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A Study of Dorsal Sacral Agenesis

Brajesh Ranjan[1], Ankita Jain[2]

[1]Lecturer Anatomy, [2] Senior Resident Gynecology & Obstetrics

[1]Government Medical College,Banda (Up), [2]Sardar Patel Medical College, Bikaner, Rajasthan

Corresponding Author: Ankita Jain, Senior Resident Gynecology & Obstetrics, Sardar Patel Medical College, Bikaner, Rajasthan.

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Abstract

Background- Sacrum is a triangular shaped irregular bone formed by fusion of five sacral vertebrae. Sacrum is also called 'Hieron osteon' meaning the holy or sacred bone.

Methods- This study was carried out in department of Anatomy and gynecology & obstetrics. 100 sacral bones from various Medical and Dental colleges of U.P & Rajasthan state were used for this study.

Result-Elongated sacral hiatus i.e. length more than 20 mm was seen in 2 (2.00%) bones. Maximum sacral hiatal length of 51.7 mm was noted. Elongated sacral hiatus were of two types i.e. inverted U and inverted V shaped. 3 (3%) bones showed partial dorsal agenesis of sacrum. Complete dorsal agenesis was seen in 1.00 % sacra. one (1.00%) bones with absent sacral hiatus were seen.

Conclusion- We conclude that, variant anatomy of dorsal wall of sacrum make administration of caudal epidural anaesthesia difficult**.**

Keywords- Spina bifida, dorsal sacral agenesis, sacral hiatus, caudal epidural block.

Introduction

Sacrum is a triangular shaped irregular bone formed by fusion of five sacral vertebrae. Sacrum is also called 'Hieron osteon' meaning the holy or sacred bone.[1] The dorsal surface of sacrum demonstrates a lateral sacral crest, intermediate sacral crest and median sacral crest formed by the fusion of transverse processes, articular process and spinous processes of the sacral vertebrae respectively. The lamina of the fifth and sometimes the fourth sacral vertebra don't fuse to form the spinous process. This is called the 'Sacral hiatus'. The structures passing through the sacral canal are cauda equina, sacral spinal nerve roots, filum termnale externa, fibro fatty tissue, epidural venous plexus and spinal meninges.[2]

The normal length of sacral hiatus is around 10 to 20 mm. When the hiatus length is more than 40 mm then it is called an elongated sacral hiatus. Dorsal agenesis of sacrum is one of the variations seen in sacrum. Here the median sacrum crest show partial or complete agenesis. Caudal epidural anaesthesia is indicated in pediatric surgeries and to reduce labour pains. Caudal epidural anaesthesia is administered through the sacral hiatus. In cases of dorsal agenesis of sacrum it is difficult to locate the hiatus. Partial blocks and complete failure of anaesthesia is seen in such patients. Other variations like absent sacral hiatus and elongated sacral hiatus also cause a problem in administering caudal epidural blocks. [3]

Materials and Methods

This study was carried out in department of Anatomy and gynecology & obstetrics. 100 sacral bones from various Medical and Dental colleges of U.P & Rajasthan state were used for this study. Broken bones and sacrum with lumbarisation and lumbar vertebra with sacralisation were not considered. Sacrum was observed for elongated sacral hiatus, partial dorsal agenesis, complete dorsal agenesis and absent sacral hiatus. Vernier caliper was used to measure length of the sacral hiatus.

Observations and Results

Elongated sacral hiatus i.e. length more than 20 mm was seen in 2 (2.00%) bones. Maximum sacral hiatal length of 51.7 mm was noted. Elongated sacral hiatus were of two types i.e. inverted U and inverted V shaped. 3 (3%) bones showed partial dorsal agenesis of sacrum. Complete dorsal agenesis was seen in 1.00 % sacra. one (1.00%) bones with absent sacral hiatus were seen.

Table 1: Variations of dorsal wall of sacrum.

Features of dorsal wall of sacrum	Number of bones	Percentage (%)
Partial Dorsal agenesis	3	3.00
Complete dorsal agenesis	1	1.00
Elongated sacral hiatus	2	2.00
Absent sacral hiatus	1	1.00

Discussion

Dorsal agenesis is due to failure of fusion of the lamina of the sacral vertebrae to form the median sacral crest. Moore[4] reason this condition to the faulty induction of vertebra formation by the underlying notochord during embryological development.

Spina bifida is an inclusive term for formative defects in neurulation and succeeding vertebral formation. This presents various neural tube defects like craniorachischis (non fusion of neural tube and non formation of vertebral arch) ,anencephaly (non fusion of ventral part of neural tube with no occipital development) and myelocele (non fusion of posterior part of neural tube and failure of vertebral arch development). [5]

Variations in length of sacral hiatus and dorsal wall of sacrum have been reported by various studies. Arora et al[6] in a study of sacrum in north Indian population observed a relatively higher incidence (16.85%) of elongated sacral hiatus. Other studies by Nagar[7] in Gujarat and Nagendrappa and Jayanthi[8] in Karnataka reported similar findings of 4.9% and 4.1% respectively. Our study in Maharashtrian population observed a lower incidence of 2.73%.

Senuglu et al[9] et al opine that developmental defects of the spine must be considered for the sake of patient safety. In a case report of completely bifid sacrum, authors stated that presence of anatomical variations may contribute to a high failure rate of caudal epidural block (7%) transpedicular and lateral screw placement. Total spina bifida and detection of duramater just beneath the hiatus have been observed in 1% of cases. Presence of spina bifida increases the chances of damage to the sacral nerves during internal screw fixation.

Caudal epidural anaesthesia is commonly administered in patients of radiculopathy and lower back pain. Doo et al[10] stated that dorsal sacral agenesis can lead to unforeseen complications like intravenous injections and dural puncture. So ultrasound or fluroscopy guidance while administering caudal block is indicated for better patient outcome.

Conclusion

Various anomalies of dorsal wall of sacrum were seen in Indian population. Knowledge of these variations will be of help to the Anaesthetists. We conclude that, variant anatomy of dorsal wall of sacrum make administration of caudal epidural anaesthesia difficult. So ultrasound or fluroscopic guidance leads to better patient outcome while giving caudal blocks.

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