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Case Report:

Complete dorsal wall defect in a dry human sacrum

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Abstract

Sacrum is a large triangular bone formed by fusion of five sacral vertebrae and intervertebral disc. The vertebral foramina of all the five sacral vertebrae fuse to form the sacral canal which is triangular in cross section. The sacrum forms the lower part of vertebral column as well as postero-superior wall of pelvic cavity. While studying the sacra available in Department of Anatomy B. J .Govt .Medical College, Pune we noticed a sacrum showing complete absence of the dorsal wall of the sacral canal. Multiple studies in past suggested dorsal wall defect of sacrum, but very few have highlighted the complete dorsal wall defect as found in our case. The knowledge of dorsal wall agenesis of sacral canal is of great value in various situations like, interpreting the radiographs of sacral spine for radiological approaches, for successful administration of caudal epidural block and in treating the cases of neurological involvement of urinary bladder and rectum.

Key words: Sacrum , sacral canal , caloscopy , sacral vertebrae

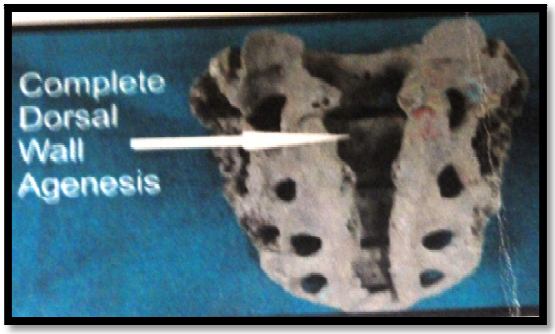
Introduction:

The sacrum is a large triangular bone formed by fusion of five sacral vertebrae & intervertebral discs.It is inserted as a wedge between two innominate bones forming the postero-superior wall of pelvic cavity. The sacral canal contains the cauda equina including the filum terminale & the spinal meninges.The subarachnoid & subdural spaces end at the level of S2 vertebra. The filum terminale emerges below at the sacral hiatus & passes downwards. The 5th sacral nerve also emerges through the sacral hiatus close to medial side of the sacral cornua.The sacral hiatus is covered posteriorly by skin, a subcutaneous fatty layer & the sacro-coccygeal membrane.In the ossification of sacrum-21 primary centres and 14 secondary centres; Additional secondary ossification centres may appear for the spinous, transverse & mamillary processes.

The sacral hiatus has a clinical implication as it is used as the site for administration of epidural anaesthesia in obstetrics & in orthopaedic practice.During caudal epidural block, the anaesthetic solution spreads superiorly & extra-durally where it acts on sacral & coccygeal spinal nerves of the cauda equina. The reliability & success of caudal epidural anaesthesia depends upon the knowledge of normal anatomy & variations of sacral hiatus & walls of sacral canal. The caloscopy, which is the endoscopy of lumbar subarachnoid space performed through different approaches in the lumbosacral spinal canal by using flexible endoscopes. The caloscopy can be performed from various different sites such as translumbar (L3-L4 level) & trans-sacral (S1-S2 or through the sacral hiatus). The caloscopy is successful if we know the common possible variations in the morphology & morphometry of sacral canal & hiatus.The variations in the development of sacral canal & hiatus can decrease the area for the attachment of extensor muscles at back causing painful conditions.When there is non-fusion of laminae of all the sacral vertebrae, as seen in our case there will be a midline gap. In spina

bifida occulta,the posterior elements of upper sacral vertebra fail to fuse. This kind of anatomical variations will lead to painful condition of the back & some clinical procedural failures.Thus, the knowledge of this anomaly should be kept in mind especially by anaesthetist & orthopaedicians while performing surgical procedures.

Case report: While studying the sacra available in Department of anatomy B.J.Government Medical College, Pune. We noticed a dry human sacrum showing complete absence of dorsal wall of the sacral canal.



Discussion:

The development of sacrum resembles the ossification of a typical vertebra. Any defect in the formation of the primary centers,which give rise to the formation of half vertebral arch will lead to incomplete formation of sacral canal & incomplete ossification of the laminae.The secondary centres of ossification appears after puberty & all the sacral vertebrae start fusing with each other. In such cases, the nerve roots are then exposed & thus these nerve roots are prone for damage by any trivial injury in that area. this could result in some kind of urinary bladder & rectal pathology.

	Vinod Kumar et.al	Nagar SK	Dr. Zaran a Patel	Senoglu et al
Complete dorsal wall defect	1.49 %	1.5 %	2 %	2.08 %

Many studies have been conducted on the morphology of sacral hiatus & various shapes have been described in literature. Developmental malformations of sacral hiatus can range from variations in the sacral hiatus to complete absence of dorsal wall of sacral canal or caudal agenesis. In the morphological features of sacral hiatus, the extent of hiatus normally lies up to the S4 vertebra but it may extend as high as S2 vertebra (Nagar S.K.) [1].Most commonly observed hiatal shapes are inverted 'U' & inverted 'V', whereas irregular dumbbell & bifid shapes are seen as variations from normal. A rare variation includes hiatal agenesis & complete dorsal wall agenesis. Stanford Helm II in their study observed 3% hiatal agenesis, while complete dorsal wall agenesis of sacral canal was observed by Trotter et al (1944)[2] in1.8% & Nagar S K in their study has found 1.5% sacra with complete absence of dorsal wall of sacral canal.Vinod Kumar et [3] all have observed 1.49% of sacra without dorsal wall of sacral canal.

Conclusion:

The sacral canal & sacral hiatus shows significant variations in its anatomy, complete dorsal wall defect of sacral canal is one of the most important of them.Complete dorsal wall defect of sacral canal is one the contributing factor for failure of caudal epidural block. So this kind of variation should be

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kept in mind by anaesthetists while giving the block.Also, the orthopaedicians & obstetricians should be aware of such kind of variation while treating the cases. Knowledge of this variation may be helpful to the radiologists in interpreting the radiographs. Physicians must also be aware of this condition while treating the cases of neurological involvement of urinary bladder and low backache.

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