



## NARROWING OF SACRAL CANAL AT THE HIATUS- A RARE ENTRAPMENT SYNDROME ENTITY

<b>Dr Jigyasa Passey</b>	Senior Resident, Department of Anatomy, Maulana Azad Medical College, New Delhi.
<b>Dr Preeti Goswami*</b>	Associate Professor, Department of Anatomy, Maulana Azad Medical College, New Delhi. *Corresponding Author
<b>Dr Sabita Mishra</b>	Director Professor & Head, Department of Anatomy, Maulana Azad Medical College, New Delhi.

**ABSTRACT** The Sacrum is formed by the union of five vertebrae forming the sacro-iliac & sacro-coccygeal joint. The sacral canal spans the entire sacrum and is occupied by the filum terminale, cauda equina and the spinal meninges. During routine osteology demonstration, a sacrum was identified in which the sacral hiatus was almost occluded. As important structures pass through the hiatus, a constricted lumen may lead to entrapment syndrome. To the best of our knowledge, this is a unique entity and maybe a rare cause of non specific low back pain; thus important for orthopaedic surgeons, chiropractors & physiotherapists.

**KEYWORDS :** Occlusion, sacral hiatus , entrapment

### INTRODUCTION-

The sacrum is a large inverted cone shaped bone formed by the fusion of five vertebrae. It participates in the formation of the postero-superior wall of the pelvic cavity; flanked between the two hip bone.

The apex of the inverted cone articulates with the Coccyx and the base with the 5<sup>th</sup> lumbar vertebrae at the lumbosacral angle. The sacrum is placed obliquely, with the dorsal surface being convex and pelvic surface concave. It contains the sacral canal, which runs through the sacrum and contains the filum terminale, cauda equina and the spinal meninges.

Its caudal end is the sacral hiatus, which is produced as a result of the failure of the fusion of the laminae at the midline. The 5<sup>th</sup> sacral nerve, filum terminale with its meninges exit from the hiatus. The skin, superficial fatty layer and superficial sacrococcygeal ligament cover the hiatus. Also, sacral hiatus can be identified easily by palpating the sacral cornua in lateral position, 5cm above the tip of the coccyx, at the upper end of the natal cleft.

Due to these anatomical advantages, Sicard & Cathetin considered the sacral hiatus for the application of the caudal epidural block described first in 1901. After the conception of the lumbar epidural block by Page in 1921, there was a steady decline in this technique.

It was rendered ineffective and a plausible explanation was its great anatomical variation and overlapping dermatomes.

Since then many morphometric studies were done on the sacral hiatus wherein the antero-posterior diameter of the caudal end of sacral hiatus were calculated to be around 5mm, we present a rare case report in which the sacral canal is narrowed to almost no lumen which may predispose individuals to entrapment syndrome, neurogenic pain and failure of caudal anesthesia.

### Case Report

During routine Osteology demonstration of 1<sup>st</sup> year MBBS students , the sacrum was identified. The bone was thoroughly examined, measured and photographed. The prominent feature was that the sacral canal was exhibited constricted lumen. The shape of the sacral hiatus was inverted 'U' shaped. No other abnormality was noted in the sacrum. The following observations were made.

### Sacral Canal Measurements

#### 1. At the base

- Oblique length was measured from the middle point of the dorsal margin of the articular facet for L5 vertebra & highest point on the median sacral crest- 2.5 cm
- Width was measured between the highest & lateral most points on of the margins of the sacral canal- 3.5cm

#### 2. At the sacral hiatus

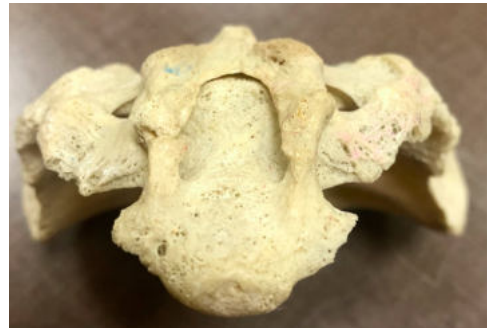
- Oblique length – could not be assessed
- Width- could not be assessed



**Fig 1.** Measurement Of Oblique Length At The Base Of Sacrum



**Fig 2.** Measurement Of The Width Of The Sacral Canal At The Base



**Fig 3.** At Sacral Hiatus- Narrowed Lumen. Measurements Could Not Be Performed

### DISCUSSION

The sacral canal is formed by the sacral vertebral foramina. It presents with 2 openings, an upper oblique opening seen from the basal surface and the caudal opening which is the sacral hiatus. It also presents with 2 lateral walls. Each lateral wall has 4 intervertebral foramina through which the canal communicates with the pelvic and dorsal sacral foramina. The canal appears triangular in cross section and its contents are the cauda equina, filum terminale and the spinal meninges. The

lower sacral spinal roots and the filum terminale pierce the arachnoid and dura mater at the middle of the sacrum where subdural and subarchnoid spaces finish. The filum terminale, its meninges and S5 nerve exit below the sacral hiatus. Filum Terminale passes downwards across the dorsal surface of 5th sacral vertebra and sacrococcygeal joint to reach coccyx whereas the 5<sup>th</sup> sacral nerve runs medial to the sacral cornua while grooving the lateral part of 5<sup>th</sup> sacral vertebra.

Incomplete fusion of laminae of sacral vertebrae leads to the formation of the sacral hiatus. The various developmental anomalies of the sacral hiatus varies from agenesis to complete failure of fusion of laminae of all sacral vertebrae which leads to a midline gap along entire sacrum. Due to such variations, these variant sizes of sacral hiatus provide variant surface area for the attachment of extensor muscles of back which may lead to painful conditions of the back (Brailsford, 1929) Many previous studies have recorded the morphometric analysis of sacral hiatus, the literature is exhaustive; Ramswaroop (2018) measured the Antero-posterior distance at the sacral hiatus to be 5.81mm which was consistent with other North Indian studies. As mentioned before, sacral hiatus is an important landmark to administer anesthesia. In our case, the sacral hiatus is completely occluded which may be an important cause of anesthesia failure in various surgical procedures. Also, due to such narrowing of the sacral canal, S5 nerve maybe entrapped at the exit or may have a variant course while exiting the sacrum. Therefore knowledge of anatomical variants of the sacral hiatus and sacral canal maybe helpful in administration of caudal anaesthesia. Moreover, this condition may be a rare differential diagnosis for chronic back pain therefore important for knowledge for Orthopaedics, Chiropractors and physiotherapists.

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