"A COMPARATIVE STUDY BETWEEN SITTING WITH LEGS PARALLEL ON THE TABLE VERSUS TRADITIONAL SITTING POSITION FOR EASE OF EPIDURAL NEEDLE PLACEMENT. A HOSPITAL BASED ONE YEAR RANDOMIZED CONTROL STUDY".

By

REG.NO: BA0120014

Dissertation

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KLE ACADEMY OF HIGHER EDUCATION AND RESEARCH, BELAGAVI

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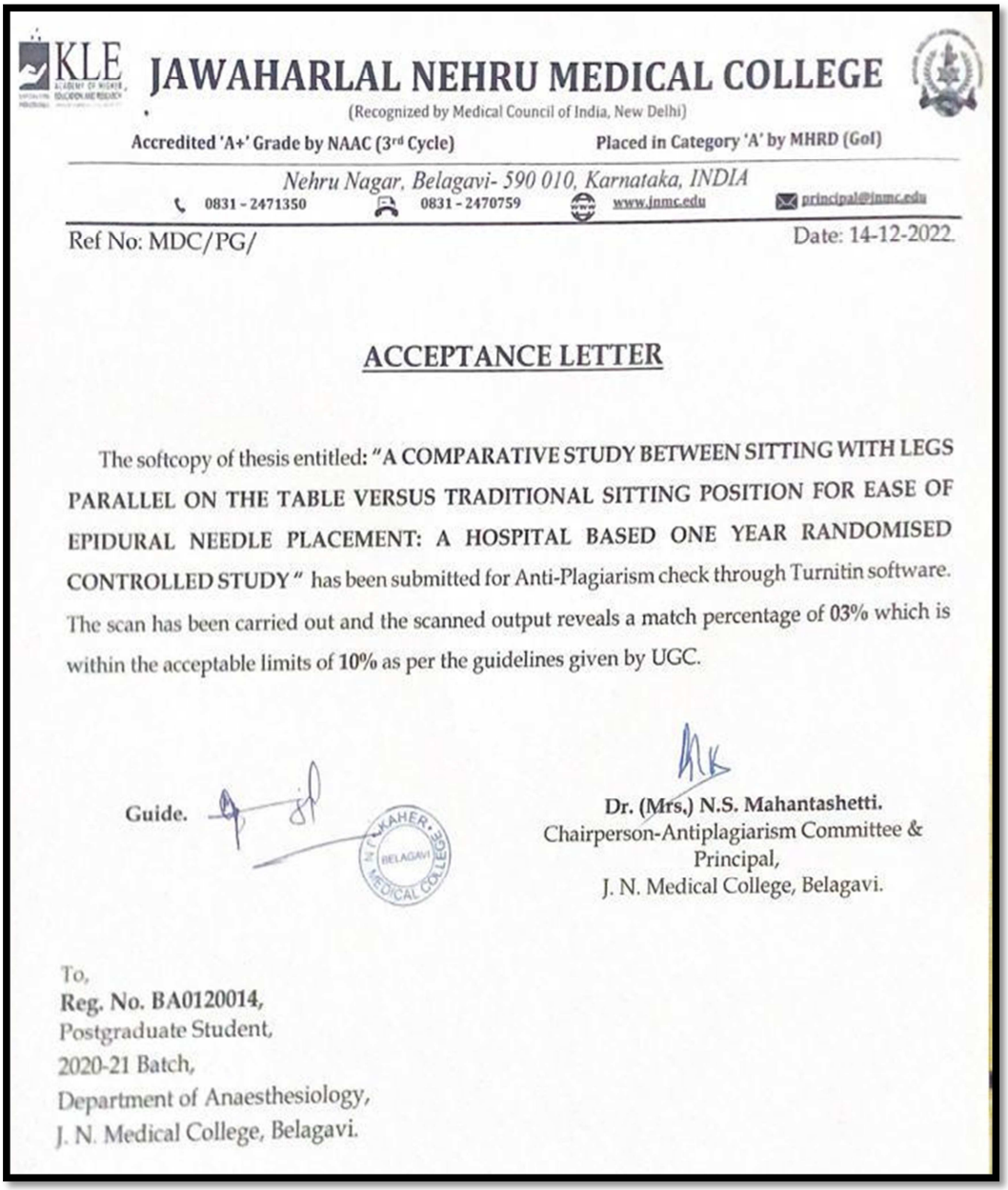

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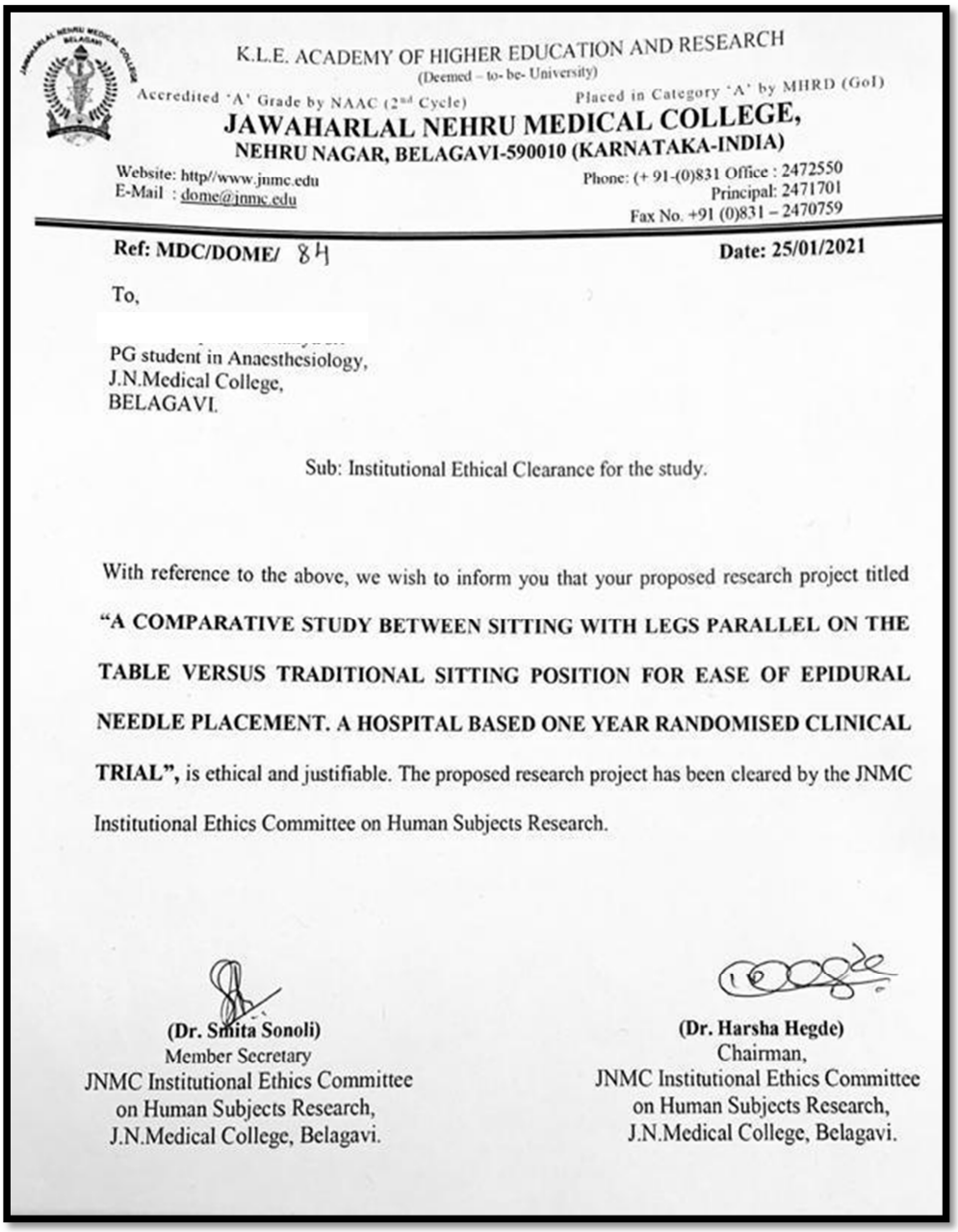

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Sub: Institutional Ethical Clearance for the study.

With reference to the above, we wish to inform you that your proposed research project titled **"A COMPARATIVE STUDY BETWEEN SITTING WITH LEGS PARALLEL ON THE TABLE VERSUS TRADITIONAL SITTING POSITION FOR EASE OF EPIDURAL NEEDLE PLACEMENT. A HOSPITAL BASED ONE YEAR RANDOMISED CLINICAL TRIAL",** is ethical and justifiable. The proposed research project has been cleared by the JNMC Institutional Ethics Committee on Human Subjects Research.

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LIST OF ABBREVIATIONS USED

IV	-	Intravenous
ASA	-	American Society of Anaesthesiologists
BMI	-	Body Mass Index
BP	-	Blood Pressure
HR/PR	-	Heart rate/ Pulse rate
cm	-	Centimetre
mm	-	Millimetre
ID	-	Internal Diameter
CNS	-	Central Nervous System
CVS	-	Cardio-Vascular System
Kg	-	Kilogram
mg	-	Milligram
mcg	-	Microgram
RR	-	Respiratory rate
RS	-	Respiratory System
MPG	-	Mallampati Grading
HSP	-	Hamstring stretch position
TSP	-	Traditional sitting position
Inj	-	Injection
Gp/G	-	Group
S. D	-	Standard Deviation
ADP	-	Accidental dural puncture
OT	-	Operation Theatre

Mins	-	Minutes
Hrs	-	Hours
MAP	-	Mean Arterial Pressure
NS	-	Not significant
S	-	Significant

ABSTRACT

Title: A comparative study between sitting with legs parallel on the table versus traditional sitting position for ease of epidural needle placement. A hospital based one year randomized control study.

Introduction: In modern anaesthesiology, epidural anaesthesia is one of the most accepted and often used technique for lower abdominal procedures. The patient's position during the insertion of the epidural needle plays a major role in the success of epidural analgesia

Aims and objectives: This study is aims to know whether the hamstring stretch maneuver would reduce lumbar lordosis and will ease the placement of epidural needle, when compared to traditional sitting position.

Materials and methods: Patients aged 18 to 50 years of either gender, belonging to ASA-I and II undergoing elective surgery with epidural anesthesia are randomized into 2 groups. Group A in the traditional sitting position and group B in hamstring stretch position.

Results: The quality of surface landmarks was good in the traditional sitting group than the hamstring stretch group.

Conclusion: The quality of surface landmarks was comparatively good in the traditional sitting group than the hamstring stretch group. The number of needle bone contacts were almost same in both groups. There are no complications associated with both the positions.

Keywords: epidural anesthesia, sitting position, needle placement, epidural space identification.

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INTRODUCTION

One of the most commonly used approaches in today's anaesthesia for lower intra abdominal, pelvic, perineal, thorax, and lower extremity surgeries is epidural anaesthesia. It offers both perioperative anaesthesia and postoperative pain management. It provides better operating conditions, such as sufficient spontaneous breathing, constricted bowel, hemodynamic stability & postop analgesia.The success of epidural analgesia is significantly influenced by patient's position during placement of epidural needle. Poor positioning can increase likelihood of back pain, epidural hemorrhage, neural damage and repeated needle insertions. In this procedure local anesthetic solution is injected into the non-contagious epidural space, which is located around the dural sac & nerve roots, to provide analgesia.

For the epidural analgesia to result in sensory blocking of appropriate dermatomes, there must be an adequate diffusion of anesthetic solution.

Patients receiving epidural anaesthesia are often sitting, which lowers lumbar lordosis & makes it simpler to access intervertebral area. Before delivering an epidural anaesthetic, reducing lumbar lordosis will make it simpler to detect epidural area & lessen likelihood of needle-to-bone contacts

The other commonly used position is hamstring stretch position, which involves sitting individual passively extending their knees to a moderate degree, increasing hamstring tension, which results in compensatory pelvic tilting, & reduction in lordosis. The purpose of this study is to investigate wether hamstring stretch position will cause reduction in lumbar pelvic tilt and eases the epidural needle insertion compared to regular sitting posture.

OBJECTIVES

PRIMARY OJECTIVE:

To compare between sitting position with legs parallel on table with traditional sitting position for the ease of epidural needle placement.

SECONDARY OBJECTIVE:

To compare time taken to identify epidural space in both the positions during epidural needle placements.

REVI EW OF LITERATURE

In 205 participants of TSP & 201 individuals belonging to HSP***, Fisher et al***[1.] assessed occurrence of needle bone-interactions that occurred in epidural labour analgesia. Both categories had a similar number of needle-bone interactions, they discovered. They employed needle bone-interactions as a stand-in for purported "easiness" of neuraxial needle implantation. Initiating epidural anesthesia with less lumbar-lordosis made it easier to locate the epidural area and resulted in fewer needle-bone interactions. They noticed that 2 groups had an equal amount of needle- bone contacts

Adduction of both-hips & forward-leaning are more effective in decreasing lumbar lordosis and simplifying spinal-puncture than a modified seated posture with maximal knee extension, according to research **by Tashayod et al**[2]. In patient sitting posture, even slight passive knee flexion can reduce lumbar pelvic tilt, tilt pelvis & increase hamstring stress.

In a study ***Soltani Mohammadi et al***[3], comparisons were made between 230 patients in standard sitting posture & 222 patients scheduled for lower abdominal or lower extremities treatments. Both groups exhibited similar reduction in space detection or implantation of needle, despite fact that there less spinal needle-bone contacts in group that was squatting.

In study ***by Manggala et al***[4] they compared CL sitting posture with TSP in patients undergoing urologic surgeries. They foun no discernible variation in the success rate of needle insertion between 2 groups & they recommended using CL seated posture as an alternative seated posture for giving SAB.

An ideal approach to locate epidural space should have high specificity & sensitivity and it should be simple to locate accidentally placed intrathecal and intravascular catheters, according to a research by ***Elsharkawy et al*** [5] Although the classic LORT has not yet been supplanted by any newer approaches.

According to a research by ***Harney D. et.al*** [6], patient position during insertion of an epidural catheter in pregnant woman directly correlates with likelihood of epidural vein cannulation. When compared to the group in lateral posture, risk for epidural vein catheter insertion was considerably greater in sitting group.

In their study***, Nitu Puthenveettil et a***[7]. compared ease of insertion of epidural catheter CLS posture to TSP. Experiment included 50 individuals with uncomplicated pregnancies who were in active labour. The CLSP group had higher proportion of parturients who received a successful epidural implantation on first try compared to TSP group. They came to conclusion that cross-legged sitting posture is more convenient for putting labour-epidural catheter than traditional sitting posture.

Modified sitting positions may lessen needle-bone contact incidents & raise effectiveness of combination spinal-epidural anaesthesia in patients having total knee or complete hip replacements***. Mehmet zgür zhan et al***[8] examined modified sitting positions, such as SP & HSP. The quantity, success rates, and degree of intervertebral-space identification were comparable among groups. BMI and simplicity of identifying the interspinous region are thought to be key factors in CSEA performance.

According to research by **Sussan Soltani et al** [9] compared to standard sitting position, squatting position will lessen spinal needle bone contact by minimising lumbar spine lordosis & better needle insertion or space identification. They found

that there were less spinal needle-bone interactions in squatting posture than in conventional sitting position.

Mehmet Özgür Özhan et al[10]compared sitting positions including hamstring stretch position (HSP) and squatting position (SP) would reduce needle - bone contact events and increase the success rate of combined spinal - epidural anesthesia (CSEA) compared to traditional sitting position (TSP) in patients undergoing total knee or hip arthroplasty and concluded that SP and HSP can be used as alternatives to the TSP. BMI and ease of interspinous space identification can be considered important determinants for CSEA success.

R D Vincent et al[11]**,** study was to determine which of the two positions used by anesthesiologists to identify the epidural space is more comfortable for pregnant patients. They evaluated both the lateral decubitus position and the sitting position in 90 term parturients who were in early labor.They concluded that neither position was clearly superior with regard to patient comfort.

Feyce Peralta et al[12]**,** performed a retrospective cohort study by medical record review. Case logs from their institution were searched for patients with documented unintentional dural puncture during attempted neuraxial analgesia and cocluded that there was an decreased PDPH incidence after unintentional dural puncture in parturients with an increased BMI, even after controlling for pushing during labor. Severity of headache and need for epidural blood patch treatment were similar in low and high BMI groups.

W S Sim et al,[13] investigated the forces required to remove thoracic epidural catheters to determine the effect of patient position on removal. Eighty-four patients undergoing open thoracotomy and thoracic patient-controlled epidural analgesia were

enrolled. Catheterisation was performed under fluoroscopic guidance before surgery, and the patients were allocated to one of three position groups for removal: prone; sitting; and lateral. On the third postoperative day, the peak tension during withdrawal in the assigned position was measured and concluded that the withdrawal forces required to remove thoracic epidural catheters were not affected by the position.

Nitu Puthenveettil et al ,[14] compared the ease of insertion of the epidural catheter in either traditional sitting position (TSP) or crossed-legged sitting position (CLSP). The primary objective was to compare the number of successful first attempts at epidural placement between the groups. Secondary objective included patient comfort, ease of landmark palpation and the number of needle-bone contact. Study was conducted in 50 parturients with uncomplicated pregnancy during active labour. Concluded that Cross-legged sitting position is a better position than the traditional sitting position for the ease of insertion of labour epidural catheter.

D Harney et al[15] studied the influence of posture on the incidence of vein cannulation during epidural catheter placement. The study was conducted in 209 term parturients who were randomized to either the sitting or lateral position (107 left lateral, 102 sitting). Epidural catheter placement was achieved using a loss of resistance to air technique with an 18-G Tuohy needle and concluded that there is a direct correlation between the incidence ofepidural vein cannulation and patient posture during epidural catheter insertion in parturients.

Murat Bahar et al[16] study ws to assess the incidence of blood vessel puncture related to epidural catheterization in three different body positions, in a cohort of morbidly obese parturients. The study was conducted in 450 (three groups of 150) morbidly obese, obstetric patients undergoing continuous epidural analgesia during

labour. Epidural catheterization was performed on patients randomized to the sitting, lateral recumbent horizontal, or lateral recumbent head-down position. Study concluded that the lateral recumbent head-down position for the performance of lumbar epidural blockade, in labour at term, reduced the incidence of lumbar epidural venous puncture in these obese parturients..

Robert Schier et al [17] conducted a meta-analysis to test the hypothesis that loss of resistance with liquid reduces complications with epidural placement. MEDLINE, EMBASE, and Cochrane databases were searched for prospective, randomized studies comparing air versus liquid as the medium for loss of resistance during epidural space identification in adults. Data were abstracted from 5 studies (4 obstetric and 1 nonobstetric) (n = 4422 patients) that met inclusion criteria and analyzed for following 6 outcomes: difficult catheter insertion, paresthesia, intravascular catheter insertion, accidental dural puncture, postdural puncture headache, and partial block.

Zhendong Xu et al, [18] studied whether sitting position is more likely to induce hypotension and higher block level than the lateral position in CSEA with hypobaric ropivacaine. Parturients undergoing elective cesarean section were randomized into three groups: the sitting, left-lateral, and right-lateral position groups. The L3-4 interspace was selected as the puncture site, and subarachnoid injection of 2.5 mL 0.5% hypobaric ropivacaine was administered. After the epidural catheter was inserted and fixed, the patient's position was changed to the left-leaning supine position. The blood pressure was measured once every 1 min followed by once every 3 min after the delivery. The sensory block level was regularly measured.They concluded that as compared to the lateral positions, CSEA with hypobaric ropivacaine

in sitting position is more likely to cause hypotension and excessively high block level.

Fatma Okucu et al,[19] compared maternal hemodynamic changes when combined spinal-epidural anesthesia (CSEA) is induced in left lateral- decubitus and sitting-positions in obese pregnant women undergoing elective cesarean section. In a total of 100 patients CSEA was performed in left lateral position in group I (n = 50) and in sitting position in group II (n = 50). At end of CSEA procedure, patients were placed in supine position. When sensory block reached at upper level of T6 dermatome, surgery was initiated. Hemodynamic, anesthetic and neonatal parameters were recorded.They concluded that left lateral decubitus and sitting positions during performance of CSEA lead to similar maternal hemodynamic changes in obese pregnant women undergoing cesarean section.

Hilde C Coppejans et al,[20]evaluated whether the sitting position during initiation of small-dose combined spinal-epidural anesthesia (CSE) would induce less hypotension as compared with the lateral position. Sixty women undergoing elective cesarean delivery were randomly assigned to receive a spinal injection consisting of 6.6 mg hyperbaric bupivacaine with sufentanil 3.3 microg in either the lateral or the sitting position. After securing the epidural catheter, patients were turned to a 15 degrees left lateral supine position. Ephedrine 5 mg IV was administered prophylactically and subsequently in case of nausea/vomiting and/or hypotension, defined as a systolic blood pressure less than 95 mm Hg or a 25% decrease from baseline values. The incidence of ephedrine supplementation was not different, females in the sitting group required less ephedrine and there were fewer problems with identifying the epidural

space. They conclude that performing a CSE technique for cesarean delivery in the sitting position was technically easier and induced less severe hypotension.

M Bonazzi et al[21] to assess the reliability of sonographic evaluation in the prediction of the depth of the lumbar epidural space. Forty males, scheduled for epidural anesthesia for surgical repair of inguinal hernia, were studied. Patients were placed in a sitting position and sagittal scanning of the lumbar spine was performed with a 5-MHz transducer over the fourth or fifth interspace in order to identify the deeper hyperechogen interface, which represents the landmark between the ligamentum flavum and the epidural space. This study concluded that ultrasound scanning of the lumbar spine provides an accurate measurement of the depth of the epidural space, which can facilitate the performance of the epidural anaesthesia and may decrease the complication rate, particularly in those patients in which anatomic landmarks are obscured.

Reshma Ambulkar et[22], compared accuracy of ultrasound (US) imaging with manual palpation for locating the intervertebral level. They included postoperative adult patients without an epidural catheter who were scheduled to have a chest radiograph in the recovery room. A radio-opaque marker was placed at random at an intervertebral space along the thoracic or lumbar spine of the patient (in the field of the chest radiograph). The level of intervertebral space corresponding to the radio-opaque marker was determined by palpation technique by one anesthetist. Two other anesthetists (A and B) blinded to the result of manual palpation, independently used USG to determine the level of intervertebral space. A consultant radiologist assessed the radiographs to determine the correct position of the marker, which was judged to

be the accurate space. **They concluded that** US imaging may not be superior to manual palpation for identifying intervertebral level.

P J Andrews et al,[23] prospectively studied the incidence of concealed aortocaval compression in parturients at term during identification of the extradural space. Forty ASA I or II parturients, at term and in active labour, who requested extradural analgesia were randomly allocated to one of two groups. Parturients in the first group (n = 22) were positioned in the left lateral decubitus position and those in the second group (n = 18) were in the sitting position. Cardiac output (CO) was recorded at one-minute intervals for five minutes before extradural catheter placement (supine position with a 15 degrees wedge under the right side), and during and thereafter for five minutes (in the supine wedged position), using the BoMED NCCOM3-R7 thoracic electrical bioimpedance (TEB) monitor. The average of five COTEB recordings before positioning the patient were compared with the average of five COTEB measurements during and after extradural space identification. A change of > 25% COTEB was considered beyond machine variability. Upper limb arterial pressure was recorded at one-minute intervals. In the left lateral decubitus position, 17 of 22 patients demonstrated a > 25% reduction in COTEB compared with five of 18 patients in the sitting position. They concluded that there is a decreased incidence of aortocaval compression during identification of epidural space in the sitting position when compared with the left lateral decubitus position.

BASIC SCIENCES

EPIDURAL SPACE:

HISTORY OF EPIDURAL ANAESTHESIA[24,25]:

Epidural space was first identified by Jean Enthuse Sicard and Ferdinand in 1901, they approached through caudal route using cocaine. A Spanish military surgeon in the year 1921 has described his work with lumbar epidural and considered as father of modern epidural anaesthesia. An Italian surgeon, Archile Doglitti has popularized segmental epidural anaesthesia and introduced the loss of resistance technique in 1949.Martinez Curbelo a Cuban anaesthesiologist practised continuous epidural anaesthesia using Tuohy-Huber needle and silk ureteral catheter.

ANATOMY OF EPIDURAL SPACE:

A good understanding of spinal column, spinal canal and spinal ligaments through which the epidural needle passes is required for the success of epidural anaesthesia. It is by practice and experience that the anaesthesiologist will able to appreciate the resistance offered by the ligaments as the epidural needle advances through the epidural space. Epidural space can be defined as the area outside the dural sac but inside the spinal canal, extending from the foramen magnum to the sacrococcygeal ligament.

Epidural space is discontinous and is divided into posterior, lateral and anterior compartments. The posterior epidural space is of greatest relevance to the anaesthesiologist because this is where the epidural needle is placed for epidural anaesthesia.

BOUNDARIES OF THE EPIDURAL SPACE:

The epidural space is bounded cranially by the foramen of magnum,caudally by the sacrococcygeal ligament covering the sacral hiatus,anteriorly by the posterior longitudinal ligament ,laterally by the vertebral pedicle,posteriorly by the ligamentum flavum and vertebral lamina,epidural space is most shallow anteriorly and deepest posteriorly and the antero-posterior dimension of the posterior epidural space is largest at mid lumbar levels,decreases at thoracic levels and disappears above C7

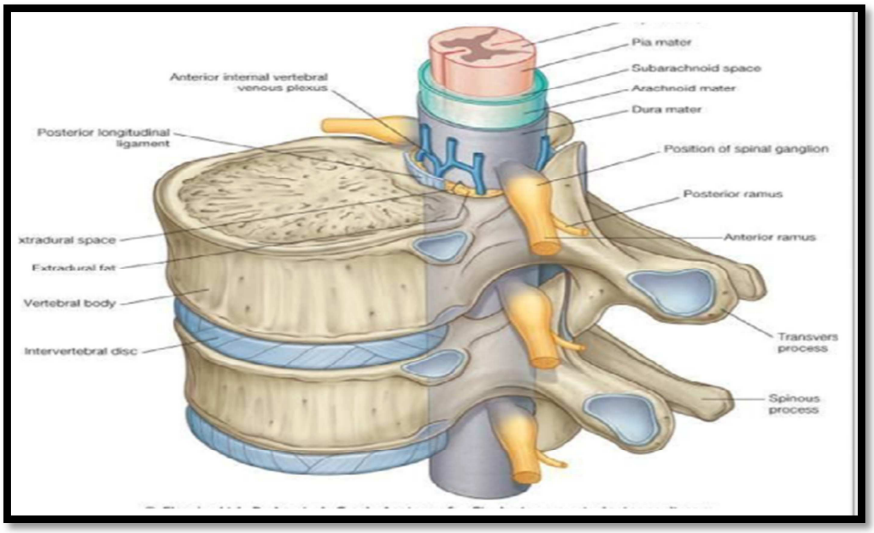


FIG 1: EPIDURAL SPACE- BOUNDARIES

CONTENTS OF THE EPIDURAL SPACE:

The contents of the epidural space are: Loose areolar tissue .Epidural fat: Most widespread material is fat predominantly located in the lateral and posterior epidural space with clinical importance in pharmacokinetics of epidurally administered drugs. 31 pairs of spinal nerves with their dural cuff on their way to the intervertebral foramen. Sacral and coccygeal nerves, spinal arteries arising from different sources at

different levels enter the epidural space through the intervertebral foramen and supply the spinal cord, meninges, periosteum and ligaments.

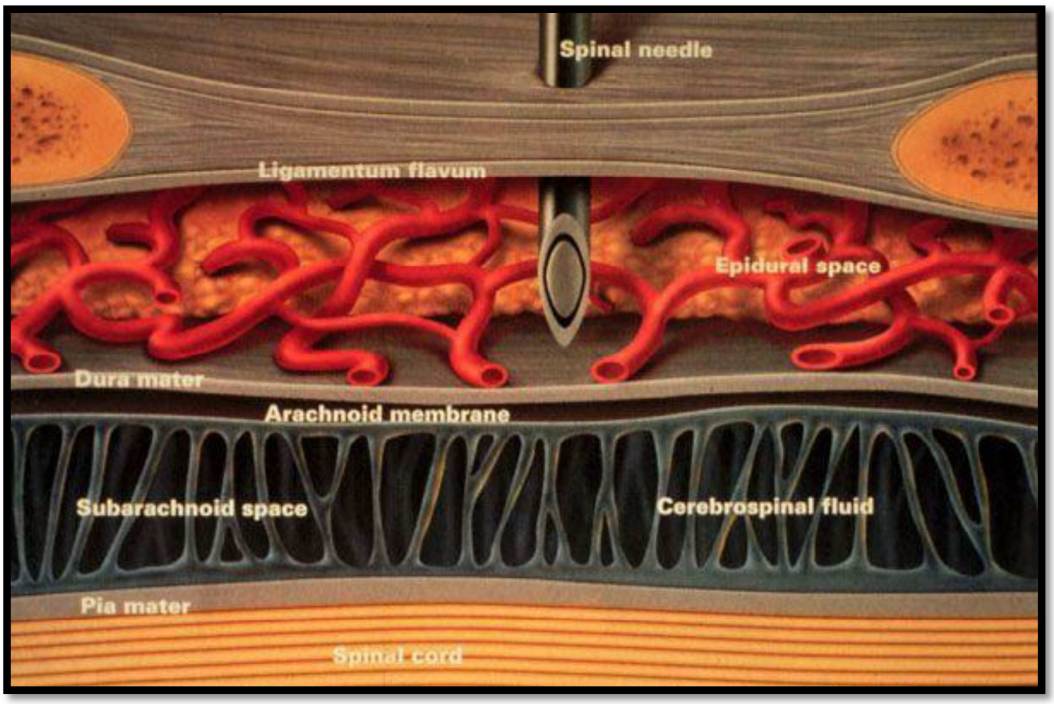


FIG 2: CONTENTS OF EPIDURAL SPACE

Vertebral venous plexus: A network of veins, the Batson venous plexus courses through the anterior and lateral parts of epidural space. These venous plexus communicates above with the intracranial venous sinuses, below with pelvic, portal and caval systems and also with intervertebral veins. Ligamentum flavum is an important landmark while identifying epidural space using epidural needle because penetrating this tissue produces a noticeable loss of resistance to air or liquid. This point of resistance should be identified because any further advancement results in inadvertant dural puncture. The ligamentum flavum will be perceived as a thicker ligament if the needle is kept in the m

EPIDURAL SPACE AND NEGATIVE PRESSURE:

In 1828 Heldt and Maloney described about negative extra dural pressure. Several factors contribute to the generation of subatmospheric pressure in the epidural space. The natural effect of Starling forces across the capillary walls produce a low fluid pressure in the tissues on the basis of oncotic pressure. This results in subatmospheric pressure and tissue collapse in the spaces of opposing surfaces of spinal canal, including the planes where dura opposes the epidural fat or canal wall, and between epidural fat and canal wall.

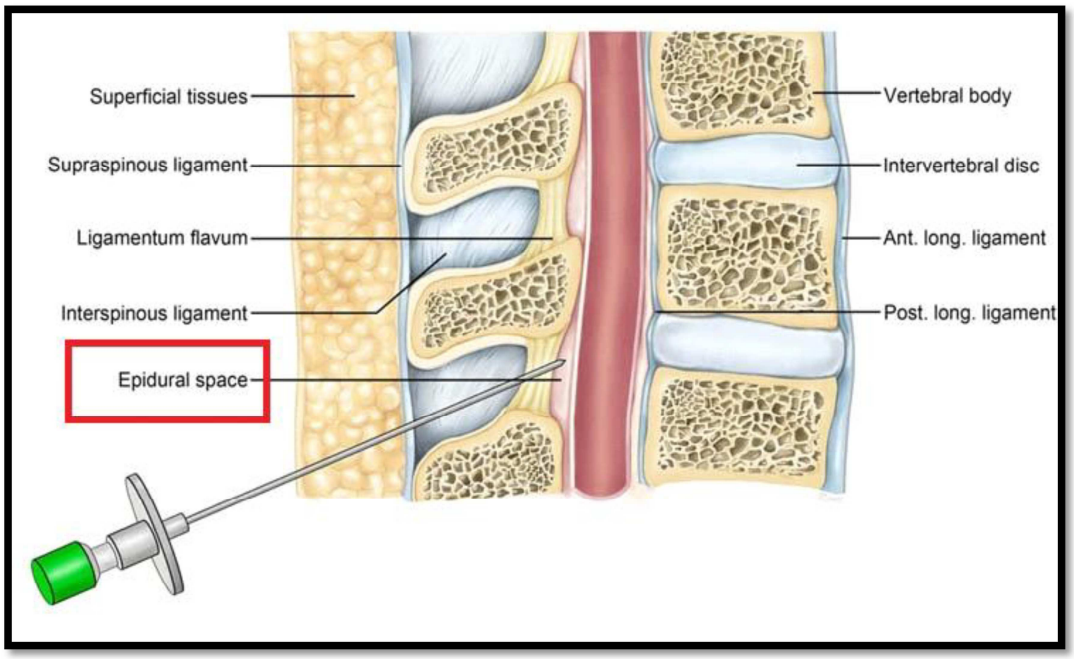


FIG:3 EPIDURAL SPACE IDENTIFICATION

PHYSIOLOGICAL EFFECTS OF EPIDURAL BLOCKADE[25]

1. CARDIOVASCULAR EFFECTS:

Epidural anaesthesia/analgesia has primarily indirect effects on cardiovascular system. Drugs absorbed into systemic circulation from the epidural space may have direct effects on organ systems. The indirect effects are mediated primarily through blockade of sympathetic nervous system and include reflex response to the primary cardiovascular effect. The extent of effect of neuraxial blockade on CVS depends on the number of spinal segments blocked. Most notable effect is systemic hypotension. Blockade below T4 results in dilatation of arteries and venous capacitance vessels, leading to decreased SVR and decreased venous return. The barorecptors are activated to produce vasoconstriction of the upper extremities. Blockade above T4 interrupts cardiac sympathetic fibres leading to bradycardia, decreased cardiac output and profound systemic hypotension.

2. PULMONARY EFFECTS:

Epidural anaesthesia has minor effects on respiratory physiology and these changes have minimal consequences in other wise healthy persons. During high thoracic epidural anaesthesia vital capacity decreases by 6%, total lung capacity decreases by 3.5% and the absolute 13 value of FEV1 decreases by 5%, FEV1/FVC ratio and tidal volume remain unchanged.Dense epidural anaesthesia does not affect at-rest respiratory function, but the ability to cough and clear secretions may be adversely affected. Gas exchange and ventilation-perfusion matching remained unchanged in elderly patients after lumbar epidural anaesthesia.Neither lumbar nor thoracic epidural anaesthesia impair the ventilatory response to hypercarbia or hypoxia in elderly patients.

3. NEUROENDOCRINE EFFECTS:

Neuraxial blockade may influence nuroendocrine functions. Neuraxial blockade higher than T9-10 is associated with decreased plasma epinephrine and norepinephrine levels. Neuraxial blockade may contribute to a mitigated stress response by direct blockade of both afferent and efferent signals. Epidural anaesthesia results in an increased tissue oxygenation compared to GA. Neuraxial blockade ,although attenuated, does not inhibit the increases in intra operative stress hormones like glucose,cortisol, catecholamines and ACTH.

4. VISCERAL EFFECTS:

Bladder: Bladder is innervated by nerves travelling with S2 through S4 nerve roots. Sympathetic nerves to bladder originate at the low thoracic /high lumbar levels and parasympathetic innervation originates at the sacral levels. Blockade of these nerve roots directly affect detrusor muscle and urinary sphincter function resulting in urinary retenion. Intestines: The sympathetic supply to abdominal viscera originates from T6 to T12-L1, while the parasympathetic supply to the gut is via the vagus nerve. Therefore,neuraxial blockade at the mid- low thoracic levels result in sympathetic denervation and parasympathetic dominance, resulting in contracted gut,relaxed sphincters and normal peristalsis.

5. THERMOREGULATION:

Thermoregulation is impaired in neuraxial blockade, the predominant cause being decreased core temperature resulting from redistribution of heat from core to periphery due to peripheral vasodilation. In addition, central thermo-regulatory response is also impaired. Sympathetic and motor blockade preclude vasoconstriction

and shivering in the lower part of the body, but even in the upper half of the body, neuraxial blockade lower thermoregulatory vasoconstriction and shivering thresholds.

6. CENTRAL NERVOUS SYSTEM:

Cerebral blood flow is auto regulated thus blood flow to central nervous system remains constant during neuraxial anaesthesia unless there is profound hypotension i.e., MAP less than 55mm of Hg in a normotensive individual. Sedation scores were directly related to the extent of segmental blockade . Sedation in neuraxial anaesthesia is due to decreased afferent input to the RAS. Neuraxial anaesthesia may be associated with a decreased incidence of early postoperative cognitive dysfunction.

DIFFERENTIAL BLOCKADE:

The ability to block sensory,motor and sympathetic nerve functions to varying degree is called ‘differential blockade’. Although smaller and myelinated fibres are generally said to be blocked more easily than larger and unmyelinated ones, the phenomenon of differential blockade appears to be more complex, especially for neuraxial anaesthesia. Sympathetic impulses carried by smaller C fibres are blocked earlier than larger sensory and motor fibres.As a result, level of sympathetic blockade is 2 to 6 segments above the level of sensory blockade,which inturn is two segments higher than motor blockade.

INDICATIONS FOR EPIDURAL ANAESTHESIA:

The common applications of epidural anaesthesia are: 1.Prolonged orthopedic surgeries like major hip/knee surgeries, repair of pelvis fractures.Obstetrics and gynaecological surgeries like C-section, labour analgesia.Urological surgeries

involving prostrate, bladder and ureters..Epidural analgesia for upper abdominal and thoracic surgeries..Epidural anaesthesia for lower abdominal and lower limb surgeries..In high risk patients with respiratory problems..Paediatric caudal for lower abdominal and lower limb surgeries.

Patient position:

The main purpose of the sitting position is to optimize lumbar flexion, resulting in easier access to the spinal needle insertion target, which is located in between two spinous processes. Lumbar flexion also pushes the thecal sac into a more superficial position. The sitting position has several variants, such as the traditional sitting position (TSP), the hamstring position, the squatting position, and the pendant position, each of which has its own advantages.

Traditional sitting position

The traditional sitting position is a comfortable position for patients and for the spinal anaesthesia operator. The patient sits on the side of the bed, with his or her feet propped up on a chair, and hugs a pillow. The spinal anaesthesia operator then has direct access to the median area of the vertebrae without being restricted by the upper part of the bed. This position is the most commonly used variant of the sitting position. The problem with this position is the need for a chair to prop up the patient's feet and the need for two assistants to help move the patient's feet to a supine position.

Hamstring stretch position:

Hamstring stretch patients were seated with the lower extremities fully supported by the bed and were coached for maximum knee extension, hip adduction, and forward lean of the torso. Moderate passive extension of the knees produces increased hamstring tension, compensatory tilting of the pelvis, and reduces the lumbar lordosis. Reduced lumbar lordosis during initiation of epidural needle placement may facilitate identification of the epidural space and decrease the number of needle-bone contacts.

Detection of epidural space :

Several methods have been used to identify epidural space,these methods either use negative potential pressure to identify epidural space or sudden loss of resistance when ligamentum flavum is pierced.

Negative pressure methods:

Hanging drop sign:

In this method when the needle is introduced at the level of resistance indicating ligamentum flavum, a drop of sterile water is kept at the hub of the needle, and when the needle is introduced through the yellow fibrous tissue the drop will be sucked into the epidural space which is called “sign of drop.”

Capillary tube method:

In this method small capillary tube filled with sterile saline with one or two air bubbles are placed which act as meniscus. As the needle enters the epidural space the

saline is sucked into the epidural space and the bubbles can be seen moving into the epidural space.

Manometer technique:

A small u shaped glass tube of 3-4 inches is used as water manometer, which is attached to the epidural needle after is passes through the interspinous ligaments. When the needle passes the ligamentum flavum and enters the epidural space there is immediate movement of liquid due to negative pressure.

Dissappearence of resistance:

1. Syringe technique: This method uses sudden loss of resistance to a pressure exerted on the plunger of the syringe filled with water as the needle goes through the ligamentum flavum.
2. Spring loaded syringe: In this method when the needle enters peridural space the syringe automatically unloads itself by virtue of the diminished resistance in the space.
3. Balloon technique: a small balloon mounted on the glass adapter is attached to the epidural needle. Balloon is inflated with 2 to 3 ml of air,when the needle enters epidural space the balloon collapses.

   In this study we used loss of resistance method for identification of epidural space

MATERIALS AND METHODS

Type of study: Randomized Clinical Trial

Duration of study and study population: Adult patients aged 18 to 60 years of either gender posted for surgery under epidural anesthesia between 1st January 2021-31st December 2021 at KLE'S Dr. Prabhakar Kore Hospital & Medical Research Center, Belagavi-590010 will be recruited as per inclusion and exclusion criteria.

Selection Criteria:

Inclusion Criteria:

- ASA physical status I and II
- Age group of 18 to 60 years.
- Duration of surgery 30mins-120mins.
- Patients undergoing elective surgeries under epidural anesthesia.
- Patient willing to give consent

Exclusion Criteria:

- Patients undergoing emergency surgeries.
- Patients with anatomical spine deformity.
- BMI more than 30kg/meter square.
- Neurological diseases, coagulation disorders, local infection, unstable hemodynamics.

Data Collection-12 Months

Sample size formula: "The least-sample size formula based on two proportions

$$n = \frac{(z_\alpha + z_\beta)^2 \bar{p}(1-\bar{p})}{d^2}$$

where p_1 and p_2 are proportions of 2 groups.

$$p = \frac{p_1 + p_2}{2} \text{ and } d = p_1 - p_2$$

z_α linked with level of significance and z_β linked with power test. For 5% level of significance $z_\alpha = 1.96$ and $z_\beta = 0.84$ for 80% power of test.

The sample size produced by using proportion of success = 50.0% and = 85.0% is 28.

The size of sample will then be increased to 50 for each group in order to make the research more conclusive".

Statistical Analysis

"The study's main objective to compare 2 groups. We will compute SD & mean for such continuous quantitative data. Utilizing appropriate statistical methods like unpaired student's t test, continuous variables between groups will be compared. The student's paired t test will be utilized to compare 2 quantitative variables within group.

Rates, ratios, and percentages will be used to express the categorical data. Chi-square test or Fisher's exact test will be used to examine the relationship between result, clinical features, and demographic factors.

Median will be used to represent discrete variables"

Discrete variable comparisons will be made using nonparametric testing. Comparison will be shown using the appropriate graphics.

Any test result with a p value below 5% (0.05) will then be deemed significant.

METHODOLOGY

After obtaining consent from ethical committee and written informed consent from the patients, study's participants are between age group of 18 & 50 who are undergoing elective surgery under epidural anaesthesia .Patients will be randomized, based on computer-generated randomization table once they have met the specific criteria and given their consent. Prior to starting epidural technique, anesthesiologists opened opaque envelopes which were sequentially digited to cover patients.

The participants were then divided into two groups: those who did hamstring stretches and conventional sitting. Group-A: In the traditional sitting position, patients' knees were flexed to about 90 degrees, their feet were placed on non-rolling support, their hips were adducted, the bed's height was adjusted to allow for maximum hip flexion & verbal coaching was given to encourage highest lumbar sagittal flexion.

Group B: Patients in this group were sitting with their lower limbs completely supported by the bed, their knees fully extended, their hips fully adducted & their heads forward.

Injecting local anaesthetic with 25G needle, then identifying epidural area with an 18G Tuohy needle. Needle-bone interaction is defined as when a needle makes contact with something that prevents the needle from moving further Number of needle bone-interaction & number of attempts made for proper placement of epidural needle are noted for both groups. Study will be completed whenever epidural-space is characterized by loss of resistance to air. After proper identification of the epidural-space, catheter is inserted 3-4 cms inside the epidural space and fixed and test dose of 3ml of 2% lignocaine with adrenaline is given.

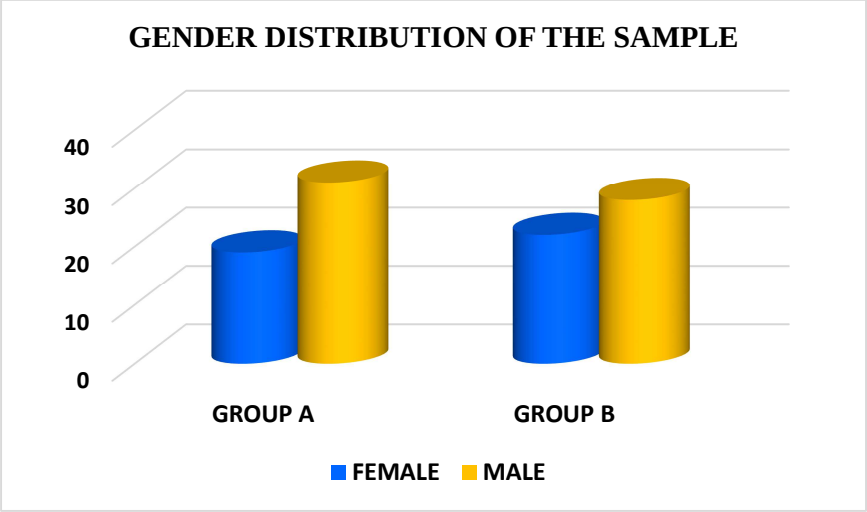
RESULTS

- Group-A. Conventional sitting position participants had their knees bent to about 90 degrees, their feet on non-rolling supports, their hips adducted & bed's height was changed to accommodate the highest amount of hip flexion & highest amount of lumbar sagittal flexion.
- Group B: Patients in this group were sitting with their lower limbs fully supported by the bed, extended to their fullest extent at the knees and hips & leaning forward.

Table1: The gender distribution in both groups

	GROUP A		GROUP B	
GENDER	**NUMBER**	**%**	**NUMBER**	**%**
FEMALE	19	38.00	22	44.00
MALE	31	62.00	28	56.00
TOTAL	50	100.00	50	100.00

Graph1: Gender distribution in both the groups:



Our study had no extreme variation in gender distribution in both groups.

Table2: The age distribution in both the groups:

AGE	GROUP A		GROUP B	
	NUMBER	%	NUMBER	%
15 - 24	7	14.00	3	6.00
25 - 34	14	28.00	6	12.00
35 - 44	7	14.00	12	24.00
45 - 54	8	16.00	9	18.00
55 - 64	14	28.00	19	38.00
> 65	0	0.00	1	2.00
TOTAL	50	100.00	50	100.00

	Mean	S.D.	Min	Max	Mean	S.D.	Min	Max	P Value	Inference
Age	41.26	13.62	18	60	46.76	13.70	18	80	0.0468	S

In The Above Tables P Value Is Calculated Using Student's Unpaired t Test

Abbreviations: NS -Not Significant, S – Significant, VS - Very Significant, HS - Highly Significant

Graph 2: Graph showing the age distribution of the sample:

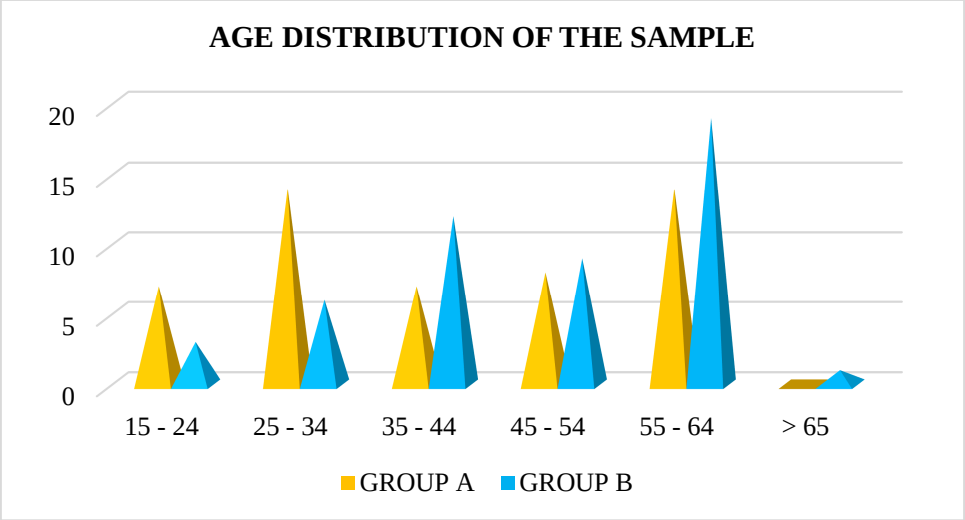


Table3: ASA physical status of patients in both the groups:

ASA	GROUP A		GROUP B	
	NUMBER	%	NUMBER	%
I	28	56.00	26	52.00
II	22	44.00	24	48.00
TOTAL	50	100.00	50	100.00

Table 4: Height, weight and BMI distribution of the patients:

	Mean	S.D.	Min	Max	Mean	S.D.	Min	Max	P Value	Inference
Height	166.36	6.59	155	180	168.82	6.86	156	180	0.0703	Ns
Weight	69.62	8.52	50	90	66.90	8.02	50	90	0.1034	Ns
Bmi	25.96	3.39	19.5	40	24.10	3.33	17.3	35.2	0.0067	Vs

Abbreviations: NS -Not Significant, S – Significant, VS - Very Significant, HS - Highly Significant

- Effect of BMI of patient was significant in both groups, that in obese patients it was difficult to identify space & number of needle bone-interactions were also high.

Table 5: Quality of surface landmarks in both groups:

QUALITY OF SURFACE LANDMARKS	GROUP A		GROUP B	
	NUMBER	%	NUMBER	%
1	22	44.00	33	66.00
2	26	52.00	17	34.00
3	2	4.00	0	0.00
TOTAL	50	100.00	50	100.00

Values Of 1 Are Significantly More in Group A and 2 Are More in Group B For the above table the Value Of P, Using Chi-Square Test, is 0.0477 (S).

Table 6: Number of Needle-Bone Interactions in both groups:

NO. OF NEEDLE BONE CONTACTS TO IDENTIFY EPIDURAL SPACE	GROUP A		GROUP B	
	NUMBER	%	NUMBER	%
1	47	94.00	49	98.00
2	3	6.00	1	2.00
TOTAL	50	100.00	50	100.00

For the above table the value of P, using chi-square test, is 0.3074 (NS) 1 and 2's are uniformly distributed in the two groups.

Table 7: Time taken for epidural space identification in both groups:

TIME TAKEN TO IDENTIFY EPIDURAL SPACE	GROUP A		GROUP B	
	NUMBER	%	NUMBER	%
0.5	1	2.00	0	0.00
1	18	36.00	23	46.00
1.5	0	0.00	2	4.00
2	0	0.00	1	2.00
NIL	31	62.00	24	48.00
TOTAL	50	100.00	50	100.00

The value of P, using chi-square test, is 0.2397 (NS)

The time taken for identification is more or less the same in the two groups

Table 8: Complications in both groups:

COMPLICATIONS	GROUP A		GROUP B	
	NUMBER	%	NUMBER	%
NO	50	100.00	50	100.00
TOTAL	50	100.00	50	100.00

There was no incidence of any complications in both the groups.

DISCUSSION

The success or failure of inserting epidural needle into epidural space depends on patient's posture during administration of epidural anaesthesia. Poor placement can result in repeated needle placements and needle-bone contact, which raises risk of neural damage, epidural hematoma, and back pain. Various studies have been conducted to determine best patient position for epidural space identification. Primary objective of sitting is to maximise lumbar flexion, which identifies intervertebral gap between 2 two spinous processes. There are various variations of seated posture each with its unique benefits, including classic sitting posture (CSP), hamstring positioning (HSP), squatted position, as well as pendant position. In our study we compared two sitting positions for ease of epidural needle-placement in 100 patients who are randomly divided in 2 groups, one group is patients in Traditional sitting position and & other group in Hamstring stretch position. Patients were instructed to maintain maximal lumbar sagittal flexion while sitting in conventional posture, with their feet resting on non-rolling support, hips adducted & bed's height modified to facilitate maximum hip flexion. Patients in hamstring stretch group were seated with their legs fully supported by bed & instructed to lean forward with their torsos tilted forward & their knees fully extended. In our study the gender distribution in the two groups was comparable with more number of male patients in first group. In our study, patient's BMI had a substantial impact on both groups, making it challenging to locate space and increasing amount of needle-bone contacts in obese individuals. In our study quality of surface landmarks was good in traditional sitting posture group when compared to hamstring stretching group. In both groups number of attempts to identify epidural space were almost same there was no significant difference. In a s

study done by Fisher et al, number of needle bone-interactions during epidural labour-analgesia for 205 individuals in typical sitting posture & 201 people in hamstring stretch position were compared. In place of actual neuraxial needle placement, they substituted needle-bone interactions. Initiating epidural anesthesia with less lumbar lordosis made it easier to locate epidural space & resulted in fewer needle-bone interactions. In this study they noticed that both groups had an equal amount of needle-bone contacts.. Numerous more research projects compared various spinal needle insertion locations, one such study is the study by Tashayod et al which showed that in comparison to a modified sitting posture with maximal knee extension, adduction of both hips & forward leaning (HSP) are more effective in reducing lumbar lordosis & simplifying spinal puncture.. Even mild passive knee flexion in patient seated position can minimize lumbar lordosis, tilt pelvis & enhance hamstring stress. In different research, Manggala et al. assessed Crossed leg SP & traditionally SP in patients who undergo urologic surgery & revealed there was no discernible difference in the two groups' efficiency for inserting needles. In our study time taken for epidural space identification was same in 2 groups. Time taken for epidural needle placement was observed only for 1st attempt insertions. Needle insertion in first attempt done in 19 patients in 1st group of which 18 patients needle was insertion done in 1min. 2^{nd} group in 25 patients needle placement was done in first attempt of which 23 patients it was done within 1min.

SUMMARY

In this study 100 patients of ASA grade I & II undergoing abdominal surgeries were randomly assigned, by double blind method to two groups, group A with patients in traditional sitting position with legs placed on side-support & group B with patients in hamstring stretch position with legs on table with maximum knee extension. Epidural needle placement was done in both groups. Parameters observed were surface-landmark identification, number of needle bone-interactions for identification of epidural-space,time taken for epidural space identification, complications in both group. This study showed that: the quality of surface landmarks was comparatively better in group A than the group B .and the number of needle bone-interactions to identify epidural space showed no significant difference between both groups.

CONCLUSION

The quality of surface landmarks identification was better in traditional sitting position group and the time taken for epidural space identification was almost same in both groups. In traditional sitting position the spaces were more easily identified. It was difficult to identify space in obese patients, but it was comparatively easy in traditional sitting position. There were complications like dural puncture in both the groups.

BIBLILOGRAPHY

1. Fisher KS, Arnholt AT, Douglas ME, Vandiver SL, Nguyen DH. A randomized trial of the traditional sitting position versus the hamstring stretch position for labor epidural needle placement. Anesth Analg. 2009;109(2):532–4. doi: 10.1213/ane.0b013e3181ac6c79.
2. Tashayod ME, Tamadon S. Spinal block in sitting position without moving the legs. Middle East J Anaesthesiol. 1980;5(8):529–33.
3. Soltani Mohammadi S, Hassani M, Marashi S M. Comparing the Squatting Position and Traditional Sitting Position for Ease of Spinal Needle Placement: A Randomized Clinical Trial. Anesth Pain Med. 2014;4(2):e13969 doi: 10.5812/aapm.13969.
4. Manggala SK, Tantri AR, Satoto D. Comparison of Successful Spinal Needle Placement Between Crossed-Leg Sitting Position and Traditional Sitting Position in Patients Undergoing Urology Surgery.
5. Elsharkawy H, Sonny A, Chin KJ. Localization of epidural space: A review of available technologies. J Anaesthesiol Clin Pharmacol. 2017;33(1):16-27. doi:10.4103/0970-9185.202184 Anesth Pain Med. 2016;6(4):e39314 doi: 10.5812/aapm.39314.
6. Harney D, Moran CA, Whitty R, Harte S, Geary M, Gardiner J. Influence of posture on the incidence of vein cannulation during epidural catheter placement. Eur J Anaesthesiology. 2005 Feb;22(2):103-6 doi:10.1017/s0265021505000190.PMID:158116587doi:10.5812 /aapm.55932. PMID:29696117;PMCID:PMC5903218.

7. Puthenveettil N, Sandhya S, Joseph N, Nair S, Paul J. Comparison of cross-legged sitting position with the traditional sitting position for the ease of insertion of an epidural catheter in parturient for providing labour analgesia: A randomised control trial. Indian J Anaesth. 2020
8. Özhan MÖ, Çaparlar CÖ, Süzer MA, Eskin MB, Atik B. Comparison of three sitting positions for combined spinal - epidural anesthesia: a multicenter randomized controlled trial. Braz J Anesthesiol. 2021 Mar-Apr;71(2):129-136. doi: 10.1016/j.bjane.2020.12.012. Epub 2020
9. Soltani Mohammadi S, Piri M, Khajehnasiri A. Comparing three different modified sitting positions for ease of spinal needle insertion in patients undergoing Spinal Anesthesia. Anesth Pain Med. 2017 Oct 23;7(5):e55932
10. Özhan MÖ, Çaparlar CÖ, Süzer MA, Eskin MB, Atik B. Comparison of three sitting positions for combined spinal - epidural anesthesia: a multicenter randomized controlled trial. Braz J Anesthesiol. 2021 Mar-Apr;71(2):129-136. doi: 10.1016/j.bjane.2020.12.012. Epub 2020 Dec 28. PMID: 33894856; PMCID: PMC9373673.
11. Vincent RD, Chestnut DH. Which position is more comfortable for the parturient during identification of the epidural space? Int J Obstet Anesth. 1991 Sep;1(1):9-11. doi: 10.1016/0959-289x(91)90023-j. PMID: 15636789.
12. Peralta F, Higgins N, Lange E, Wong CA, McCarthy RJ. The Relationship of Body Mass Index with the Incidence of Postdural Puncture Headache in Parturients. Anesth Analg. 2015 Aug;121(2):451-6. doi: 10.1213/ANE.0000000000000802. PMID: 25993388.
13. Sim WS, Choi JW, Lee CJ, Nahm FS, Lee SH, Shin BS, Cho HS. The influence of patient position on withdrawal force of thoracic epidural

catheters. Anaesthesia. 2012 Jan;67(1):19-22. doi: 10.1111/j.1365-2044.2011.06913.x. Epub 2011 Oct 4. PMID: 21972884.

14. Puthenveettil N, Sandhya S, Joseph N, Nair S, Paul J. Comparison of cross-legged sitting position with the traditional sitting position for the ease of insertion of an epidural catheter in parturient for providing labour analgesia: A randomised control trial. Indian J Anaesth. 2020 Mar;64(3):199-203. doi: 10.4103/ija.IJA_786_19. Epub 2020 Mar 11. PMID: 32346166; PMCID: PMC7179790
15. Harney D, Moran CA, Whitty R, Harte S, Geary M, Gardiner J. Influence of posture on the incidence of vein cannulation during epidural catheter placement. Eur J Anaesthesiol. 2005 Feb;22(2):103-6. doi: 10.1017/s0265021505000190. PMID: 15816587.
16. Bahar M, Chanimov M, Cohen ML, Friedland M, Shul I, Gofman V, Gershfeld S, Geller R, Sherman DJ. The lateral recumbent head-down position decreases the incidence of epidural venous puncture during catheter insertion in obese parturients. Can J Anaesth. 2004 Jun-Jul;51(6):577-80. doi: 10.1007/BF03018401. PMID: 15197121.
17. Schier R, Guerra D, Aguilar J, Pratt GF, Hernandez M, Boddu K, Riedel B. Epidural space identification: a meta-analysis of complications after air versus liquid as the medium for loss of resistance. Anesth Analg. 2009 Dec;109(6):2012-21. doi: 10.1213/ANE.0b013e3181bc113a. PMID:
18. Xu Z, Shen F, Zhang Y, Tao Y, Chen X, Liu Z. Combined spinal-epidural anesthesia with hypobaric ropivacaine in sitting position significantly increases the incidence of hypotension in parturients undergoing cesarean

section. J Obstet Gynaecol Res. 2017 Apr;43(4):669-675. doi: 10.1111/jog.13253. Epub 2016 Dec 27. PMID: 28026887.

19. Okucu F, Aksoy M, Ince I, Aksoy AN, Dostbıl A, Ozmen O. Combined spinal epidural anesthesia in obese parturients undergoing cesarean surgery : A single-blinded randomized comparison of lateral decubitus and sitting positions. Anaesthesist. 2021 Dec;70(Suppl 1):30-37. English. doi: 10.1007/s00101-021-00995-8. Epub 2021 Jun 22. PMID: 34159412.
20. Coppejans HC, Hendrickx E, Goossens J, Vercauteren MP. The sitting versus right lateral position during combined spinal-epidural anesthesia for cesarean delivery: block characteristics and severity of hypotension. Anesth Analg. 2006 Jan;102(1):243-7. doi:
21. Bonazzi M, Bianchi De Grazia L, Di Gennaro S, Lensi C, Migliavacca S, Marsicano M, Riva A, Laveneziana D. Individuazione ecoguidata dello spazio epidurale lombare [Ultrasonography-guided identification of the lumbar epidural space]. Minerva Anestesiol. 1995 May;61(5):201-5. Italian. PMID: 7478051.
22. Ambulkar R, Patil V, Doctor JR, Desai M, Shetty N, Agarwal V. Accuracy of ultrasound imaging versus manual palpation for locating the intervertebral level. J Anaesthesiol Clin Pharmacol. 2017 Jul-Sep;33(3):348-352. doi: 10.4103/joacp.JOACP_285_16. PMID: 29109634; PMCID: PMC5672528.
23. Andrews PJ, Ackerman WE 3rd, Juneja MM. Aortocaval compression in the sitting and lateral decubitus positions during extradural catheter placement in the parturient. Can J Anaesth. 1993 Apr;40(4):320-4. doi: 10.1007/BF03009629. PMID: 8485791.

24. Admir Hadzic-Textbook of regional anaesthesi and acute pain management edition 4,230-264

25. Ronald D Miller, Miller's a=Anaesthesia, 9th edition, vol 2:2422-2426

ANNEXURE –I – CONSENT FORM

Master / /Miss. _____we are requesting you to enroll you in the study titled "**A COMPARATIVE STUDY BETWEEN SITTING WITH LEGS PARALLEL ON THE TABLE VERSUS TRADITIONAL SITTING POSITION FOR EASE OF EPIDURAL NEEDLE PLACEMENT - A HOSPITAL BASED ONE YEAR RANDOMISED CLINICAL TRIAL"** conducted by **Dr.**_____Post Graduate in M.D. Anaesthesiology under the guidance of **Dr. _____ M.D.** Professor Department of Anaesthesiology, J.N. Medical College, Belagavi under KAHER, Belagavi.

Respected Sir/Madam, we request you to participate in our study as you are eligible for it. During the study you will be asked some questions regarding your medical history and you are supposed to answer to the best of your knowledge.

Your participation in this research is voluntary. Your decision whether or not to participate in the study will not affect your relationship with J.N.Medical College. If you decide to participate you are free to withdraw at any time.

INTRODUCTION AND PURPOSE: The present study will be conducted among patients in the age group of 18-50 years scheduled for various elective surgeries under epidural anaesthesia at KLE's Dr. Prabhakar Kore Charitable Hospital and Medical Research Centre, Belagavi. You are requested to participate in the study and your participation is completely voluntary and to know whether the hamstring stretch position would reduce the lumbar lordosis and will ease the placement of epidural needle when compared to traditional sitting position.

PROCEDURE: If you agree to enroll in my study, I will ask your present, past and family history. Then you will be clinically examined in detail. You will be allotted into one of the two groups randomly using computer generated software.

Group-A: In the traditional sitting position, patients' knees were flexed to about 90 degrees, their feet were placed on non-rolling support, their hips were adducted, the bed's height was adjusted to allow for maximum hip flexion & verbal coaching was given to encourage highest lumbar sagittal flexion.

Group B: Patients in this group were sitting with their lower limbs completely supported by the bed, their knees fully extended, their hips fully adducted & their heads forward.

BENEFITS: Patient will not be eligible for any kind of monetary benefits or free services by virtue of our participation in the study.

RISKS: Methods applied to the study are safe

COST OF PARTICIPATION: The cost of the investigation will be borne by the study subject. The other indirect expenses will be borne by the investigator.

PRIVACY AND CONFIDENTIALITY: The results of the study may be published in journals for scientific purposes. However, your identity will not be revealed. All information collected will be coded so that no one other than the investigator will know your identity.

WITHDRAWAL FROM THE STUDY: You can withdraw from the study at any time if you wish to do so.

ALTERNATIVES: The researcher may use the information gathered from this study for presentation in scientific meetings. However, your identity will not be revealed. Any information that is obtained in connection with this study and that can be identified with your identity will remain confidential.

PRIVACY AND CONFIDENTIALITY: The only people to know that you are as research subject are you and members of the research team. No information provided by you during the research will be disclosed to other without your written permission except:

1. In emergency to protect your rights and welfare.
2. If required by law.

AUTHORIZATION TO PUBLISH RESULTS: When the results of the research are published or discussed, in a conference, no information will be displayed that would disclose your identity. Any information that is obtained in connection with this study and that can be identified with your identity remaining confidential.

FINANCIAL INCENTIVES FOR PARTICIPATION: No financial incentives are being offered to enrolled patients. It is purely being done with the idea of research and all the cost of the study will be borne by the investigator.

COMPENSATION: In the event of injury related to the study, treatment will be made available through KLES Hospital and MRC, Belagavi. There is no compensation or payment for such medical treatment by law. If you get injured you may contact **Dr._____**at Department of Anaesthesiology, J.N. Medical College or by Ph. No: _____.QUESTIONS: In case you have any questions related to the study, in future or in case of study related injury or illness, you can

contact **Dr._____**Department of Anesthesiology, J.N. Medical College, Belagavi. Phone number: _____or Dr. M.G.Dhorigol M.D, Professor Dept. Of Anaesthesiology, J.N. Medical College, Belagavi. If you have any queries about your rights as a study subject, you may call, DR. HARSHA HEGDE**,** Chairman, JNMC, IEC& Scientist, ICMR, National Institute of Traditional Medicine, Belagavi.

CONSENT STATEMENT TO PARTICIPATE IN RESEARCH STUDY

I Mr./Mrs.---------- voluntarily agree for the participation as a subject for the study. By signing this consent form I am not giving up any of my legal right. I may withdraw from the study any time. I am signing the consent form after having read or been read to me in my vernacular language, including the risk and the benefits and having all my queries cleared.

Name of study patient: ----------

Signature or the left thumb impression:

Legally authorized relative ----------

Signature: ----------

Name and signature of witness:----------

Name and signature of investigator: ----------

Date: ----------

Place: ----------

ANNEXURE -II

PROFORMA

A COMPARATIVE STUDY BETWEEN SITTING WITH LEGS PARALLEL ON THE TABLE VERSUS TRADITIONAL SITTING POSITION FOR EASE OF EPIDURAL NEEDLE PLACEMENT - A HOSPITAL BASED ONE YEAR RANDOMISED CLINICAL TRIAL

Group allotted: Date of Examination :

Name: Age:

Gender: Occupation:

Address:

History and examination:

Weight: Clubbing:

Height: Pulse:

Temp: B.P.:

Pallor: RR:

Cyanosis: SPO_2:

Pedal edema: Allen's test:

Drugs and past history:

H/o previous surgery/(s) where airway difficulty was encountered. Yes No

Allergy and previous anesthetic experience:

Cardio-respiratory system:

Angina: CVS:

Dyspnea: Heart sounds:

Cough: RS:

Expectoration: Trachea:

Asthma: Breath Sounds:

Hemoptysis:

CNS

P/A

Musculoskeletal system

Teeth:

Jaw movements:

Airway assessment:

Spine:

Preoperative physical status ASA Grade I II III IV V

Proposed surgery:

PARAMETERS	**GROUP A** **TRADITIONAL SITTING POSITION**	**GROUP B** **HAMSTRING POSITION**
EASE OF INSERTION OF EPIDURAL NEEDLE i.) QUALITY OF SURFACE LANDMARKS a) Easy to Identify -1 b) Difficult to Identify-2 c) Impossible to Identify-3		
NO .OF NEEDLE BONE CONTACTS TO IDENTIFY EPIDURAL SPACE I.) If less than 3 – Score 1 II.) If more than 3 – Score 2		
TIME TAKEN TO IDENTIFY EPIDURAL SPACE		
COMPLICATIONS		
PARESTHESIA		
ACCIDENTAL DURAL PUNCTURE		
NEURAL TRAUMA		
PATIENT DISCOMFORT		

- SIGNATURE OF THE ANAESTHESIOLOGIST: _____
- SIGNATURE OF THE WITNESS: _____
- SIGNATURE OF THE PRINCIPAL INVESTIGATOR: _____

ANNEXURE-III

IMAGES

IMAGE 1: PATIENT WITH LEGS PARALLEL ON THE TABLE (HAMSTRING STRETCH POSITION)

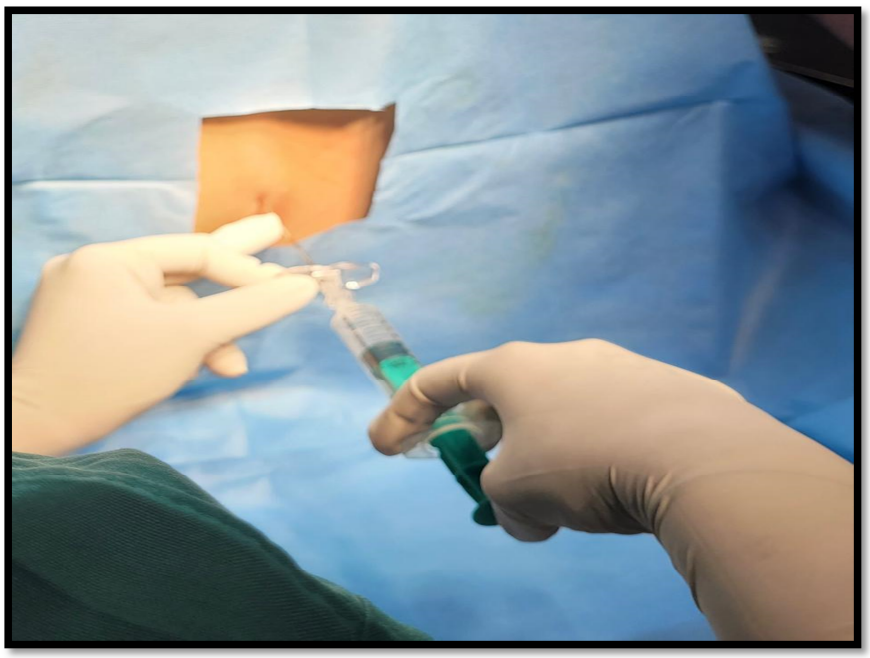


IMAGE 2 EPIDURAL SPACE IDENTIFICATION USING LOSS OF RESISTANCE TECHNIQUE

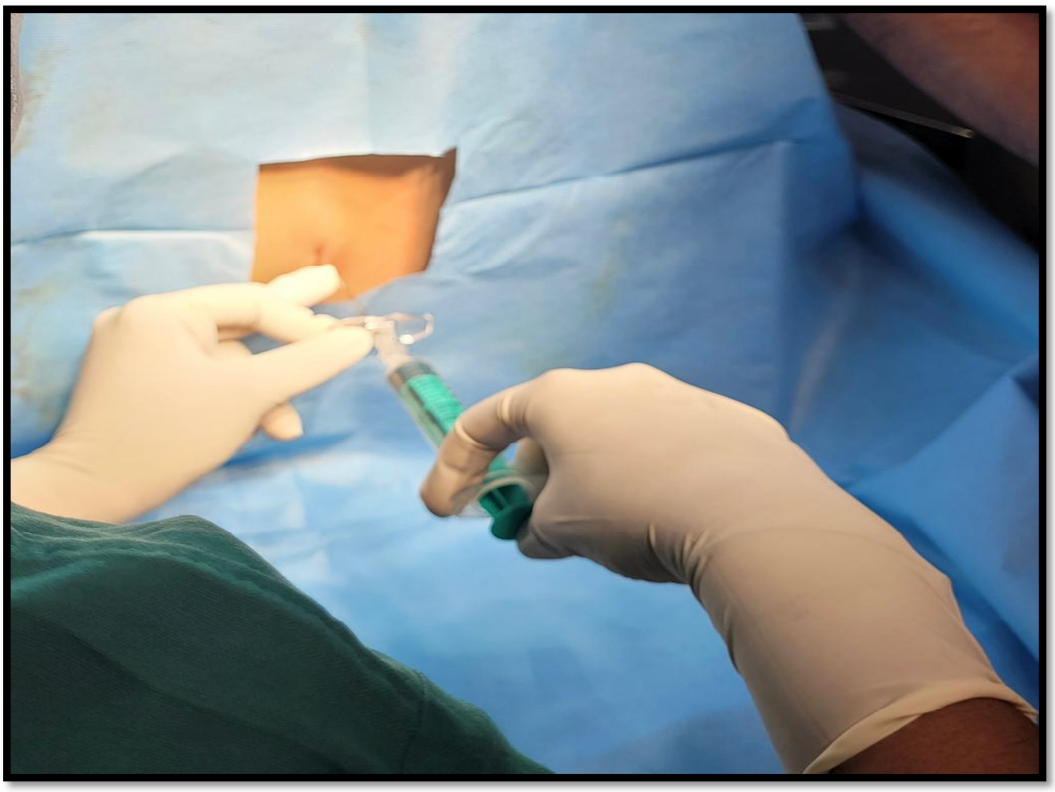


IMAGE 3:LOSS OF RESISTANCE TECHNIQUE

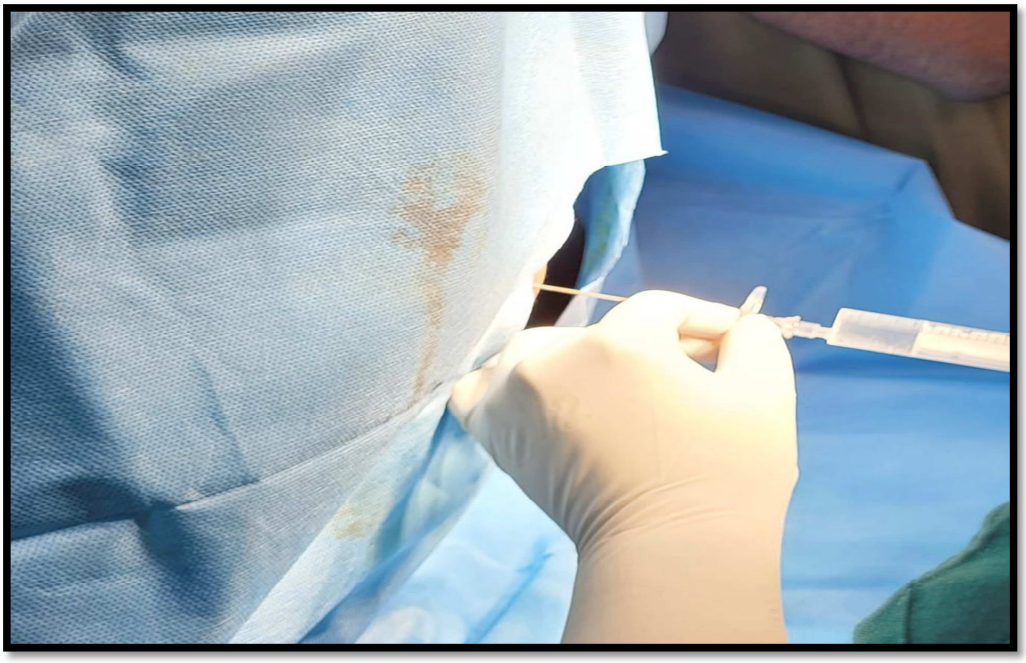


IMAGE 4:EPIDURAL TEST DOSE GIVEN

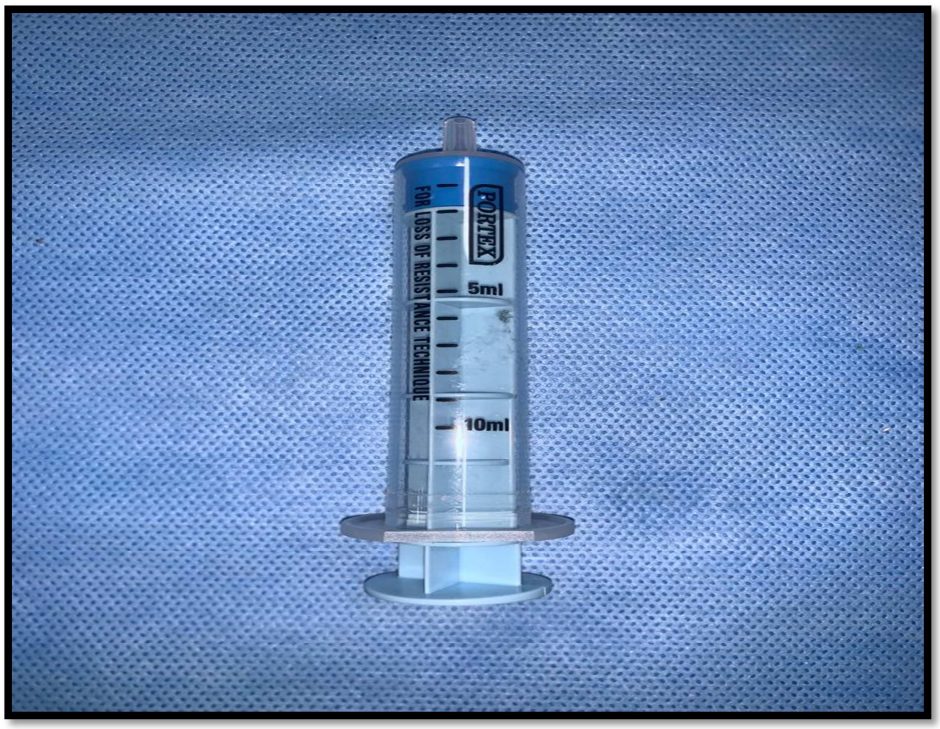


IMAGE 5:LOSS OF RESISTANCE SYRINGE

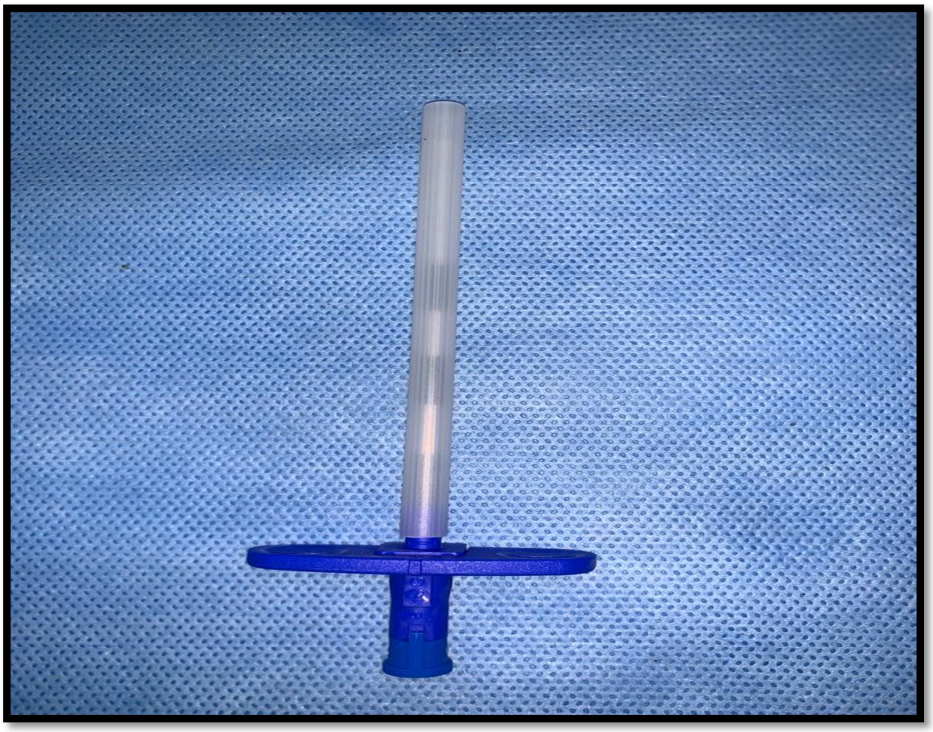


IMAGE 6:TUHOY'S EPIDURAL NEEDLE

ANNEXURE-IV

MASTER CHART

.S.No.	PATIENT NAME	ASA STATUS	AGE	SEX	HEIGHT(cm)	WEIGHT(Kgs)	BMI	Quality of Surface Landmarks	No.Of Needle Bone Contacts to Identify Epidural Space	Time Taken to Identify Epidural Space	Complications
1	Ramachandra	II	59	M	170	80	27.3	2	1	nil	NO
2	Jyothi	II	44	F	156	90	40	3	2	nil	NO
3	Vinayak	I	24	M	170	60	20	3	1	nil	NO
4	Yashodha	II	60	F	160	70	27.3	2	1	nil	NO
5	Gangubhai	II	60	F	160	60	23.4	2	1	nil	NO
6	Meera	II	60	F	166	70	25.4	2	1	nil	NO
7	Wasavva patil	II	60	F	166	80	29	2	1	nil	NO
8	Bhupal jain	I	58	M	170	80	27.7	2	1	nil	NO
9	Laxmi	I	22	F	160	50	19.5	1	1	30secs	NO
10	Hanmanth	I	42	M	170	70	24.2	2	1	nil	NO
11	Chetan	I	29	M	170	60	20.8	1	1	1min	NO
12	Soujanya	I	37	F	160	60	29	2	1	nil	NO
13	Abhishek	I	18	M	170	60	24.2	1	1	1min	NO
14	Masabi	II	60	F	160	70	27.3	2	1	NIL	NO
15	Prashanth	I	24	M	176	70	24.2	2	1	NIL	NO
16	Hanumanthappa	I	33	M	170	80	27.7	2	1	NIL	NO
17	Asipa	II	42	F	160	60	23.4	2	1	NIL	NO
18	Mukandh	II	58	M	170	70	24.2	1	1	1min	NO
19	Gajanan	II	60	M	170	70	24.2	2	1	NIL	NO
20	Mahesh	I	45	M	175	60	24	2	1	NIL	NO

21	Girimalla	II	60	M	170	60	24.2	2	1	NIL	NO
22	Helen	II	57	M	165	60	23	2	1	NIL	NO
23	Naruna sauz	I	31	F	160	55	23.5	1	1	1Min	NO
24	Chandappa	II	54	M	170	70	24.2	1	1	NIL	NO
25	Sunil	I	42	M	175	70	23.8	2	1	NIL	NO
26	Javed	I	24	M	180	70	23	1	1	NIL	NO
27	Shankar	II	45	M	160	75	28	2	1	NIL	NO
28	Sameer	I	24	M	176	80	27	2	1	NIL	NO
29	Arjun	I	31	M	170	70	24.2	1	1	1MIN	NO
30	Sophiya	I	24	F	170	58	24.2	1	1	1MIN	NO
31	Javed	I	25	M	170	70	24.2	1	1	1MIN	NO
32	Ramachandra	II	60	M	175	80	27	2	1	NIL	NO
33	Maruthi	I	40	M	170	65	25	1	1	1MIN	NO
34	Dinesh	II	30	M	180	75	24	1	1	1MIN	NO
35	Nirmala	II	50	F	156	70	28	2	1	1MIN	NO
36	Ishwar	I	32	M	165	70	27.2	1	1	1MIN	NO
37	Mahesh	I	30	M	160	72	28	1	1	NIL	NO
38	Siddarth	I	30	M	165	73	28.2	1	1	1MIN	NO
39	Mahalakshmi	II	45	F	156	80	30	2	2	NIL	NO
40	Ramakrishna	II	55	M	165	90	29	1	1	NIL	NO
41	Ramya	I	30	F	155	70	30	2	1	NIL	NO
42	Mohan	I	45	M	170	70	24.2	1	1	1MIN	NO
43	Nihanth	I	32	M	170	75	25	1	1	1MIN	NO
44	Sowmya	I	26	F	160	70	28	1	1	1MIN	NO
45	Lakshmi	I	40	F	160	60	29	1	1	1MIN	NO
46	Rahul	I	28	M	170	65	22.5	1	1	1MIN	NO
47	Surekha	II	45	F	160	65	25.4	2	1	1MIN	NO
48	Chandrakala	II	50	F	160	80	31.2	2	1	NIL	NO

49	Saraswathi	II	55	F	156	75	30.8	2	2	NIL	NO
50	Ajay	I	28	M	170	68	23.5	1	1	NIL	NO
51	Mahadevi patil	II	39	M	170	60	20.8	1	1	1MIN	NO
52	Vidhyashree	I	27	F	160	90	35.2	2	2	NIL	NO
53	Bhimappa	II	45	M	170	60	20.8	1	1	1MIN	NO
54	Imamsab	II	59	F	175	60	19.6	1	1	NIL	NO
55	Kundan kumar	I	18	M	165	60	22	1	1	1MIN	NO
56	Laxmi bhai	II	60	F	160	55	21.1	1	1	NIL	NO
57	Prabhavathi	II	45	F	160	60	29	1	1	NIL	NO
58	sukravva	II	60	F	165	55	22.1	1	1	NIL	NO
59	Subash	I	43	M	170	68	23.5	1	1	NIL	NO
60	Muttava	II	60	F	160	60	29	2	1	NIL	NO
61	Kashavva	I	60	F	160	68	28	2	1	NIL	NO
62	Ninagappa	II	80	M	170	80	26	2	1	NIL	NO
63	Hanmanthappa	I	33	M	170	70	23.5	1	1	NIL	NO
64	Padmavathi	I	60	F	160	70	28	2	1	NIL	NO
65	Ningappa	II	56	F	165	68	25	2	1	NIL	NO
66	Nabanna	I	37	M	160	65	25.4	1	1	1MIN	NO
67	Chandrashekar	II	44	M	170	65	23.1	2	1	NIL	NO
68	Sonali patil	II	60	F	160	60	29	2	1	NIL	NO
69	Praveen patil	I	26	M	180	70	21.6	1	1	1MIN	NO
70	Kasimab	II	60	M	170	70	24.2	2	1	NIL	NO
71	Vijay	I	43	M	170	60	20.8	1	1	1MIN	NO
72	Ananda kolkar	I	45	M	170	68	24	1	1	1.5 MIN	NO
73	Kumar Tuadale	II	56	M	175	70	24	2	1	NIL	NO
74	Nagappa	II	60	M	165	72	25.7	2	1	NIL	NO
75	Shankarappa	II	35	M	170	60	20.8	1	1	1MIN	NO
76	Abhishek	I	18	M	180	70	21.6	1	1	1MIN	NO

77	Shivalingappa	I	58	M	176	68	24	1	1	1min	NO
78	Parvati	II	60	F	160	60	29	2	1	NIL	NO
79	Bharati vijay	I	41	F	165	70	25.7	1	1	1MIN	NO
80	Laxmi bhai.R	II	60	F	160	70	27.3	2	1	NIL	NO
81	Vishwas	I	18	M	180	70	21.6	1	1	1MIN	NO
82	Sangappa	II	60	M	170	80	26	1	1	NIL	NO
83	Gangadhar	II	53	M	174	80	26.4	2	1	NIL	NO
84	Sarala	I	50	F	170	70	24.2	1	1	1MIN	NO
85	Nandini	II	30	F	160	50	19.5	1	1	1MIN	NO
86	Sushila devi	II	60	F	170	60	20.8	2	1	NIL	NO
87	Shivappa	I	44	M	180	70	21.6	1	1	1MIN	NO
88	Mahesh	I	45	M	175	80	26.4	1	1	1MIN	NO
89	Ratnavva	II	58	F	180	70	21.6	1	1	1MIN	NO
90	Yallen	I	52	F	175	60	19.6	1	1	1MIN	NO
91	Swapnil patil	I	37	M	175	75	26	1	1	2MINS	NO
92	Narayan	II	60	M	170	70	24.2	2	1	NIL	NO
93	Ashok	I	47	M	180	73	22.5	1	1	1MIN	NO
94	Hanmanthappa	I	33	F	170	50	17.3	1	1	1MIN	NO
95	Swapnil patil	I	37	M	175	75	26	1	1	1.5MIN	NO
96	Suresh	I	57	M	175	70	23	1	1	1MIN	NO
97	Neeta	I	36	F	170	65	22.5	1	1	1MIN	NO
98	Asiya	I	28	F	160	55	21.5	1	1	1MIN	NO
99	Jainabi	II	40	F	156	70	28.8	2	1	NIL	NO
100	Ashok	I	45	M	165	70	25.7	1	1	1MIN	NO

Legends :- (A) Quality Of Surface Landmarks :- (i.) Easy to identify(1), (ii.) Difficult to identify(2), (iii.) Impossible to identify(3) .
(B) No.Of Needle Bone Contacts to Identify Epidural Space :- (i.) If less than 3 - Score 1, (ii.) If more than 3 - Score 2 .If time mentioned it is first attempt.