A STUDY OF DORSAL SACRAL AGENESIS IN THE REGION OF EASTERN UTTAR PRADESH

Dr. Fateh Mohammad¹, Dr. Kamil Khan², Dr. Md Tabrej Alam³

¹Professor, Department of anatomy, Global medical college and Research center Mirzapur pole, Saharanpur, UP.

²Assistant Professor, Department of Anatomy, Hind Institute of Medical Science, Mauataria, Sitapur, UP

³Associate Professor, Department of anatomy, Career Institute of medical science, Lucknow, UP

Article Info: Received 14 September 2019; Accepted 11 October 2019

DOI: <https://doi.org/10.32553/ijmbs.v3i10.613>

Corresponding author: Dr. Kamil Khan

Conflict of interest: No conflict of interest.

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: The present study has been carried out on 98 completely ossified undamaged dry human sacra of undetermined age and sex in the department of Anatomy in the population of Eastern Uttar Pradesh. Each sacrum is examined for the agenesis of the dorsal surface. Representative photographs of different sacrum having partial or complete agenesis on the dorsal surface are taken using a digital camera

Result: Elongated sacral hiatus i.e. length more than 40 mm was seen in 5 (5.1%) bones. Maximum sacral hiatus length of 52.6 mm was noted. Elongated sacral hiatus were of two types i.e. inverted U and inverted V shaped. 4 (4.08%) bones showed partial dorsal agenesis of sacrum. Complete dorsal agenesis was seen in 1 sacrum. One bone with absent sacral hiatus was seen.

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

Keywords: 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 terminale externa, fibro fatty tissue, epidural venous plexus and spinal meninges.²

The average length of sacral hiatus is around 20 to 40 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

The present study has been carried out on 98 completely ossified undamaged dry human sacra of undetermined age and sex in the department of Anatomy. Each sacrum is examined for the agenesis on the dorsal surface. Representative photographs of different sacrum having partial or complete agenesis on the dorsal surface are taken using a digital camera.

Observations

Elongated sacral hiatus i.e. length more than 40 mm was seen in 5 (5.10%) bones. Maximum sacral hiatus

length of 52.6 mm was noted. Elongated sacral hiatus were of two types i.e. inverted U and inverted V shaped. 4 (4.08%) bones showed partial dorsal agenesis of sacrum. Complete dorsal agenesis was seen in 1 sacrum. one bones with absent sacral hiatus were seen.

Table 1: Variations of dorsal wall of sacrum

Features on dorsal surface of sacrum	Number of bones	Percentage (%)
Partial Dorsal agenesis	4	4.00
Complete dorsal agenesis	1	1.00
Elongated sacral hiatus	5	5.00
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. Moore⁴ 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 myelocoele (non fusion of posterior part of neural tube and failure of vertebral arch development).⁵

Variations in length of sacral hiatus and dorsal surface 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 Nagar⁷ in Gujarat and Nagendrappa and Jayanthi⁸ in Karnataka reported similar findings of 4.9% and 4.1% respectively. Our study in population of Eastern Uttar Pradesh observed an incidence of 5.1%.

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 on dorsal surface 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 surface of sacrum make administration of caudal epidural anaesthesia difficult. So ultrasound or fluroscopic guidance leads to better patient outcome while giving caudal blocks.

References

1. Sugar O. How the sacrum got it's name. JAMA 1987;257:2061-3.
2. Standring S. Gray's Anatomy - The Anatomical Basis of Clinical Practice. 40th ed. London: Churchill Livingstone Elsevier; 2008. p.724-8.
3. Senoglu N, Senoglu M, Oksuzl H, Gumusalan Y, Yuksel KZ, Zencirci B, Ezberci M, Kizilkanat E . Landmarks of the sacral hiatus for caudal epidural block: an anatomical study. Br J Anasth. 2005;95(5):692-5.
4. Moore Keith L. The Developing Human, Clinically Oriented Embryology, 8th ed, 2007; pp. 350,387-88, Saunders, Elsevier, Philadelphia, Pennsylvania.
5. Dharati M. Kubavat, Shaileshkumar K. Nagar, Padma Varlekar, Kanan Uttekar, Sneha V. Kumar, Chintan Lakhani. A Study of Total Spina Bifida of the Sacrum in Western India. International Journal of Recent Trends in Science And Technology. 2013;7(1):10-3.
6. Arora S, Dhingra R, Malik VS, Garsa V, Chhabra S. Study of Various Shapes of Sacral Hiatus in North Indian Population. 2016;5(10):1328-32.
7. Nagar SK. A study of Sacral Hiatus in dry human sacra. Journal of Anatomical Society of India. 2007;53(2):18-21.
8. Nagendrappa RB and Jayanthi KS. Study of dorsal wall of sacrum. Int J Res Med Sci. 2014;2(4):1325-1328.
9. Senoglu N, Senoglu M, Gumusalan Y. Total spina bifida occulta of the sacrum. International Journal of Anatomical Variations 2008;1:26-7.