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# Study of the Level at which the Sacral Hiatus Opens in South Indian Population

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**Abstract:** ***The sacrum is a triangular bone which is formed by the fusion of five vertebrae and forms the posterosuperior wall of the pelvic cavity. The bone is wedged between two hip bones. Rostrally the bone articulates with the fifth lumbar vertebrae and caudally it articulates with coccyx. The spines of the sacral vertebrae are fused to form the medial sacral crest. The medial sacral crest presents below a sacral hiatus which is arched and is produced by the failure of the lamina of the fifth sacral vertebra to meet in the median plane. If the laminae of the higher sacral vertebrae are not fused, then the hiatus will be seen at a higher level. 100 Sacrum were observed and the level at which the sacral hiatus opens is reported. Orthopaedicians and anaesthetists need to be aware of such conditions and their frequency in the local populations because the success of caudal epidural anaesthesia and analgesia depends on the anatomical variations of sacral hiatus.***

**Keyword:** Anaesthetists, Lumbar, Orthopaedicians, Sacrum, Vertebrae.

## 1. Introduction

The sacrum is a triangular bone which is formed by the fusion of five vertebrae and forms the posterosuperior wall of the pelvic cavity. The bone is wedged between two hip bones. Rostrally the bone articulates with the fifth lumbar vertebrae and caudally it articulates with coccyx. The spines of the sacral vertebrae are fused to form the medial sacral crest. The medial sacral crest presents below a sacral hiatus which is arched and is produced by the failure of the lamina of the fifth sacral vertebra to meet in the median plane[1]. If the laminae of the higher sacral vertebrae are not fused, then the hiatus will be seen at a higher level. The hiatus is one of the useful landmarks to give epidural analgesia[2]. Sometimes non-fusion of all the five laminae of the sacrum is observed posteriorly which will present a midline gap[3]. This condition is observed in spina bifida. These kinds of anatomical variations can cause lower backache[4] and also may cause the failure of epidural analgesia[5] procedure. Our study aims to observe such variations and help the anesthetists and orthopaedicians to be aware of such conditions while performing surgical procedures.

## 2. Materials and Methods

100 Sacrum were observed in the Department of Anatomy, JSS Medical college, Mysore and DM-WIMS, Meppadi, Kerala without considering the sex and age of the individual to whom the sacrum belongs.

## 3. Observations and Results

| Level of the Vertebrae at Which the Sacral Hiatus is Found | Percentage of Occurrence |
|---|---|
| Unfused | 1 |
| S1 | 00 |
| S2 | 1 |
| S3 | 8 |
| S4 | 57 |
| S5 | 33 |

In the present study one sacrum was found to have unfused lamina having an open sacral canal. None of the sacrum showed sacral hiatus at S1. 1% of the sacrum was having hiatus at the level of second sacral vertebra, 8% at third and 33% at fifth sacral vertebra. Maximum numbers of the sacrum i.e., 57% of them were seen to have hiatus at the level of fourth sacral vertebra.

Images showing the different levels at which the sacral hiatus is opening. The lower right picture showing open sacral lamina

## 4. Discussion

The sacrum develops from the fusion of five vertebrae. After puberty the sacral vertebrae start fusing with each other. The primary centers which form the each half of the vertebral arch fuse posteriorly to form a complete sacral canal. Any defect in the formation leads to incomplete formation of sacral canal. In the present study one sacrum was found to have unfused lamina having an open sacral canal. None of the sacrum showed sacral hiatus at S1. 1% of the sacrum was having hiatus at the level of second sacral vertebra, 8% at third and 33% at fifth sacral vertebra. Maximum numbers of the sacrum i.e., 57% of them were seen to have hiatus at the level of fourth sacral vertebra. The knowledge about the level of the sacral hiatus is important because it is useful in caudal analgesia procedure. The knowledge of structural modification is essential. According to M P Shah[6] the hiatus was found at the level of fourth sacral vertebrae in 55.9%, at the level of third sacral vertebrae in 33.7%, at the level of fifth sacral vertebrae in 3.4% and at the level of second sacral vertebrae in 3.4% in 1.5 % of the cases it was unfused and the rest was found at the level of first sacral vertebra. Our study is not in agreement with that of the other study. The difference may be because of the study in different population, the environmental factors which result in such deformities may be some of the differentiating points which form such anomalies. In clinical practice it is very important because the success of the caudal epidural anesthesia depend upon such variations.

## 5. Conclusion

Orthopaedicians and anaesthetists need to be aware of such conditions and their frequency in the local populations because the success of caudal epidural anaesthesia and analgesia depends on the anatomical variations of sacral hiatus. Lower backache and other neurological symptoms may be caused due to such anomalies. There is a lot of future scope for such studies because local environmental factors and also nutritional factors are responsible for such anomalies which can be identified by further studies.

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