A COMPARATIVE RANDOMIZED STUDY OF THORACIC PARAVERTEBRAL BLOCK VERSUS INTER PLEURAL BLOCK FOR POST OPERATIVE ANALGESIA AFTER MODIFIED RADICAL MASTECTOMY, CHOLECYSTECTOMY AND NEPHRECTOMY SURGERIES.

Dissertation submitted to

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In partial fulfillment of the regulations

For the award of the degree of

M.D (ANAESTHESIOLOGY)

BRANCH-X

Reg No : 201720253

GOVT. CHENGALPATTU MEDICAL COLLEGE & HOSPITAL,

CHENGALPATTU - 603001.

MAY-2020.

CERTIFICATE

This is to certify that the dissertation titled "**A COMPARATIVE RANDOMIZED STUDY OF THORACIC PARAVERTEBRAL BLOCK VERSUS INTER PLEURAL BLOCK FOR POST OPERATIVE ANALGESIA AFTER MODIFIED RADICAL MASTECTOMY, CHOLECYSTECTOMY AND NEPHRECTOMY SURGERIES.**" is the bonafide original work of **DR. KOSHINI. S**, in partial fulfillment of the requirements for **M.D.Branch-X (ANAESTHESIOLOGY)** Examination of the Tamil Nadu Dr.M.G.R. Medical University to be held in May 2020. The period of study was from January 2018 to August 2019.

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BONAFIDE CERTIFICATE

This is to certify that dissertation "**A COMPARATIVE RANDOMIZED STUDY OF THORACIC PARAVERTEBRAL BLOCK VERSUS INTER PLEURAL BLOCK FOR POST OPERATIVE ANALGESIA AFTER MODIFIED RADICAL MASTECTOMY, CHOLECYSTECTOMY AND NEPHRECTOMY SURGERIES**." is a bonafide work performed by Dr. Koshini. S, postgraduate student of Anaesthesiology, Chengalpattu medical college, Chengalpattu, under my guidance and supervision in fulfilment of regulations of The Tamil Nadu Dr. M.G.R Medical University for the award of M.D. Degree during the Academic period 2017-2020.

Prof. DR. R.RADHAKRISHNAN, M.D.,D.A.
Department of Anaesthesiology,
Chengalpattu Medical College,
Chengalpattu.

DECLARATION

I, **Dr. KOSHINI. S**, solemnly declare that dissertation titled "**A COMPARATIVE RANDOMIZED STUDY OF THORACIC PARAVERTEBRAL BLOCK VERSUS INTER PLEURAL BLOCK FOR POST OPERATIVE ANALGESIA AFTER MODIFIED RADICAL MASTECTOMY, CHOLECYSTECTOMY AND NEPHRECTOMY SURGERIES**." is a bonafide record of work done by me in the Department of Anaesthesiology, Government Chengalpattu Medical College and Hospital during June 2018 to August 2019 under the guidance of **Prof.Dr.R.RADHAKRISHNAN**,**M.D.,D.A.** Professor of Anaesthesiology, Government Chengalpattu Medical College and Hospital, Chengalpattu.This dissertation is submitted to Tamil Nadu Dr. M.G.R. Medical University, in partial fulfillment of the University regulations for the award of M.D.Degree (Branch x) Anaesthesiology- May 2020.

SIGNATURE OF THE CANDIDATE

KOSHINI.S

CERTIFICATE FROM THE INSTITUTIONAL ETHICAL

COMMITTEE CERTIFICATE

INSTITUTIONAL ETHICAL COMMITTEE

Reg. No: ECR/774/INST/TN/2015

CHENGALPATTU MEDICAL COLLEGE, CHENGALPATTU

Title of Work	:	A Comparative randomized Study of Thoracic Para vertebral block versus inter Pleural block for post operative Analgesia after modified radical Mastectomy, Cholecystectomy and Nephrectomy surgeries.
Principal Investigator	:	Dr.S.Koshini
Designation	:	1st yr PG
Co-Investigators	:	Dr.Radhakrishnan,MD.,D.A., Professor , Department of Anaesthesiology
Department	:	Anaesthesiology

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CERTIFICATE - II

This is to certify that this dissertation work titled **"A COMPARATIVE RANDOMIZED STUDY OF THORACIC PARAVERTEBRAL BLOCK VERSUS INTER PLEURAL BLOCK FOR POST OPERATIVE ANALGESIA AFTER MODIFIED RADICAL MASTECTOMY, CHOLECYSTECTOMY AND NEPHRECTOMY SURGERIES."** of the candidate KOSHINI. S with registration Number 201720253 for the award of M.D. degree in the branch of Anaesthesiology. I personally verified the urkund.com website for the purpose of plagiarism Check. I found that the uploaded thesis file contains from introduction to conclusion pages and result shows 13%percentage of plagiarism in the dissertation.

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I wish to express my thanks to our beloved **DEAN**, Govt. Chengalpattu Medical College and Hospital, for permitting me to utilize the hospital facilities for this dissertation.

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Koshini. S

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INTRODUCTION

Breast cancer surgeries, nephrectomy surgeries and cholecystectomy surgeries are usually done under general anaesthesia alone which does not offer adequate post operative pain relief. Regional blocks can be used to reduce the pain and narcotic requirement in the post operative period(1). There are several regional techniques available for post operative pain relief in modified radical mastectomy surgeries. In Paravertebral block (PVB) the local anesthetic is injected near the thoracic vertebra adjacent to the spinal nerves when they emerge from the intervertebral foramina,. This produces ipsilateral somatic and sympathetic nerve blockade in multiple dermatomes above and below the site of injection(2).

Paravertebral block is as effective as epidural analgesia but with lesser incidence of complications(3). Reistad et al initially described the technique of interpleural analgesia(4). Interpleural analgesia can be used to prevent postoperative pain caused by thoracic and upper abdomen surgeries(4). The principle on which this technique is based involves spread of local anaesthetic solution from the interpleural space into the paravertebral and intercostal region, thus blocking the spinal and intercostal nerves and providing regional analgesia(5). This study compares the effect of PVB and IPB in reducing post operative pain and narcotic requirements.

AIM OF THE STUDY

The aim of this study is to compare paravertebral block and interpleural block on the post operative pain relief of patients who undergo modified radical mastectomy, cholecystectomy and nephrectomy surgeries assessed by visual analogue scale and on the narcotic requirements during the post operative period.

CONCEPT AND TECHNIQUE

The possibility of developing post surgical chronic pain syndrome in mastectomy patients is as high as 20% to 50%. Regional analgesia techniques can reduce the incidence of postsurgical chronic pain in these patients (5)

Interpleural analgesia can be used to treat acute postoperative pain caused by thoracic and upper abdominal surgeries. Studies have shown that interpleural analgesia is useful in treating the pain caused by cholecystectomies(4). Some complications include pneumothorax, damage to the underlying lung, infection, bleeding and block failure.(5) the paravertebral block is used for providing analgesia in patients undergoing intrathoracic, abdominal or pelvic procedures or surgery to the breast(6). Single shot injection of local anaesthetic into the paravertebral space has been shown to control acute pain and reduces intraoperative and post operative need for opioids(7). A good knowledge of the anatomy of paravertebral space and interpleural space is important for proper identification.

ANATOMY OF PARAVERTEBRAL SPACE

The thoracic paravertebral space is a region which is wedge shaped on either side of the vertebral column, which is continuous with the intercostal space laterally, epidural space medially and opposite side paravertebral space by the prevertebral fascia. If local anaesthetic drugs are injected into this space, it can spread cranially or caudally.

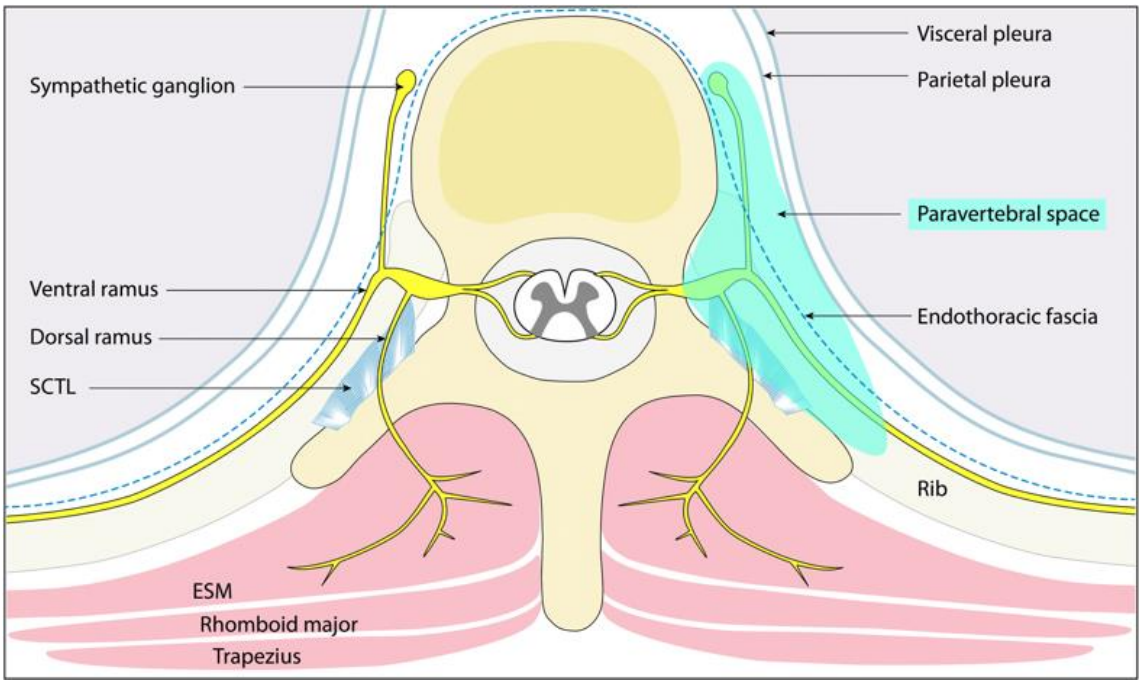
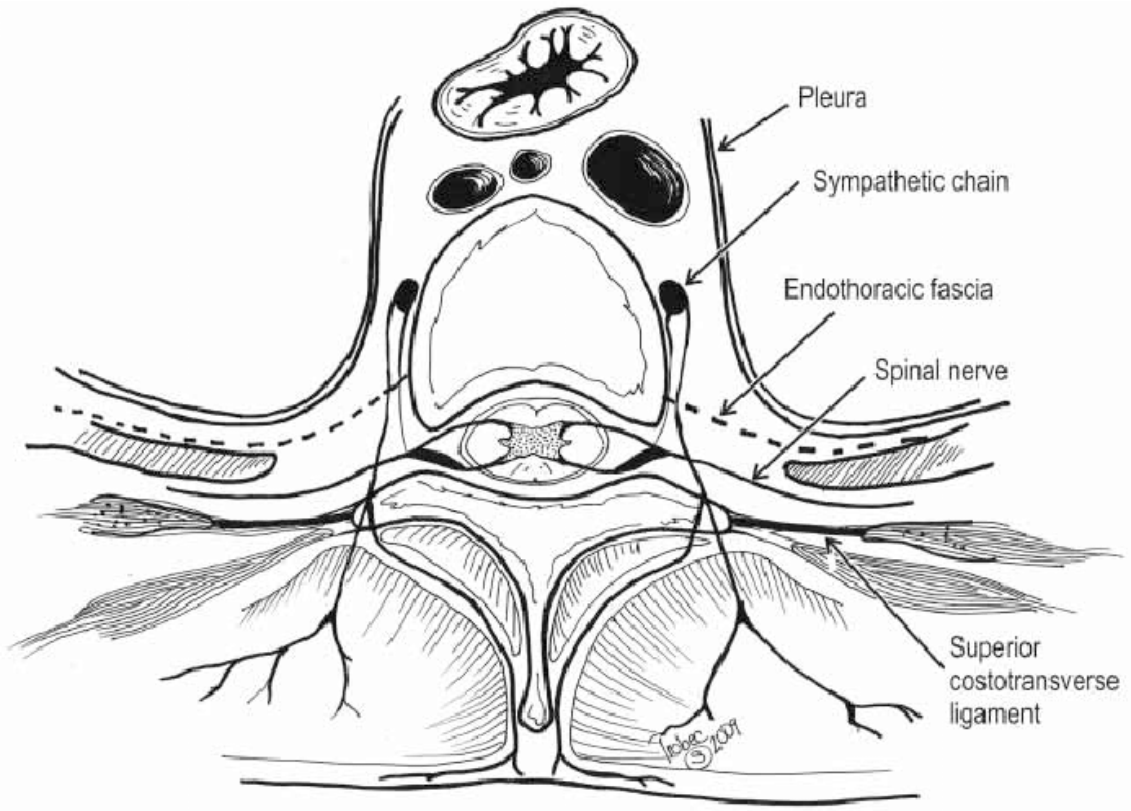


Figure 1: anatomy of paravertebral space

BOUNDARIES(6)



Anteriorly : parietal pleura

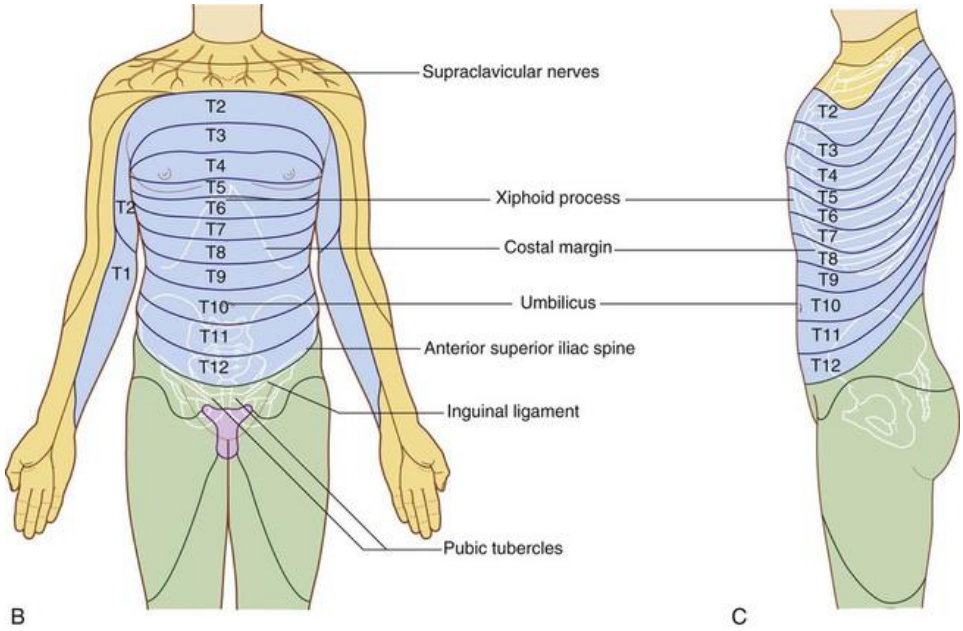
Medially : vertebral body, intervertebral disc and foramen

Laterally : posterior intercostal membrane

Posteriorly : superior costotransverse ligament

DISTRIBUTION OF ANAESTHESIA

The thoracic nerve roots after emerging from the intervertebral foramina, divide into dorsal and ventral rami. The skin and muscles of the paravertebral region are supplied by the dorsal ramus and the ventral division continues as the intercostal nerve. Thoracic paravertebral block produces unilateral anaesthesia on the side of injection and the dermatomal distribution depends on whether a single level or multiple levels are blocked and the volume of local anaesthetic drug injected into the paravertebral space.(8)



PATIENT POSITIONING

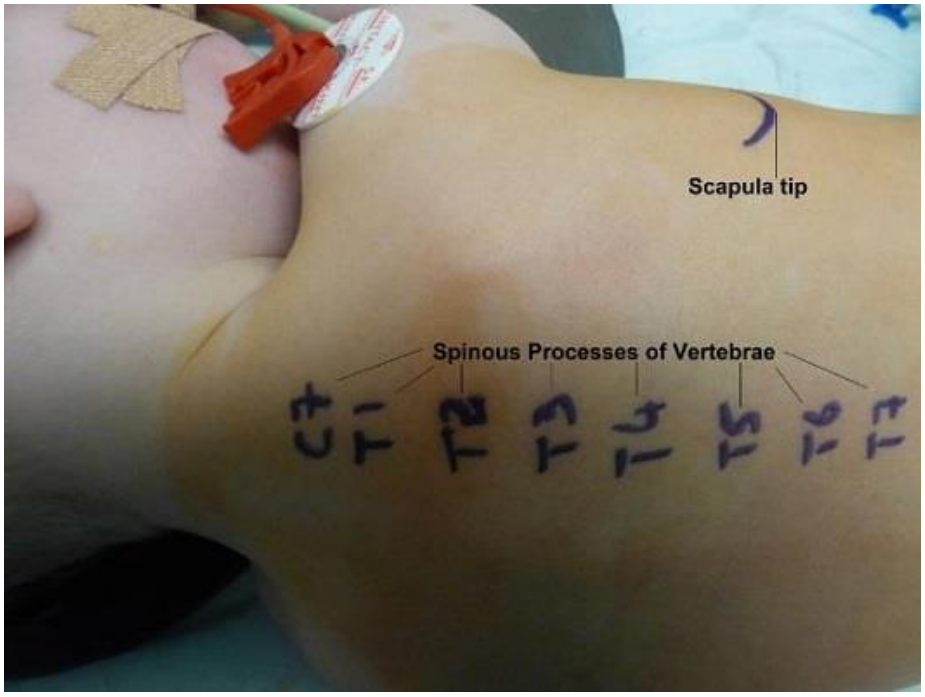
To perform a paravertebral block, we can place the patient in sitting position or lateral decubitus position with the knee chest position. The patient has to be positioned properly so that the needle successfully enters the paravertebral space as proper positioning increases the distance between the adjacent transverse processes.(8)

LANDMARKS

1) Spinous processes of vertebra

2) Spinous process of C7 vertebra

3) Lower border of scapula to identify T7



TECHNIQUE:

Thoracic paravertebral block can be performed in either sitting, lateral, or prone position. The sitting position is better because it is easy to identify the bony landmarks easily in this position. Local anaesthetic is used to infiltrate the skin and subcutaneous tissues so that the patient is comfortable during needle insertion. At the midline the spinous process of the vertebra is identified, the Tuohy epidural needle is inserted 2.5 to 3 cm lateral to the most cephalad part of the corresponding spinous process. The needle is directed perpendicularly to the skin till it contacts the transverse process of the lower vertebra which usually occurs at a depth of 2 to 4 cm. Once the transverse process is contacted, the needle is advanced slightly further until a loss of resistance is felt. A single injection of 15 mL can produce somatic blockade on the side of block over four or five dermatomes even though the spread of block is variable.

CHOICE OF LOCAL ANESTHETIC

Drugs that have a long duration of action and hence a long duration of analgesia are used in paravertebral block. This block usually does not produce any motor block.

LOCAL ANAESTHETIC DRUG	ONSET (mins)	DURATION OF ANALGESIA (hrs)
2% lidocaine	10 - 15	3 - 4
0.5% Ropivacaine	15 - 25	8 - 12
0.5% Bupivacaine	15 - 25	12 - 18
0.5% Levobupivacaine	15 - 25	12 - 18

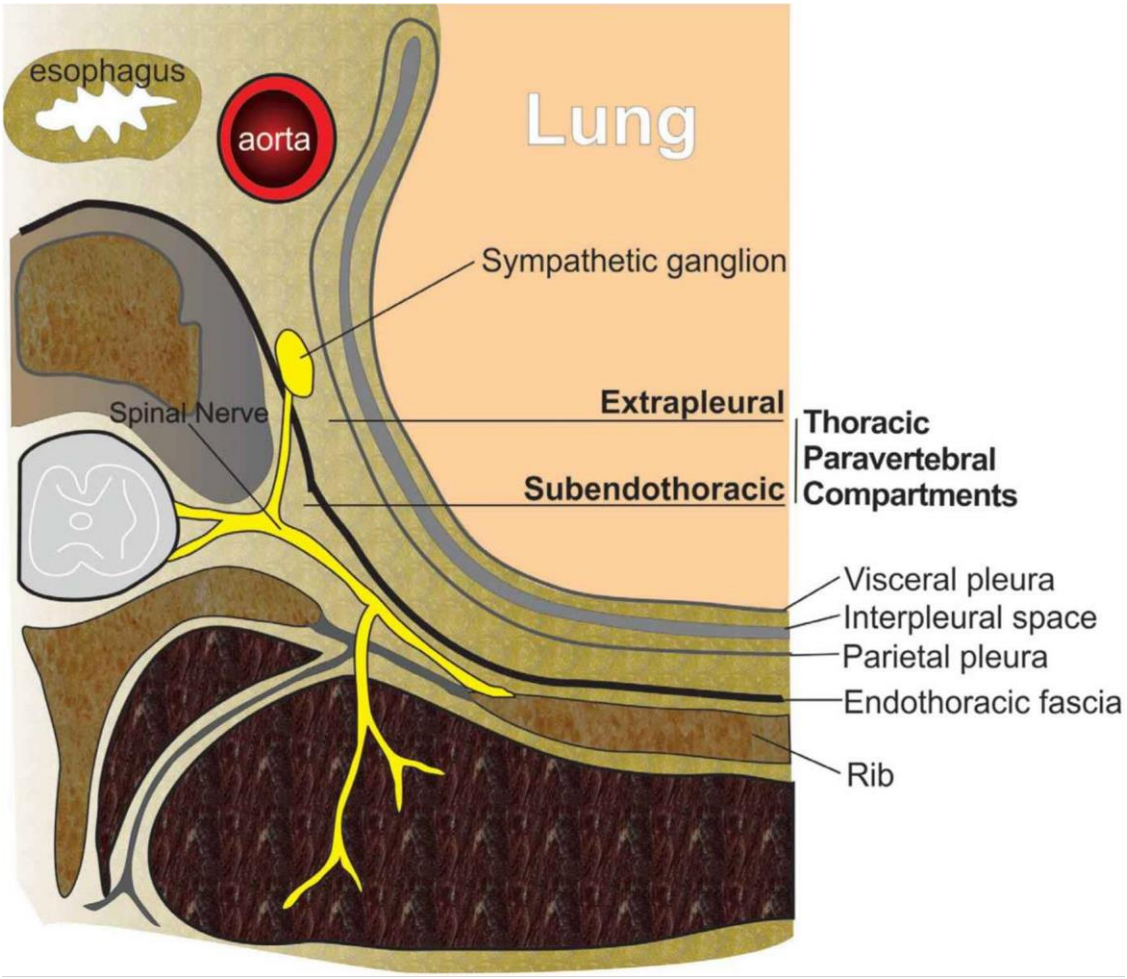
SIDE EFFECTS AND COMPLICATIONS (6)

1) There is risk of accidental injection of local anaesthetic into the subarachnoid or epidural space.

2) Intravascular injection.

3) Pleural puncture and pneumothorax can occur with an incidence of 1.1% and 0.5%, respectively.

INTERPLEURAL BLOCK

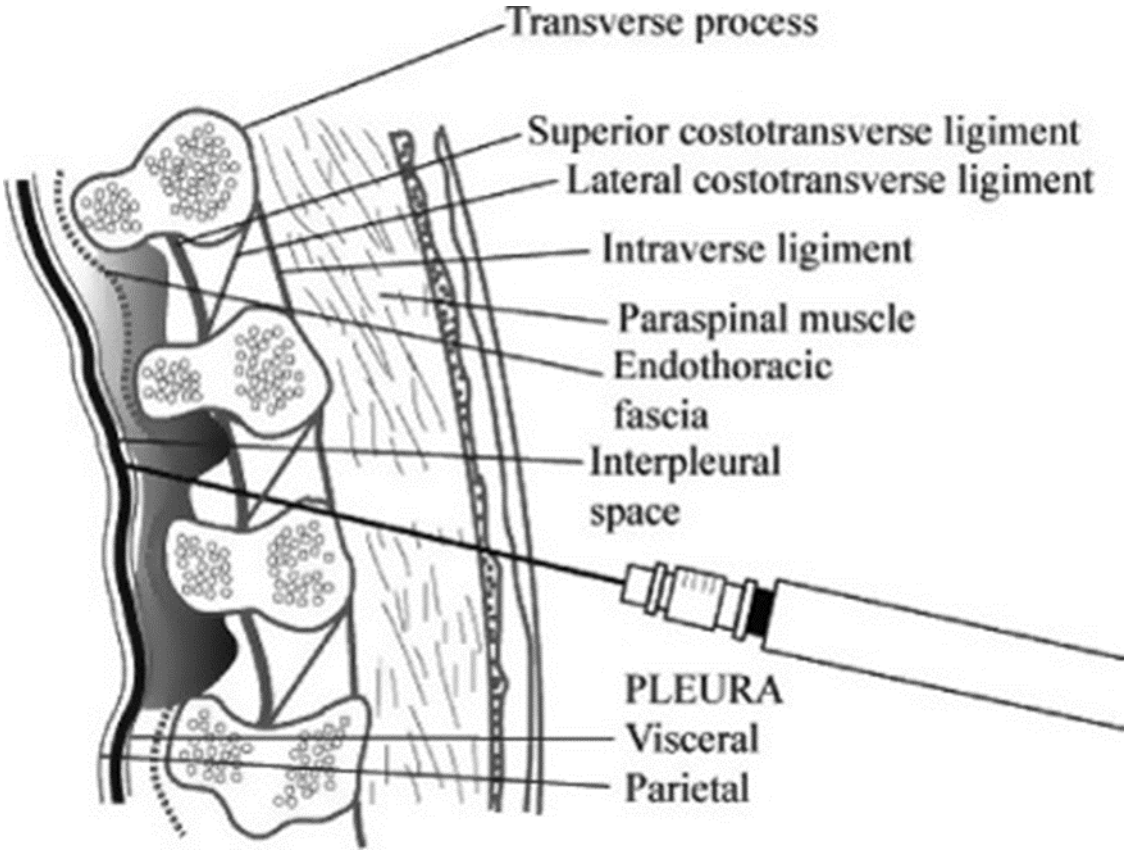


INTRODUCTION

Reiestad et al. first performed interpleural block for the treatment of postoperative pain in thoracic surgeries. The local anaesthetic injected into the interpleural space spreads to multiple intercostal nerves in a retrograde manner and blocks them. This technique is suitable for providing pain relief to thoracic and abdominal surgeries and can reduce post operative opioid consumption.

ANATOMY

To perform an interpleural block, the needle has to pass through the intercostal space. The intercostal spaces have 3 layers of muscles namely the external intercostal, internal intercostal muscles and the innermost intercostal muscles. The neurovascular bundle containing an intercostal vein, artery, and nerve is present at the lower border of each rib.



The intercostal nerves are part of the somatic nervous system, they arise from the anterior rami of the thoracic spinal nerves from T1 to T11. The intercostal nerves have an independent course and are distributed to the thoracic pleura and the abdominal peritoneum. The anterior rami after passing through the intervertebral foramina are initially located above the parietal pleura. As they move away from the midline, the nerves lie in between the internal and innermost intercostal muscles. They are present in the neurovascular bundle along with the artery and vein in the lower border of the ribs.

The pleura is formed by a serous membrane which folds onto itself to form 2 layers namely the parietal and visceral pleura. The parietal or outer pleura is present on the inner side of the chest wall and the visceral pleura lies in contact with the lungs and other intrathoracic structures with a thin space between the two layers called the pleural cavity. The parietal pleura is separated from the thoracic wall by a layer of connective tissue called the endothoracic fascia. The use of intrapleural bupivacaine has been associated with lower pain scores as assessed by linear analog scale and rank pain score.(9)

INDICATIONS

1) Interpleural block is used to treat acute postoperative pain due to thoracic surgeries, mastectomy surgeries and upper abdominal surgeries like cholecystectomy. VadeBoncouer et al. in their study found that interpleural analgesia decreased opioid consumption in these patients and improved pulmonary function in the post operative period.

2) Rib fractures, acute herpes zoster, and pain due to ischemia in the upper extremity.

3) Chronic pain conditions like cancer pain, post-herpetic neuralgia, pain due to schronic pancreatitis, and complex regional pain syndromes.

CONTRAINDICATIONS

Absolute Contraindications

1) Refusal by patient
2) Allergy to local anaesthetic drugs
3) Infection at site of injection

Relative Contraindications

1) Coagulopathy
2) Phrenic nerve palsy
3) Pulmonary diseases like bullous lung disease, recent pulmonary infections, chronic obstructive pulmonary disease, pleural adhesions and hemothorax.

EQUIPMENT

1) Topical antiseptic solution

2) Sterile gloves, gauze, and towels or drape

3) 16- to 18-gauge Tuohy epidural needle

4) 25-gauge needle (for infiltration at procedure site in an awake patient)

5) Glass or plastic loss-of-resistance syringe

6) Pulse oximetry, a non-invasive blood pressure monitoring device, continuous electrocardiogram monitor.

7) Local anesthetic (bupivacaine with a concentration of 0.25% to 0.5% can be used with a volume of 10 to 30 ml)

PREPARATION

To perform an interpleural block, the patient can be placed in supine or lateral position with the affected side facing up. The site of needle insertion can be selected anywhere between the fourth and seventh intercostal spaces. The needle will be inserted on the upper part of the rib in order to avoid injuring the neurovascular structures in the lower border of the rib. The site of needle insertion is chosen 10 cm lateral to the midline at the selected intercostal space. The site is cleansed with an antiseptic solution and draped in a sterile manner.

TECHNIQUE

The Tuohy epidural needle is inserted into the intercostal space chosen on the upper border of the rib. The needle is advanced during expiration in order to avoid injury to visceral pleura. The interpleural space can be identified by the loss of resistance technique(10). After entering the interpleural space, either a single injection can be given or a catheter can be placed. A continuous catheter is usually used if prolonged pain relief is required. Single bolus, intermittent dosing, or continuous infusion can be given via the interpleural catheter. If catheter is placed, catheter site should be frequently checked for any bleeding or infection. If single injection of drug is given, after injection, the needle can be removed. When the Tuohy needle is inside the interpleural space, a closed system must be maintained to avoid air from being entrained into the space which may lead to pneumothorax.

COMPLICATIONS(11)

1) The most common complication of interpleural block is pneumothorax. A retrospective review of 703 procedures found that the incidence of pneumothorax may be as high as 2%. However, if we use techniques to avoid entrainment of air into the pleural space while performing the block, it can reduce the incidence of pneumothorax.

2) Local anesthetic drug toxicity.

3) Injury to the phrenic nerve and upper thoracic sympathetic ganglia can lead to hemidiaphragm paralysis or Horner syndrome.

4) Bleeding or hemothorax

5) Local infection at site of injection

6) Migration or misplacement of catheter

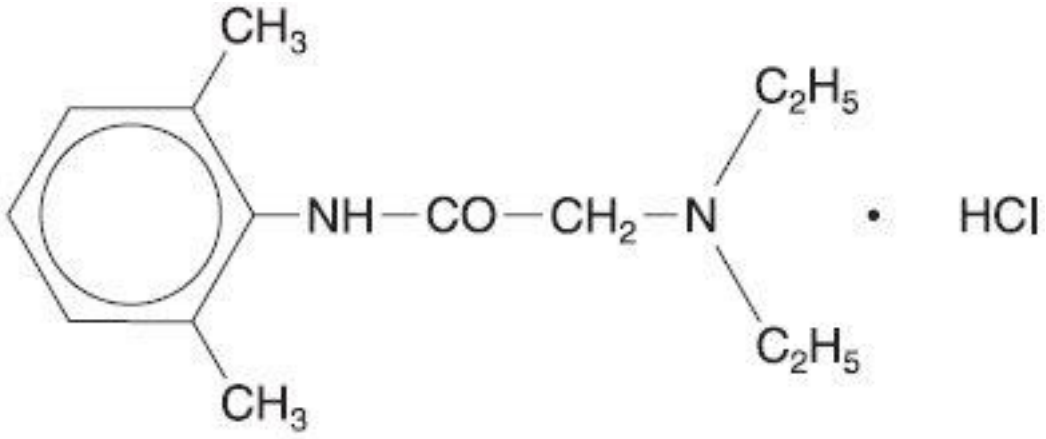
7) Pleural Effusion

8) Bronchopleural fistula

9) Failed block

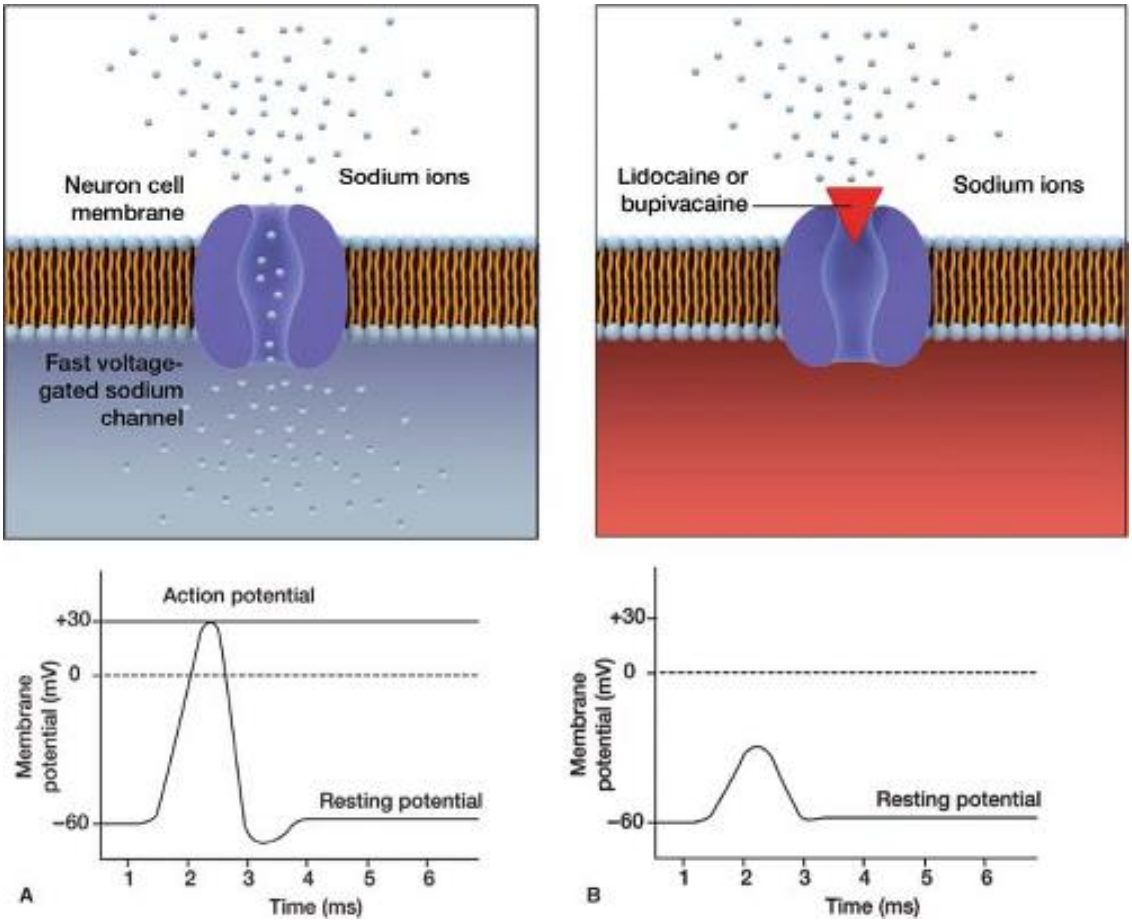
LIGNOCAINE

Chemical structure of Lignocaine



Mechanism of Action (12**)**

Local anesthetic drugs act by blocking the voltage gated sodium channels and preventing the sodium current. Due to this there is reduced excitability of the conducting tissues such as neuronal, cardiac or central nervous system tissue. Local anesthetic drugs prevent passing of the sodium ions through the sodium channels which is essential for depolarization and hence block the transmission of nerve impulses. The primary site of binding is on the sodium channel and they bind on it in the open state disrupting its function. This effect is done from the inside of the cell, hence the drug should cross the cell membrane to reach the inner surface of the sodium channel. As the sodium channel fails to open there is no permeability to sodium ions and this will prevent depolarization. The threshold potential is not reached and so an action potential is not generated and propagated.



Esters and amide group of local anaesthetics have different metabolic pathways. Lidocaine is metabolized hepatically by microsomal enzymes to form monoethylglycinexylidide which undergoes hydrolysis to form xylidide. Monoethylglycinexylidide has 80% of the anti arrhythmic activity of lidocaine and has a long elimination half-life. Hence there is prolonged anti arrhythmic action even after the infusion of lignocaine has stopped. Xylidide is then excreted by kidneys as 4-hydroxy-2,6-dimethylaniline in urine.

ANAESTHETIC POTENCY(13)

Local anesthetic drugs vary in their potency and a wide range of concentrations can be used ranging from 0.5 to 4%. The potency depends on lipid solubility of the drug. Each drug has a different amount of lipid solubility based on the aromatc ring structure. This is because the more lipid soluble drug penetrates the membrane more easily to exert its action. The more potent the drug, the smaller is the amount required to produce the given effect. Example, Bupivacaine is more lipid soluble when compared to lignocaine and articaine, hence it can be used in a 0.5% concentration than a 4% concentration. The duration of action also depends on the structure along with the amount of protein binding.

TIME FOR ONSET

If a drug has greater lipid solubility, it increases its potency and hence it can rapidly diffuse through the membrane to reach the inner surface of the ion channel. For local anesthetic drugs, this shortens the time for the onset of anesthesia in isolated nerve fibers but is also affected by other factors. Some drugs have vasodilating properties which increases systemic absorption. This reduces the amount of drug available to reach the nerve membrane. High lipid solubility also causes sequestration of the drug into the fatty tissues and myelin sheath and prevents it from dispersing through the tissue fluids. Increased systemic absorption and increased sequestration in tissues delays the onset of

action as fewer molecules reach the neuronal membrane. This effect can be overcome by using higher concentrations of drug to allow more number of molecules to reach the membrane and hence fasten the onset of action.

Inspite of the multiple number of factors which influence the quantity of drug reaching the site of action, the most important factor for faster onset of action is the amount of drug that exists in the lipid soluble form rather than a water soluble form. Local anaesthetic drugs are prepared as hydrochloride salts to give stability in solution. In this form, the drug is injected as a water soluble form and are not able to penetrate the neuronal membrane. Hence the time for onset of a drug is directly related to the number of molecules that convert to the lipid-soluble form when introduced to a physiologic pH of 7.4. This ratio depends on the ionization constant (pKa) for the particular anesthetic and is calculated using the Henderson-Hasselbalch equation.

If a local anaesthetic drug has a pH of 7.4 and is injected into a tissue having a pH of 7.4, then 50% of the molecules are in ionized form and 50% are in unionized form. The unionized form is capable of entering the cell membrane as it is lipid soluble. Acidic environment of tissues reduces the pH and favours more amount of drug to be in the ionized form. Hence there is difficulty when using these drugs at inflamed or infected tissues. Once the unionized form enters the cell membrane it is converted to the quarternary form to exert its effect of blocking the sodium channel.

Alkalinization of the drug increases the percentage of lipid soluble form and enhances the onset of action and the depth of block.

MINIMUM EFFECTIVE CONCENTRATION

The minimum amount of drug that is required to produce blockade of conduction is called Cm. It is similar to MAC used for inhalational anaesthetics. Cm is influenced by the diameter of the nerve fibers, tissue pH and the frequency of nerve stimulation. The Cm required to block motor nerves is twice than that required for sensory nerves. Hence motor block need not occur with sensory block.

DURATION OF ACTION

Local anesthetics have different amounts of protein binding and hence have a variable duration of action. Local anesthetics bind to plasma proteins in a reversible manner after being absorbed into the blood stream. The amount of drug bound to plasma proteins is expressed as percentage and correlates with the drug's affinity for protein within the sodium channels as well. The greater the tendency for protein binding, the longer will be the duration of blockade. The duration of action is prolonged when mixed with adrenaline(14) Addition of vasoconstrictors limits systemic absorption and maintains the concentration of drug at the site of action.

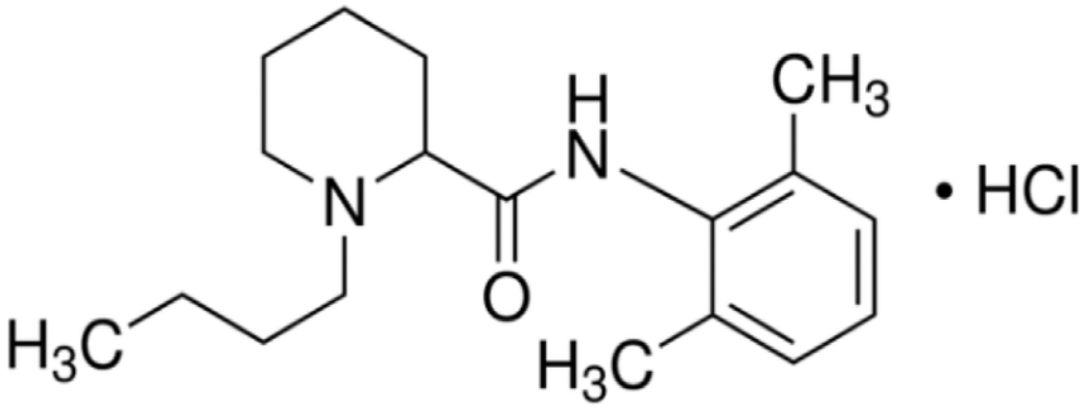
For example, bupivacaine has 95% protein binding when compared to 55% for mepivacaine, and this is the reason for the difference in their duration of action. Duration of anesthesia also depends on the time a drug remains in close proximity to the nerve fibers. For this reason, vasopressors are added to local anaesthetic formulations in order to delay systemic absorption and prolong duration of anesthesia. The addition of epinephrine depends on the drug chosen and the level of block required as lignocaine itself has vasodilating property. For example, when used alone, lidocaine dilates the vasculature and reduces its own duration of action, whereas mepivacaine and bupivacaine do not. Plain lidocaine can be used for short procedures following infiltration.

BUPIVACAINE

Bupivacaine is an amide type of local anaesthetic with a longer duration of action than lignocaine. The terminal amino portion has a piperidine ring. It is used in performing local infiltration, intraoperative regional anaesthesia, post operative analgesia and for treating chronic pain. Epidural anaesthesia with 0.5% bupivacaine provides good sensory anaesthesia for surgeries in the abdominal and thoracic regions. Intercostal blocks using bupivacaine can give effective anaesthesia for a duration of four to five hours. Bupivacaine is a racemic mixture with two enantiomers present in equal amounts unlike ropivacaine which is a pure S (-) enantiomer. Bupivacaine is cardiotoxic but ropivacaine was developed to reduce the toxic profile and to improve the block characteristics.

MECHANISM OF ACTION

The mechanism of action of bupivacaine is the same as that for the other local anaesthetics like lignocaine where the sodium channel is reversibly blocked and prevents conduction of impulses in the nerve fibres.



Bupivacaine hydrochloride

Bioavailability

The pharmacokinetic properties of bupivacaine and its plasma concentration is dependent on systemic absorption, distribution to tissues and elimination. Absorption and distribution depend on the vascularity of the site where the drug is injected and the degree of ionization of the drug. Increased levels will affect the other conduction systems like cardiac and nervous system. At a particular site of injection the amount of drug that is systemically absorbed depends on the dose of drug deposited at that site. More lipid soluble agents will have a slower rate of systemic absorption.

The local anaesthetic properties and toxic effects of each of the enantiomers of bupivacaine was described by Aberg and colleagues in 1972 who showed that the S(-) enantiomer was less toxic that the R (+) form(15). Hence levobupivacaine was found to be less toxic and better than bupivacaine for epidural anaesthesia(16).

METABOLISM

Similar to other amide local anesthetics bupivacaine is also mainly metabolized by the cytochrome enzymes in the liver by N-dealkylation and glucuronide conjugation and the products are eliminated by kidneys. Liver disease will reduce the clearance of drug and cause increased drug levels in the plasma. Renal disease does not significantly affect the pharmacokinetic properties of the drug. Only small amounts of drug is recovered unchanged in the urine.

Bupivacaine is highly protein bound in the plasma. Protein binding is more than lignocaine and equal to etidocaine. The increased protein binding causes a reduction in tissue to blood coefficient. The uptake of drug in the liver is low even though the drug reaches the hepatic circulation quickly. The drug is safe to use in obstetrics as there is decreased transfer to fetus via the placenta due to the increased protein binding. In one study which used bupivacaine with adrenaline, it was showed that adrenaline decreased fetal levels of bupivacaine. The fraction of bupivacaine that is protein bound is inactive and the unbound

fraction of drug is responsible for toxic reactions. The CVS to CNS toxicity ratio of bupivacaine is 2.0.

TOXICITY

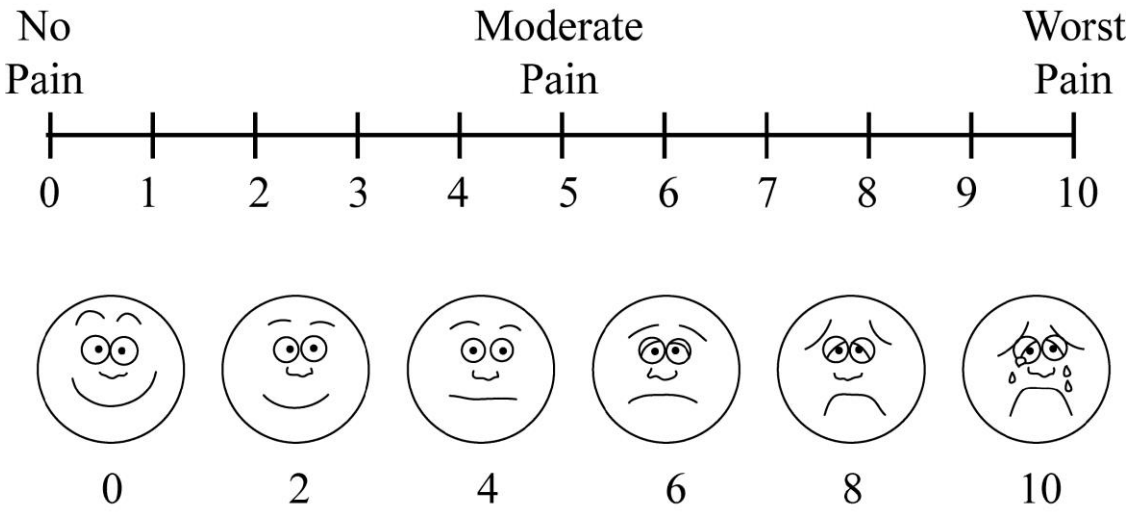
Local anaesthetic drugs cross the blood brain barrier readily after absorption into the systemic circulation. CNS features such as slurred speech, twitching, disorientation, circumoral numbness, light headedness, paresthesias, drowsiness, and seizures can occur. Characteristically the CNS effects occur before any issue arises in ventilation or circulation. Increased rate of infusion into the epidural space increases the amount of toxicity. Intermittent injection into the epidural space provides more effective anaesthesia and decreased toxicity when compared with continuous infusion of drug. The potential to cause toxicity of CNS is directly proportional to the potency of the drug. It also depends on other factors like protein binding, acidosis and co administration of depressant drugs.

PAIN ASSESSMENT

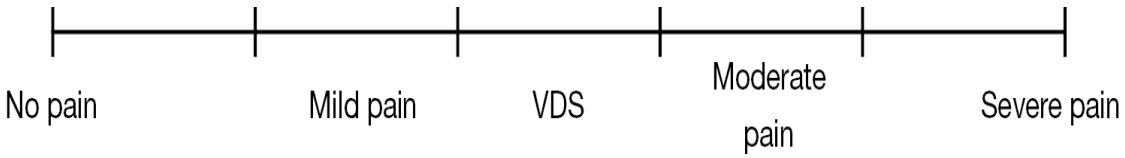
Visual Analogue Scale/Graphic Rating Scale(17)

The Visual Analogue Scale (VAS) is a continuous psychometric scale which is commonly used as a outcome measure of pain relief in epidemiology and research studies. It consists of a straight line with two endpoints that define extreme situations like “no pain” or “very severe pain”. (18). The patient is asked to choose a position on the line between the two end points depending on his/her pain level. The distance between ‘no pain’ and the mark chosen by the patient then defines the subject’s pain. It was first used by Freyd in 1923 in the field of psychology. Woodforde and Merskey first reported the use of the extreme descriptors such as “no pain at all” and “pain as bad as it could be”. In addition to the visual analogue scale, if descriptive terms or numerical values are added, it is called Graphic Rating Scale. The optimum length of the line seems to be 10 to 15 cm as it showed the smallest error when compared to too small or too large lines and is also convenient for the patients(19).

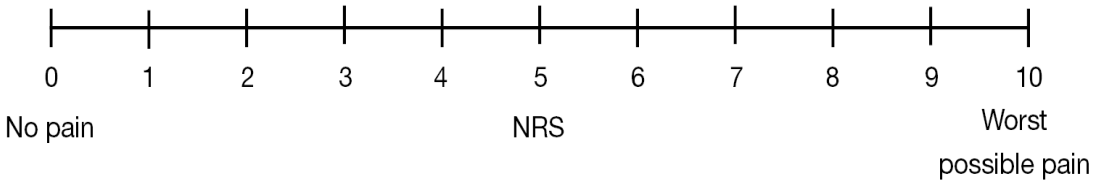
VISUAL ANALOGUE SCALE



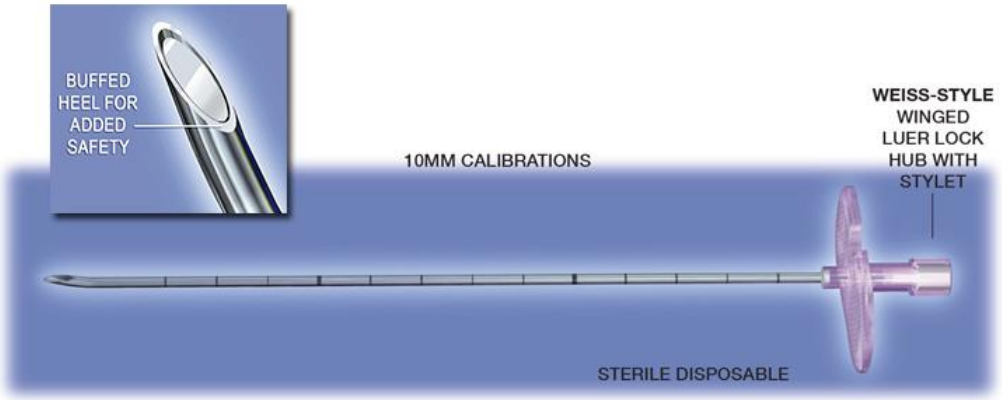
VERBAL DESCRIPTIVE SCALE



NUMERICAL RATING SCALE



EQUIPMENTS


BUFFED
HEEL FOR
ADDED
SAFETY
10MM CALIBRATIONS
WEISS-STYLE
WINGED
LUER LOCK
HUB WITH
STYLET
STERILE DISPOSABLE

EPIDURAL NEEDLES

History

The epidural space was first described in 1901 by James Leonard Corning, an American Neurologist. In 1921, Fidel Pages, a Spanish surgeon used epidural anaesthesia in human beings. An American anaesthesiologist, Edward Boyce Tuohy designed a curved bevel for the needle tip used in neuraxial anaesthesia, which enabled to insert catheters and place them in the epidural space in the cephalic or caudal direction according to the desired level of block. Tuohy epidural needle is used widely to perform epidural anaesthesia and to introduce epidural catheters. Curbelo from Cuba was the first to introduce a catheter in the epidural space. Philip Bromage introduced the continuous epidural technique.

Tuohy needle has:

- A hub which can be without wings or with wings for better control over the needle during insertion.
- A shaft with 1 cm markings to measure the depth of insertion into the epidural space.
- Tip with a blunt bevel having a curve at 15–30 degrees through which the epidural catheter passes at an angle. If it passes straight, it may hit and injure the dura or spinal canal.
- A plastic stylet.

TYPES OF EPIDURAL NEEDLES

- Tuohy needle is 10 cm in length, 3½ inch with 1 cm markings. 16 G and 18 G sizes are available. Tip is called Huber's tip. For use in pediatric population, 19 G, 5 cm in length with 0.5 cm markings is available. This allows the passage of a 21 G catheter into the epidural space.

- Modified Tuohy needle (Tuohy Hustead needle) is of shorter length, has a short rounded tip, and a bevel opening located 2.7 mm from the tip to avoid accidental dural puncture.

- Weiss epidural needle with fixed wings (17G, 18G)

- Portex needles: 16G (light blue), 18G (dark blue) sizes are available.

- Blunt tip epidural needle was introduced by Dr DK Baheti for interventional block. It is a 20G, 15 cm or 6 inches long needle made of stainless steel, which can be autoclaved.

Complication Due to Epidural Needles(20)

- Post Dural puncture headache due to accidental dural puncture causing CSF leak.
- Pneumothorax
- Renal injury
- Injury to veins
- Paraplegia
- Neuralgia

The probable cause for these iatrogenic complications can be sharp tip of the needle resulting in a puncture of internal organ like pleura, peritonium or vein.The blunt tip needle introduced by Dr Baheti may reduce the complications following such interventional procedures.

LOCAL ANESTHETIC SYSTEMIC TOXICITY

DEFINITION OF THE PROBLEM (21)

Local anaesthetic systemic toxicity which is due to an increased concentration of drug in the plasma, commonly occurs due to an accidental intravascular injection of an appropriate dose of local anaesthetic drug injected at a particular site for nerve blockade. It can also occur due to absorption of the drug after it is injected in peripheral tissues. The central nervous system and cardiovascular system are the most important sites of toxicity of local anaesthetic drugs. The drugs differ in regard to the ratio of CNS and CVS toxicity where CNS features commonly occur before the CVS features. A lot of factors influence the severity of LAST like patient risk factors, medications, site of block, the type and dose of drug used, early detection of toxicity and adequacy of treatment.

CNS toxicity occurs in two stages. Initially there is an excitation phase as the inhibitory pathways from brain are depressed. Later it progresses to a depressant phase as there is more global depression of CNS. CVS toxicity has direct and indirect components. When CNS excitation occurs, sympathetic nervous system is activated and causes tachycardia and hypertension. As the concentration of the drug in blood increases, direct myocardial depression and arrhythmias can occur. Safe plasma concentration of lignocaine is less than 5

micrograms per ml. at high concentrations the local anaesthetics also block the cardiac sodium channels.

When bupivacaine is accidentally injected intravenously, it can cause severe hypotension, arrhythmias and heart blocks. As the protein binding sites are saturated with the drug, the fraction of unbound drug increases and diffuses into the heart. For bupivacaine, the cardiotoxic concentration is 8-10 micrograms per ml. Bupivacaine has more profound depressant effect on the myocardium compared to lignocaine as it binds to the sodium channel during systole and during diastole, it takes a longer time to dissociate off the channel compared to lignocaine. The most common arrhythmias are premature ventricular contractions and ventricular tachycardia.

Treatment of Local Anesthetic Systemic Toxicity

Prevention is more important in local anaesthetic toxicity. If it occurs, treatment should begin at the earliest suspicion. Immediate management includes general safety, supplemental oxygen and resuscitation measures, the initial priority is to promptly manage the airway, provide circulatory support and methods to reduce the local anaesthetic from the receptor sites(22). Management of seizures involves maintenance of ventilation to the patient’s lungs with oxygen as hypoxia and metabolic acidosis occurs. Benzodiazepine drugs like midazolam and diazepam can be used intravenously to suppress the seizures. If

the seizures do not respond to initial treatment, muscle relaxants can be used to prevent acidosis and hypoxia caused by the seizures.

Many studies have shown the successful use of intralipid for resuscitation. The American society of regional anaesthesia has given a checklist for the management of LAST(23). Intralipid can be started immediately after airway management. It is given as an initial bolus of 1.5 ml/kg followed by 0.25 ml/kg/min infusion. The mechanism of action is not clear but the most accepted theory is the lipid sink phenomenon(24). Calcium channel blockers and beta blockers are to be avoided during resuscitation. Adrenaline can be used at a lower dose of 10 to 100 micrograms and vasopressin is avoided. If the patient does not respond to treatment, cardiopulmonary bypass should be instituted if available.

REVIEW OF LITERATURE

1) Kundra et al compared the post operative pain relief between thoracic paravertebral block and interpleural block in 120 patients undergoing modified radical mastectomy. They concluded that interpleural block is as effective as paravertebral block in providing post operative pain relief but paravertebral block provides a more complete block. Further, lung functions are better preserved in both the blocks.

2) Col R N Verma et al performed interpleural block in 28 patients who were treated with ICD and concluded that it was effective in relieving the pleural irritation and pain associated with ICD and hence helping in the faster recovery of the patients.

3) Kolli S Chalam allotted 100 pediatric patients undergoing thoracotomy and compared the effect of ropivacaine and bupivacaine in ultrasound guided paravertebral block and concluded that paravertebral block is safe and effective in pediatric patients. They used 0.25% bupivacaine, 0.4 ml/kg in pediatric patients and showed that it provided effective analgesia in children undergoing PDA ligation surgery.

4) Khaled Elbahrawy et al compared interpleural and paravertebral levobupivacaine analgesia in patients undergoing thoracoscopic sympathectomy for patients suffering from palmar hyperhidrosis and concluded that both interpleural and paravertebral block provided

comparable pain relief but paravertebral block provided longer and effective analgesia.

5) A Schnabel et al studied the efficacy and safety of paravertebral blocks in breast surgeries through meta analysis of 15 RCTs including 877 patients and concluded that paravertebral block either performed alone or along with GA provides better pain relief with little adverse effects compared with other analgesic strategies.

6) R M Dravid et al concluded that Interpleural block is effective in treating unilateral surgical and non-surgical pain from the chest and upper abdomen in both the acute and chronic settings. It has been shown to provide safe, high quality analgesia after cholecystectomy, thoracotomy, renal and breast surgery, and for certain invasive radiological procedures of the renal and hepatobiliary systems. It has also been used successfully in the treatment of pain from multiple rib fractures, herpes zoster, complex regional pain syndromes, thoracic and abdominal cancer, and pancreatitis.

7) Lynnette J. Mann et al Thoracic and abdominal surgical procedures substantially decrease tidal volume, FVC, and FEV, during the early postoperative period. This decrease can be minimized by reducing postoperative pain, thus improving the patient's ability to cough and clear secretions, maintain adequate ventilation, and cooperate with physical

therapy. This in turn helps prevent atelectasis, collapse, and consolidation. The use of intrapleural bupivacaine in this study was associated with lower pain scores at all times as assessed by linear analog scale and rank pain score.

8) Pankaj Kundra and Karuppiah Ajeetha compared two techniques to identify the interpleural space namely loss of resistance technique and negative pressure technique and concluded that although both techniques are safe and effective, the loss of resistance technique had higher first attempt success rate.

9) The article on pain assessment by M Hafaeli explained about several aspects of pain and its assessment. The various tools for pain assessment were explained and reviewed.

10) Gacio et al performed paravertebral block to relieve acute post operative pain and intercostobrachial neuralgia after major breast surgeries and showed that single injection paravertebral block reduced the consumption of opioids for pain relief.

11) Hetta et al performed pectoralis serratus interfascial plane block and compared it with paravertebral block in radical mastectomy cases, it was concluded that although pectoralis serratus interfascial pain block was easy to perform and reduced post operative pain but still it was inferior to paravertebral block.

12) Bartakke and Varma et al published a review on analgesia for breast surgery. They described interpleural blocks which are more commonly performed as single-shot blocks, or a catheter can be inserted for providing continuous analgesia. The single shot block provides analgesia for 6 to 10 hours. There is chance of block failure and incidence of pneumothorax is 2%. Damage to the underlying lung, infection, and bleeding may occur and makes this block less utilized in present day.

13) The American Society of regional anaesthesia and pain management has provided a checklist for local anaesthesia systemic toxicity if it were to occur while performing blocks due to intravascular absorption of the drug.

14) Weltz et al conducted a review of the hospital records of patients who underwent mastectomy surgeries. They had performed blocks at multiple levels using 4 ml of 0.5% bupivacaine with epinephrine starting from the C7 space to T7 space. The analgesia in these patients lasted for upto 23 hours and they concluded that paravertebral block is effective for pain relief in these patients and has good patient patient comfort and satisfaction.

15) Mohta et al used Dexmedetomedine as an adjuvant to bupivacaine and performed paravertebral block in patients undergoing breast surgeries. The duration of analgesia lasted longer, there was reduced opioid

requirement and nausea in the post operative period, when compared to bupivacaine used alone.

16) Marco Scarci et al performed a meta analysis and reviewed more than 184 papers to check whether paravertebral block is as effective as epidural analgesia in breast surgeries. They found that paravertebral block was equally efficacious to epidural analgesia but with lesser side effects and lower risk of complications. There was a marked reduction in the risk of pulmonary complications and there was a quick return of pulmonary function to normal.

17) P.C.Higgins et al sed interpleural analgesia as the sole anaesthetic for an 83 year old female patient who had severe obstructive pulmonary disease, coronary artery disease, atrial fibrillation with dyspnea on minimal exertion. The patient underwent mastectomy surgery for an invasive carcinoma at the level of 7^{th} intercostal space using 20 ml of 0.5% bupivacaine. This is one of the very few case reports where interpleural analgesia was used as the sole technique for mastectomy.

18) Reiestad and Stomskag performed interpleural block with 20 ml of 0.5% bupivacaine in 81 patients and reported that only 3 of them needed additional analgesia and that the initial dose was effective and provided pain relief for an average of ten hours. Brismar et al. found that he same dose of 0.5% bupivacaine was effective in eight out of nine patients

included in their study, but the duration was less than six hours in many patients.

19) D.W.Blake et al compared intercostal blocks and interpleural blocks in cholecystectomy patients. Intercostal blocks are effective but require multiple injections. Interpleural catheter can be inserted and it can be used to provide additional drug or continuous infusion of local anaesthetic. Interpleural block is effective for upper abdominal surgeries like cholecystectomy. It is technically easier to perform and there are only minor changes in blood pressure.

20) Hiroki Shimizu et al conducted a retrospective analysis in 51 patients who underwent breast surgeries. They concluded that thoracic paravertebral block was effective in reducing chronic pain in these patients for more than one year.

21) Richardson et all explained the mechanism of action of local anaesthetic drug injected into the paravertebral space. The spinal nerve roots are covered only by a thin membranous nerve sheath and hence are more effectively blocked.

MATERIALS AND METHODS

This is a prospective, randomized, comparative study planned to compare thoracic paravertebral block and interpleural block in patients undergoing modified radical mastectomy surgeries and cholecystectomy surgeries on various parameters, to identify the effectiveness of their use with respect to clinical practice with regard to better patient satisfaction and comfort The ethical committee approval was obtained for the study.

STUDY DESIGN

Randomised Prospective Comparative Interventional study.

SAMPLE SIZE:

The sample size was calculated to be 120 based on the pilot study. They were randomly allocated to 60 in each group and named as Group PVB (paravertebral block) and Group IPB (interpleural block)

RANDOMISATION:

Randomisation done by sealed envelope technique.

POPULATION TO BE STUDIED:

Adult patients posted for elective modified radical mastectomy, cholecystectomy and nephrectomy under general anaesthesia.

STUDY GROUP:

ASA I and II patients > 18 yrs of age with breast malignancy scheduled to undergo elective modified radical mastectomy, cholecystectomy and nephrectomy surgeries.

STUDY SETTING:

Dept of Anaesthesiology, Chengalpattu Medical College and Hospital, Chengalpattu. Dept of General Surgery, Chengalpattu Medical college and Hospital, Chengalpattu. Dept of Urology, Chengalpattu Medical College and Hospital, Chengalpattu.

DURATION OF STUDY:

June 2018 – August 2019

INCLUSION CRITERIA

ASA I and II patients > 18 yrs of age, posted for elective modified radical mastectomy, cholecystectomy and nephrectomy surgeries.

EXCLUSION CRITERIA:

Patients with pre-existing respiratory diseases (tuberculosis, obstructive pulmonary disease, asthma, lung, and pleural infections), previous lung surgeries, co-existing cardiovascular diseases.

Patients with history of allergy to LAs and bleeding diathesis.

PREOPERATIVE EVALUATION

Informed consent

Detailed history including

- Hours of fasting
- Habits
- Medical problems and surgical procedures

Routine clinical examination including

- Airway assessment (Modified Mallampatti classification)
- Spine
- Vitals
- CVS, RS, etc.

Investigations such as

- Hb, Blood urea, Creatinine, Random Blood sugar, ECG.

Chest X ray

Lignocaine test dose

Random assignment to the lateral or posterior popliteal block was done before surgery.

PROCEDURE

After obtaining informed consent and performing thorough preoperative assessment, patient was shifted to the operation theatre. A good intravenous line was secured using an 18 G venflon and iv fluids were started. The pulse oximeter probe, ECG leads and NIBP cuff was connected to the patient for monitoring. Difficult airway cart, emergency drugs, appropriate sized ET tubes, laryngoscope blade according to the patient were kept ready. The oxygen source and suction apparatus were checked. The patient was explained about the procedure and positioned according to the block. The skin was cleansed with betadine solution and draping was done with sterile linen.

The patients planned for interpleural block were placed in lateral position with the site of surgery facing up. Local infiltration was given with 2ml of 2% lignocaine under aseptic precautions. An 18 gauge epidural Tuohy needle was inserted in the 7^{th} intercostal space, 10 cm lateral to the midline posteriorly. The needle is directed along the superior border of the rib. The interpleural space was identified by loss of resistance technique and after negative aspiration, 20 ml of 0.5% bupivacaine was injected. Patients were immediately turned supine and the block was assessed at 5 mins interval till 20 mins to check the number of dermatomes blocked.

In patients posted for paravertebral block, patient was placed in sitting position, the third thoracic spine was identified. Under aseptic precautions, after local skin infiltration, 18 gauge Tuohy epidural needle was inserted 2.5 cm lateral to the spinous process and advanced till the transverse process of the lower vertebra is located. The needle was walked off and advanced till a loss of resistance was felt as the needle crossed the superior costo-transverse ligament and enters the paravertebral space. 20 ml of 0.5% bupivacaine was slowly injected after negative aspiration. The patient was immediately turned to supine position and level of block was assessed by pin prick method. A sham puncture was produced at the site of injection.

Anesthesia was induced with 2.5% thiopentone in a dose which was sufficient to abolish eyelash reflex. Patient was intubated after administering atracurium 0.5mg/kg. Anesthesia was maintained using 1 minimum alveolar concentration (MAC) of sevoflurane and 66% of nitrous oxide in oxygen.patient was ventilated using a circle system. Analgesia was provided with intravenous fentanyl (1µg/kg) if there was any change in hemodynamic response (more than 20% increase in pulse rate and blood pressure (BP) from the baseline) to surgical incision after completion of the procedure, residual neuromuscular blockade was antagonized with a mixture of neostigmine and glycopyrrolate.The patient was transferred to recovery room for observation after recording BP, HR, and SpO2.

VAS score was noted at 0.5, 2, 4, 8, 12, and 24h post-operatively and then every day till patient was discharged. The quality of the block was assessed by intraoperative fentanyl and post operative tramadol and diclofenac requirement. Patients in whom intraoperative fentanyl was required, tramadol during first 4 hrs post operatively were considered as failed block.

OBSERVATION AND RESULTS

This study was conducted in Chengalpattu Government medical college and hospital.

TYPES OF SURGERIES

SURGERY	GROUP PVB	GROUP IPB	TOTAL
Modified radical mastectomy	40	40	80
Open cholecystectomy	18	18	36
Open nephrectomy	2	2	4

STATISTICAL ANALYSIS

A sample of 120 patients divided into 2 groups of 60 each. Data was expressed as mean, SD or absolute values. The data collected were analyzed using the Statistical Package for the Social Sciences, version 16. Parametric and non-parametric data of the two groups were compared and analyzed using the unpaired student's t-test and Mann Whitney U-test respectively. Qualitative analysis was compared with Chi square test. The results were considered to be significant when $p<0.05$. The patients in both the groups were statistically comparable in distribution of age, weight ,height and sex distribution.

TABLE 1: AGE DISTRIBUTION

Age	Group				Chi square test
	Paravertebral group		Interpleural group		
	n	%	n	%	
31 -40 years	14	23.33%	9	15.00%	$\chi 2$=1.93 P=0.58(NS)
41 -50 years	18	30.00%	17	28.33%	
51 -60 years	19	31.67%	25	41.67%	
>60 years	9	15.00%	9	15.00%	
Total	60	100.00%	60	100.00%	

P> 0.05 not significant NS= not significant

TABLE 2: MEAN AGE DISTRIBUTION

Group	N	Mean	Std. Deviation	Student independent t-test
Paravertebral group	60	50.22	10.04	t=1.01 P=0.31(NS)
Interpleural group	60	45.37	8.95	

Table 1 and 2 compares the Age (yrs) distribution among the patients considered for the study in Group IPB and Group PVB , each group comprising of 60 members . On calculating the Mean and Standard Deviation in both the groups, it was found that the patients were statistically comparable in both groups with respect to age having a Mean value of 50.22 for Group PVB and 45.37 in Group IPB .The Mean values of both the groups were plotted as bar diagram and P value was calculated by Student t test , p =0.31. As the value is >0.05 it was INSIGNIFICANT.

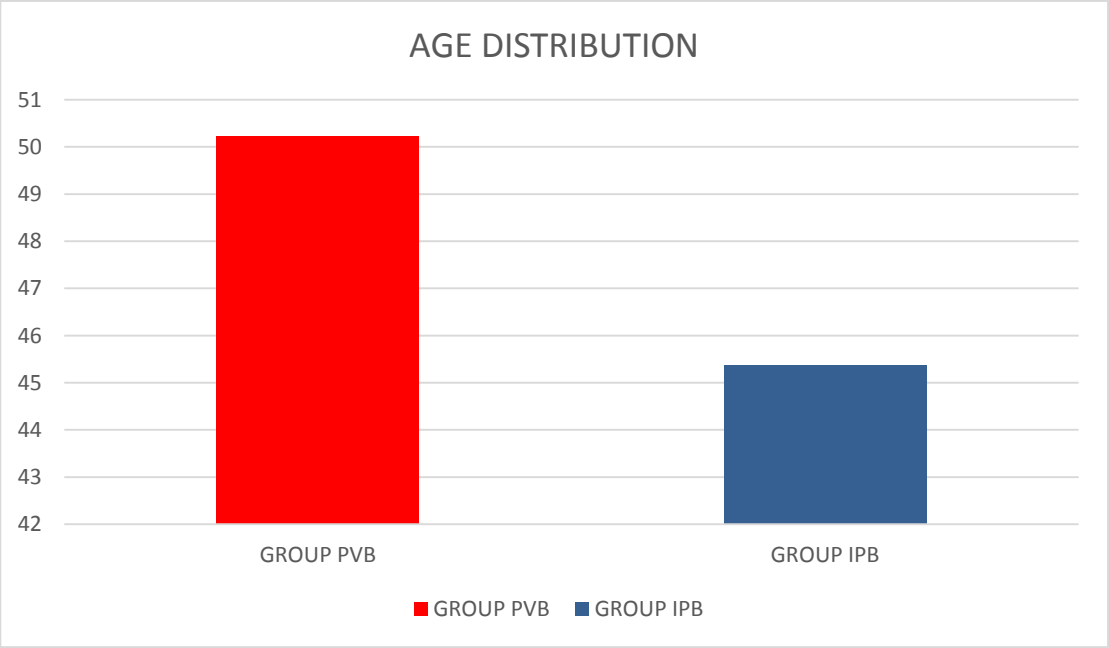


Figure 1 : Bar diagram showing age distribution between the two groups, group PVB and group IPB.

TABLE 3 : SEX DISTRIBUTION

Gender	Group				Chi square test
	Paravertebral group		Interpleural group		
	n	%	n	%	
Male	10	16.67%	8	13.33%	$\chi 2$=0.26 P=0.61(NS)
Female	50	83.33%	52	86.67%	
Total	30	100.00%	30	100.00%	

TABLE 4 :SEX WISE MEAN AGE

		Group				Student independent t-test
		Paravertebral group		Interpleural group		
		Mean	SD	Mean	SD	
Sex	Male	53.50	10.32	56.13	6.15	t=0.63 P=0.53(NS)
	Female	49.56	9.97	51.35	9.19	t=0.94 P=0.34(NS)

Table 4 compares the sex (M&F) distribution among the patients considered for the study in Group PVB and Group IPB, each group comprising of 60 members(M+F) . On calculating the Mean and Standard Deviation in both the groups, it was found that the patients were statistically comparable in both groups with respect to sex comprising of 53.5% of Male and 49.56% of Female in Group PVB and 56.13% of Male and 51.35% of Female in Group L .The values of both the groups were plotted as Pie chart and P value was calculated by chi square test. As the value is >0.05 it was INSIGNIFICANT.

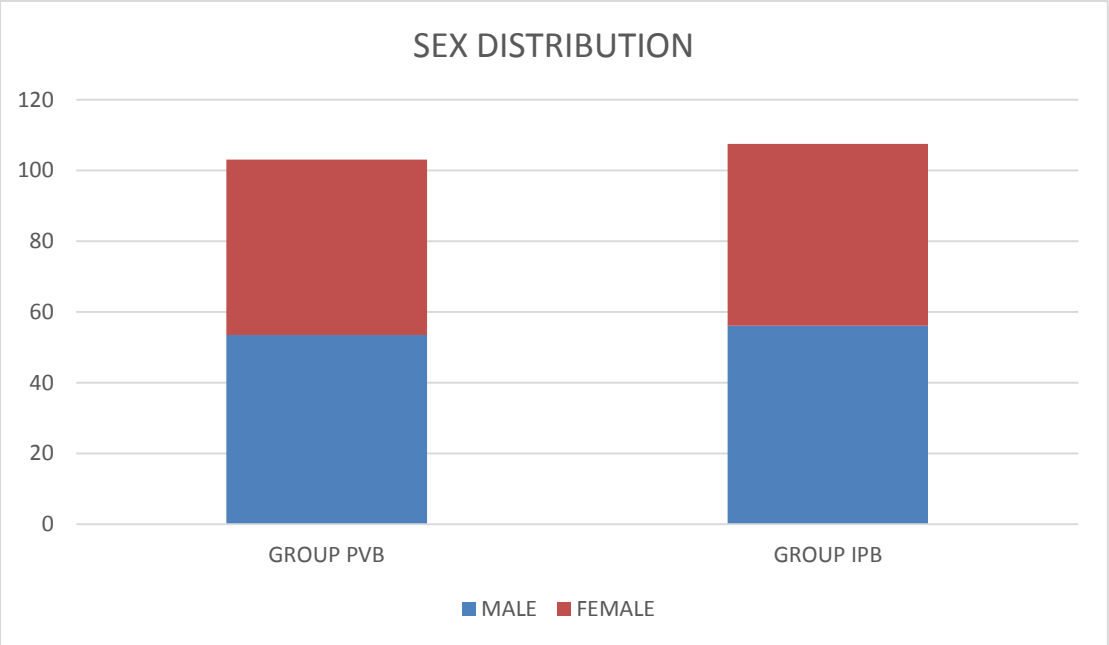


Figure 2: Bar diagram showing sex distribution among group IPB and PVB.

TABLE 5: MEAN WEIGHT

Group	N	Mean	Std. Deviation	Student independent t-test
Paravertebral group	30	56.72	7.47	t=0.49 P=0.61(NS)
Interpleural group	30	57.40	7.55	

Table 5 compares the Weight (kg) distribution among the patients considered for the study in Group PVB and Group IPB, each group comprising of 60 members . On calculating the Mean and Standard Deviation in both the groups, it was found that the patients were statistically comparable in both groups with respect to weight having a Mean value of 56.72 for Group PVB and 57.40 in Group IPB .The Mean values of both the groups were plotted as bar diagram and P value was calculated by Student t test, p = 0.61. As the value is >0.05 it was INSIGNIFICANT.

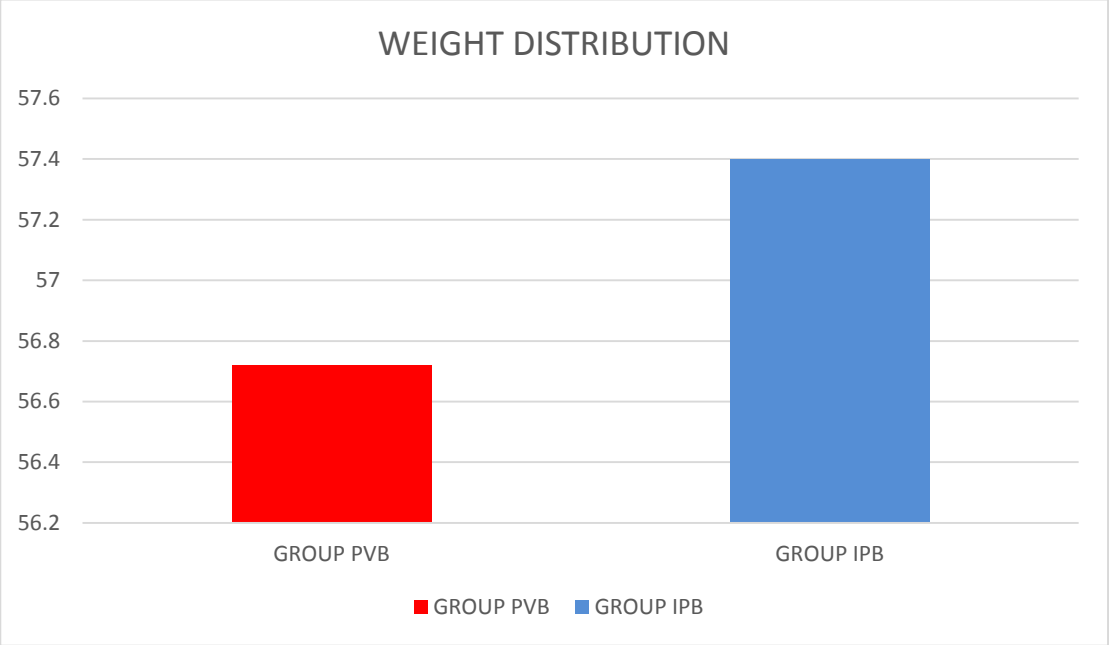


Figure 3 : Bar diagram showing weight distribution among Group PVB and Group IPB.

TABLE 6: WEIGHT

weight	Group				Chi square test
	Paravertebral group		Interpleural group		
	n	%	n	%	
41 -50 years	10	16.67%	12	20.00%	$\chi 2$=0.84 P=0.66(NS)
51 -60 years	31	51.67%	26	43.33%	
61 -70 years	19	31.67%	22	36.67%	
Total	60	100.00%	60	100.00%	

Table 6 shows weight distribution between the two groups.

TABLE 7: ASA Physical Status

ASA	Group				Chi square test
	Paravertebral group		Interpleural group		
	n	%	n	%	
I	32	53.33%	24	40.00%	$\chi 2=2.14$ P=0.14(NS)
II	28	46.67%	36	60.00%	
III	0	0.00%	0	0.00%	
Total	60	100.00%	60	100.00%	

Table 7 shows the ASA physical status distribution among the two groups and analysis was done with Chi square test and P value was calculated as p=0.14. As p >0.05, it was STATISTICALLY INSIGNIFICANT.

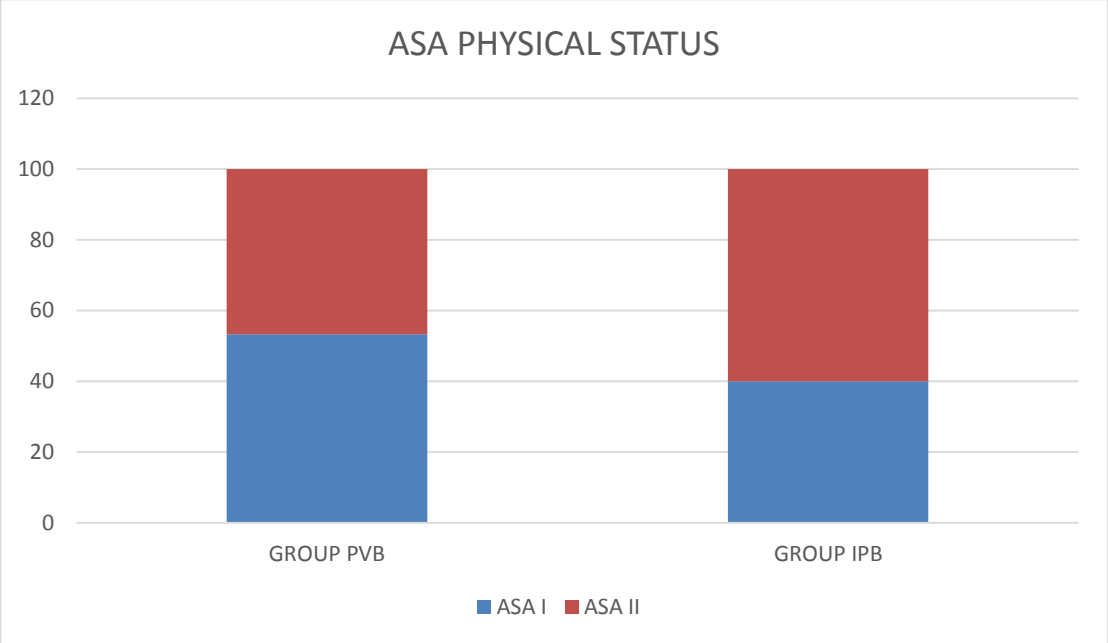


Figure 4: Bar diagram showing ASA physical status distribution among Group PVB and Group IPB.

TABLE 8: MEAN HEIGHT

Group	N	Mean	Std. Deviation	Student independent t-test
Paravertebral group	60	153.47	7.86	t=1.00 P=0.32(NS)
Interpleural group	60	154.86	7.45	

Table 8 compares the Height (cm) distribution among the patients considered for the study in Group PVB and Group IPB, each group comprising of 60 members. On calculating the Mean and Standard Deviation in both the groups, it was found that the patients were statistically comparable in both groups with respect to height having a Mean value of 153.47 in Group PVB and 154.86 in Group IPB. The Mean values of both the groups were plotted as bar diagram and P value was calculated by Student t test p = 0.32. As the value is >0.05 it was INSIGNIFICANT.

TABLE 9: HEIGHT

Height	Group				Chi square test
	Paravertebral group		Interpleural group		
	n	%	n	%	
< 150 cm	24	40.00%	18	30.00%	$\chi 2=1.80$ P=0.41(NS)
151-160 cm	25	41.67%	26	43.33%	
>161 cm	11	18.33%	16	26.67%	
Total	60	100.00%	60	100.00%	

P> 0.05 not significant NS= not significant

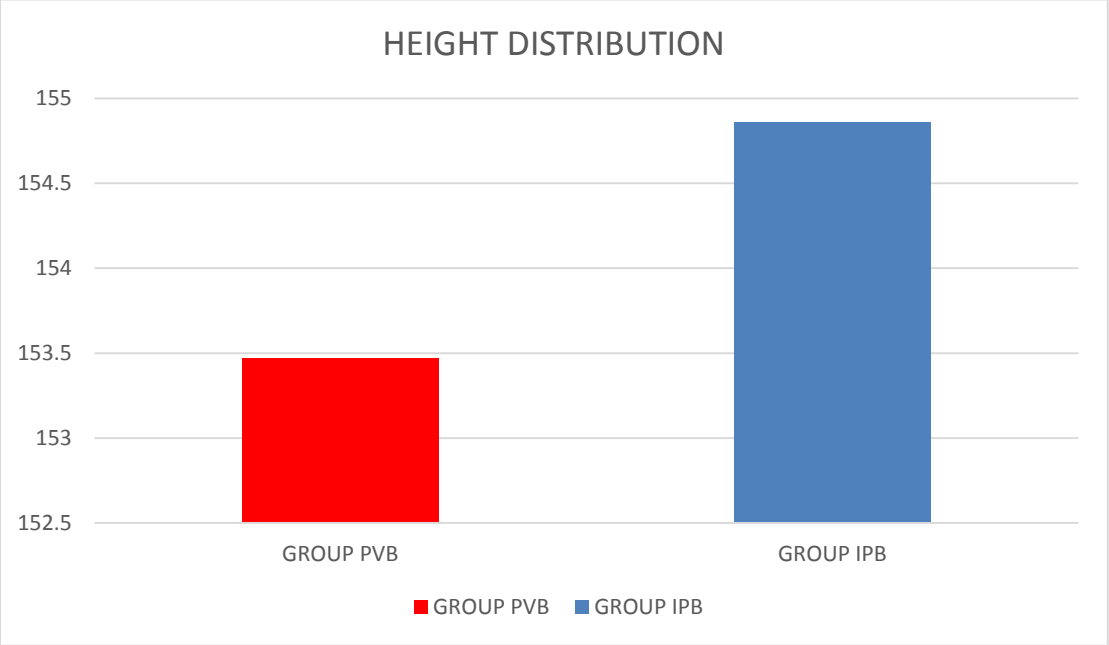


Figure 5: Bar diagram showing height distribution between Group PVB and Group IPB

TABLE 10: MEAN HEART RATE

Group	N	Mean	Std. Deviation	Student independent t-test
Paravertebral group	60	83.88	9.00	t=0.19 P=0.84(NS)
Interpleural group	60	84.23	10.23	

Table10 compares the mean heart rate among the patients considered for the study in Group PVB and Group IPB , each group comprising of 60 members . On calculating the Mean and Standard Deviation in both the groups, it was found that the patients were statistically comparable in both groups with respect to heart rate having a Mean value of 83.88 in Group PVB and 84.23 in Group IPB. The Mean values of both the groups were plotted as bar diagram and P value was calculated by Student t test p = 0.84. As the value is >0.05 it was INSIGNIFICANT.

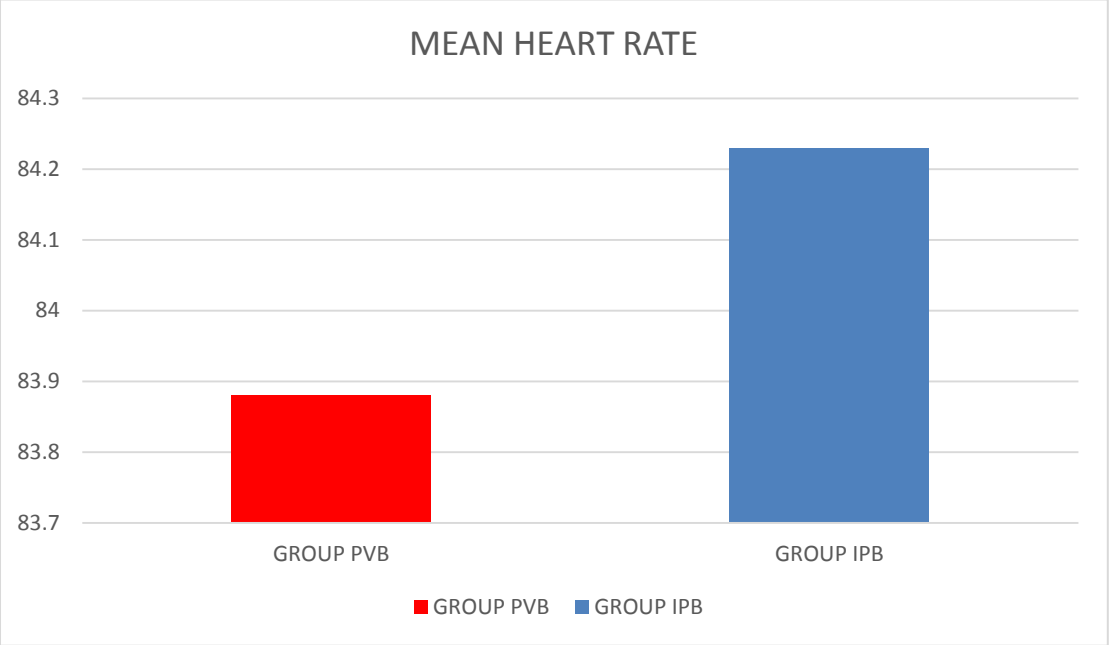


Figure 6: Bar diagram showing Mean Heart Rate distribution between Group PVB and Group IPB.

TABLE 11: MEAN MAP

Group	N	Mean	Std. Deviation	Student independent t-test
Paravertebral group	60	87.917	7.7532	t=1.40 P=0.16(NS)
Interpleural group	60	85.267	12.3739	

Table11 compares the mean arterial pressure among the patients considered for the study in Group PVB and Group IPB , each group comprising of 60 members . On calculating the Mean and Standard Deviation in both the groups, it was found that the patients were statistically comparable in both groups with respect to mean arterial pressure having a Mean value of 83.88 in Group PVB and 84.23 in Group IPB. The Mean values of both the groups were plotted as bar diagram and P value was calculated by Student t test p = 0.16. As the value is >0.05 it was INSIGNIFICANT.

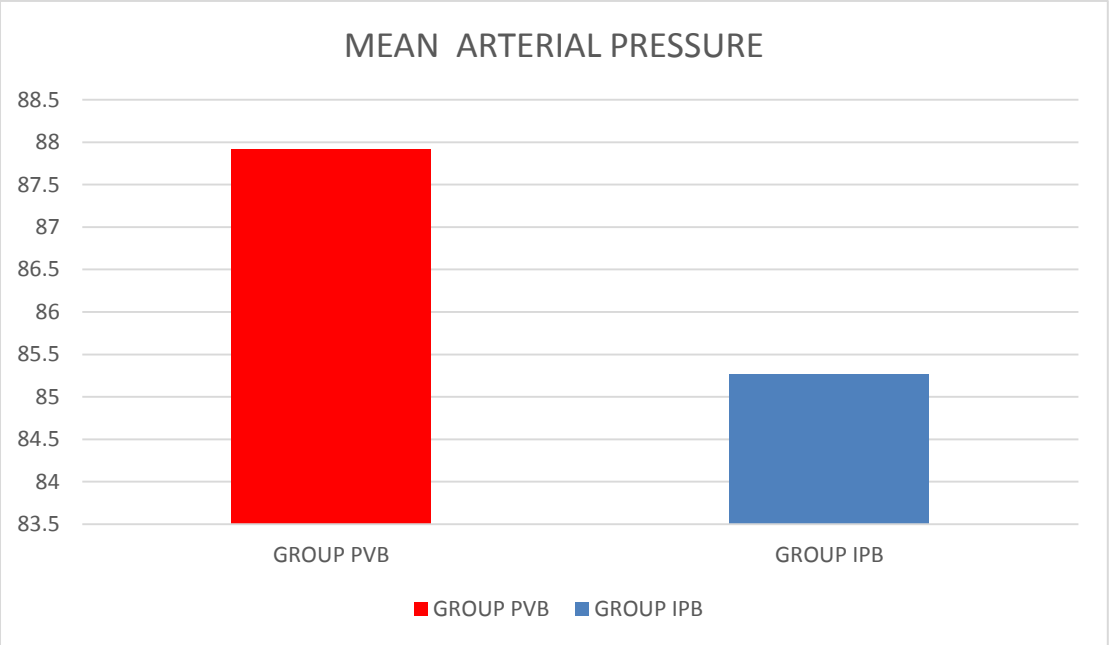


Figure 7: Bar diagram showing distribution of Mean Arterial Pressure between Group PVB and Group IPB.

TABLE 12: MEAN DURATION OF SURGERY(in minutes)

Group	N	Mean	Std. Deviation	Student independent t-test
Paravertebral group	60	122.30	20.04	t=0.75 P=0.44(NS)
Interpleural group	60	119.08	25.99	

Table12 compares the mean duration of surgery among the patients considered for the study in Group PVB and Group IPB , each group comprising of 60 members . On calculating the Mean and Standard Deviation in both the groups, it was found that the patients were statistically comparable in both groups with respect to duration of surgery having a Mean value of 122.30 in Group PVB and 119.08 in Group IPB. The Mean values of both the groups were plotted as bar diagram and P value was calculated by Student t test p = 0.84. As the value is >0.05 it was INSIGNIFICANT.

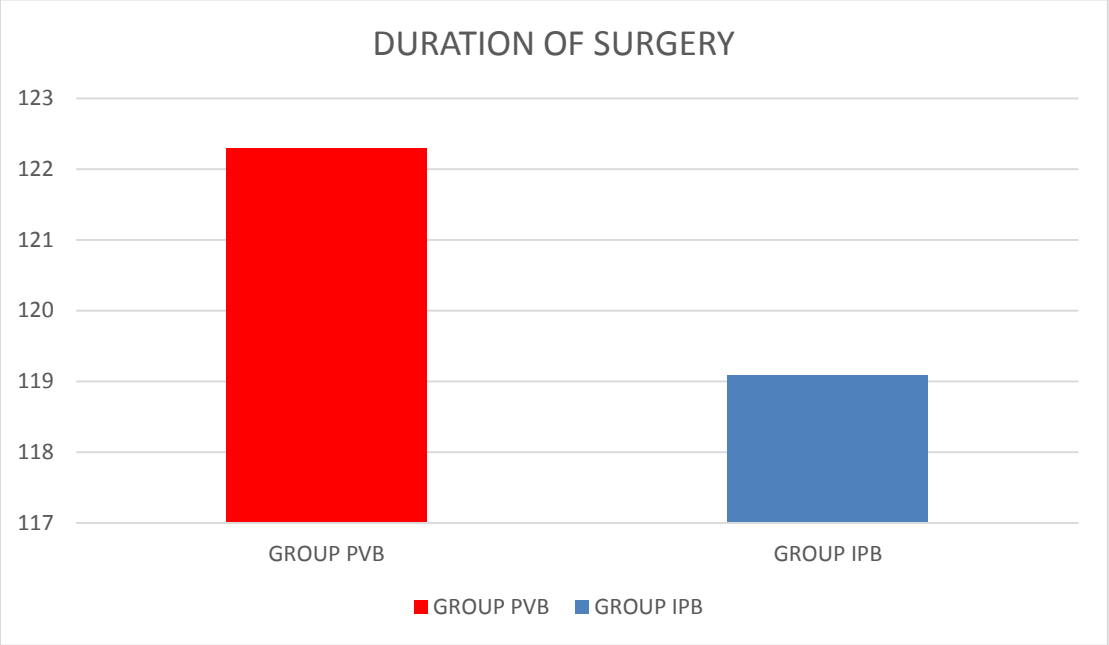


Figure 8 : Bar diagram showing the duration of surgery among Group PVB and Group IPB.

TABLE 13: NUMBER OF ATTEMPTS

	Group				Chi square test
	Paravertebral group		Interpleural group		
	n	%	n	%	
One	52	86.67%	51	85.00%	$\chi 2=1.26$ P=0.53(NS)
Two	7	11.67%	9	15.00%	
Three	1	1.66%	0	0.00%	
Total	60	100.00%	60	100.00%	

Table 13 compares the number of attempts required for successful block in Group PVB and Group IPB, each group comprising of 60 members each. During the study it was found that in Group PVB the block was successfully stimulated in first attempt in 52 patients (86.67%), in second attempt in 7 patients (11.67) and 1 (1.66%) patients required 3 attempts for successful block. In Group IPB, 51 patients (85%) were successfully stimulated in first attempt, 9 patients(15%) were stimulated in second attempt whereas none of them required third attempt for successful block. The values were plotted as bar diagram and Chi square test was calculated and value was found to be statistically INSIGNIFICANT. It concludes that both Paravertebral block and Interpleural block are technically similar in ease of performing the block.

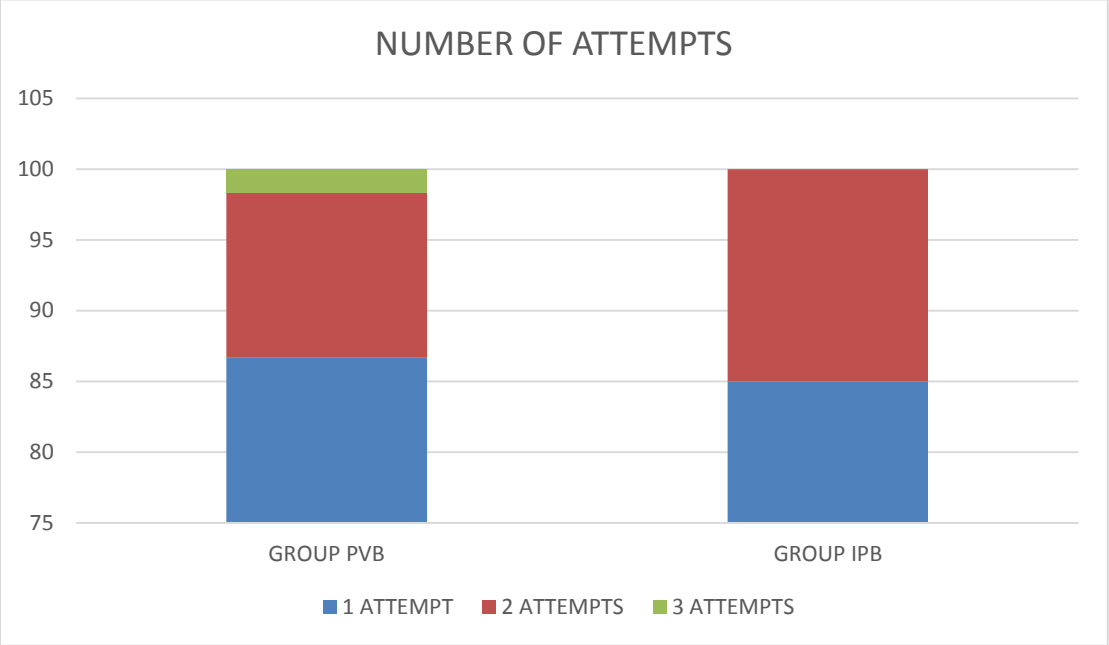


Figure 9 : Bar diagram showing the number of attempts for performing successful block in Group PVB and Group IPB.

TABLE 15: MEAN DURATION OF ANALGESIA (in minutes)

Group	N	Mean	SD	Student independent t-test
Paravertebral group	60	361.83	77.39	**t=2.37 P=0.02*(S)**
Interpleural group	60	331.33	62.48	

S=significant * P<0.05 significant

Table 14 compares the Duration of anaesthesia (min) in Group PVB and Group IPB , each group comprising of 60 members . On calculating the Mean and Standard Deviation in both the groups, it was found that the Mean value in Group PVB was 361.83 and 331.33 in Group IPB .The Mean values of both the groups were plotted as bar diagram and P value was calculated by Student t test , p = 0.02. As the value is <0.05 it was SIGNIFICANT.

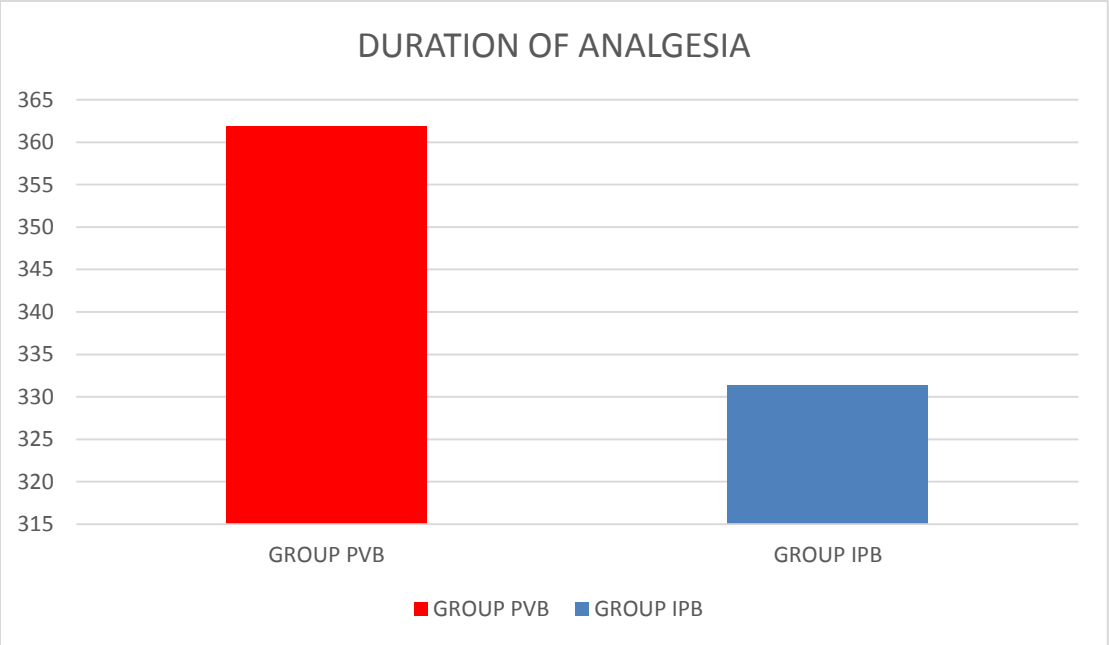


Figure 10: Bar diagram showing duration of analgesia between Group PVB and Group IPB.

RESULTS

We included 120 patients, American society of Anaesthesiologists ASA physical status I and II, posted for elective modified radical mastectomy, cholecystectomy and nephrectomy surgeries between June 2018 and August 2019 after getting approval from the Institutional Ethical Committee. The patients were divided into two groups of 60 each and they underwent the intervention according to their allocation. The physical characteristics of the patient, age, sex, baseline parameters and duration of surgery were comparable in both the groups. There was no significant difference in the block characteristics between the two groups. First attempt success rate was slightly higher in the paravertebral group when compared to the interpleural group. But there was no significant difference in first attempt success rate between the two groups.

VAS score was similar in both groups throughout the study period. Duration of post operative analgesia was higher in paravertebral group. But there was no significant difference in the consumption of opioid in both groups. There was no significant difference in the mean heart rate and mean arterial pressure in both groups.

DISCUSSION

It has been demonstrated in our study that both paravertebral and interpleural block provide similar and satisfactory pain relief in modified radical mastectomy, cholecystectomy and nephrectomy surgeries, although paravertebral block has a slightly higher duration of action when compared to interpleural block. Effective pain relief in the immediate post operative period reduces the incidence of chronic pain(25). The consumption of opioids in the post operative period was not significantly different in both groups.

The mechanism of post operative pain relief in paravertebral block is due to the direct penetration of LA into the neurological structures present within the paravertebral space because the spinal nerves have a thin sheath which can be easily penetrated by the drug(26). The paravertebral space being avascular limits the diffusion of drug and increases the duration of sensory block thus providing effective and long lasting pain relief in the post operative period(27).

The local anaesthetic drug in interpleural block is deposited between the parietal and visceral pleura and it diffuses across the endothoracic and subserous fascia and passes through the innermost intercostal muscles to provide blockade at multiple contiguous levels(11). Analgesia occurs due to reverse diffusion of drug into the subpleural space. The extent of uptake of the drug by the visceral pleura is highly unpredictable. After diffusing out of the pleural layers the drug can get deposited on the surfaces of lung, diaphragm and pericardium. This will

reduce the amount of local anaesthetic drug available to act on the intercostal nerves. This is the reason why patients undergoing paravertebral block have a more complete block and increased duration of analgesia.

In paravertebral block there is sufficient spread of local anaesthetic to the lower cervical and upper thoracic spaces but in interpleural block the drug moves in a gravity dependent manner to collect at a lower point in the pleural cavity. Hence the spread of drug will depend on patient movement and position. The level in interpleural block is usually not sufficient for axillary dissection due to this reason.

In paravertebral block there is blockade of nociceptive afferent input and afferent blockade of sympathetic chain. This provides the characteristic “total afferent block”. This mechanism is responsible for preventing chronic pain.

CONCLUSION

Interpleural block is as effective as paravertebral block in providing effective analgesia for patients undergoing modified radical mastectomy, cholecystectomy and nephrectomy surgeries. But paravertebral block can achieve more complete block and slightly increased duration of analgesia when compared to interpleural block.

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ANNEXURE – I

PROFORMA

CASE NO :
DATE:

NAME:

AGE : WEIGHT:
HEIGHT:

MEDICAL/SURGICAL HISTORY:

INVESTIGATIONS

Hb : SUGAR:
BLOOD GROUP

PLATELET: UREA / CREAT:
VIRAL MARKERS

CXR: ECG
ECHO:

VITALS

BP: PR : SPO2:

TEMP: CVS: RS:

AIRWAY: SPINE:

INTRAOP

NUMBER OF ATTEMPTS OF BLOCK:

PREMEDICATION:

PREOXYGENATION:

INDUCTION:

INTUBATION:

MAINTENANCE:

INTRAOP FENTANYL:

REVERSAL: DURATION OF PROCEDURE:

EXTUBATION:

POST OPERATIVE PERIOD

VAS SCORES :

POSTOP MORPHINE/DICLOFENAC:

DURATION OF ANALGESIA:

MASTER CHART

S.NO	NAME GROUP PVB	IP NO	AGE	SEX	ASA	WEIGHT	HEIGHT
1	SHANTHI	23517	50	F	I	56	152
2	JAYA	21003	36	F	I	49	147
3	SALSA	15378	36	F	I	45	143
4	PACHAYAMMAL	12545	53	F	II	53	145
5	THILAGAVATHY	16223	56	F	I	55	152
6	RANI	3702	75	F	II	48	144
7	SUNDARI	65763	65	F	I	52	149
8	SHANTHI	12309	45	F	I	63	151
9	MURUVAMMAL	13051	60	F	I	54	146
10	DHANALAKSHMI	13029	64	F	II	63	151
11	RAJAKANNI	14112	63	F	I	54	149
12	AMUDHA	15424	40	F	II	51	146
13	RAJAKANNI	16485	63	F	I	55	149
14	VENDAMMAL	12446	60	F	I	53	148
15	ELLAMMAL	15004	60	F	I	49	149
16	JAYANTHI	2110	49	F	II	55	151
17	MURUGAN	5977	65	M	II	61	167
18	GOPALAKRISHNAN	11066	64	M	II	67	159
19	DEVI	11075	40	F	II	53	165
20	RANI	10290	55	F	II	55	149
21	VICTORIA	4750	48	F	I	53	152
22	AJEEMA BEEVI	7541	55	F	II	54	148
23	MANMATHAN	5909	62	M	II	68	157
24	RAJESHWARI	6814	60	F	II	54	148
25	KOKILA	3272	42	F	I	48	161
26	JAYAVEL	21145	36	M	I	54	152
27	PADAVATTAMMAL	17284	48	F	II	51	145
28	KANCHANA	13429	55	F	II	45	156
29	DEEPALAKSHMI	15108	39	F	I	53	150
30	THILAGANAYAGI	16236	56	F	I	54	153
31	SIVAGAMI	13754	45	F	II	56	148

S.NO	NAME GROUP PVB	IP NO	AGE	SEX	ASA	WEIGHT	HEIGHT
32	MURUGAN	11814	52	M	I	69	171
33	MUNUSAMY	12492	47	M	II	65	168
34	PERUMAL	11447	43	M	I	74	164
35	MANJULA	3634	38	F	I	65	155
36	RADHAKRISHNAN	3636	55	F	I	66	153
37	DHAVAMANI	65088	60	F	II	48	142
38	BHUVANESHWARI	69337	47	F	II	56	158
39	INDUMTHY	67945	35	F	I	48	160
40	LAKSHMI	67901	35	F	I	56	153
41	PANNEERSELVAN	64724	63	M	II	69	172
42	MANJULA	67242	54	F	II	63	138
43	DEVI	62969	32	F	I	52	162
44	KALAISELVI	65108	48	F	II	55	151
45	KEELADEVI	63781	50	F	I	53	146
46	SUDHA	64722	37	F		46	150
47	MARIAMBEE	61488	57	F	I	65	157
48	LAKSHMI	62441	60	F	II	53	144
49	PANJALAI	59991	43	F	II	64	155
50	MARI	66659	58	M	I	73	168
51	LOGANATHAN	59686	45	M	II	68	172
52	KUMUDHA	53278	50	F	I	56	152
53	LALITHA	54543	58	F	II	51	148
54	DEVAKI	55105	45	F	II	65	151
55	EZHILVILI	18495	36	F	I	66	154
56	PREMA	11431	35	F	II	51	152
57	GOWRI	31001	43	F	I	56	166
58	MANGAMMA	7483	40	F	II	45	157
59	PACHAYAMMAL	36616	50	F	I	69	149
60	AMSA	10290	52	F	I	55	158

S.NO	NAME GROUP IPB	IP NO	AGE	SEX	ASA	WEIGHT	HEIGHT
1	LEELAMMAL	56127	62	F	II	67	165
2	NAVANEETHAN	45060	45	M	I	68	155
3	DWARAKA BAI	39838	61	F	II	46	164
4	DEVASIGAMANI	41842	60	M	II	70	143
5	MANONMANI	40194	42	F	I	45	164
6	KUMUDAVALLI	40606	45	F	II	59	154
7	RANI	27863	67	F	II	58	157
8	KAMALA	36263	37	F	II	64	149
9	SENGIAMMAL	35050	39	F	II	49	167
10	VEDAVALLI	29766	48	F	I	55	154
11	BANUPRIYA	34138	53	F	I	58	161
12	NAGAVALLI	30256	52	F	II	57	146
13	LALITHA	29561	45	F	II	65	151
14	SARASWATHI	28686	43	F	II	63	146
15	SARASWATHI	2129	68	F	I	48	162
16	AMUDHA	2195	35	F	II	57	143
17	VIJAYA	2525	57	F	I	49	148
18	MALAR	2078	58	F	I	64	158
19	MAHESWARI	2330	54	F	II	66	144
20	KAVITHA	2336	35	F	II	61	152
21	PUSHPA	2338	44	F	II	58	150
22	KARPAGAM	2605	50	F	II	54	148
23	ZEENATH BEGUM	2769	60	F	II	49	146
24	MEENATCHI	2530	49	F	II	67	164
25	VISHA	3406	64	F	I	43	153
26	DILLIRANI	2815	48	F	I	55	142
27	BAKYAVATHI	3106	62	F	II	54	164
28	RAJAM	1373	58	F	II	56	153
29	JAYALAKSHMI	2889	48	F	II	58	157
30	DEVAKI	2839	38	F	II	51	155
31	JAYAMALLIKA	2751	55	F	I	46	152
32	KALAIVANI	277	59	F	II	55	164
33	VISALATCHI	2586	60	F	I	51	163

S.NO	NAME GROUP IPB	IP NO	AGE	SEX	ASA	WEIGHT	HEIGHT
34	MUNIYAMMAL	2581	52	F	I	55	167
35	VIJAYA	2524	57	F	I	59	155
36	GIRIJA	1845	54	F	II	63	157
37	MANNAMMAL	3420	57	F	II	67	14
38	JAYALAKSHMI	3356	49	F	II	54	150
39	RAMAJAYM	3065	50	F	II	64	161
40	AMUDHA	3142	40	F	II	55	157
41	VENDAMMAL	2742	54	F	I	68	160
42	PONNIYAMMAL	51083	41	F	II	45	149
43	REVATHY	47389	60	F	II	68	157
44	ROJA	47596	35	F	II	51	154
45	MANORANJITHAM	46041	60	F	II	58	153
46	KASTHURI	40449	68	F	I	54	155
47	ALAMELU	39018	38	F	I	53	156
48	MATHIYAZHAGAN	40749	55	M	I	67	148
49	KANNIYAPPAN	39214	63	M	I	68	168
50	BHUVANA	34126	58	F	I	64	155
51	SHANTHI	37004	38	F	I	52	154
52	PURUSHOTHAMAN	38412	59	M	II	67	167
53	KALAISELVI	65108	50	F	I	55	142
54	JAGADEESAN	21119	49	M	I	46	165
55	PONNI	24163	61	F	II	45	155
56	SAVITHRI	18911	54	F	I	67	168
57	RANJITHAM	2552	52	F	II	48	146
58	MANIKKAM	20164	60	M	I	67	153
59	LAKSHMIPATHI	21139	58	M	II	62	157
60	KOWSALYA	2811	46	F	II	56	149

S NO	NAME Group PVB	HR	MAP	DURATION OF SURGERY (MINS)	NUMBER OF ATTEMPTS	INTRA OP FENTANYL/ POSTOP TRAMADOL/ DICLOFENAC	DURATION OF ANALGESIA (MINS)
1	SHANTHI	68	83	135	1	-	330
2	JAYA	85	93	100	1	-	450
3	SALSA	84	86	150	1	-	300
4	PACHAYAMMAL	83	93	145	2	-	240
5	THILAGAVATHY	94	73	148	1	-	180
6	RANI	75	100	125	2	-	340
7	SUNDARI	96	86	160	1	DICLOFENAC	320
8	SHANTHI	94	83	115	1	-	420
9	MURUVAMMAL	68	93	120	1	-	440
10	DHANALAKSHMI	59	83	135	1	FENTANYL	120
11	RAJAKANNI	84	90	125	1	-	380
12	AMUDHA	86	73	165	1	DICLOFENAC	340
13	RAJAKANNI	84	83	140	1	-	440
14	VENDAMMAL	75	93	110	1	-	400
15	ELLAMMAL	85	103	95	1	-	420
16	JAYANTHI	74	93	115	3	-	380
17	MURUGAN	94	96	110	1	-	360
18	GOPALAKRISHNAN	98	83	125	1	-	330
19	DEVI	76	76	100	1	-	420
20	RANI	101	86	145	1	-	450
21	VICTORIA	86	86	120	1	-	360
22	AJEEMA BEEVI	65	83	110	1	-	330
23	MANMATHAN	75	96	130	2	-	420
24	RAJESHWARI	77	93	100	1	-	345
25	KOKILA	87	103	90	1	-	335
26	JAYAVEL	75	80	145	1	-	440
27	PADAVATAMMAL	88	76	165	1	-	420
28	KANCHANA	81	86	120	1	DICLOFENAC	360
29	DEEPALAKSHMI	72	93	130	1	-	300
30	THILAGANAYAGI	94	96	115	1	-	280

S NO	NAME Group PVB	HR	MAP	DURATION OF SURGERY (MINS)	NUMBER OF ATTEMPTS	INTRA OP FENTANYL/ POSTOP TRAMADOL/ DICLOFENAC	DURATION OF ANALGESIA (MINS)
31	SIVAGAMI	99	93	105	1	-	380
32	MURUGAN	86	76	95	1	-	420
33	MUNUSAMY	75	90	125	1	-	410
34	PERUMAL	81	86	85	1	-	450
35	MANJULA	73	90	110	2	-	340
36	RADHAKRISHNAN	94	80	135	1	-	380
37	DHAVAMANI	76	83	105	1	FENTANYL	110
38	BHUVANESHWARI	85	93	110	1	-	480
39	INDUMTHY	94	86	155	1	-	420
40	LAKSHMI	85	76	160	1	-	350
41	PANNEERSELVAN	88	93	145	1	DICLOFENAC	340
42	MANJULA	84	76	120	1	-	370
43	DEVI	86	83	115	1	-	400
44	KALAISELVI	94	86	130	1	-	360
45	KEELADEVI	95	96	110	2	-	330
46	SUDHA	75	100	100	2	DICLOFENAC	450
47	MARIAMBEE	91	90	95	1	-	420
48	LAKSHMI	76	96	110	1	-	345
49	PANJALAI	84	83	125	1	DICLOFENAC	350
50	MARI	92	96	130	1	-	420
51	LOGANATHAN	78	76	110	2	-	400
52	KUMUDHA	94	93	120	1	-	380
53	LALITHA	78	100	95	1	-	360
54	DEVAKI	85	96	125	1	-	345
55	EZHILVILI	82	93	135	1	FENTANYL	135
56	PREMA	84	83	120	1	-	410
57	GOWRI	88	76	85	1	-	350
58	MANGAMMA	86	86	130	1	-	375
59	PACHAYAMMAL	87	86	145	1	-	360
60	AMSA	95	93	120	1	-	420

S NO	NAME GROUP IPB	HR	MAP	DURATION OF SURGERY	NUMBER OF ATTEMPTS	INTRAOP FENTANYL/POST OP TRAMADOL/ DICLOFENAC	DURATION OF ANALGESIA
1	LEELAMMAL	75	83	125	1	-	360
2	NAVANEETHAN	85	86	120	1	-	340
3	DWARAKA BAI	86	86	90	1	-	220
4	DEVASIGAMANI	84	86	85	1	-	360
5	MANONMANI	92	96	95	1	-	410
6	KUMUDAVALLI	76	80	130	1	-	360
7	RANI	85	86	140	2	FENTANYL	180
8	KAMALA	84	86	150	1	DICLOFENAC	340
9	SENGIAMMAL	82	93	120	1	-	320
10	VEDAVALLI	73	80	130	1	-	320
11	BANUPRIYA	91	83	125	1	-	340
12	NAGAVALLI	85	83	130	2	-	300
13	LALITHA	94	93	125	1	-	320
14	SARASWATHI	96	103	140	1	DICLOFENAC	340
15	SARASWATHI	92	86	125	1	-	320
16	AMUDHA	102	73	130	1	-	320
17	VIJAYA	82	96	100	1	-	310
18	MALAR	83	76	105	1	-	400
19	MAHESWARI	94	83	105	1	-	380
20	KAVITHA	75	86	110	2	-	420
21	PUSHPA	73	93	120	1	DICLOFENAC	360
22	KARPAGAM	95	93	145	1	-	330
23	ZEENATH BEGUM	94	73	135	1	-	320
24	MEENATCHI	82	93	155	1	DICLOFENAC	400
25	VISHA	76	86	125	2	-	420
26	DILLIRANI	95	83	145	1	-	330
27	BAKYAVATHI	82	8	110	1	-	300
28	RAJAM	83	86	95	1	-	330
29	JAYALAKSHMI	85	93	125	1	-	350
30	DEVAKI	88	100	140	2	--	420

S NO	NAME GROUP IPB	HR	MAP	DURATION OF SURGERY	NUMBER OF ATTEMPTS	INTRAOP FENTANYL/POST OP TRAMADOL/ DICLOFENAC	DURATION OF ANALGESIA
31	JAYAMALLIKA	68	73	130	2	-	425
32	KALAIVANI	76	96	135	2	-	400
33	VISALATCHI	94	86	155	1	-	430
34	MUNIYAMMAL	75	93	95	1	DICLOFENAC	450
35	VIJAYA	71	76	115	1	-	320
36	GIRIJA	76	93	145	1	-	220
37	MANNAMMAL	95	90	125	1	-	350
38	JAYALAKSHMI	83	86	135	2	-	200
39	RAMAJAYM	75	83	100	1	-	330
40	AMUDHA	94	86	95	1	DICLOFENAC	350
41	VENDAMMAL	82	86	125	1	-	400
42	PONNIYAMMAL	88	96	130	1	-	320
43	REVATHY	84	93	125	1	-	280
44	ROJA	76	73	95	1	DICLOFENAC	360
45	MANORANJITHAM	35	96	120	1	-	340
46	KASTHURI	91	96	145	1	-	320
47	ALAMELU	74	83	140	1	FENTANYL	165
48	MATHIYAZHAGAN	100	93	120	1	-	330
49	KANNIYAPPAN	82	83	125	1	-	300
50	BHUVANA	84	80	130	1	-	310
51	SHANTHI	86	86	5	1	-	190
52	PURUSHOTHAMAN	94	76	100	1	-	280
53	KALAISELVI	92	83	25	1	--	385
54	JAGADEESAN	95	80	120	1	-	360
55	PONNI	92	76	130	1	DICLOFENAC	365
56	SAVITHRI	90	90	125	2	-	330
57	RANJITHAM	88	93	110	1	-	320
58	MANIKKAM	86	86	95	1	-	330
59	LAKSHMIPATHI	84	83	135	1	DICLOFENAC	240
60	KOWSALYA	75	90	140	1	-	260