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Agenesis of Dorsal Wall of Sacrum: A Case Report

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Case Report

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Abstract: Sacrum is a triangular bone formed by fusion of five sacral vertebrae. It is wedged between two hip bones. Its base articulates with 5th lumbar vertebra and apex with coccyx. Complete agenesis of the dorsal wall of sacrum was observed during one routine osteology tutorial. The same is presented. The sacral canal was completely open posteriorly due to non fusion of the laminae from S1 to S5. The sacral canal is formed by sacral vertebral foramina. The anterior wall of the canal is formed by fusion of the sacral vertebral bodies. The fused laminae, spines and ossified ligamenta flava form the dorsal wall. The sacral canal is triangular in cross section and contains cauda equina, filum terminale and spinal meninges. Duramater and arachnoid mater end at middle of sacrum (generally at the level of S2) while filum terminale is continuation of piamater till coccyx. Knowledge of variations in the dorsal wall of sacrum due to congenital factors is essential for anesthesiologists, surgeons and physicians to treat the related disorders. Study of the variation in anatomical features of sacral hiatus and dorsal wall of sacral canal is important with regards to its clinical application in caudal epidural anesthesia. Sacral approach to epidural space is reliable and effective means of blocking sacral nerves.

Keywords: Sacrum, agenesis, dorsal wall.

INTRODUCTION

The Sacrum is a triangular bone formed by fusion of five sacral vertebrae. Variations are observed in its development [1]. It is wedged between two hip bones. Its base articulates with 5th lumbar vertebra and apex with coccyx. Its pelvic surface is concave while dorsal is convex enclosing the sacral canal. The sacral canal is formed by sacral vertebral foramina. The anterior wall of the canal is formed by fusion of the sacral vertebral bodies [2]. The fused laminae, spines and ossified ligamenta flava form the dorsal wall.

CASE REPORT

The variation was observed during one routine osteology tutorial for 1st yr MBBS students (Fig-1 & 2). The same is presented. Complete agenesis of the dorsal wall of sacrum was observed. The sacral canal was completely open posteriorly due to non fusion of the laminae from S1 to S5.

DISCUSSION

The incidence of complete agenesis of dorsal wall of sacrum varies from 0.98% to 4.3% in different literature. The sacral canal is formed by sacral vertebral foramina. The anterior wall is formed by fusion of the sacral vertebral bodies [2]. The fused laminae, spines and ossified ligamenta flava form the dorsal wall. The sacral canal is triangular in cross section. It is bounded by bodies of sacral vertebra anteriorly, pedicles laterally, laminae posterolaterally and spine posteriorly. Sacral approach to epidural space is reliable and effective block of sacral nerves.

The sacral canal contains cauda equina, filum terminale and spinal meninges. Dura and arachnoid end at middle of sacrum (generally at the level of S2) while filum terminale is continuation of piamater till coccyx. The lower end of sacral canal is an arch shaped sacral hiatus. A lot of variations in shape of sacral hiatus have been noted [3] most common being inverted V and inverted U. Other shapes less commonly seen are dumb-bell shaped, irregular and bifid hiatus. Infrequent findings like absence of hiatus due to bony over growth and complete agenesis of dorsal wall of sacral canal have also been well documented. Complete deficiency of the fusion on dorsal aspect leads to complete dorsal wall agenesis or total spina bifida [4].

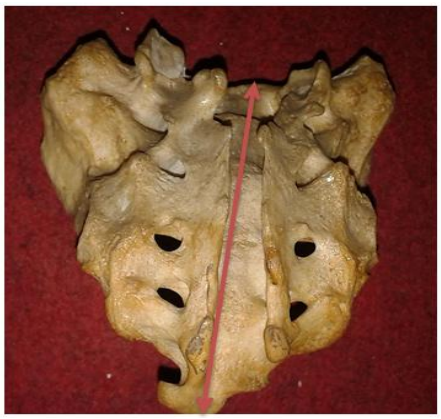

Fig-1: Dorsal view of Sacrum, Arrow showing complete dorsal wall agenesis

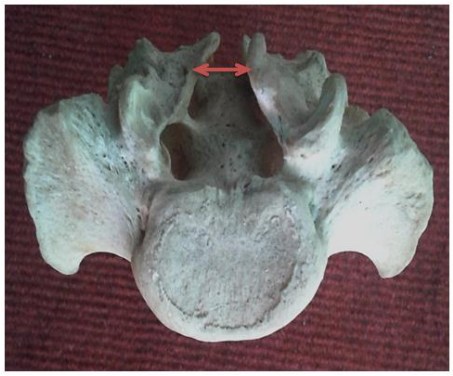

Fig-2: Superior view. Arrow showing complete dorsal wall agenesis

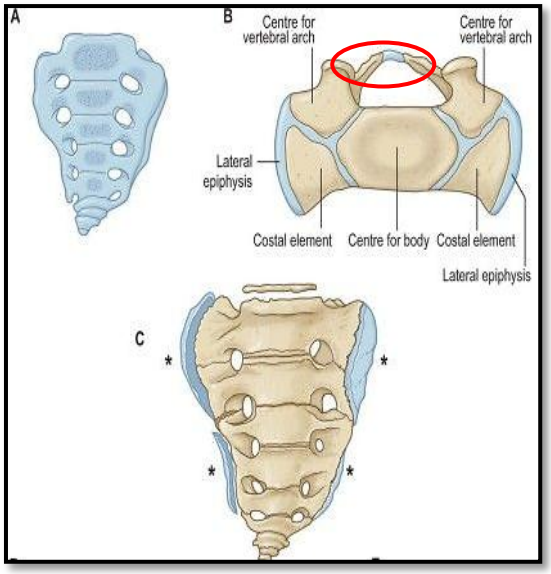

Fig-3: Ossification of the sacrum and coccyx. A: at birth B: base of the sacrum of a child about four years old C: At the 25 years, epiphysial plates for each lateral surface marked by asterisks Site of non-fusion causing the deformity

Sacrum resembles typical vertebra in the ossification of its segments [5]. Primary centers for the centrum and each half of neural arch appear between 10 and 20 weeks of intrauterine life. Additional primary centers for costal elements are present. Each costal element unites with its half of neural arch at 2nd & 5 th year and the conjoined element so formed unites anteriorly with centrum and posteriorly with its opposite fellow at about 8 years (Fig-3). After puberty the fused neural arches and costal elements of adjacent

vertebrae begins to coalesce from below upwards. At the same time individual epiphyseal centers develop for bodies, spinous tubercles and costal elements. The primary centre for neural arch appears near the root of transverse tubercles and then spreads anteriorly towards pedicles and posteriorly towards lamina and spine. Complete fusion of five vertebrae as single piece of bone was observed after puberty. Any defect in fusion leads to incomplete formation of sacral canal and incomplete ossification of laminae. Sacral spina bifida occulta (SSBO) is a term that corresponds to the incomplete closure of sacral canal. The condition may refer to a range of anomalies, varying from partial defect of the posterior arch of some vertebrae to pan-sacral S1–S5 spina bifida [6]. It can cause lower back ache due to compression of nerve roots and may also cause the failure of caudal epidural block. Spina bifida occulta or cystica can be accompanied and neurological defects can be present in such cases.

CLINICAL CONSIDERATIONS

Awareness of the morphological variations of the sacrum is very important. Study of the variation in anatomical features of sacral hiatus and dorsal wall of sacral canal is relevant with regards to its clinical application in caudal epidural anesthesia [7]. Preoperatively, sacral spina bifida occulta may cause failure of caudal epidural block, where as ultra-sonography and fluoroscopy may appear helpful [3].

Orthopedicians must be aware of this condition and should rule it out in patients with chronic low backache. Knowledge about this abnormality is also important in the field of paediatrics to deal with the associated congenital abnormalities. For forensic experts this abnormality can be a very important clue in determining the identity of an individual.

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