing a chronic, persistent low back pain due to arthritic changes occurring at the site of pseudoarthrosis Bertolotti M (1917). Mahato (2010) reported 3.9% of sacra presented lumbarization, 2.1% with partial and 1.8% with complete separation of the S1. Sacrum with partial lumbarization, parameters were normal to similar but parameters with complete lumbarization were smaller than normal.

Malanga and Cook (2004) reported wrong level emergency decompression in a patient with a cauda equine syndrome, due to neglecting complete lumbarization of S1. Incorrect numbering can theoretically lead to problems with the administration of epidural or intradural anaesthetics in patients with lumbosacral transitional vertebra. Vandana A *et al.*, (2011) reported 18.4% lumbosacral transitional vertebra of which 14.1% cases of sacralization and 4.3% cases of lumbarization.

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