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VARIATIONS IN SACRAL HIATUS FOR CAUDAL EPIDURAL BLOCK OF DRIED SACRAL BONE AMONG CENTRAL INDIAN POPULATION: AN ANATOMICAL STUDY

Anaesthesiology

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ABSTRACT

Aim: To interpret the morphological disparities of sacral hiatus for Caudal epidural block of dried sacral bone among Central Indian population **Material and methods:** Study was carried out in 30 sacral bones (unknown sex & age) of Indian origin obtained from the department of anatomy in Chirayu medical college. Composition of sacrum, shape of sacral hiatus and level of hiatus along with other dimensions were recorded **Results:** Morphology of total 30 dry sacral bones were observed for various parameters of sacral hiatus and the measurements were recorded using digital vernier calipers. **Conclusion:** Anatomical familiarity of sacral hiatus is crucial in caudal epidural anesthesia administration to control intra operative analgesia by obstetrics during labor, in other genitourinary surgeries and also to prevent chronic pain of lower back origin,

KEYWORDS

Sacral Hiatus, Morphology, Caudal Epidural Anesthesia

INTRODUCTION:

Sacrum is formed by the union of five vertebras. It is a triangular bone, the caudal apex of which articulates with the coccyx and its wide superior base with the fifth lumbar vertebra at the lumbosacral angle[1]. It is also considered to be most variable part of spine. The sacral canal is the continuation of lumbar spinal canal enclosing cauda equina and also the spinal meninges [2]. Near the caudal end of sacral canal lies an opening called the Sacral hiatus (usually an inverted U shaped) covered posteriorly by skin, a subcutaneous fatty layer and the sacrococcygeal membrane[3].

Sacral hiatus is located inferior to lower end of median sacral crest or the 4th (or 3rd) fused sacral spines and can be located on the body surface two inches above the tip of coccyx beneath the skin of natal cleft [4] .The sacral canal is generally filled with adipose tissue and the epidural venous plexus, the density of which decreases with age thereby determines the effectiveness in the spread of local anesthetics administered for caudal anesthesia.

Two French physicians, Fernand Cathelin and Jean-Anthanase Sicard[5], has described the caudal anesthesia for the first time. Caudal epidural block is broadly utilized to provide anesthesia for several clinical procedures; to control the chronic pain of lower back and also in management of lumbar spinal disorders and it involves the injection of anesthetic medications into the epidural space through the sacral hiatus. CEB is useful when anesthesia of the lumbar and sacral dermatomes is required.

In 1941 obstetrics department used for the first time Sacral hiatal route to administer epidural anesthesia for painless delivery and for transpedicular and lateral mass screw placementin orthopedic practice it is used. CEB is also employed in surgery below the umbilicus like repair of hernia, lower limb surgery, skin grafting procedures on the anal canal and rectum[7]. Despite wider range of clinical applications for caudal anesthesia at times it is hard to locate the anatomical location of caudal epidural space and the sacral hiatus particularly in adults. Determining the landmarks enables the physician to discover the sacral hiatus further furnishes the success rate of CEB[3]

MATERIAL & METHODS:

Current Study was carried out in 30 dry sacral bones (unknown sex & age) of Indian origin obtained from the department of anatomy in Chirayu medical college. Bones with pathology, fracture, wear and tear were excluded from the present study. Measurements were noted by using Digital vernier calipers Sacrum has been analyzed in relation to its composition. Sacral hiatus has been studied for different characteristics and the following parameters were recorded

1) Composition of Sacrum
2) Shape of hiatus
3) Level of apex of hiatus
4) Level of base of hiatus
5) Length of hiatus: Measured from apex to midpoint of base.

OBSERVATION & RESULTS:

Morphology of total 30 sacral bones were observed in regard to different parameters of sacral hiatus and the measurements were noted as follows as depicted in Tables 1,2,3,4,5

Table1: Composition of Sacrum (n=30)

S.No	Composition of sacrum	No. of Specimens	Percentage (%)
1	3 Segments	1	3.33
2	4 Segments	2	6.66
3	5 Segments	24	80
4	Coccygeal ankylosis	3	10
	Total	30	100

Table 2: Shape of Sacral Hiatus (n=30)

Sr.No.	Shapes	No.of Specimens	Percentage (%)
1.	Inverted -U	10	33.33
2.	Inverted-V	14	46.66
3.	Irregular	05	16.66
4.	Dumbbell	01	3.33
5.	Fused	01	3.33
	TOTAL	30	100

Table 3: Location of Apex of Sacral Hiatus (n=30)

Sr.No.	Apex Location	No. of Specimens	Percentage (%)
1.	S2 level	02	6.66
2.	S3 Level	09	30
3.	S4 Level	19	63.66
	Total	30	100

Table 4: Location of Base of Sacral Hiatus (n=30)

Sr.No.	Location	No. of Specimens	Percentage (%)
1.	4th Sacral vertebra	05	16.66
2.	5th Sacral vertebra	21	70
3.	Coccyx	04	13.33
	Total	30	100

Table 5: Length of Sacral Hiatus from apex to midpoint of base (n=30)

S.No	Length(cm)	No. of Specimens	Percentage (%)
1	1-2	2	6.66
2	2-3	25	83.33
3	3-4	3	10
	Total	30	100

DISCUSSION:

Variations in the anatomical variations of the sacral hiatus and the posterior wall of sacral canal are significantly related to the caudal epidural block clinically in several regards like painless labor, to prevent chronic low back pain by injecting corticosteroids ad the local

anesthetics epidurally e.t.c. Failure rate of about 25% has been noted in CEB. Sacral hiatus plays a key role as a bony landmark in the accomplishment of Caudal epidural block although difficult to palpate in obese individuals

In the present study composition of the sacrum is made with five segments was seen in 80 % (24) of the sacrum, 4 segments were observed in 6.66% (2) of cases, while 3 segments is identified in 3.33% (1). Shewale et al[8] observed 5 segments in 69.6% of cases and 4 segments has been recorded in 2.45% of cases. Whereas in another study by Trotter and Lanier[9] (1945) has observed 4 segments in sacrum among 8(0.7%) cases only. The present findings are in correlation with the observations of Shewale et al.

Coccygeal ankylosis was identified in 10% of cases of the present study. Shewale et al [8] noticed coccygeal ankylosis among 18.13% of specimens. Present study has shown Inverted V and U shape is noted among 46.66% and 33.33% of cases. In addition to these other shapes like irregular and dumbbell of the sacral hiatus was also noted among 16.66% and 3.33% of cases. Anupriya et al studies in their study has observed maximum incidences of sacral hiatus of inverted V and U shaped 35.85 % and 26.42% respectively[10].

Apex of the sacral hiatus has a great role in the success of caudal epidural block. As there is considerable disparity in the position of apex ranging from S2 – S4 , it is important to know the level of apex for effective CEB. Among the cases observed the location of the apex of sacral hiatus is at at the level of S4 in 63.33% of specimens while least percentage was observed at the level of S2.

Sekiguchi et al 2004 [12]noticed the apex 64% at S4 level i& in 4% of sacra at S2 level which was almost close to the present study but they found a lower incidence of 15% at S3.Patel et al [12]noted that 59.33% cases the presented apex at S4 .P. Sasikala[13]et al 11 in their study has noted location of apex of sacral hiatus at the level of S4 in 72.41% and is seen in 6.90% presented at S3 level.

Knowledge of the base of sacral hiatus is also important as the position has substantial variations ranging from S4 to coccyx. Present study has noted the base at the level of S5 in 70% of the cases. In another study by Suma et al [14]found the base in 64.84% of cases at 5th sacral vertebra. In the study by Anupriya et al[10] studies among 62.26% of cases base is observed at S5 seen while in24.53% of a specimens, it was at lowest location of coccyx. In the study by Aggarwal[15] et al it was at coccyx among 61.40% Nagar et al [16]noted the level of base at coccyx in 72.6% of the specimens. In a study by Sasikala et al[13]noted base of sacral index at S5 level among 82.76% while in 10.34% of cases base is found at level of coccyx .The finding were almost in agreement with the earlier studies.

Among the cases observed 83.33% of the sacra has presented the length varied from 1-2cm while in 10% of the sacra exhibited a range of 3-4cm .Neeta Chhabra[17]In her study the length of the sacral hiatus varied from 9.98 mm to 61.98 mm and In 33.33% cases it was found 21 to 30 mm long sacral hiatus. The present findings are in agreement to the studies done by Trotter& Lanier [10] (1945) who mentioned a mean hiatal length of 24.8 mm in American males and19.8 mm in females respectively.

CONCLUSION :

Sacrum is widely used by anesthetists while giving caudal epidural block & also for sex determination in several medico legal proceedings. Disparities in shape and level of hiatus may result in caudal epidural anesthesia failure. Thus the variations provided from the present study have to be considered while administering caudal epidural block as the success rate of caudal epidural anesthesia rely on determining its exact location. Therefore all the physicians should be aware of the sacral anatomy, most importantly to the aforesaid professions.

REFERENCES:

1. Patil D, Jadav H, Kumar B et al. Anatomical study of sacral hiatus for caudal epidural block. Nat J Med Res 2012; 2(3):272-5.
2. Aggarwal A. Morphometry of sacral hiatus and its clinical relevance in caudal epidural block. Surgical and Radiologic Anatomy 2009; 31(10):793-80.
3. Senoglu N, Senoglu M, Oksuz H et al. Landmarks of the sacral hiatus for caudal epidural block: an anatomical study. Br. J Anaesth 2005; 95(5):692-5.
4. Standring S. Grays Anatomy. The anatomical basis of clinical practice. London:Elsevier Churchill Livingstone. 2005; 40th Ed 724-728.
5. Lakshmi AT, Azra J. Surgically Relevant Morphometry of Sacral Hiatus. Anatomica Karnataka 2013;7(1):52-6.
6. Chen PC, Tang SFT, Hsu TC et al. Ultrasound guidance in caudal epidural needle placement. Anaesthesiology 2004;101(1):181–4.
7. Seema, Singh M, Mahajan A. An anatomical study of variations of sacral hiatus in sacra of North Indian origin and its clinical significance. Int J Morphol.2013;31(1):110-4.
8. Shewale SN, Laeeque M, Kulkarni PR et al. Morphological and morphometrical study of sacral hiatus. Int J Recent Trends in Sci & Tech 2013; 6(1):48-52.
9. Trotter M and Lanier PF. Hiatus canalis sacralis in American whites and Negroes. Hum Biol. 1945;17:368-81.
10. Anupriya A, Sophia MM. Anatomical study of sacral hiatus in south Indian population & its clinical significance in caudal epidural anesthesia. NJCA. 2014; 3(3): 128-136.
11. Sekiguchi M, Yabuki S, Satoh K et al. An anatomical study of the sacral hiatus: a basis for successful caudal epidural block. Clin J Pain 2004;20(1):51–4.
12. Patel ZK, Thummar B, Rathod SP et al. A multi-centric morphometric study of dry human sacrum of Indian population in Gujarat region. NJIRM 2011;2(2):31- 5.
13. P. Sasikala Arunkumar S. Bilodi Study of sacrum and its importance in epidural block Int J Cur Res Rev | Vol 7 Issue 9 May 2015.
14. Suma HY, Kulkarni R, Kulkarni RN. A study of sacral hiatus among sacra in South Indian population. Anatomica Karnataka 2011;5:40-4.
15. Aggarwal A, Aggarwal A, Harjeet, Sahni D. Morphometry of sacral hiatus and its clinical relevance in caudal epidural block. Surg Radiol Anat. 2009 Dec;31(10):793-800. doi: 10.1007/s00276-009-0529-4. Epub 2009 Jul 4. PubMed PMID: 19578805/
16. Nagar SK. Shah Medical College, Jamnagar, Gujarat: A study of sacral hiatus in dry human sacra. J Anat Soc India. 2004;53:18–21/
17. Neeta ChhabraAn Anatomical Study of Size and Position of Sacral Hiatus; Its Importance in Caudal Epidural BlockInternational Journal of Health Sciences & Research (www.ijhsr.org) Vol.4; Issue: 12; December 2014