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Original Research Article

Correlation of distance from skin to lumbar epidural space with age and height of patients

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ABSTRACT

Background: Epidural block is a popular and versatile procedure with applications as sole anaesthetic, as an analgesic adjuvant to general anaesthesia and for post-operative analgesia in procedures involving lower limbs, perineum, pelvis, abdomen and thorax. However, success of the epidural technique depends upon the correct identification of epidural space. The knowledge of distance from skin to epidural space can help in better identification of epidural space and epidural catheter placement with fewer incidences of complications. We conducted a study to find the distance from skin to the epidural space and its correlation with patient height and age to improve the success rate.
Methods: Seventy-four patients scheduled to undergo lower lumbar surgeries where epidural block was required as anaesthetic or analgesic, were included in the study. These patients were randomly divided into four different groups of 37 patients each according to their age (group A and group B) and height (group C and group D). In these patient's epidural block was given by standard technique according to the need of surgery and epidural depth measured. Obtained results were compared among group A, B and group C, D depending on their age and height respectively.
Results: In group A (age 20-30 years), mean epidural depth was 3.96±0.4 cm while in group B (age 30-40 years) mean epidural depth was 4.05±0.5 centimeters. In group C (height 155-169 cm) mean epidural depth was 3.88±0.4 centimeters while it was 4.13±0.5 centimeters in group D (height 170-184 cm).
Conclusions: There was increase in epidural depth with increase in height of patients but there was no correlation between age of patients and epidural depth.

Keywords: Epidural depth, Age, Height

INTRODUCTION

Epidural anaesthesia is a central neuraxial block technique which acts by blocking spinal nerves in epidural space at the point of their emergence from dura before entering into intervertebral foramina. It was introduced in 1885 by corning and subsequent improvement in equipment, drugs and technique in last century has made it a popular and versatile procedure.[1] Epidural space is a potential space that lies between the dura and the periosteum lining the inside of vertebral canal.[2] This space can be reached in a midline sagittal plane by penetrating skin, subcutaneous tissues, supraspinous ligament, interspinous ligaments and ligamentum flavum.[3]

Since it is a blind procedure, it is difficult to accurately identify the epidural space resulting into 1.5% failure rate. This can be due to excess fat, undue ossification or repeated puncture of the dura mater.[4] Various techniques have been used for localizing epidural space. These techniques are mainly based on either negative pressure

(visual methods) or loss of resistance (tactile methods). Depth of the epidural space from skin varies and a maximum depth is seen in the third interspace between L3 and L4 spine, above and below this space the depth decreases.[3] It also varies from patient to patient at the same vertebral level. Precise estimation of this epidural depth prior to the procedure will increase the chances of successful block and decrease the complications associated with unwanted dural puncture. Epidural depth can be influenced by variety of factors. While there are several studies on correlation of distance from skin to epidural space with BMI of patients, studies on correlation of epidural depth with height and age are relatively few. Of these, most are focused on paediatric population, considering epidural anaesthesia to be more challenging in children.[5] So we performed a prospective, randomized, double blinded observational study to determine the correlation between the distance from the skin to the epidural space with age and height of adult patients.

METHODS

This prospective, randomized, double blinded observational study was conducted in the Department of Anaesthesiology and critical care at Pt B D Sharma PGIMS Rohtak from December 2017 to May 2018.

Seventy-four patients between 20 to 50 years of age of either sex belonging to American Society of Anesthesiologist physical status class 1 or 2, scheduled to undergo lower limb surgeries where epidural block was required as anaesthetic or analgesic, were included in the study. The patients with local infection, spinal column abnormalities, previous spine surgery, congenital or acquired coagulation disorders and BMI more than twenty-five were excluded from the study.

Because of feasibility constraints we had selected a sample size of seventy-four patients. These patients were randomly divided into four different groups according to their age and height by using computer generated method of randomization.

Depending on age, patients were divided into two groups: group A- patients with age between 20-30 years (n-37) and group B- Patients with age between 30-40 years (n-37).

Depending on height, patients were divided into another two groups: group C- patients with height between 155-169 centimeters (n-37) and group D- patients with height between 170-184 centimeters (n-37).

Detailed clinical history, complete general physical and systemic examination were conducted for all the patients. Patient's age, sex, weight and height were recorded. Routine investigations were carried out. Informed and written consent was obtained from all the patients after explaining anaesthetic procedure in detail. Patients were kept fasting for 6 hours prior to scheduled time of surgery. They were premedicated with tab. alprazolam 0.25 mg and tab. ranitidine 150 mg at bed time and 2 hours pre operatively.

After arrival in the operation theater, intravenous line was secured and routine monitoring was established. All epidural blocks were given with the patient in sitting position. A rubber marker was inserted on the 18 G Tuohy's needle and placed near the hub. After all aseptic precautions, epidural needle was inserted through mid-line approach at the L3-L4 or L4-L5 interspace. Epidural space was localized by LOR (loss of resistance) syringe technique. After that the rubber marker was advanced to touch the skin.

On successful localization of epidural space, a test dose of 3 ml of 2% lignocaine with adrenaline was given through the needle. Five minutes after the test dose, if there were no signs of subarachnoid or intravenous injection, epidural drug was given as per the requirement of surgical procedure. On removing the needle, distance from skin to epidural space was measured by measuring the distance between rubber marker and tip of Tuohy's needle with the help of a measuring scale.

After measuring the distance from skin to epidural space, anesthesia and analgesia was continued according to requirement for surgical procedure. At the end of study, data of all these patients was compiled and analyzed statically by student unpaired t-test using SPSS software. A p value<0.05 was considered to be significant.

RESULTS

The age, weight, sex, and height of patients were recorded. Data of all 74 patients enrolled in the study was analyzed using student's unpaired t-test. Out of 74 enrolled patients 30 pts were female and 44 were male patients. The mean BMI of patients was 22.12±3.14.

In group A, mean epidural depth was 3.96±0.4 centimeters while in group B mean epidural depth was 4.05±0.5 centimeters (Table 1) and (Figure 1) On comparing the depth of epidural space among two age groups, the difference was found to be statistically non-significant (p value>0.1).

Table 1: Comparison of epidural depth according to age groups.

Age group	Group-A (20-30 Years) (n=37)	Group-B (30-40 Years) (n=37)	P value (level of significance)
Epidural depth (mm)	3.96±0.4 (Mean± SD)	4.05±0.5 (Mean± SD)	>0.10*

*denotes non-significant.

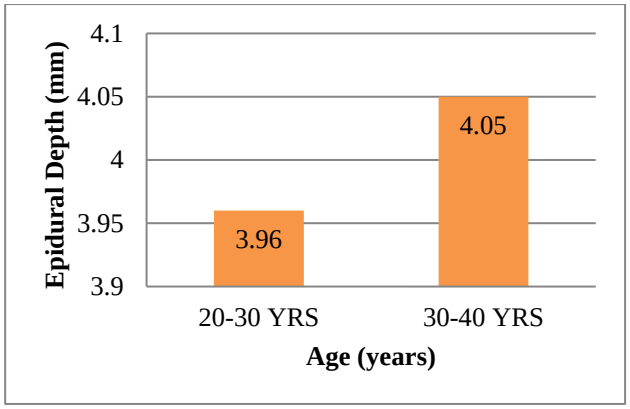

Figure 1: Graphical comparison of epidural depth according to age groups.

In group C mean epidural depth was 3.88±0.4 centimeters while it was 4.13±0.5 centimeters in group D. (Table-2) and (Figure 2). Epidural space depth was significantly more in group D as compared to group C (p value<0.1).

Table 2: Comparison of epidural depth according to height.

Height group	Group-C (155-169cm) (n=37)	Group-D (170-184 cm) (n=37)	P value (level of significance)
Epidural depth (mm)	3.88±0.4 (Mean± SD)	4.13±0.5 (Mean± SD)	<0.10**

**denotes statistically significant

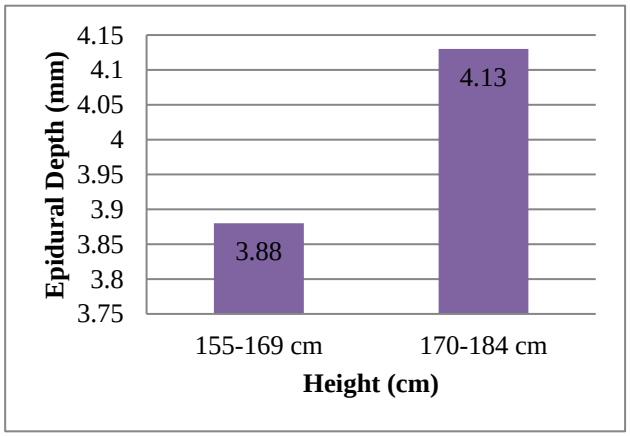

Figure 2: Graphical comparison of epidural depth according to height of patients.

DISCUSSION

This study has been conducted to analyze the correlation between the depth of epidural space with height and age of patients. The success of epidural anaesthesia depends upon the correct identification of the epidural space. If proper identification of the epidural space is not done, a false loss of resistance may be encountered at the level of ligamentum flavum and catheter placement at this site will result in failure of block. On the other hand, if the needle is advanced too far, it may lead to dural puncture and can have fatal cardiovascular and respiratory systems effects if large doses of local anaesthetic drugs got injected intrathecally. Also, the chances of post dural puncture headache is very high with large bore Tuohy's needle after accidental dural puncture.[6]

Hence it is very important to determine a suitable parameter for correct estimation of the distance from skin to epidural space. This will help us to have better patient outcome. A lot of studies has been done on correlation of depth of epidural space with BMI and observed that with increase in BMI the distance from skin to epidural space also increased, but there is scarcity of studies on correlation of epidural depth with height and age of patients.[7,8,11] So we conducted this study to find whether there is any correlation exist between epidural space depth with patient's age and height.

In our study we found that epidural depth was more in patients with height from 170 to 184 centimeters as compared to patients with height less than 170 centimeters. Our results were in contrast to the study conducted by Hirabayashi et al in which they studied the distance from the skin to the epidural space in 1007 epidural punctures, to determine whether there was any systemic relationship between the distance from skin to the epidural space and physical constitution.[8]

They found good correlation between the body weight and epidural depth but the height of the patient had less influence on the epidural depth. In contrast to our study Rosenberg et al and Shiroyama et al also found that distance from skin to epidural space was not correlated with height of the patient.[9,10]

We found no statistically significant difference in epidural depths of two different age groups. Similar to our study Ravi et al also found no relationship between age and depth of epidural space in patients of different age groups.[11]

CONCLUSION

There is a definite correlation between height of patient and distance from skin to epidural space. There is increase in epidural depth with increase in height of patients. But previous studies have found no effect of increase in height on epidural depth. So further studies are needed with a larger number of subjects and better precision to be able to make a better prediction of epidural space depth according to height of patient. The correlation between the distance from the skin to the epidural space and age was less striking.

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Ethical approval: Not required

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