

**“COMPARISION OF SAFETY AND EFFICACY OF UNILATERAL
PARAVERTEBRAL BLOCK WITH SUBARACHNOID BLOCK FOR
INGUINAL HERNIA REPAIR”**

Dissertation submitted to

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In partial fulfilment for the award of the degree of

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IN

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BRANCH X



INSTITUTE OF ANAESTHESIOLOGY AND CRITICAL

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CHENNAI- 600003

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CERTIFICATE

This is to certify that the dissertation titled, **“COMPARISION OF SAFETY AND EFFICACY OF UNILATERAL PARAVERTEBRAL BLOCK WITH SUBARACHNOID BLOCK FOR INGUINAL HERNIA REPAIR”** Submitted by **Dr.PERIYANNAN.G** in partial fulfilment for the award of the degree of DOCTOR OF MEDICINE in Anaesthesiology by The Tamilnadu Dr.M.G.R Medical University, Chennai is a bonafide record of work done by him in the INSTITUTE OF ANAESTHESIOLOGY& CRITICAL CARE, ,” Madras Medical College, during the academic year 2015-2018.

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PLAGIARISM CERTIFICATE

This is to certify that this dissertation work titled **“COMPARISION OF SAFETY AND EFFICACY OF UNILATERAL PARAVERTEBRAL BLOCK WITH SUBARACHNOID BLOCK FOR INGUINAL HERNIA REPAIR”** of the candidate **Dr.PERIYANNAN.G** with Registration Number 201520014 for the award of M.D 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 85 pages and result shows 15 percentage of plagiarism in the dissertation.

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DECLARATION

I hereby declare that the dissertation titled, “**COMPARISION OF SAFETY AND EFFICACY OF UNILATERAL PARAVERTEBRAL BLOCK WITH SUBARACHNOID BLOCK FOR INGUINAL HERNIA REPAIR**” has been prepared by me under the guidance of **Prof.Dr.M.Vellingiri, MD,DA**, Professor of Anaesthesiology, Institute of Anaesthesiology & Critical care, Madras Medical College, Chennai, in partial fulfillment of the regulations for theaward of the degree of M.D (Anaesthesiology) examination to be held in April 2018. This study was conducted at Institute of Anaesthesiology & Critical care, Madras Medical College, Chennai.

I have not submitted this dissertation previously to anyjournal or any university for the award of any degree or diploma.

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S.NO	CONTENTS	PAGE NO
1	Introduction	1
2	Aim Of The Study	2
3	Inguinal Hernia	3
4	Thoracic Paravertebral Block	6
5	Subarachnoid Block	12
6	Assessment Of Pain & Discharge criteria	21
7	Pharmacology Of Bupivacaine	29
8	Review Of Literature	34
9	Materials & Methods	40
10	Observation Results and Analysis	45
11	Discussion	81
12	Conclusion	85
13	References	
14	Annexure	
	a) Ethical committee	
	b) Antiplagiarism screen shot	
	c) Patient information form	
	d) Patient consent form	
	e) Proforma	
	f) Master chart	

INTRODUCTION

Inguinal herniorrhaphy (IH) is a common day care procedure. It can be performed under general anaesthesia (GA) peripheral nerve blockade, subarachnoid block (SAB) or paravertebral block (PVB). PVB is providing long-lasting unilateral anaesthesia, haemodynamic stability, early ambulation and prolonged pain relief. PVB produces ipsilateral segmental analgesia through injection of local anaesthetic onto the spinal nerve roots alongside the vertebral column. It is advocated predominantly for unilateral procedures such as thoracotomy, breast surgery, chest wall trauma, hernia or renal surgery. This study was undertaken to compare safety and efficacy between unilateral PVBs and SAB in patients undergoing IH.

AIM OF THE STUDY

1. Duration of post operative analgesia

(Post operative Visual Analogue Scale pain score)

2. Time to reach the discharge criteria

(Modified post- anaesthetic discharge scoring.)

3. Intra operative and post operative haemodynamics

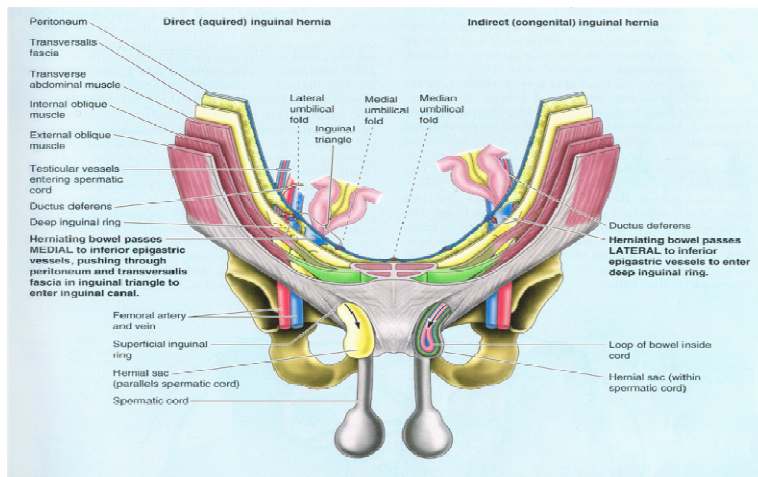
4. Total rescue analgesic consumption

INGUINAL HERNIA

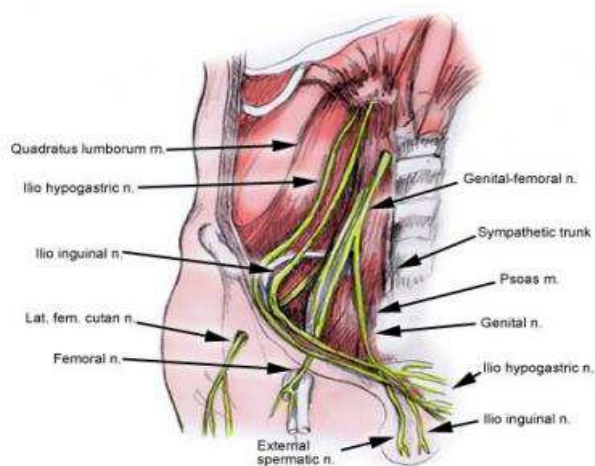
In inguinal or groin hernias a hole forms in the internal oblique and transversus muscles. If this hole forms lateral (or away from the middle) to the inferior epigastric blood vessels, an indirect inguinal hernia forms. If the hole forms medial (or towards the middle) to the inferior epigastric blood vessels, a direct inguinal hernia is formed. Regardless, in open surgery, the external oblique muscle layer is opened over the hernia (weakened internal and transversus muscle). The hole (or holes) in the internal oblique and the transversus muscle are found. A dual sided mesh is used to reinforce the hernia defect and the muscle around the hole.

Boundries of inguinal canal:

The posterior wall is formed by the transversalis fascia. The roof is formed by the transversalis fascia, internal oblique and transversus abdominis. The floor is formed by the **inguinal** ligament (a 'rolled up' portion of the external oblique aponeurosis) and thickened medially by the lacunar ligament.



Nerve supply of inguinal region :



- **Iliohypogastric nerves:**

The iliohypogastric nerves stem from the anterior rami of the 1st lumbar spinal nerves and form branches that run below the subcostal nerves to the lower part of the abdominal wall. They innervate the skin over the iliac crests, upper iliac (inguinal) regions, and hypogastric(pubic) regions

(the area below the navel). They also give nerve supply to the internal oblique and transversus abdominis muscles.

- **Ilioinguinal nerves:**

These nerves stem from the anterior rami of the 1st lumbar spinal nerves. They run between the layers of abdominal muscle and down to the inguinal canal. They innervate the scrotal skin in men and labia majora in women, the area over the pubic bone, and the medial portions of the thigh. They also innervate the internal oblique and transversus abdominis muscles.

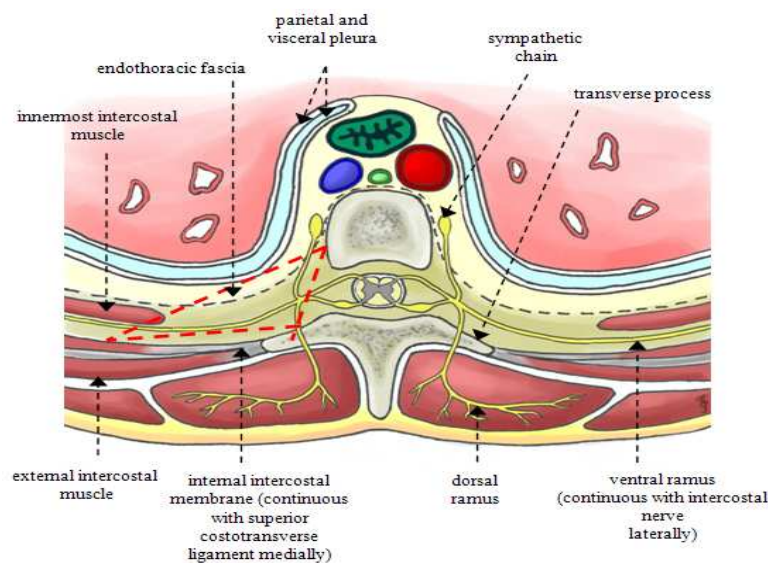
THORACIC PARAVERTEBRAL BLOCK

Anatomy

The thoracic paravertebral space (TPVS) is a wedge-shaped space that lies on either side of the vertebral column. It is wider on the left than on the right. The parietal pleura forms the anterolateral boundary, while the base is formed by the posterolateral aspect of the vertebral body, the intervertebral disc, the intervertebral foramen and its contents. The superior costotransverse ligament, which extends from the lower border of the transverse process above to the upper border of the transverse process below, forms the posterior wall of the TPVS. The apex of the space is continuous, with the intercostal space lateral to the tips of the transverse processes. Interposed between the parietal pleura and the superior costotransverse ligament is a fibroelastic structure, the endothoracic fascia, which is the deep fascia of the thorax and lines the inside of the thoracic cage. In the paravertebral location, the endothoracic fascia is closely applied to the ribs and fuses medially with the periosteum at the midpoint of the vertebral body. An intervening layer of loose connective tissue, the “subserous fascia,” is found between the parietal pleura and the endothoracic fascia. The endothoracic fascia thus divides the TPVS into two potential fascial compartments, the anterior “extrapleural paravertebral compartment” and the posterior “subendothoracic paravertebral compartment”

The TPVS contains fatty tissue, within which lies the intercostal (spinal)

nerve, the dorsal ramus, the intercostal vessels, the rami communicantes, and, anteriorly, the sympathetic chain. The spinal nerves in the TPVS are segmented into small bundles lying freely among the fat and devoid of a fascial sheath, which makes them exceptionally susceptible to local anesthetic block. The intercostal nerve and vessels are located behind the endothoracic fascia, while the sympathetic trunk is located anterior to it in the TPVS.



Communications of the Thoracic Paravertebral Space:

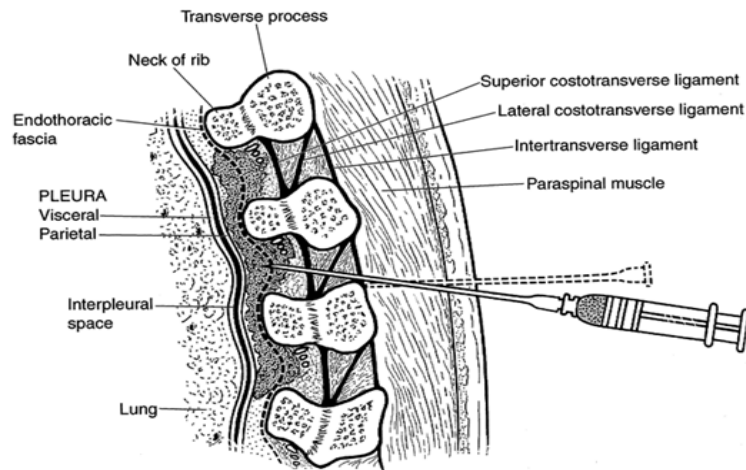
The TPVS is continuous with the intercostal space lateral the epidural space medially via the intervertebral foramen, and the contralateral paravertebral space via the prevertebral and epidural space. The cranial extension of the TPVS is still not defined, but we have observed radiologic spread of contrast medium into the cervical region after thoracic paravertebral injection. The origin of the psoas major muscle forms the caudal

boundary, and inferior (lumbar) spread through the TPVS is thought to be unlikely. Ipsilateral thoracolumbar anesthesia, radiologic spread of contrast below the diaphragm, and thoracolumbar spread of colored dye in cadavers have been described, and there is disagreement about the caudal limit of spread.¹ The endothoracic fascia is continuous inferiorly with the fascia transversalis of the abdomen dorsal to the diaphragm through the medial and lateral arcuate ligaments and the aortic hiatus. An injection in the lower TPVS posterior to the endothoracic fascia can spread inferiorly through the medial and lateral arcuate ligaments to the retroperitoneal space behind the fascia transversalis, where the lumbar spinal nerves lie, and is the anatomic basis of the technique of “extended unilateral anesthesia.”

Technique of Thoracic Paravertebral Block

PATIENT POSITIONING

The patient is positioned in the sitting or lateral decubitus (with the side to be blocked uppermost) position and supported by a technician. The back should assume knee-chest position, similar to the position required for neuraxial anesthesia. The patient's feet rest on a stool to allow greater patient comfort and a greater degree of kyphosis. The positioning increases the distance between the adjacent transverse processes and facilitates advancement of the needle between the transverse processes.



The subcutaneous tissues and paravertebral muscles are infiltrated with local anesthetic to decrease the discomfort at the site of needle insertion. The fingers of the palpating hand should straddle the paramedian line and fix the skin to avoid medial or lateral skin movement. The needle is attached to a syringe containing local anesthetic via extension tubing and advanced perpendicularly to the skin at the level of the superior aspect of the corresponding spinous process. Constant attention to the depth of needle insertion and the slight medial to lateral needle orientation is critical to avoid inadvertent puncture of the pleura leading to pneumothorax and direction of the needle toward the neuraxial space, respectively. The utmost care should be taken to avoid directing the needle medially (risk of epidural or spinal injection). The transverse process is typically contacted at a depth of 3 to 6 cm. If it is not, it is possible the needle tip has missed the transverse processes and passed either too laterally or in between the processes. Osseous contact at shallow depth (e.g., 2 cm) is almost always due to a too lateral needle insertion (ribs). In this case, further advancement could result in too deep insertion and

possible pleural puncture. Instead, the needle should be withdrawn and redirected superiorly or inferiorly until contact with the bone is made. After the transverse process is contacted, the needle is withdrawn to the skin level and redirected superiorly or inferiorly to "walk off" the transverse process and enter the paravertebral space. The ultimate goal is to insert the needle to a depth of 1 cm past the transverse process. A certain loss of resistance to needle advancement often can be felt as the needle passes through the superior costotransverse ligament; however, this is a nonspecific sign and should not be relied on for correct placement.

The needle can be redirected to walk off the transverse process superiorly or inferiorly. Proper handling of the needle is important both for accuracy and safety. Once the transverse process is contacted, the needle should be re-gripped 1 cm away from the skin so that insertion only can be made 1 cm deeper before skin contact with the fingers prevents further advancement. After aspiration to rule out intravascular or intrathoracic needle tipplacement, 5 mL of local anesthetic is injected slowly. The process is repeated for the remaining levels to be blocked.

COMPLICATIONS OF PARAVERTEBRAL BLOCK

Complications of paravertebral nerve blocks may include the following:

- Failed block

- Hypotension
- Vascular puncture
- Pleural puncture
- Pneumothorax

APPLICATIONS OF PARAVERTEBRAL BLOCK

- Thoracic surgeries**
- Liver surgeries**
- Inguinal hernia surgery**
- Ambulatory surgeries**

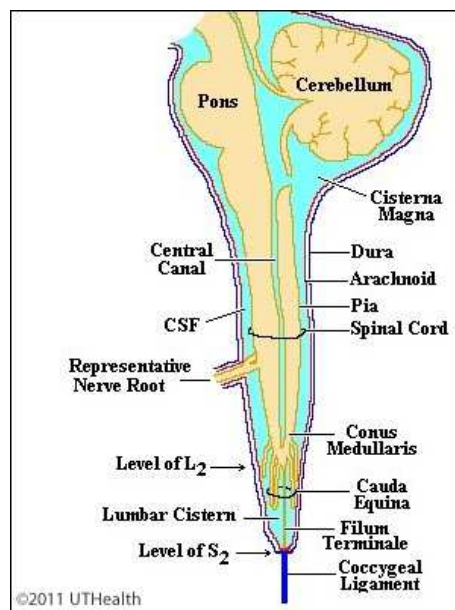
PVB resulted in faster time to home readiness, and was associated with fewer adverse events and better analgesia compared to fast-track generalanaesthetic regimen in outpatient inguinal herniorrhaphy

- Cholecystectomy**
- Rib fracture**
- Breast surgeries**

SUBARACHNOID BLOCK

Anatomy

There are 7 cervical, 12 thoracic, 5 lumbar vertebrae. The sacrum comprises 5, and coccyx 4 fused segments.



Although the individual vertebrae have their own features, they are constructed on a basic pattern as represented by the mid-thoracic vertebrae. The body, through which the weight of the subject is transmitted, and the vertebral (or neural) arch, which surrounds and protects the spinal cord lying in the vertebral foramen. The arch comprises a pedicle and a lamina on each side, and a dorsal spine. Each lamina, in turn, carries a transverse process and superior and inferior articular processes that bear the articular facets. The pedicles are

notched; the notches of each adjacent pair together form an intervertebral foramen through which emerges a spinal nerve.

The Spinal Meninges

The spinal cord has three covering membranes or meninges: the dura mater, arachnoid mater and pia mater.

The dura mater

The dural covering of the brain is a double membrane, between the walls of which lie the cerebral venous sinuses. The dura mater that encloses the cord consists of a continuation of the inner (meningeal) layer of the cerebral dura, which is made up of dense fibrous tissue; the outer (endosteal) layer of the cerebral dura terminates at the foramen magnum, where it merges with the periosteum enclosing the skull, and is thereafter represented by the periosteal lining of the vertebral canal. The dural sac usually extends to the level of the 2nd segment of the sacrum; occasionally it ends as high as L5, at other times it extends to S3. As a result of this, it is occasionally possible to perform an inadvertent spinal tap during the course of a caudal injection. The dural sheath then continues as the covering of the filum terminale to end by adhering to the periosteum on the back of the coccyx. The sac widens out in both the cervical and lumbar regions, corresponding to the cervical and lumbar enlargements of the spinal cord. It lies rather loosely within the spinal canal, buffered in the epidural fat, but it is attached at the following points to its bony surroundings:

1 Above, to the edges of the foramen magnum and to the posterior aspects of the bodies of the 2nd and 3rd cervical vertebrae.

2 Anteriorly, by slender filaments of fibrous tissue to the posterior longitudinal ligament.

3 Laterally, by prolongations along the dorsal and ventral nerve roots, which fuse into a common sheath and which then blend with the epineurium of the resultant spinal nerves.

4 Inferiorly, by the filum terminale to the coccyx.

However, the dural sac is completely free posteriorly.

The arachnoid mater

This is a delicate membrane which lines the dural sheath and which sends prolongations along each nerve root. Above, it is continuous with the cerebral arachnoid, which loosely invests the brain, and which dips into the longitudinal fissure between the cerebral hemispheres.

The pia mater

This, the innermost of the three membranes, is a vascular connective tissue sheath that closely invests the brain and spinal cord, and projects into their sulci and fissures. The spinal pia is thickened anteriorly into the lineasplendens along the length of the anterior median fissure. On either side, it forms the ligamentum denticulatum, a series of triangular fibrous strands

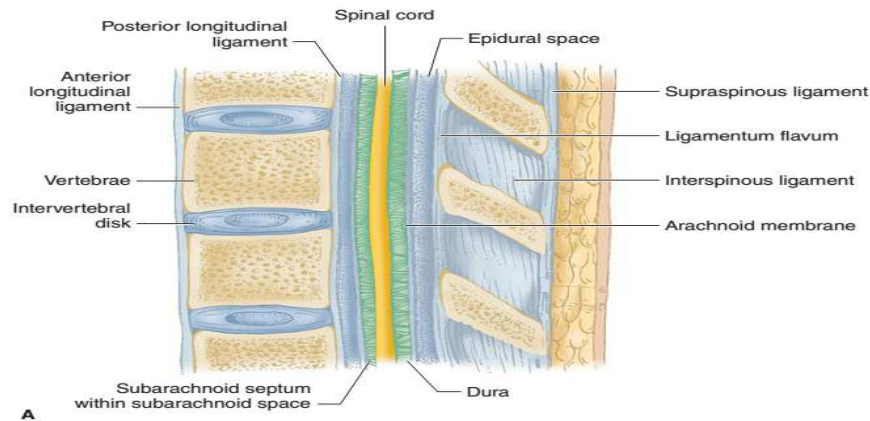
attached at their apices to the dural sheath; they are 21 in number, and lie between the spinal nerves down to the gap between the 12th thoracic and 1st lumbar root. The lowermost denticulation is bifid and is crossed by the 1st lumbar nerve root. The posterior subarachnoid septum consists of an incomplete sheet of pia passing from the posterior median sulcus of the cord backwards to the dura in the midline. Inferiorly, the pia is continued downwards as the filum terminal, which pierces the lower end of the dural sac and then continues to the coccyx with a covering sheath of dura.

The compartments related to the spinal meninges

These are the subarachnoid, subdural and epidural spaces.

The **subarachnoid space** contains the CSF. It is traversed by incomplete trabeculae at the posterior subarachnoid septum and the ligamentum denticulatum, which have already been described. This space communicates with the tissue spaces around the vessels in the pia mater that accompany them as they penetrate into the cord. These continuations of the subarachnoid space have been described as breaking up into finer ramifications that surround individual nerve cells (the Virchow–Robin spaces) and which have been considered as pathways by which a spinal anaesthetic permeates the cord. It is debatable whether such spaces actually exist; they are probably

artefacts produced by shrinkage in the course of fixation of the histological material.



The **subdural space** is a potential one only; the arachnoid is in close contact with the dural sheath and is separated from it only by a thin film of serous fluid. The subdural space within the vertebral canal rarely enters the consciousness of the clinician, unless it is the accidental site of catheter placement during attempted epidural analgesia or anaesthesia. The subdural injection of local anaesthetic is thought to be associated with patchy anaesthesia, often unilateral and often extensive.

The **epidural space** contains veins and fat and separates the dura from the periosteum of the vertebrae. Note that the nerve roots traverse this space, allowing effective introduction of local anaesthetics into this space, particularly for obstetric purposes (as in an epidural block).

The anterior and posterior nerve roots penetrate the dura at the intervertebral foramen, and the sleeve of dura, which envelops these roots, becomes continuous with the epineurium of the peripheral nerves.

Technique of Subarachnoid Block

The spine is palpated, and the patient's body position is examined to ensure that the plane of the back is perpendicular to that of the floor. This ensures that a needle will pass parallel to the floor and stay midline as it courses deeper (Figure 45-4). The depression between the spinous processes of the vertebra above and below the level to be used is palpated; this will be the needle entry site. A sterile field is established with chlorhexidine or a similar solution. A fenestrated sterile drape is applied. After the preparation solution has dried, a skin wheal is raised at the level of the chosen interspace with local anesthetic using a small (25-gauge) needle. A longer needle can be used for deeper local anesthetic infiltration. Next, the procedure needle is introduced in the midline. Remembering that the spinous processes course caudal from their origin at the spine, the needle will be directed slightly cephalad. The subcutaneous tissues offer little resistance to the needle. As the needle courses deeper, it will enter the supraspinous and interspinous ligaments, felt as an increase in tissue resistance. The needle also feels more firmly implanted in the back. If bone is contacted superficially, a midline needle is likely hitting the

lower spinous process. Contact with bone at a deeper level usually indicates that the needle is in the midline and hitting the upper spinous process, or that it is lateral to the midline and hitting a lamina. In either case, the needle must be redirected. As the needle penetrates the ligamentum flavum, an obvious increase in resistance is encountered. At this point, the procedures for spinal and epidural anesthesia differ. For epidural anesthesia, a sudden loss of resistance (to injection of air or saline) is encountered as the needle passes through the ligamentum flavum and enters the epidural space. For spinal anesthesia, the needle is advanced through the epidural space and penetrates the dura–arachnoid membranes, as signaled by freely flowing CSF.

Contraindications to neuraxial blockade.

Absolute

- Infection at the site of injection
- Patient refusal
- Coagulopathy or other bleeding diathesis
- Severe hypovolemia
- Increased intracranial pressure
- Severe aortic stenosis
- Severe mitral stenosis

Relative

- Sepsis
- Uncooperative patient
- Preexisting neurological deficits

Demyelinating lesions

Stenoticvalvular heart lesions

Left ventricular outflow obstruction (hypertrophicobstructive cardiomyopathy)

Severe spinal deformity

Complications of neuraxialanesthesia.

Adverse or exaggerated physiological responses

Urinary retention

High block

Total spinal anesthesia

Cardiac arrest

Anterior spinal artery syndrome

Horner's syndrome

Complications related to needle/catheter placement

Backache

Dural puncture/leak

Postdural puncture headache

Diplopia

Tinnitus

Neural injury

Bleeding

Intraspinal/epidural hematoma

Misplacement

No effect/inadequate anesthesia

Subdural block

Inadvertent subarachnoid block 1

Inadvertent intravascular injection

Catheter shearing/retention

Inflammation

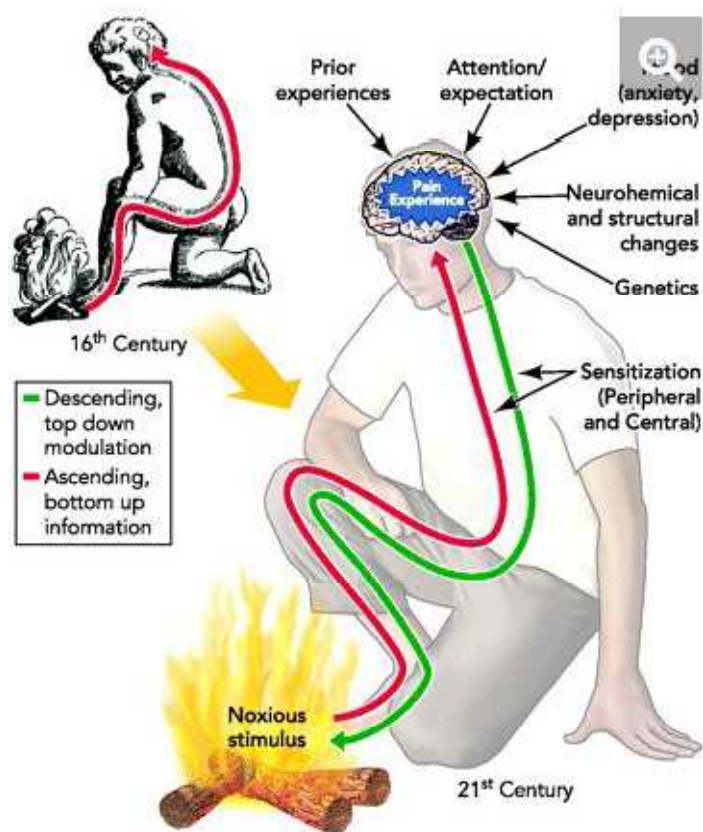
Arachnoiditis

Assessment Of Pain & Discharge criteria

The term pain is derived from the term poena. Pain is defined as an unpleasant emotional or sensory experience with associated potential or actual tissue damage or described in terms of such damage.

It is proven fact all can perceive pain regardless of age, neonates, Infants, children, even a preterm child. They show a severe stress response to painful stimuli

PAIN PATHWAY:



□ At the time of injury a local inflammatory response is induced by the noxious stimulus in the periphery i.e.nociceptors get sensitized and there

will be primary hyperalgesia

□ A delta and C fibers conduct this noxious stimulus to CNS which initiates a sequence of events i.e. reflex withdrawal from stimulus, aversive behaviour and perception of pain.

□ The sustained noxious input from C fibers produces a central sensitization which alters sensory processing in spinal cord (neuroplasticity) leading to allodynia and hyperalgesia at the site of injury.

The mechanism of pain response has certain differences in the early life (neonatal period) from adults which are as follows:

1. The reflex responses will be exaggerated and they have a much lower threshold for pain sensitization than adults
2. There will be less coordination in the motor component of the withdrawal reflex i.e. during the withdrawal response there will be involvement of whole body movements
3. The sensory neurons in the receptive fields which influence localization and discrimination are larger and there is great overlapping.
4. In early life central sensitization is done by A delta fibers rather than C

fibers since maturity of this fibers takes place after birth and that too C fiber much later than A fiber.

5. At birth the peripheral inflammatory response is immature.

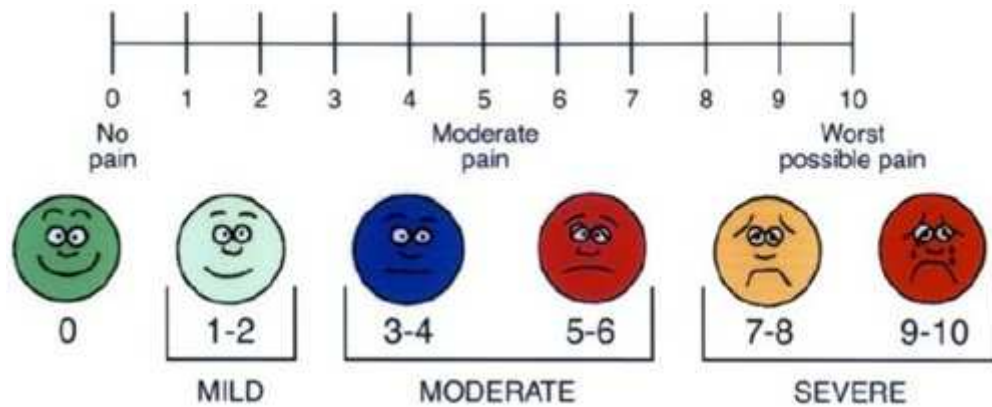
ASSESSMENT OF PAIN

Pain must be assessed with a multidimensional approach, as follows;

- Chronicity
- Severity
- Quality
- Contributing/associated factors
- Location/distribution or etiology of pain, if identifiable
- Mechanism of injury, if applicable
- Barriers to pain assessment

Pain Scales

The presently available pain measures fall into two categories: singledimensional scales and multidimensional scales. The results obtained from these instruments must be viewed as guides and not absolutes.



Single-Dimensional Scales

Single-dimensional scales are a simple way for patients to rate the intensity of their pain. These scales assess a single dimension of pain and measure only pain intensity. Patients report on the intensity of their pain through a self-report. These scales are useful in acute pain when the etiology is clear, such as trauma, pancreatitis, and otitis media. However, they can oversimplify the pain experience. The scales use either numeric, verbal or visual descriptors to quantify pain or to quantify the degree of relief of pain.

Visual scales use pictures of anatomy to describe the location of pain. The Wong-Baker Faces Pain Rating Scale can be used with children, adults, patients with mild to moderate cognitive impairment, and patients with language issues. This scale presents pictures of 6–8 different facial expressions that show a range of emotions, as shown in the image below

Faces Pain Rating Scale

Verbal scales use common words (eg, Low, mild, severe) to describe the intensity of the pain. The Melzack and Torgerson scale uses five verbal descriptors: mild, discomforting, distressing, horrible and excruciating.

A verbal numeric pain rating scale is commonly used, in which patients rate their own pain using a scale of 0–10. Advantages of numeric scales are their simplicity, reproducibility, and sensitivity to small changes in pain.

Children may use this scale.

Multidimensional Scales

Multidimensional scales measure the intensity, the nature and location of the pain, and in some cases, the impact the pain is having on activity or mood. These are useful in complex or persistent acute or chronic pain when intensity needs to be assessed as well as social support, interference with activities of daily living, and depression.

The McGill Pain Questionnaire assesses pain in three dimensions: sensory, affective, and evaluative. The three major dimensions are subdivided into 20 subclasses that represent varying degrees of pain. This scale takes 5–15 minutes to complete.

The Brief Pain Inventory quantifies both pain intensity and associated

disability, addressing the patient's functional status. It is used for patients with cancer, human immunodeficiency virus, and arthritis. It takes 5–15 minutes to complete and uses 11 numeric scales to address pain intensity, mood, ability to work, relationships, sleep, enjoyment of life, and the effect of pain on general activity. The Brief Pain Inventory can measure the progress of a patient with a progressive disease and can show improvement or decline in the patient's mood and activity level. Evaluating function is important in overall pain management.

DRUGS ACTING AT VARIOUS SITES OF PAIN PATHWAY:

- PERIPHERAL LEVEL-local anaesthetics,NSAIDS,opioids
- SPINAL CORD-opioids,alpha 2 agonists,local anaesthetics
- CORTICAL LEVEL-opioids

For effective treatment of pain, various combined modes of treatment are available. Among these methods regional anaesthesia provides efficient pain relief and has several advantages over other methods which are as follows

1) Analgesia provide by regional block reduces general anaesthesia requirement, resulting in

- More rapid recovery
- Decreased postoperative opioid requirement
- Early return to appetite
- Reduced incidence of PONV
- Early discharge

2) Regional block avoids undesirable autonomic reflexes like

- Laryngospasm
- Cardiac dysrhythmias

3) Muscle relaxation is adequate in regional anaesthesia-

Use of muscle relaxant avoided, decreased risk of respiratory

Insufficiency

4) After delicate surgery, immobilisation is easier because of some residual blockade and adequate pain relief

5) Intra operative and post operative bleeding is reduced

6) Diminished stress response

7) Greater cardiovascular stability

8) Fewer episodes of hypoxia

9) Reduced need for postoperative ventilator support

10) Free from hypotensive response from sympathectomy produced by LA

Post Anesthesia discharge scoring system:

The decision to discharge a patient undergoing day surgery is a major step in the hospitalization pathway, because it must be achieved without compromising the quality of care, thus ensuring the same assistance and wellbeing as for a long-term stay. Therefore, the use of an objective assessment for the management of a fair and safe discharge is essential.

Postanesthesia Discharge Scoring System

Vital Signs (BP and Pulse)	Activity	Nausea and Vomiting	Pain	Surgical Bleeding
2: Within 20% of preoperative baseline	2: Steady gait, no dizziness	2: Minimal: treat with PO meds	2: Acceptable control per the patient; controlled with PO meds	2: Minimal: no dressing changes required
1: 20-40% of preoperative baseline	1: Requires assistance	1: Moderate: treat with IM medications	1: Not acceptable to the patient; not controlled with PO medications	1: Moderate: up to 2 dressing changes
0: >40% of preoperative baseline	0: Unable to ambulate	0: Continues: repeated treatment		0: Severe: more than 3 dressing changes

The authors propose the Post Anaesthetic Discharge Scoring System (PADSS), which considers six criteria: vital signs, ambulation, nausea/vomiting, pain, bleeding and voiding. Each criterion is given a score ranging from 0 to 2. Only patients who achieve a score of 9 or more are considered ready for discharge. Furthermore, PADSS has been modified to ensure a higher level of safety, thus the "vital signs" criteria must never score lower than 2, and none of the other five criteria must ever be equal to 0, even if the total score reaches 9.

PHARMACOLOGY OF BUPIVACAINE

Bupivacaine is an amide local anaesthetic agent. It was first synthesized by Ekenstam in 1957 and was first used clinically by Widmon and Telimo in 1963. It belongs to n-alkyl substituted piperidylidines. It is produced as a racemic mixture containing both S and R in equal proportions. It is supplied as a hydrochloride salt.

CHEMICAL STRUCTURE:



- Bupivacaine has a butyl group on the piperidine nitrogen atom of the molecule
- It is a long acting local anaesthesia drug with high anaesthetic potency
- It is more lipid soluble, highly protein bound and greater intrinsic potency
- It crosses the placenta and blood brain barrier

PHYSIO-CHEMICAL PROFILE:

- Molecular weight-288
- Pka-8.1
- Plasma protein binding-95%
- Partition coefficient-28(lipid solubility)
- Clearance-8.3 l/min
- Elimination t_{1/2} -210 mins
- Elimination t_{1/2} in neonates and young infants:480-720mins
- Umbilical vein –maternal arterial concentration ratio-0.32

PHARMACOLOGICAL PROPERTIES:

- ONSET-moderate
- POTENCY - 4
- DURATIO – long

MECHANISM OF ACTION

Like all local anaesthetics, it inhibits sodium channels. It decreases or prevents large transient increase in permeability of the cell membranes to sodium ions that causes depolarisation of the membrane and thereby blocks nerveconduction. The permeability of resting nerve membrane to potassium ions as well as sodium ions are reduced and hence got a stabilizing action on all

excitable membranes.

PHARMACOKINETICS

- Rapidly absorbed from the site of injection
- Peak systemic concentration reached 5-30 mins after administration
- Duration of action 360-720mins
- Dose dependant first pass pulmonary extraction occurs
- Metabolism in liver-dealkylation to pipecoloxylidine,aromatic hydroxylation
- Excretion-only 5%as unchanged drug and rest as metabolites

PREPARATION

- 0.25%,0.5%solutions in 10ml,20ml vials respectively
- 0.5%(5mg/ml)bupivacaine with 80mg dextrose(to increase baricity)in 4ml ampoules for subarachnoid injections(baricity 1.0207)

MAXIMAL DOSE:

- 2.5mg/kg** bodyweight and strength used is 0.25-0.75% with or without adrenaline.Adrenaline causes mild intensification and modest prolongation of blockade ,but reduces its toxicity

EFFECTS

- Local nerve blockade
- Regional-pain,temperature,touch,motor power and vasomotor tone are blocked

- Systemic-due to systemic absorption or accidental i.v administration

38

- It is highly potent(4 times)more than lignocaine.Its duration of action is longer than lignocaine.
- It produces differential sensory /motor blockade

ADVERSE EFFECTS:

CENTRAL NERVOUS SYSTEM:Toxicity produces

- Circumoral numbness, metallic taste
- Light headedness, dizziness,tinnitus
- Confusion, slurred speech
- Convulsions

CARDIO VASCULAR SYSTEM:Effect is dose related

- Depresses automaticity and contractility of heart
- It decreases rapid phase of depolarisation(V MAX) in purkinjefibers& ventricular muscle causes prolonged PR and QT interval
- Re-entrant phenomenon and ventricular arrhythmias can occur

- Slow rate of recovery from use dependant blockade
- Results mostly from high lipid solubility
- R-enantiomer is more toxic than S-enantiomer
- Pregnancy increases cardiotoxic effects of bupivacaine

ALLERGIC REACTIONS:

Due to the preservative methyl paraben

USES:

- Central neuraxial blocks
- Peripheral nerve blocks
- For local infiltration subcutaneously

CONTRAINDICATIONS:

- Known hypersensitivity to amide local anaesthetics
- Intravenous regional anaesthesia

REVIEW OF LITERATURE

- ❖ Sunil kumarsinha et al (2016) did a prospective randomised, comparative and single blind study. 66 male patients, aged 18–65 years, American Society of Anesthesiologists (ASA) physical status Grade I or II, posted for unilateral inguinal hernia-fully reducible direct or indirect hernia (Nyhus classification ^[12]) were randomly allocated into two groups using computer-generated randomisation sequence. Group *P* patients received PVB from T₁₀ to L₂ with 5 ml of bupivacaine (0.5%) with 1:400,000 epinephrine injected at each segment, and Group *S* patients received SAB with 12.5 mg of hyperbaric bupivacaine. Unilateral PVB is more efficacious than conventional SAB for inguinal hernia repair in terms of prolonged post-operative analgesia, better haemodynamic control, shorter time required for reaching the discharge criteria and lesser incidence of side effects. Hence, PVB could be a better and safe alternative to SAB for early home readiness.

- ❖ MC Mandal et al (2011) Fifty-four consenting male patients posted for inguinal hernia repair were randomized into two groups, to receive either the two-segment paravertebral block (group-P, *n*=26) at T10 and L1 or unilateral spinal anaesthesia (group-S, *n*=28), respectively. The time to

ambulation (primary outcome), time to the first analgesic, total rescue analgesic consumption in the first 24-hour period and adverse events were noted. Block performance time and time to reach surgical anaesthesia were significantly higher in the patients of group-P ($P<0.001$). Time to ambulation was significantly shorter in group-P compared to group-S ($P<0.001$), while postoperative sensory block was prolonged in patients of group-S; $P<0.001$. A significantly higher number of patients could bypass the recovery room in group-P compared to group-S, (45% versus 0%, respectively, $P<0.001$). No statistically significant difference in adverse outcomes was recorded.

- ❖ Bhattacharya P et al (2010) compared unilateral lumbar PVB with conventional spinal anaesthesia (SA) in 60 consenting ASA I and II males aged 18-65 years, scheduled for unilateral inguinal hernia repair. Patients were randomly assigned into two groups, P (n=30) or S (n=30) to receive either PVB or SA, respectively. Two patients (7%) in group P had to be converted to general anaesthesia due to block failure. During surgery, patients of both groups received intravenous infusion of propofol titrated to light sedation. The time to first post-operative analgesic requirement (primary outcome measure) as 342 +/- 73 min in group P and 222 +/- 22 min in group S ($P<0.0001$). Time to ambulation was 234 +/-

111 min in group P and 361 +/- 32 min in group S ($P < 0.0001$). Urinary retention requiring catheterization were found in zero (0%) patients in group P compared with five (16%) in group S ($P = 0.024$). It can be concluded that unilateral PVB is more efficacious than conventional SA in terms of prolonging post-operative analgesia and reducing morbidities in patients undergoing elective unilateral inguinal hernia repair.

- ❖ CananTülayIşıl et al (2014) Sixty (ASA) I–III patients aged between 18–64 years with unilateral inguinal hernia were enrolled in this study. Two patients in Group SA and 4 patients in Group PVB were excluded, and statistical analyses were done on 54 patients. In regard to anaesthetic choice, patients were divided into two groups, with 30 patients in each: Group SA, spinal anaesthesia and Group PVB, paravertebral block. Standard monitoring was done, and mean arterial pressure (MAP) and heart rate (HR) were recorded during the surgical procedure. Demographic variables, surgical data, patient satisfaction, the onset times to reach T10 dermatome and to reach peak sensory level, and onset time to reach modified Bromage 3 motor block were recorded. Postoperative nausea and vomiting and pain at postoperative hours 0–24 with the visual analog scale (VAS) were also measured. Compared to pre-anaesthesia measurements, the decrease in HR and MAP during the 10th–90th minute period was significant in Group SA ($p < 0.01$). In Group PVB, sensory

block duration time was higher, whereas paralysis rate was higher in Group SA ($p < 0.01$). Bromage scores were significantly different between the groups ($p < 0.01$). In Group SA, VAS score at the 24th postoperative hour, nausea, and vomiting were significantly higher compared to Group PVB ($p < 0.01$). In conclusion, paravertebral block provides acceptable surgical anaesthesia, maintaining good quality and long duration on postoperative analgesia in unilateral hernia repair.

- ❖ AkcaboyEatal(2009) Sixty patients were randomly assigned to receive either PVB or unilateral SA under standardized protocols (PVB at T9-L1 levels with 5 mL of 0.5 % levobupivacaine for each, unilateral SA at L2-L3 level with 8 mg 0.5% hyperbaric levobupivacaine). All patients were sedated with propofol, 10-70 mg.kg.min. Data on anesthesia, surgery and PACU times, hemodynamic changes, home readiness, pain, and incidence of adverse effects were recorded. One block failed in the PVB group. Anesthesia-related time and onset time were longer in the PVB group, but phase 1 PACU time, time to home-readiness with and without voiding and actual discharge time were significantly shorter in the PVB group. Although the fast-tracking rate was higher in the PVB group, this difference was not significant. The mean propofol dose was higher in the PVB group (52.03 \pm 19.32 [35-73] mg x kg x min⁻¹) than in the SA group (44.0 \pm 18.8 [33-70] mg x kg x min⁻¹) ($P = 0.002$). VAS scores at 4,

6 and 12 hours were significantly lower in the PVB group, both at rest and during movement. VAS scores at 30, 60, 120, 180 min and at 18, 24 and 48 hours were comparable in the two groups. Duration of sensory block, onset time of discomfort, time to first analgesic, and time to first rescue analgesic were longer in the PVB group. In ambulatory IH, PVB provided shorter home readiness time, long lasting postoperative analgesia and improved quality of recovery, and could be a good alternative to SA.

- ❖ Manjaree Mishra et al (2007) total 60 patients undergoing elective inguinal hernia repair; randomized into two groups having 30 each. Group 1 received paravertebral block and group received spinal anesthesia. The parameters like age, mean arterial pressure (before and after block), heart rate (before and after block), procedural time, time taken to onset of effect and time for appearance of post operative pain were noted. Statistical Analysis was done for the final correlation. The mean arterial pressure and heart rate after the block was significantly higher in group 1. The procedural time and time for the onset of effect was also significantly more in group 1. However there was no motor blockage and significantly prolonged post operative analgesia in group 1.

The paravertebral block is certainly better aesthetic modality for the inguinal hernia .

- ❖ Weltz CR et al (2003) Paravertebral block anesthesia was performed on 30 consecutive patients posted for inguinal hernia repair. Block placement took an average of 12.3 minutes, in six cases repeat injection at one or two spinal levels was required due to incomplete blockade. Paravertebral block achieved effective anesthesia in 28 of 30 cases; conversion to general anesthesia was performed for two failed blocks. postoperative data on the 28 completed blocks. There were no other complications of anesthesia and no cases of urinary retention. Time to onset of pain averaged 15 hours, while duration of sensory block was 13 hours. Patients were prescribed a standing order of naproxen 500 mg B.I.D. for 4 days regardless of pain; supplemental oral narcotic use during the 48 hours following surgery averaged 3.5 tablets, with 6 patients not requiring any narcotic. ninety-six percent of patients scheduled for ambulatory surgery were discharged from the postanesthesia care unit, with an average stay of 2.5 hours. Employed patients returned to work on day 5.5 (range 3-10 days); patients who were not employed returned to regular activities in 5.8 days (range 1-14 days). Eighty-two percent of patients reported being "very satisfied" with the anesthetic technique.

MATERIALS AND METHODS

The study, “A Prospective, Randomized Single blinded Case control study comparing the safety and efficacy of Unilateral paravertebral block with Subarachnoid block for Inguinal hernia repair ”

The study was carried out in General Surgery theatre, Government General Hospital after obtaining institutional approval. The study was done in 60 patients posted for unilateral inguinal hernia repair.

Study design

The study is a Prospective, Randomized Single blinded Case control study.

Selection of Cases

60 adult patients in the age group of 18-65 years belonging to ASA PS I and II who were scheduled to undergo elective Inguinal Hernia Repair were chosen. All the patients were assessed and those with normal clinical, haematological, biochemical and radiological parameters were selected.

Informed consent was obtained from all the patients. All the patients were randomly assigned to two groups. Group – P and Group – S each containing 30 patients.

GROUP P : Paravertebral block from T10 to L2 with 5ml of bupivacaine (0.5%) with 1: 400,000 epinephrine at each segment.

GROUP S : Sub arachnoid block with 12.5mg of hyperbaric bupivacaine (0.5%)

Inclusion criteria

- **Age : 18-65 years**
- **Weight : 50-80 kgs**
- **BMI : < 30 KG/M²**
- **ASA : I & II**
- **Diagnosis: Fully reducible direct or indirect inguinal hernia**
- **Mallampatti score : I & II**
- **Patient who gave valid informed consent**

Exclusion criteria

- **Patient's refusal**
- **Untreated and uncontrolled systemic illness**

- **Allergy to Local Anaesthetics**
- **Coagulopathy**
- **Thoracic Vertebral disease or deformity**
- **Chronic analgesic use**
- **Systemic or local sepsis**
- **H/O seizures & any neurological deficit**
- **Psychiatric disease**
- **Not satisfying inclusion criteria**

MATERIALS:

18G venflon

Drugs – Inj. Bupivacaine 0.5%, Inj.Epinephrine, Inj,Fentanyl, Inj.Midazolam, Emergency drugs and normal saline.

Spinal needle 25 G

Monitors – ECG, NIBP, SPO2,

STUDY OUTCOME MEASURES:

1. Duration of post operative analgesia
(Post operative Visual Analogue Scale pain score)
- 2.Time to reach the discharge criteria
(Modified post- anaesthetic discharge scoring.)
3. Intra operative and post operativehaemodynamics

4. Total rescue analgesic consumption

METHODOLOGY OF STUDY

This study was done at the Institute of Anaesthesiology and critical care, Madras Medical College between April to September 2017. The aim of this study is to Compare the safety and efficacy of Unilateral paravertebral block with Subarachnoid block for Inguinal hernia repair

Patients were excluded if they had a history of sensitivity to local anesthetic, bleeding disorders or receiving anticoagulant, spine or chest wall deformity or pregnancy. Before surgery patients were randomly allocated according to the computer generated sequence into two equal groups. Group P (PVB = 30 patients) received ipsilateral Paravertebral block from T10 to L2 with 5ml of bupivacaine (0.5%) with 1: 400,000 epinephrine at each segment. while the group S (SAB=30 patients) received Sub arachnoid block with 12.5ml of hyperbaric bupivacaine (0.5%). PVB was performed with the patient in sitting position from T10 to L2 thoracic vertebra under complete aseptic precaution with low resistant technique with saline using an 25- G Quincke needle seeking contact with the transverse process of the thoracic vertebra then sliding the needle caudally for 1–1.5 cm into the paravertebral space and 5 ml of

bupivacaine 0.5% with 1:400,000 epinephrine at each segment was injected. SAB block was performed while the patient in sitting position infiltration of the skin at puncture site with 2 ml of xylocaine 2%, 25-G Quincke the needle was inserted in L3 L4 space injected 12.5mg (2.5ml) of hyperbaric bupivacaine (0.5%) in subarachnoid space. Hypotension was defined as a decrease of more than 20% of the base line MBP and was treated with increments of 6 mg bolus doses of ephedrine iv and 250 ml fluid bolus. Intra operative haemodynamics was monitored. After the surgery patients was shifted to ward . VAS Score and Modified post anesthesia discharge scoring observed. Postoperative analgesia was provided with tramadol. Pain intensity was measured using VAS pain score. Nausea lasting more than 10 min or vomiting was treated with ondansetron 4 mg. Complications related to local anesthetic drug and PVB technique like pneumothorax or epidural spread of local anesthetic as evidenced by test for sensory deficit on contralateral side were also recorded. Chest X-ray was requested for any patient in PVB group if had any difficulty of breath, desaturated or had diminished air entry at any time after the block. Primary outcome was the time to first analgesia in minutes to first registration of VAS pain score >6. Secondary outcome measures were mean VAS scores, intra and post operative hemodynamic variables and postoperative nausea and vomiting (PONV).

OBSERVATION RESULTS and ANALYSIS

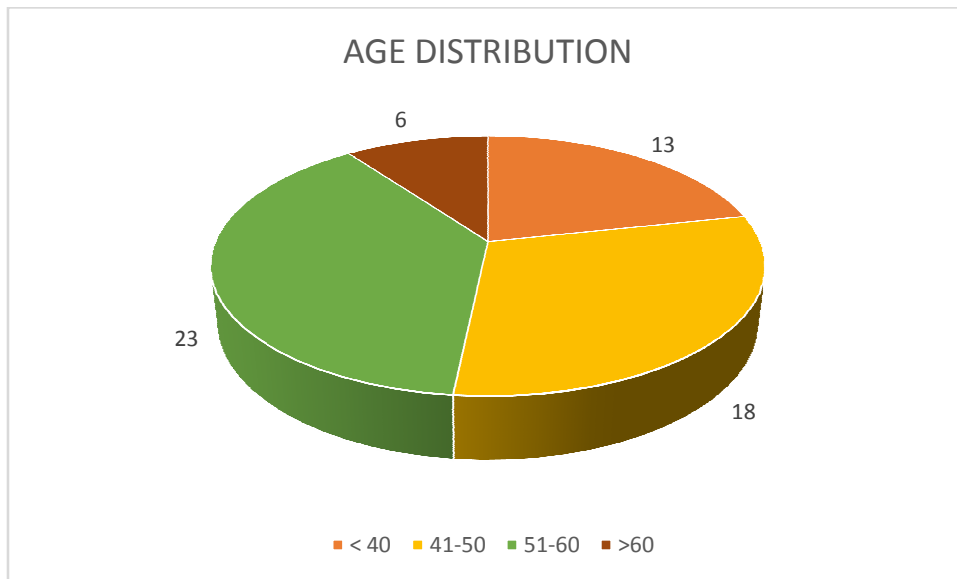
DATA ANALYSIS

Descriptive statistics was done for all data and were reported in terms of mean values and percentages. Suitable statistical tests of comparison were done. Continuous variables were analysed with the unpaired t test.. Categorical variables were analysed with the Chi-Square Test and Fisher Exact Test. Statistical significance was taken as $P < 0.05$.

RESULTS

AGE DISTRIBUTION

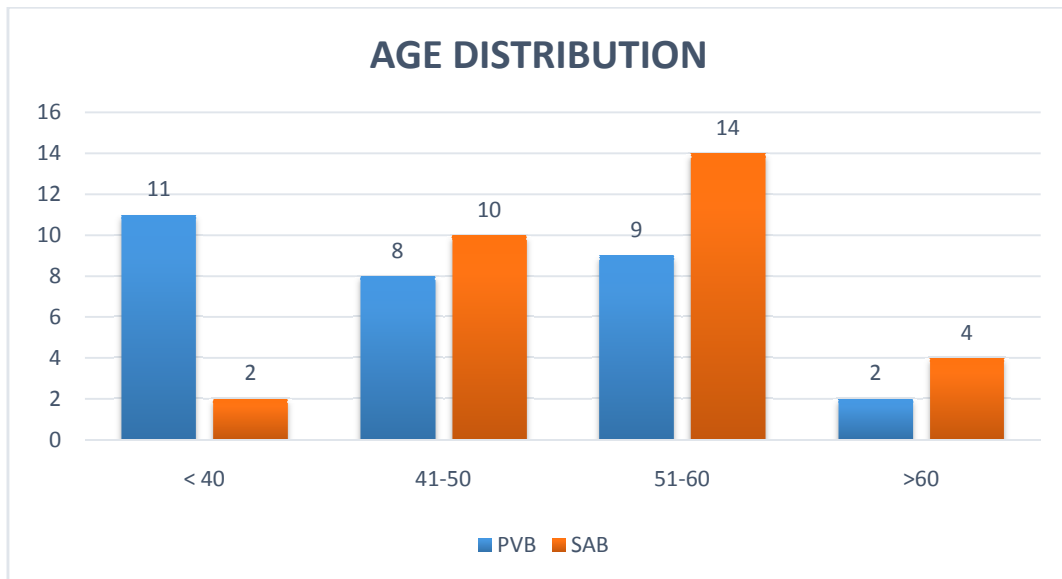
AGE (IN YEARS)	NO OF PATIENTS	PERCENTAGE
< 40	13	21.70%
41-50	18	30%
51-60	23	38.30%
>60	6	10%



Range :32- 65 years

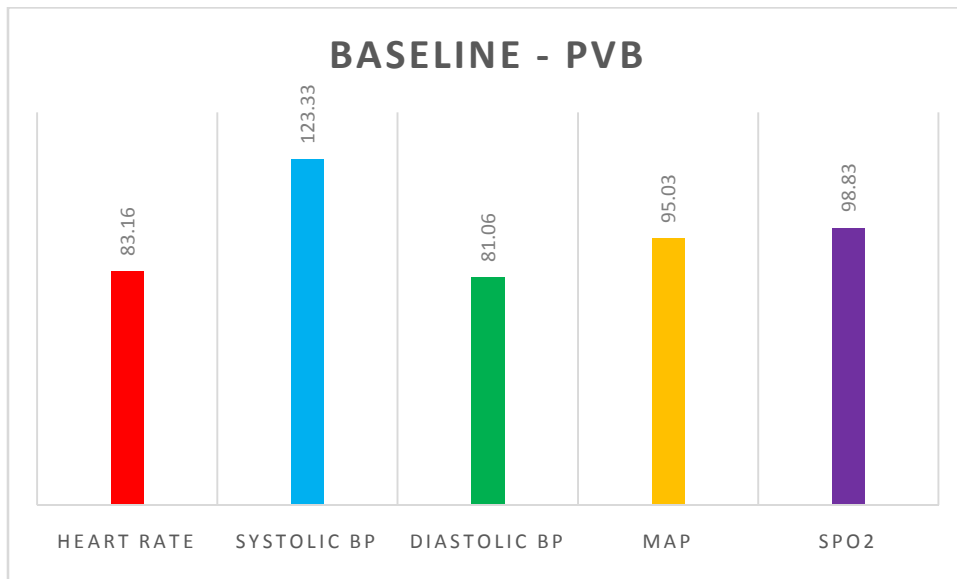
Mean age - 49.5 years

AGE (IN YEARS)	PVB	SAB
< 40	11	2
41-50	8	10
51-60	9	14
>60	2	4

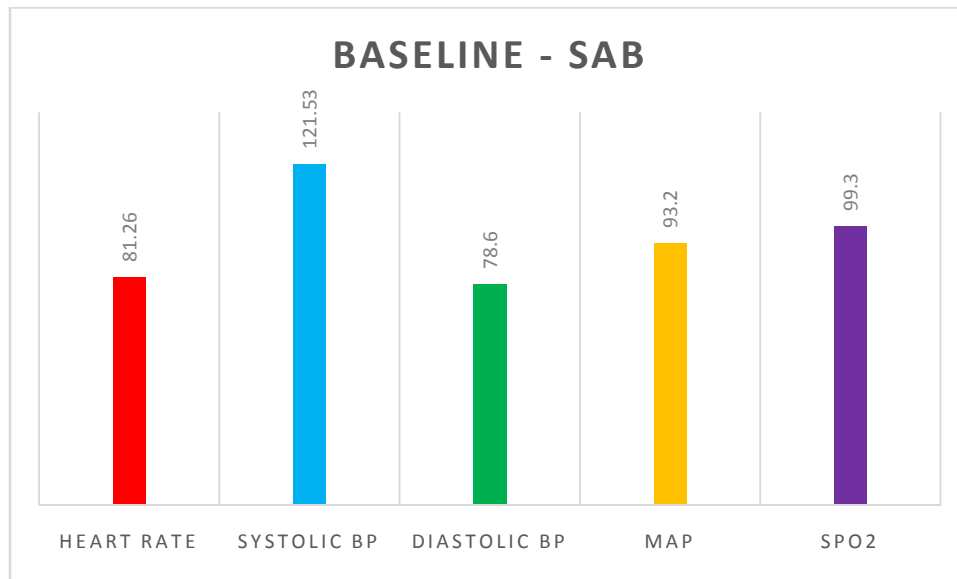


Patients less than forty years most commonly underwent paravertebral block while above 40 commonly underwent subarachnoid block.

BASELINE - PARAVERTEBRAL BLOCK		
PARAMETERS	MEAN	SD
HEART RATE	83.16	9.46
SYSTOLIC BP	123.33	11.36
DIASTOLIC BP	81.06	10.52
MAP	95.03	8.23
SPO2	98.83	0.74

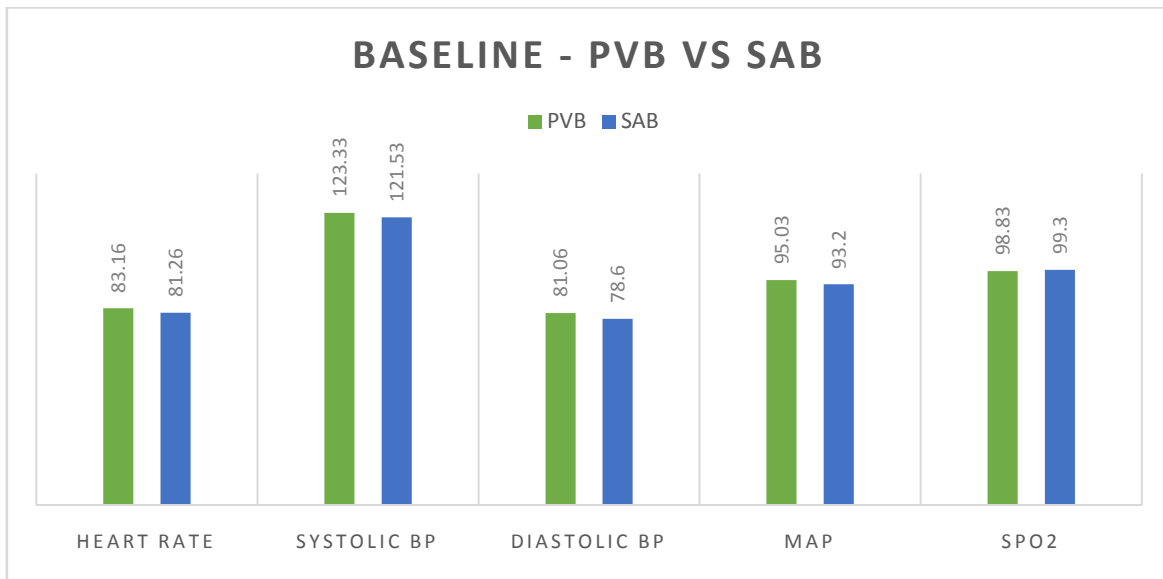


BASELINE - SUB ARACHNOID BLOCK		
PARAMETERS	MEAN	SD
HEART RATE	81.26	10.8
SYSTOLIC BP	121.53	11.79
DIASTOLIC BP	78.6	7.39
MAP	93.2	7.71
SPO2	99.3	0.5

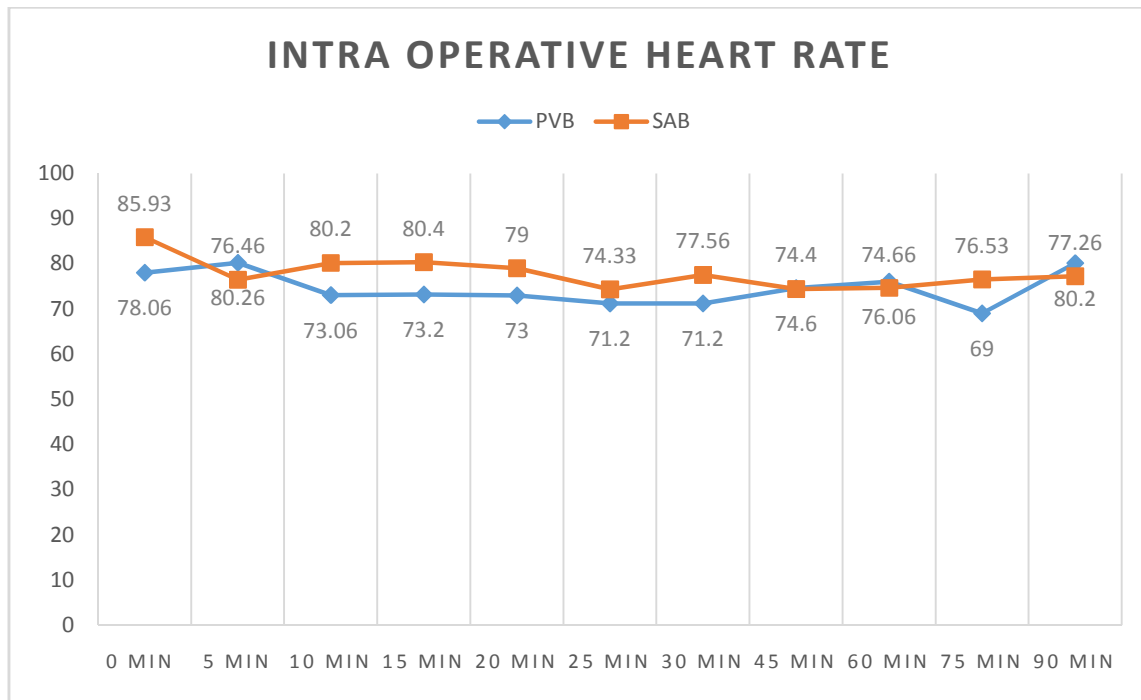


BASELINE - MEAN COMPARISON			
PARAMETERS	PVB	SAB	P VALUE
HEART RATE	83.16	81.26	0.472
SYSTOLIC BP	123.33	121.53	0.55
DIASTOLIC BP	81.06	78.6	0.298
MAP	95.03	93.2	0.379
SPO2	98.83	99.3	0.007

There not significant difference in baseline value between both groups except for SPO2 .



INTRA OPERATIVE - MEAN COMPARISON			
HEART RATE	PVB	SAB	P VALUE
0 MIN	78.06	85.93	0.001
5 MIN	80.26	76.46	0.063
10 MIN	73.06	80.2	0.001
15 MIN	73.2	80.4	0.004
20 MIN	73	79	0.002
25 MIN	71.2	74.33	0.143
30 MIN	71.2	77.56	0.004
45 MIN	74.6	74.4	0.926
60 MIN	76.06	74.66	0.541
75 MIN	69	76.53	0.011
90 MIN	80.2	77.26	0.195

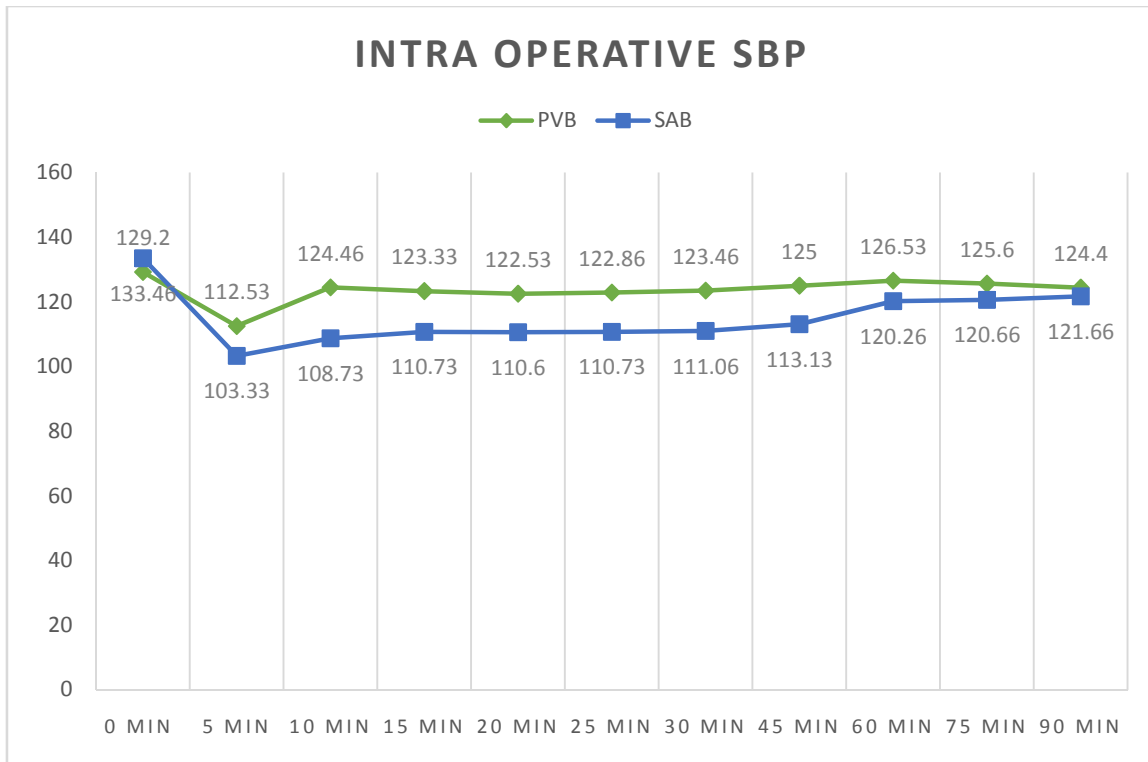


Intra operative Heart rate there is difference in two blocks where heart rate is comparatively much higher in SAB compared to that of PVB. This difference was analysed using unpaired t test and was statistically significant at various time period here atleast in first 30 minutes.

SYSTOLIC BLOOD PRESSURE

INTRA OPERATIVE - MEAN COMPARISON			
SYSTOLIC BP	PVB	SAB	P VALUE
0 MIN	129.2	133.46	0.101
5 MIN	112.53	103.33	0.001
10 MIN	124.46	108.73	0.001
15 MIN	123.33	110.73	0.001

20 MIN	122.53	110.6	0.001
25 MIN	122.86	110.73	0.001
30 MIN	123.46	111.06	0.001
45 MIN	125	113.13	0.001
60 MIN	126.53	120.26	0.001
75 MIN	125.6	120.66	0.001
90 MIN	124.4	121.66	0.033

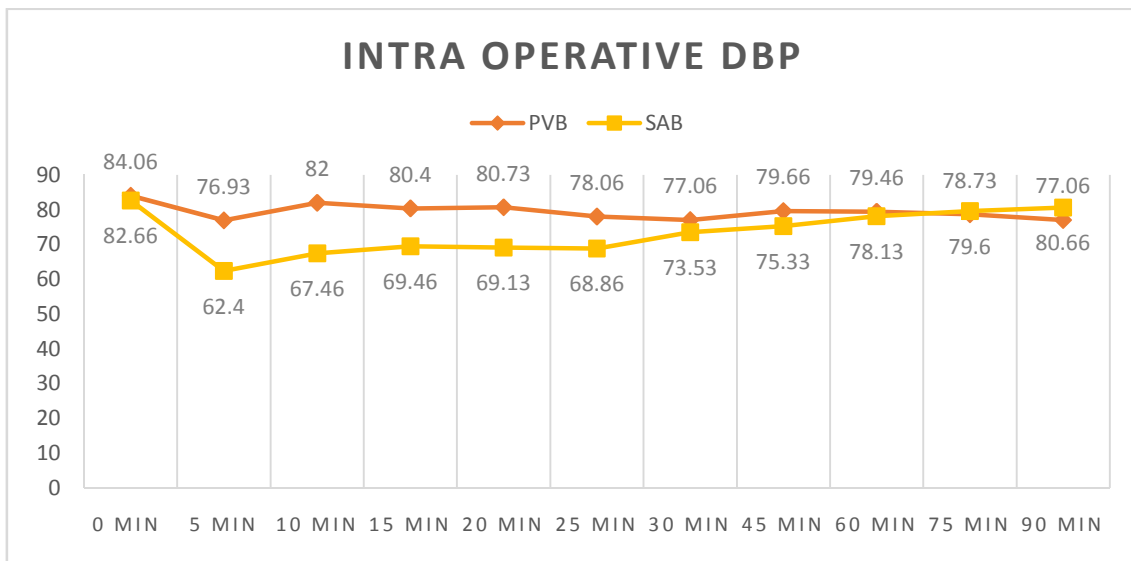


Intra operative systolic BP there is difference in two blocks where SBP is comparatively lower in SAB compared to that of PVB. This difference was analysed using unpaired t test and was statistically significant at various time period except at the start (0 min) .

DIASTOLIC BP

INTRA OPERATIVE - MEAN COMPARISON			
DIASTOLIC BP	PVB	SAB	P VALUE
0 MIN	84.06	82.66	0.483
5 MIN	76.93	62.4	0.001
10 MIN	82	67.46	0.001
15 MIN	80.4	69.46	0.001
20 MIN	80.73	69.13	0.001
25 MIN	78.06	68.86	0.001
30 MIN	77.06	73.53	0.008
45 MIN	79.66	75.33	0.003
60 MIN	79.46	78.13	0.333
75 MIN	78.73	79.6	0.466
90 MIN	77.06	80.66	0.003

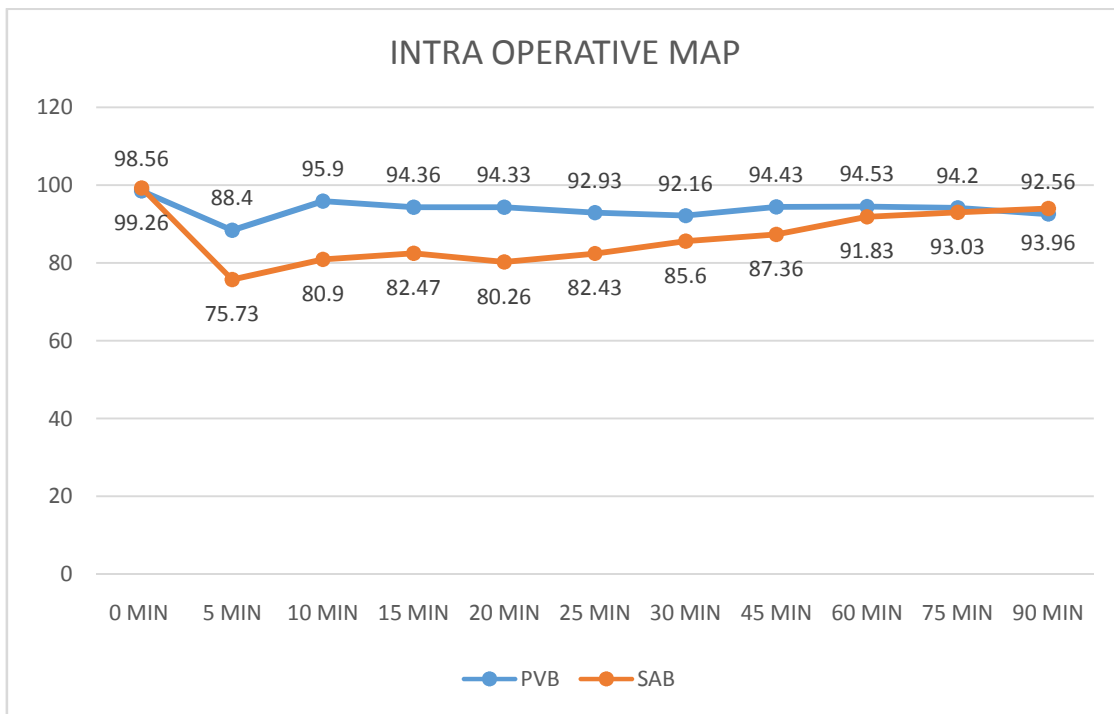
Intra operative diastolic blood pressure there is difference in two blocks where DBP is comparatively lower in SAB compared to that of PVB. This difference was analysed using unpaired t test and was statistically significant at various time period except at 0 and 60 min.



MEAN ARTERIAL PRESSURE

INTRA OPERATIVE - MEAN COMPARISON			
MAP	PVB	SAB	P VALUE
0 MIN	98.56	99.26	0.692
5 MIN	88.4	75.73	0.001
10 MIN	95.9	80.9	0.001
15 MIN	94.36	82.47	0.001
20 MIN	94.33	80.26	0.001
25 MIN	92.93	82.43	0.001

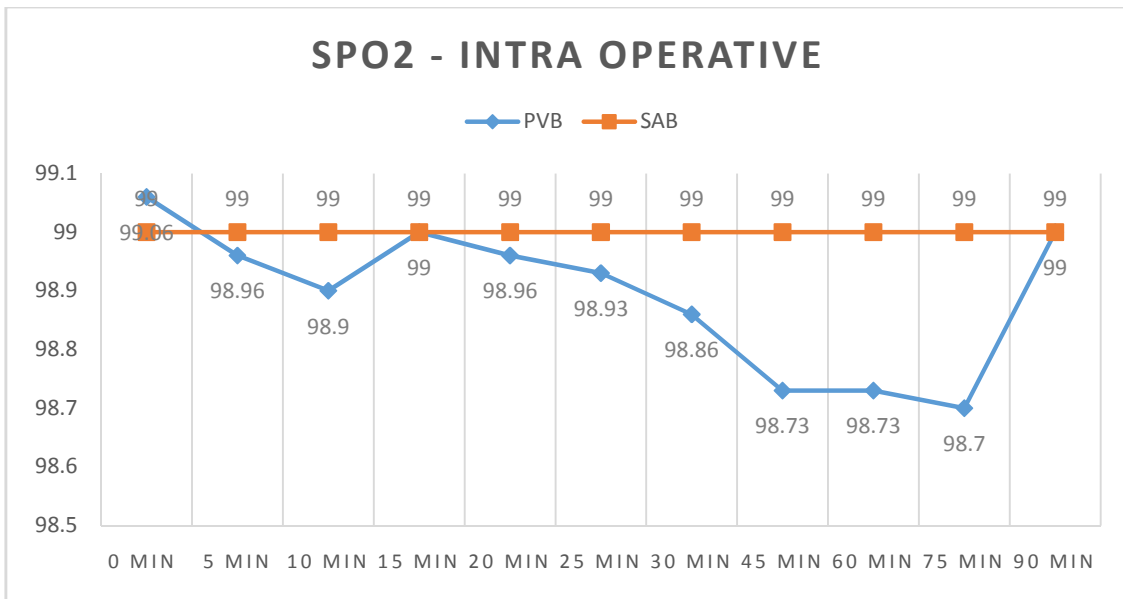
30 MIN	92.16	85.6	0.001
45 MIN	94.43	87.36	0.001
60 MIN	94.53	91.83	0.012
75 MIN	94.2	93.03	0.248
90 MIN	92.56	93.96	0.154



Intra operative mean arterial pressure there is difference in two blocks where MAP is comparatively lower in SAB compared to that of PVB. This difference was analysed using unpaired t test and was statistically significant at various time period except at later stages after 60 minutes.

SP02

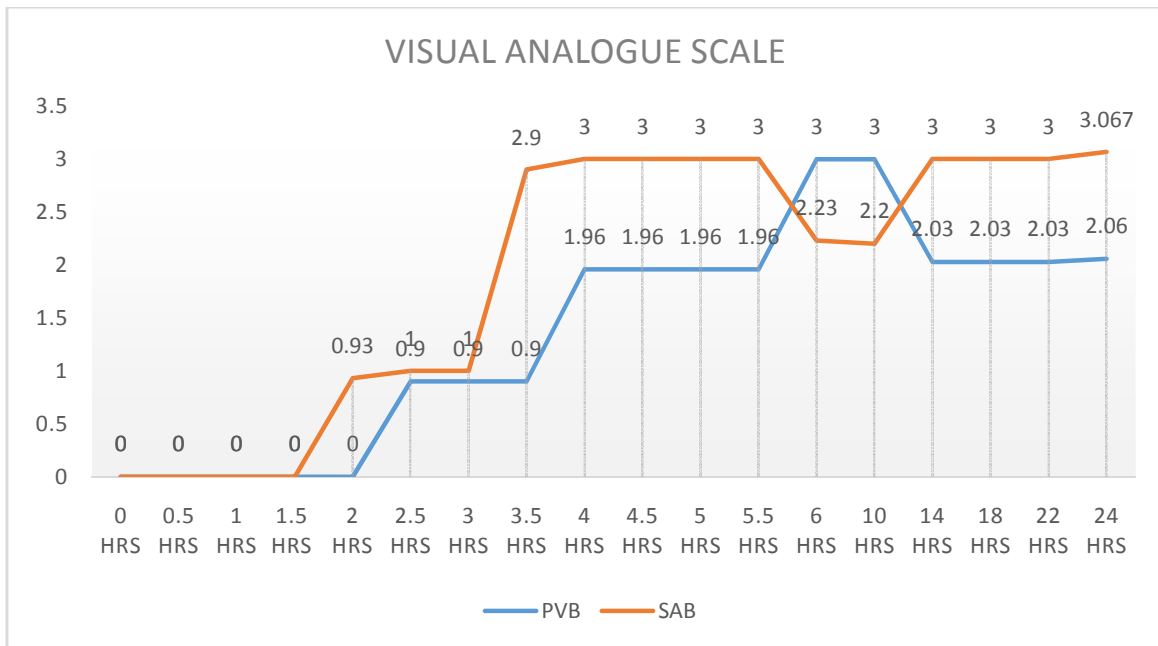
INTRA OPERATIVE - MEAN COMPARISON			
SPO2	PVB	SAB	P VALUE
0 MIN	99.06	99	0.534
5 MIN	98.96	99	0.661
10 MIN	98.9	99	0.179
15 MIN	99	99	1
20 MIN	98.96	99	0.661
25 MIN	98.93	99	0.42
30 MIN	98.86	99	0.039
45 MIN	98.73	99	0.002
60 MIN	98.73	99	0.002
75 MIN	98.7	99	0.001
90 MIN	99	99	1



There is not much difference in Spo2n of two groups intraoperatively except at later stages which is also not a massive difference to consider it as an impact.

VISUAL ANALOGUE SCALE

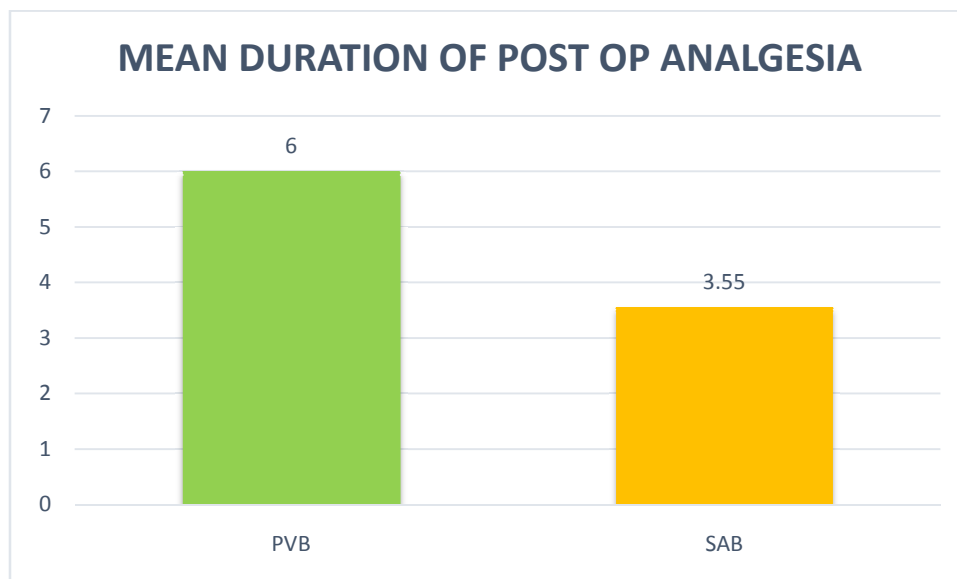
VISUAL ANALOGUE SCALE			
TIMELINE	PVB	SAB	P VALUE
0 HRS	0	0	NIL
0.5 HRS	0	0	NIL
1 HRS	0	0	NIL
1.5 HRS	0	0	NIL
2 HRS	0	0.93	0.001
2.5 HRS	0.9	1	0.078
3 HRS	0.9	1	0.001
3.5 HRS	0.9	2.9	0.001
4 HRS	1.96	3	0.001
4.5 HRS	1.96	3	0.001
5 HRS	1.96	3	0.001
5.5 HRS	1.96	3	0.001
6 HRS	3	2.23	0.001
10 HRS	3	2.2	0.001
14 HRS	2.03	3	0.001
18 HRS	2.03	3	0.001
22 HRS	2.03	3	0.001
24 HRS	2.06	3.067	0.001



In Visual analogue scale ,paravertebral block has an reduced range over a time period which is also statistically significant.

DURATION OF POST OP ANALGESIA

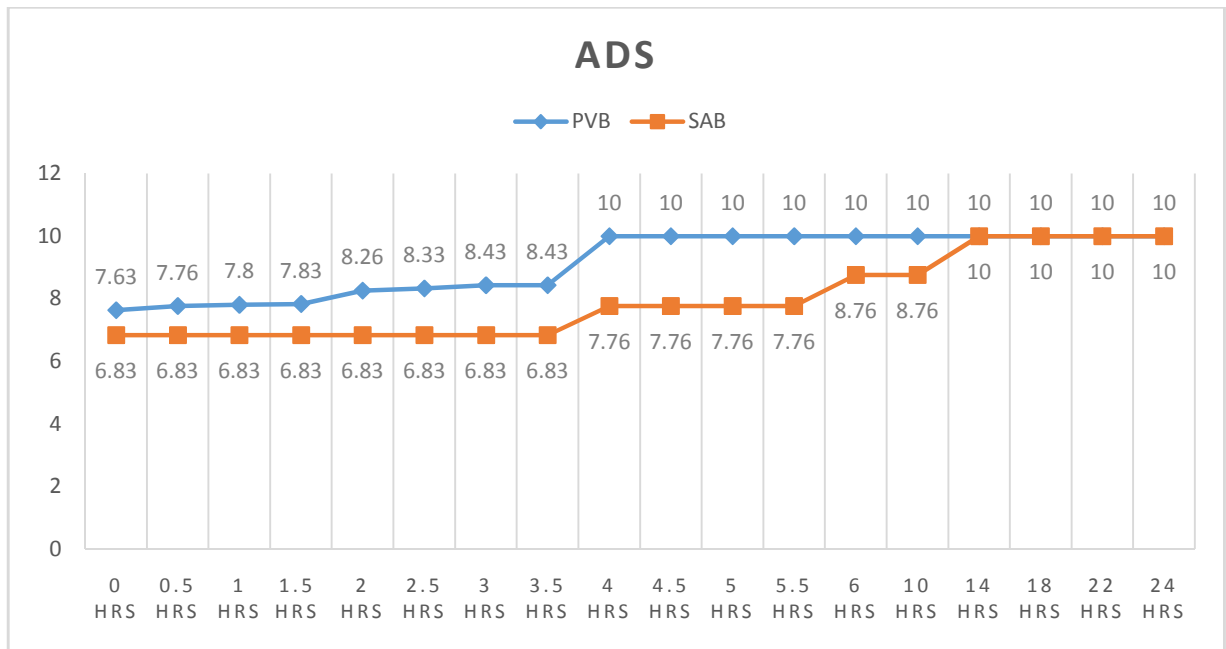
DURATION OF POST OP ANALGESIA		
TYPE OF BLOCK	MEAN	SD
PVB	6	0
SAB	3.55	0.15
P VALUE - 0.001		
UNPAIRED T TEST		
SIGNIFICANT		



Mean duration required for post op analgesia is much higher in paravertebral block compared to that of sub arachnoid block which show analgesia is sustained for longer period in paravertebral and this is also statistically significant with an P value of 0.001.

ANAESTHETIC DISCHARGE SCORING

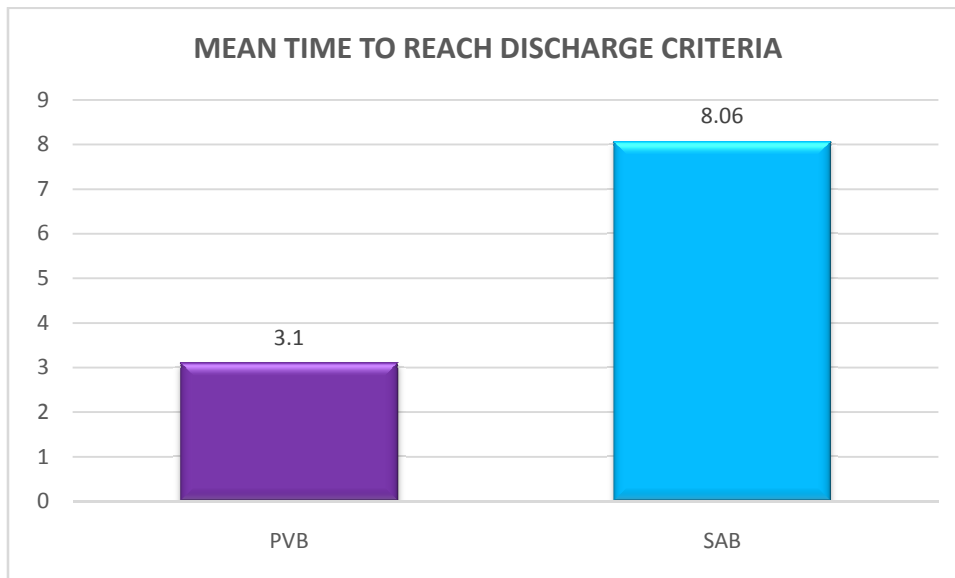
TIMELINE	PVB	SAB	P VALUE
0 HRS	7.63	6.83	0.001
0.5 HRS	7.76	6.83	0.001
1 HRS	7.8	6.83	0.001
1.5 HRS	7.83	6.83	0.001
2 HRS	8.26	6.83	0.001
2.5 HRS	8.33	6.83	0.001
3 HRS	8.43	6.83	0.001
3.5 HRS	8.43	6.83	0.001
4 HRS	10	7.76	0.001
4.5 HRS	10	7.76	0.001
5 HRS	10	7.76	0.001
5.5 HRS	10	7.76	0.001
6 HRS	10	8.76	0.001
10 HRS	10	8.76	0.001
14 HRS	10	10	NIL
18 HRS	10	10	NIL
22 HRS	10	10	NIL
24 HRS	10	10	NIL



In anaesthetic discharge scoring, paravertebral block has an higher criteria over a time period which is also statistically significant all over during surgery which proves an better availability for the patient under paravertebral block.

TIME TO REACH DISCHARGE CRITERIA

TYPE OF BLOCK	MEAN	SD
PVB	3.1	0.95
SAB	8.06	3.65
P VALUE - 0.001		
UNPAIRED T TEST		
SIGNIFICANT		



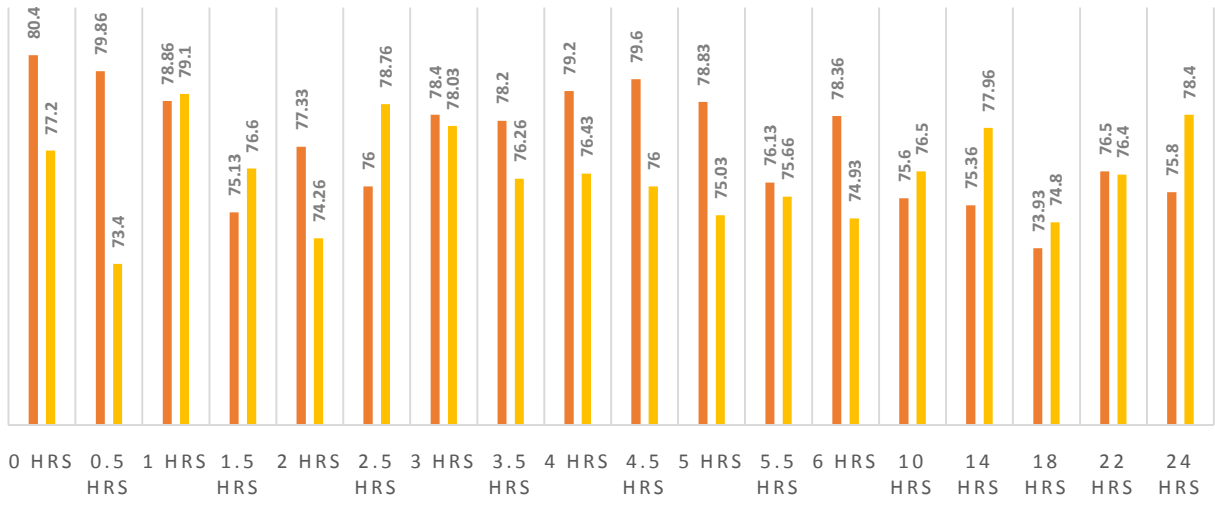
Mean time to reach discharge criteria is much lower in paravertebral block compared to that of sub arachnoid block which show patients recover quick from anaesthesia in paravertebral and this is also statistically significant with an P value of 0.001.

POST OP - MEAN COMPARISON			
HEART RATE	PVB	SAB	P VALUE
0 HRS	80.4	77.2	0.138
0.5 HRS	79.86	73.4	0.003
1 HRS	78.86	79.1	0.917
1.5 HRS	75.13	76.6	0.458
2 HRS	77.33	74.26	0.155
2.5 HRS	76	78.76	0.201
3 HRS	78.4	78.03	0.86
3.5 HRS	78.2	76.26	0.383
4 HRS	79.2	76.43	0.202
4.5 HRS	79.6	76	0.132
5 HRS	78.83	75.03	0.101
5.5 HRS	76.13	75.66	0.829
6 HRS	78.36	74.93	0.111
10 HRS	75.6	76.5	0.701
14 HRS	75.36	77.96	0.259
18 HRS	73.93	74.8	0.673
22 HRS	76.5	76.4	0.96
24 HRS	75.8	78.4	0.247

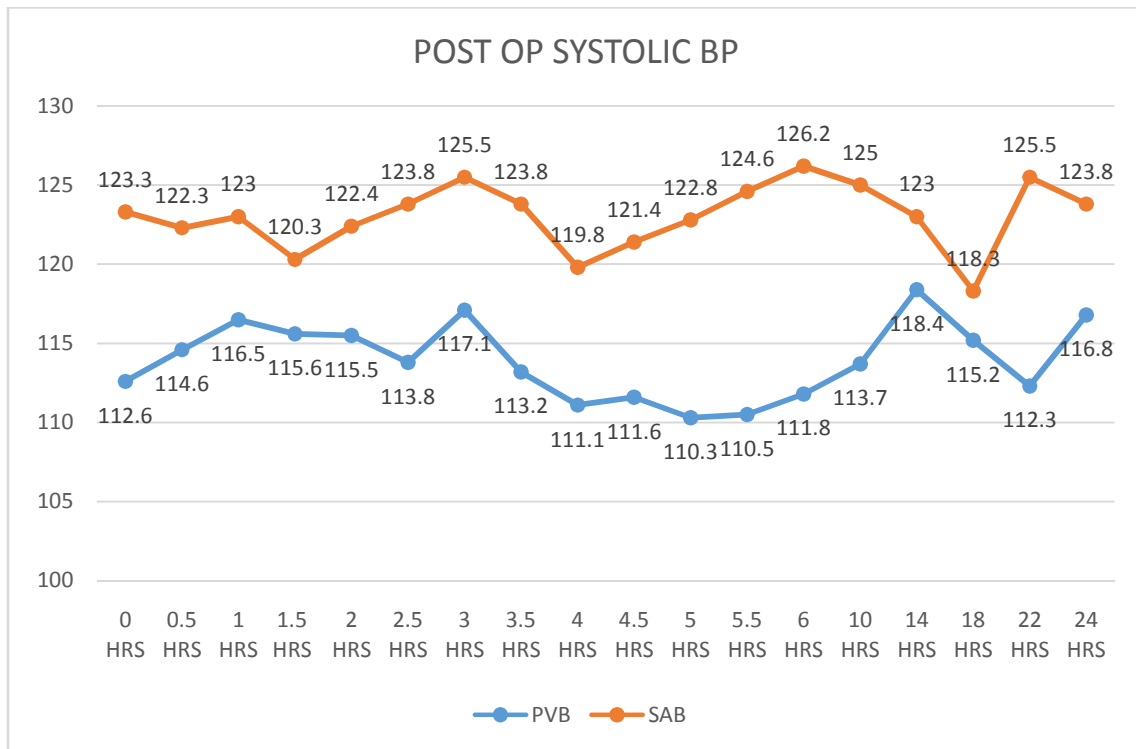
There is no statistically significant difference in heart rate post operatively between both groups.

POST OP HEART RATE

■ PVB ■ SAB



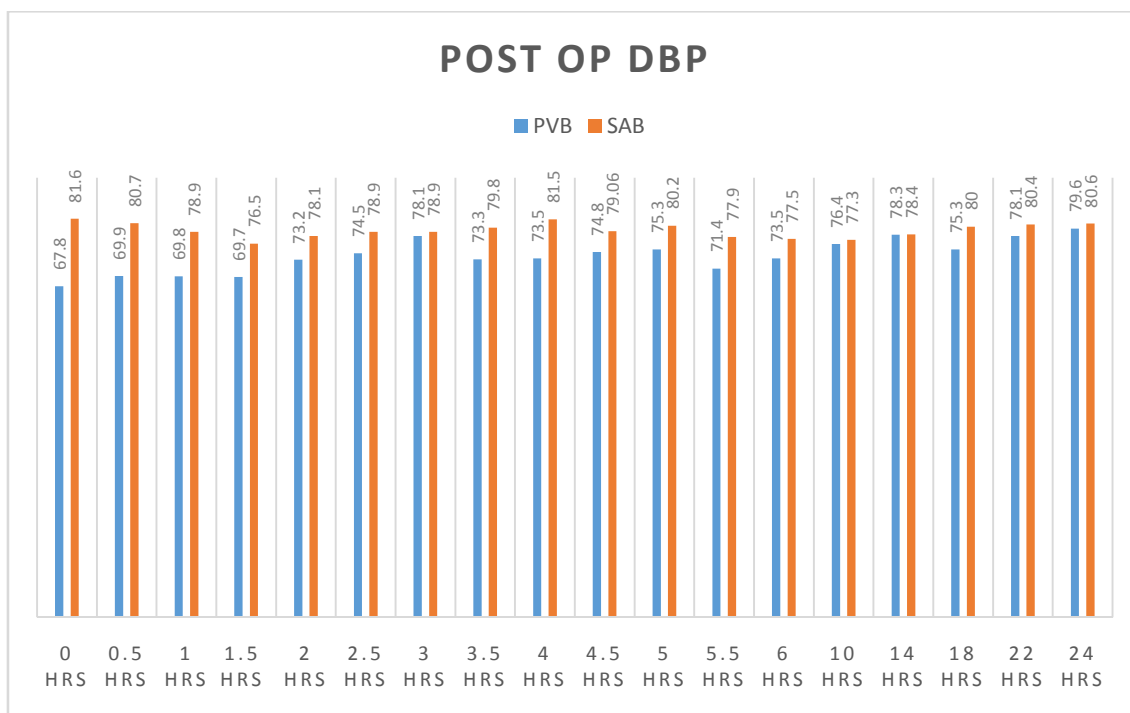
POST OP - MEAN COMPARISON			
SYSTOLIC BP	PVB	SAB	P VALUE
0 HRS	112.6	123.3	0.001
0.5 HRS	114.6	122.3	0.001
1 HRS	116.5	123	0.001
1.5 HRS	115.6	120.3	0.043
2 HRS	115.5	122.4	0.001
2.5 HRS	113.8	123.8	0.001
3 HRS	117.1	125.5	0.001
3.5 HRS	113.2	123.8	0.001
4 HRS	111.1	119.8	0.001
4.5 HRS	111.6	121.4	0.001
5 HRS	110.3	122.8	0.001
5.5 HRS	110.5	124.6	0.001
6 HRS	111.8	126.2	0.001
10 HRS	113.7	125	0.001
14 HRS	118.4	123	0.012
18 HRS	115.2	118.3	0.17
22 HRS	112.3	125.5	0.001
24 HRS	116.8	123.8	0.001



There is statistically significant difference in systolic BP post operatively between both groups almost upto 24 hrs post-surgery.

POST OP - MEAN COMPARISON			
DIASTOLIC BP	PVB	SAB	P VALUE
0 HRS	67.8	81.6	0.001
0.5 HRS	69.9	80.7	0.001
1 HRS	69.8	78.9	0.001
1.5 HRS	69.7	76.5	0.001
2 HRS	73.2	78.1	0.001
2.5 HRS	74.5	78.9	0.007

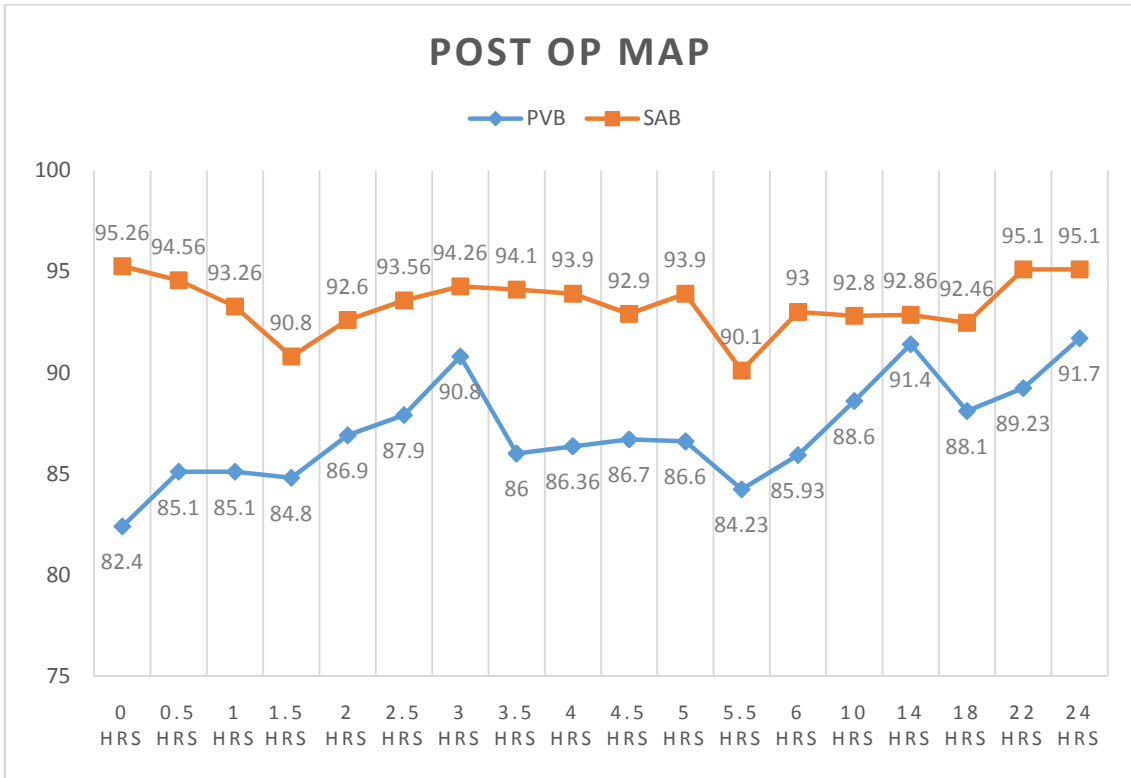
3 HRS	78.1	78.9	0.477
3.5 HRS	73.3	79.8	0.001
4 HRS	73.5	81.5	0.001
4.5 HRS	74.8	79.06	0.008
5 HRS	75.3	80.2	0.002
5.5 HRS	71.4	77.9	0.003
6 HRS	73.5	77.5	0.041
10 HRS	76.4	77.3	0.637
14 HRS	78.3	78.4	0.963
18 HRS	75.3	80	0.001
22 HRS	78.1	80.4	0.083
24 HRS	79.6	80.6	0.421



There is statistically significant difference in diastolic BP post operatively

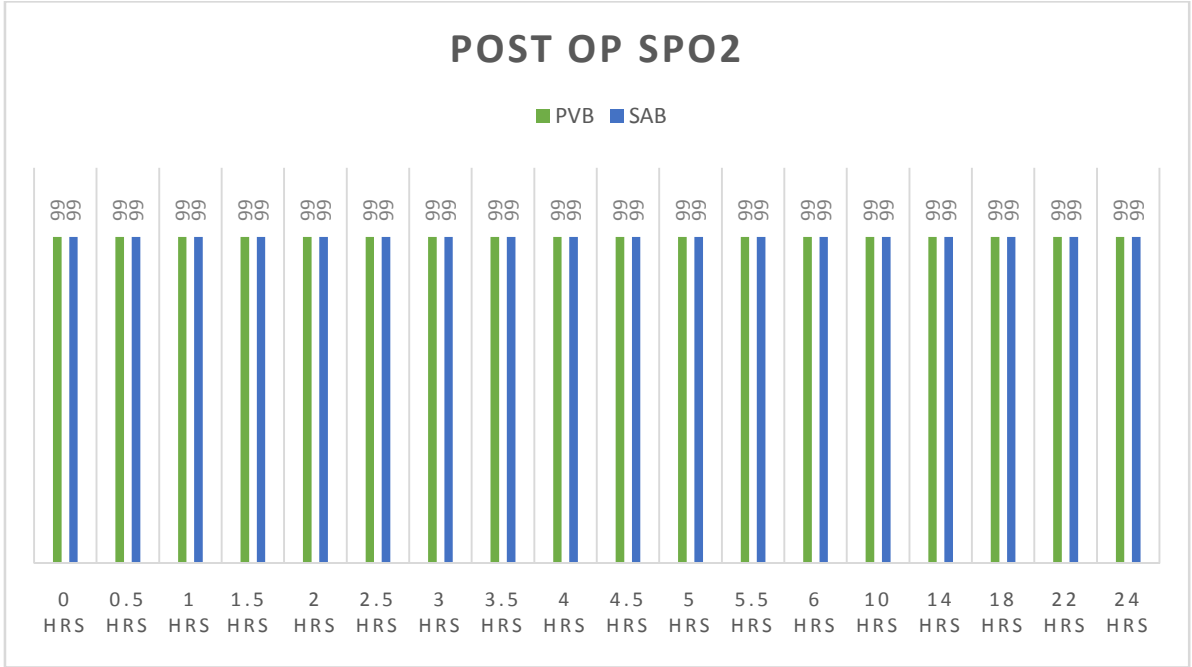
between both groups almost up to 6 hours post-surgery. Where there is no significant difference between groups post 6 hours

POST OP - MEAN COMPARISON			
MAP	PVB	SAB	P VALUE
0 HRS	82.4	95.26	0.001
0.5 HRS	85.1	94.56	0.001
1 HRS	85.1	93.26	0.001
1.5 HRS	84.8	90.8	0.001
2 HRS	86.9	92.6	0.001
2.5 HRS	87.9	93.56	0.001
3 HRS	90.8	94.26	0.001
3.5 HRS	86	94.1	0.001
4 HRS	86.36	93.9	0.001
4.5 HRS	86.7	92.9	0.001
5 HRS	86.6	93.9	0.001
5.5 HRS	84.23	90.1	0.059
6 HRS	85.93	93	0.001
10 HRS	88.6	92.8	0.005
14 HRS	91.4	92.86	0.256
18 HRS	88.1	92.46	0.001
22 HRS	89.23	95.1	0.001
24 HRS	91.7	95.1	0.001



There is statistically significant difference in mean arterial pressure post operatively between both groups almost upto 24 hrs post-surgery except during 14 hrs where the difference was much less.

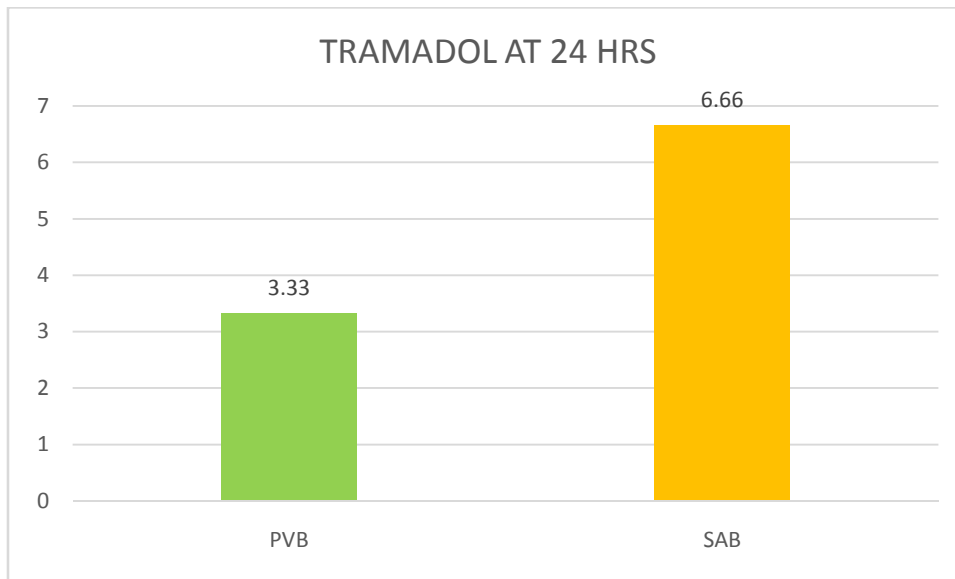
POST OP - MEAN COMPARISON			
SPO2	PVB	SAB	P VALUE
0 HRS	99	99	NIL
0.5 HRS	99	99	NIL
1 HRS	99	99	NIL
1.5 HRS	99	99	NIL
2 HRS	99	99	NIL
2.5 HRS	99	99	NIL
3 HRS	99	99	NIL
3.5 HRS	99	99	NIL
4 HRS	99	99	NIL
4.5 HRS	99	99	NIL
5 HRS	99	99	NIL
5.5 HRS	99	99	NIL
6 HRS	99	99	NIL
10 HRS	99	99	NIL
14 HRS	99	99	NIL
18 HRS	99	99	NIL
22 HRS	99	99	NIL
24 HRS	99	99	NIL



There is no statistically significant difference in SpO₂ post operatively between both groups as it has been maintained same in both groups throughout post-operative period at 99%.

TRAMADOL REQUIREMENT

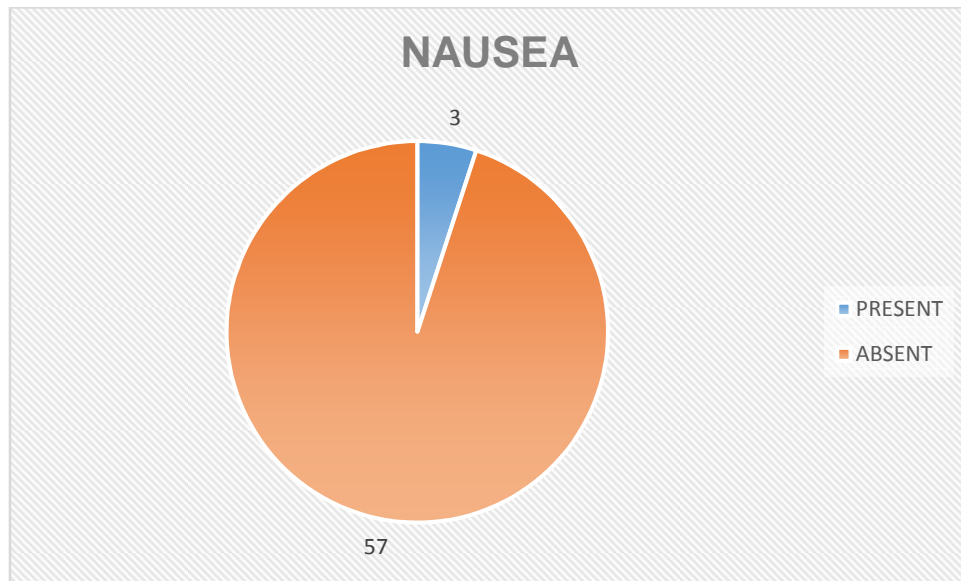
TIMELINE	PVB	SAB	P VALUE
0 HRS	0	0	NIL
0.5 HRS	0	0	NIL
1 HRS	0	0	NIL
1.5 HRS	0	0	NIL
2 HRS	0	0	NIL
2.5 HRS	0	0	NIL
3 HRS	0	0	NIL
3.5 HRS	0	0	NIL
4 HRS	0	0	NIL
4.5 HRS	0	0	NIL
5 HRS	0	0	NIL
5.5 HRS	0	0	NIL
6 HRS	0	0	NIL
10 HRS	0	0	NIL
14 HRS	0	0	NIL
18 HRS	0	0	NIL
22 HRS	0	0	NIL
24 HRS	3.33	6.66	0.561



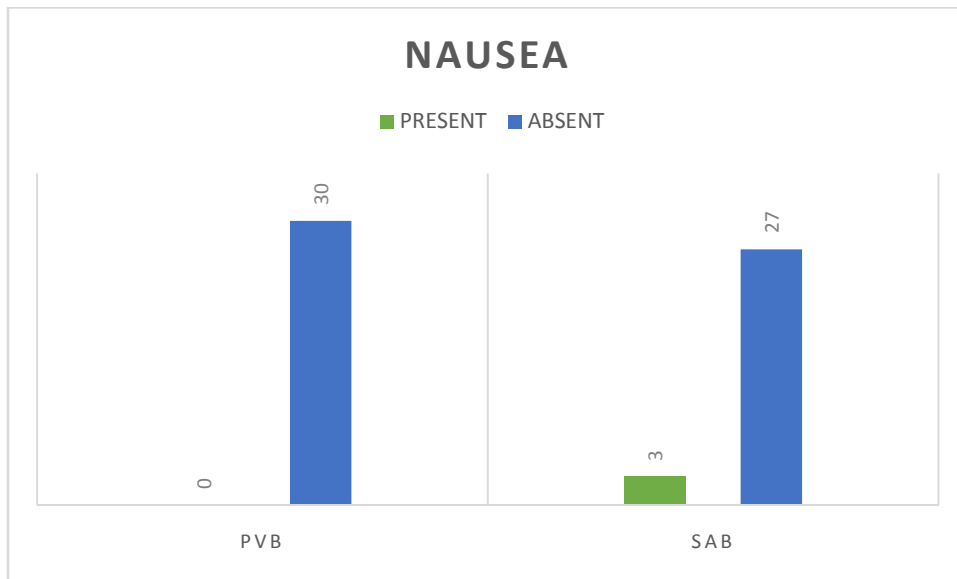
Tramadol was required only after 24 hours in both type of blocks .while we compared the total rescue analgesic in two groups, it was much lesser in paravertebral block though it was not statistically significant with P value of 0.561.

ADVERSE EFFECTS

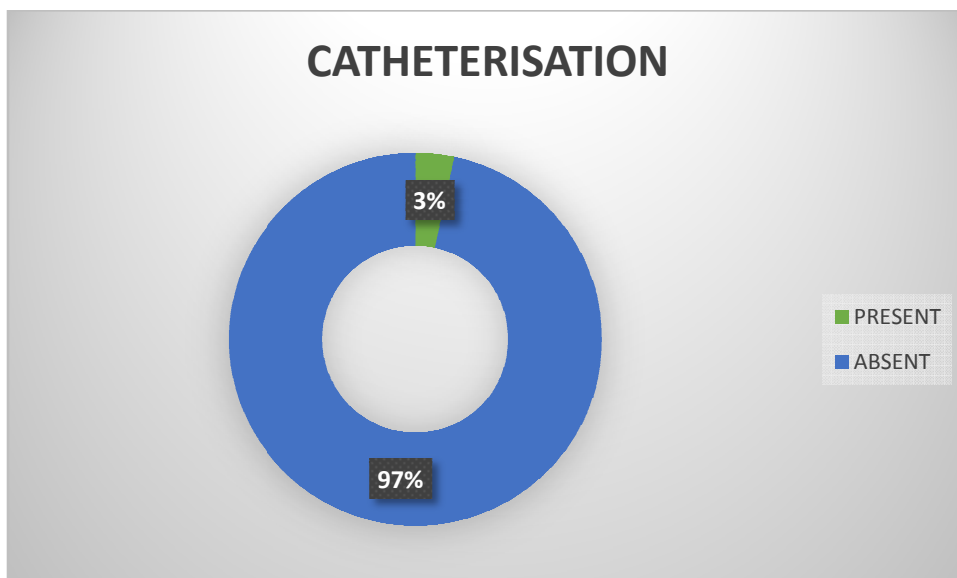
NAUSEA	NO OF PATIENTS	PERCENTAGE
PRESENT	3	5%
ABSENT	57	95%



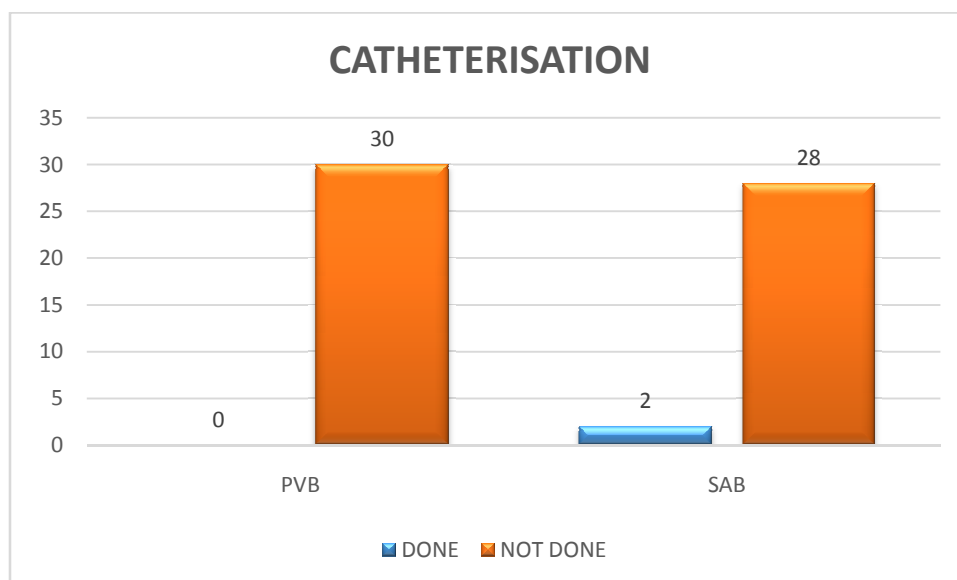
NAUSEA	TYPE OF BLOCK	
	PVB	SAB
PRESENT	0	3
ABSENT	30	27
P VALUE - 0.076		
CHI SQUARE TEST		
NON SIGNIFICANT		



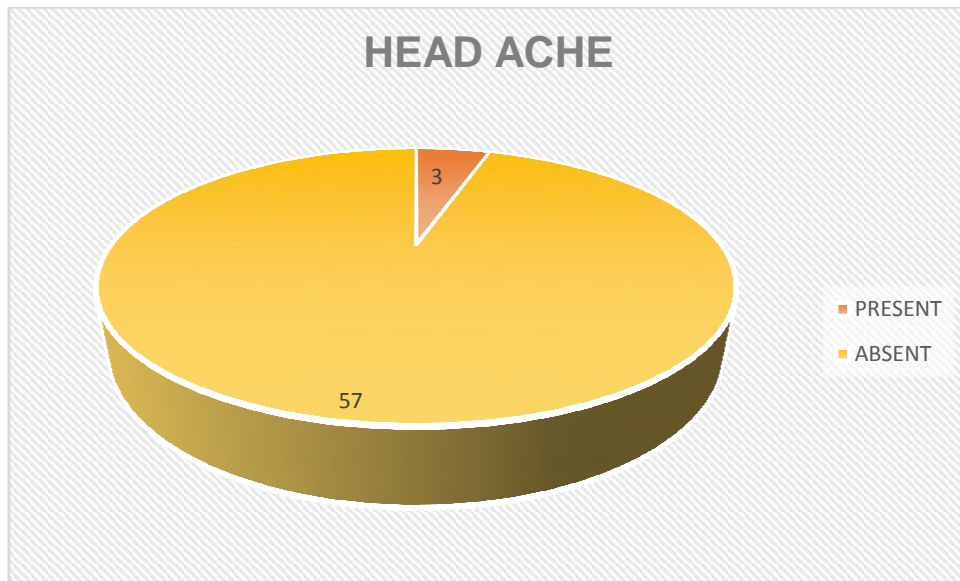
CATHETERISATION	NO OF PATIENTS	PERCENTAGE
PRESENT	2	3%
ABSENT	58	97%



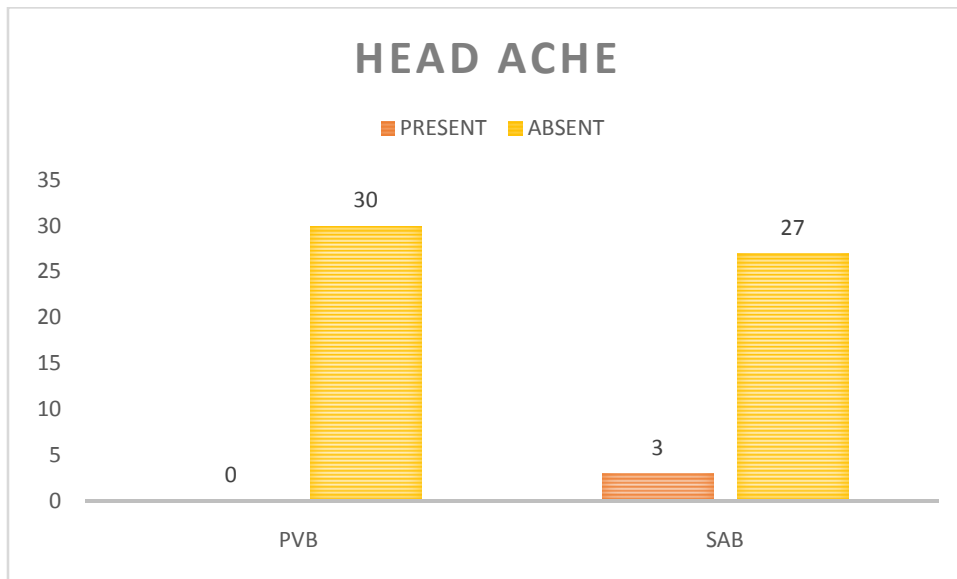
	TYPE OF BLOCK	
CATHETERISATION	PVB	SAB
DONE	0	2
NOT DONE	30	28
P VALUE - 0.150		
CHI SQUARE TEST		
NON SIGNIFICANT		



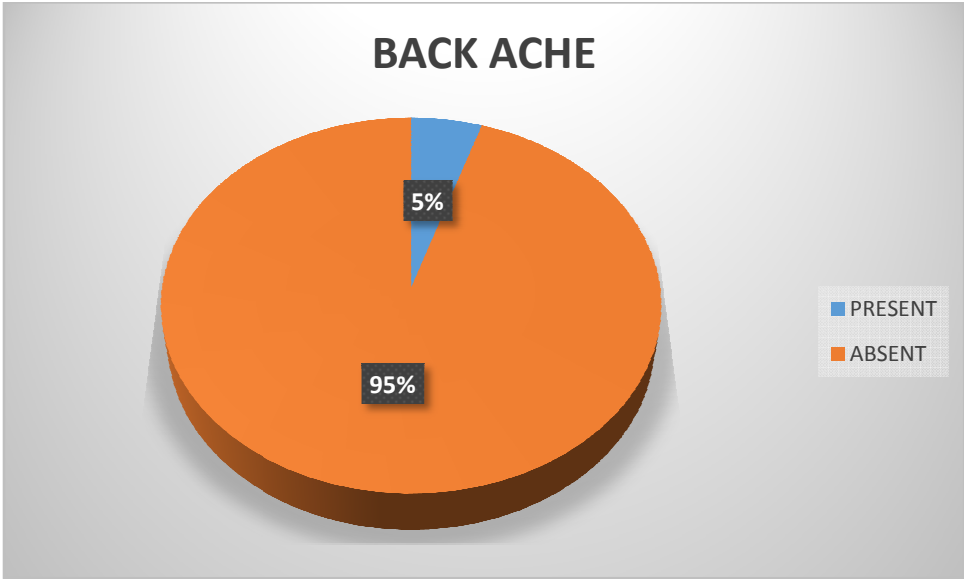
HEAD ACHE	NO OF PATIENTS	PERCENTAGE
PRESENT	3	5%
ABSENT	57	95%



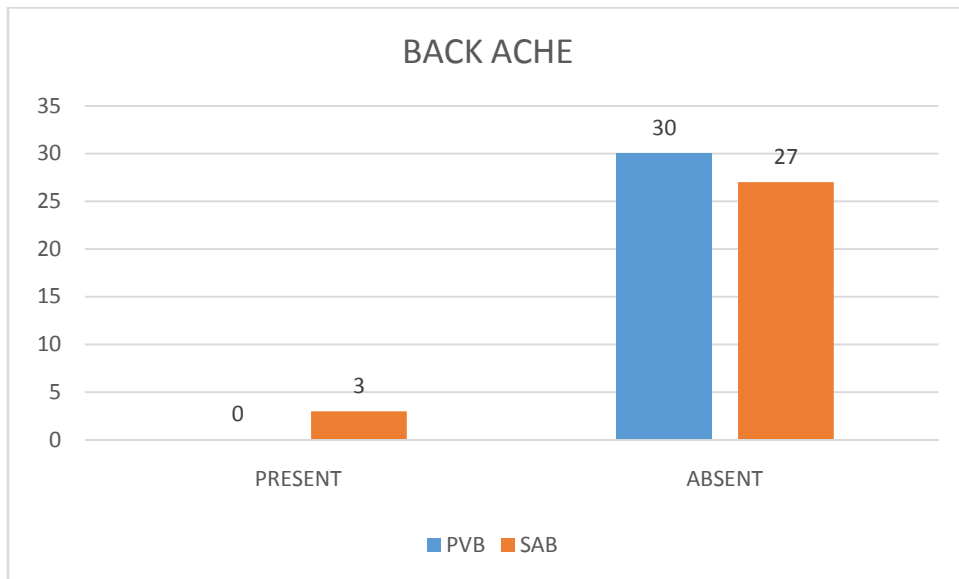
HEAD ACHE	TYPE OF BLOCK	
	PVB	SAB
PRESENT	0	3
ABSENT	30	27
P VALUE - 0.076		
CHI SQUARE TEST		
NON SIGNIFICANT		



BACK ACHE	NO OF PATIENTS	PERCENTAGE
PRESENT	3	5%
ABSENT	57	95%



BACK ACHE	TYPE OF BLOCK	
	PVB	SAB
PRESENT	0	3
ABSENT	30	27
P VALUE - 0.076		
CHI SQUARE TEST		
NON SIGNIFICANT		



Nausea, Catheterisation, Headache, Back ache all are seen in only few cases that too only in subarachnoid block.

DISCUSSION

In the present study, comparing paravertebral block with spinal anaesthesia in the patients that underwent unilateral inguinal hernia repair, it was determined that adequate anaesthesia was achieved with paravertebral block during the procedure and the patient remained haemodynamically stable, postoperative adverse events were minimal, and it is a preferable anaesthesia method because of prolonged analgesia.

The two groups which received thoracic paravertebral block and spinal anaesthesia were compared with respect to the following parameters:

1. Duration of post operative analgesia

(Post operative Visual Analogue Scale pain score)

2. Time to reach the discharge criteria

(Modified post- anaesthetic discharge scoring.)

3. Intra operative and post operative haemodynamics

4. Total rescue analgesic consumption

The two groups which received thoracic paravertebral block and Subarachnoid block were compared with respect to the .Duration of post operative analgesia. The results obtained were thoracic paravertebral block given to unilateral inguinal hernia significantly increases Duration of post operative analgesia as measured by VAP Scoring system compared to Subarachnoid block group. This was found to be STATISTICALLY SIGNIFICANT as p value is <0.05

The two groups which received thoracic paravertebral block and Subarachnoid block were compared with respect to the Time to reach discharge criteria measured by Modified post- anaesthetic discharge scoring system. The results obtained were thoracic paravertebral block for unilateral inguinal hernia significantly decreases the Time to reach the discharge. This was found to be STATISTICALLY SIGNIFICANT as p value is <0.05 .

The two groups which received thoracic paravertebral block and Subarachnoid block were compared with respect to the Intra operative and post operative haemodynamics The results obtained were thoracic paravertebral block for unilateral inguinal hernia significantly stable Intra operative haemodynamics. This was found to be STATISTICALLY SIGNIFICANT as p value is <0.05 .

And there was no significant difference in the postoperative systolic blood pressure, diastolic blood pressure and mean arterial pressure between the two groups and it was found to be STATISTICALLY INSIGNIFICANT as p value is >0.05 .

Being inspired by their experiences on paravertebral block that they used to reduce chronic pain in breast surgery, Weltz et al. (6) started using lumbar paravertebral block for inguinal hernia surgeries. They thought that paravertebral block would be preferred due to prolonged sensory block characterized by minimal postoperative pain and lower use of narcotics, lower incidence of nausea and vomiting, and shorter hospital care requirement. Hadzic et al. (7) confirmed these findings by comparing paravertebral anaesthesia with general anaesthesia in the cases that underwent inguinal hernia repair. In the present study as well, prolonged analgesia was provided in the group that received paravertebral anaesthesia and the incidence of nausea and vomiting was lower. Naja et al. (11) compared the efficacy of bilateral paravertebral block and mild sedation with that of general anaesthesia in ventral hernia surgeries and determined that paravertebral block was more effective. In the present study as well, it was determined that the surgery could be performed under mild sedation with paravertebral anaesthesia in cases undergoing unilateral inguinal hernia repair.

In another study, Naja et al. (12) compared paravertebral block performed with the help of a nerve stimulator with ilio-inguinal nerve block in children that underwent herniorrhaphy. The two methods were compared in terms of intraoperative haemodynamic stability, postoperative pain scores at rest and during activity, requirement for additional analgesics, and parent satisfaction and it was determined that paravertebral block was superior to ilio-inguinal nerve block. The cases first underwent general anaesthesia and then received regional anaesthesia. Paravertebral block was performed in the cases through three different levels as T₁₂-L₁, L₁-L₂ and L₂-L₃, and the local anaesthetic drug was . In the present study , we injected the local anaesthetic. However, we performed injection through 5 levels between T₁₀ and L₂ since the adult patients included in the study only received mild sedation. Based on our observations, the most important dermatomes that should be blocked correspond to T₁₂ - L₁ levels, where the surgical team that would perform inguinal hernia surgery works most. In order to achieve complete anaesthesia in lower dermatomes in the beginning of the surgery, anaesthesia should start from lower levels and continue to the upper levels.

CONCLUSION

It is concluded that paravertebral block might be an alternative to spinal anaesthesia method in inguinal hernia surgery as it provides adequate anaesthesia during perioperative period and high quality analgesia during the postoperative period

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**INSTITUTIONAL ETHICS COMMITTEE
MADRAS MEDICAL COLLEGE, CHENNAI 600 003**

EC Reg.No.ECR/270/Inst./TN/2013
Telephone No.044 25305301
Fax: 011 25363970

CERTIFICATE OF APPROVAL

To
Dr.G.Periyannan
Post Graduate in M.D. Anaesthesiology
Institute of Anaesthesiology & Critical Care
Madras Medical College
Chennai 600 003

Dear Dr.G.Periyannan,

The Institutional Ethics Committee has considered your request and approved your study titled "**COMPARISON OF SAFETY AND EFFICACY OF UNILATERAL PARAVERTEBRAL BLOCK WITH SUBARACHNOID BLOCK INGUINAL HERNIA REPAIR**" - **NO.06012017 (III)**.

The following members of Ethics Committee were present in the meeting hold on **24.01.2017** conducted at Madras Medical College, Chennai 3

- | | |
|--|---------------------|
| 1.Dr.C.Rajendran, MD., | :Chairperson |
| 2.Dr.M.K.Muralidharan,MS.,M.Ch.,Dean, MMC,Ch-3 | :Deputy Chairperson |
| 3.Prof.Sudha Seshayyan,MD., Vice Principal,MMC,Ch-3 | : Member Secretary |
| 4.Prof.B.Vasanthi,MD., Prof.of Pharmacology.,MMC,Ch-3 | : Member |
| 5.Prof.A.Rajendran,MS, Prof. of Surgery,MMC,Ch-3 | : Member |
| 6.Prof.N.Gopalakrishnan,MD,Director,Inst.of Nephrology,MMC,Ch | : Member |
| 7.Prof.Baby Vasumathi,MD.,Director, Inst. of O & G | : Member |
| 8.Prof.K.Ramadevi,MD.,Director,Inst.of Bio-Che,MMC,Ch-3 | : Member |
| 9.Prof.R.Padmavathy, MD, Director,Inst.of Pathology,MMC,Ch-3 | : Member |
| 10.Prof.S.Mayilvahanan,MD,Director, Inst. of Int.Med,MMC, Ch-3 | : Member |
| 11.Tmt.J.Rajalakshmi, JAO,MMC, Ch-3 | : Lay Person |
| 12.Thiru S.Govindasamy, BA.,BL,High Court,Chennai | : Lawyer |
| 13.Tmt.Arnold Saulina, MA.,MSW., | :Social Scientist |

We approve the proposal to be conducted in its presented form.

The Institutional Ethics Committee expects to be informed about the progress of the study and SAE occurring in the course of the study, any changes in the protocol and patients information/informed consent and asks to be provided a copy of the final report.

Member Secretary - Ethics Committee

MEMBER SECRETARY
INSTITUTIONAL ETHICS COMMITTEE
MADRAS MEDICAL COLLEGE
CHENNAI-600 003

Urkund Analysis Result

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http://e-safe-anaesthesia.org/e_library/09/Thoracic_paravertebral_Block_Update_2009.pdf

Instances where selected sources appear:

163

INTRODUCTION Inguinal herniorrhaphy (IH) is a common day care procedure. It can be performed under general anaesthesia (GA) peripheral nerve blockade, subarachnoid block (SAB) or paravertebral block (PVB). PVB is providing long-lasting unilateral anaesthesia, haemodynamic stability, early ambulation and prolonged pain relief. PVB produces ipsilateral segmental analgesia through injection of local anaesthetic onto the spinal nerve roots alongside the vertebral column. It is advocated predominantly for unilateral procedures such as thoracotomy, breast surgery, chest wall trauma, hernia or renal surgery. This study was undertaken to compare safety and efficacy between unilateral PVBs and SAB in patients undergoing IH.

AIM OF THE STUDY

1. Duration of post operative analgesia (Post operative Visual Analogue Scale pain score)
2. Time to reach the discharge criteria (Modified post- anaesthetic discharge scoring.)
3. Intra operative and post operative haemodynamics
4. Total rescue analgesic consumption

INGUINAL HERNIA In inguinal or groin hernias a hole forms in the internal oblique and transversus muscles. If this hole forms lateral (or away from the middle) to the inferior epigastric blood vessels, an indirect inguinal hernia forms. If the hole forms medial (or towards the middle) to the inferior epigastric blood vessels, a direct inguinal hernia is formed. Regardless, in open surgery, the external oblique muscle layer is opened over the hernia (weakened internal and transversus muscle). The hole (or holes) in the internal oblique and the transversus muscle are found. A dual sided mesh is used to reinforce the hernia defect and the muscle around the hole.

INFORMATION TO PARTICIPANTS

Investigator :Dr. G. PERIYANNAN

Name of the Participant:

Title:

“Comparison of safety and efficacy of Unilateral paravertebral block with Subarachnoid block for Inguinal hernia repair” (A Prospective, randomized, single blinded study)

You are invited to take part in this research study. We have got approval from the IEC. You are asked to participate because you satisfy the eligibility criteria .We want to compare and study the safety and efficacy of Unilateral paravertebral block and Subarachnoid block for Inguinal hernia repair.

What is the Purpose of the Research:

For inguinal hernia Unilateral paravertebral block and Subarachnoid block are performed to study

1. To compare duration of post-operative analgesia (Post operative visual analogue scale pain score)
2. Time to reach discharge criteria (modified past anaesthesia discharge scoring)

3. To assess intra operative and post operative haemodynamics
4. Total rescue analgesic consumption

The Study Design:

All the patients in the study will be divided into two groups.

Group 1- Group P (Paravertebral block)

Group 2- Group S (Subarachnoid block)

Benefits

The paravertebral block and subarachnoid block improves intra operative haemodynamics, reduces opioid requirement, causes post operative pain relief.

Discomforts and risks:

Intravascular local anaesthetic injection

Damage to neuro vascular structure

This intervention has been shown to be well tolerated as shown by previous studies. And if you do not want to participate you will have alternative of setting the standard treatment and your safety is our prime concern.

Time :

Date :

Place :

Signature / Thumb Impression of patient

Patient Name:

Signature of the Investigator : _____

Name of the Investigator : _____

PATIENT CONSENT FORM

Study title :

“Comparison of safety and efficacy of Unilateral paravertebral block with Subarachnoid block for Inguinal hernia repair” (A Prospective, randomized, single blinded study)

Study centre:

Institute of Anaesthesiology and Critical Care,
RAJIV GANDHI GOVT GENERAL HOSPITAL,
MADRAS MEDICAL COLLEGE,
CHENNAI – 600 003.

Participant name:

I.P. No:

Age:

Sex:

I confirm that I have understood the purpose of procedure for the above study. I have the opportunity to ask the question and all my questions and doubts have been answered to my satisfaction.

I have been explained about the pitfall in the procedure. I have been explained about the safety, advantage and disadvantage of the technique.

I understand that my participation in the study is voluntary and that I am free to withdraw at anytime without giving any reason.

I understand that investigator , regulatory authorities and the ethical committee will not need my permission to look at my health records both in respect to current study and any further research that may be conducted in relation to it, even if I withdraw myself from the study . I understand that my identity will not be revealed in any information released to third parties or published, unless as required under the law . I agree not to restrict the use of any data or results that arise from the study.

Time:

Date: Sign / thumb impression

of patient

Place:

Patient name:

Signature of the investigator:

Name of the investigator:

ஆராய்ச்சி தகவல் தாள்

ஆராய்ச்சி தலைப்பு :

குடலிறக்க நோய் அறுவை சிகிச்சியின் பொழுது பேரா வேர்ட்பற்றல் ப்ளாக் மற்றும் சப் அரக்னாய்டு ப்ளாக் மூலம் வலி நிவாரண தன்மையை ஒப்பிடுதல் .

ஆராய்ச்சியாளர் பெயர் : மருத்துவர் . கோ. பெரியண்ணன் ,

பங்கேற்பாளர் பெயர் :

ஆராய்ச்சியின் நோக்கம் :

குடலிறக்க நோய் அறுவை சிகிச்சியின் பொழுது பேரா வேர்ட்பற்றல் ப்ளாக் அல்லது சப் அரக்னாய்டு ப்ளாக் மூலம் புவிவாக்கைன் மருந்து செலுத்தி வலி நிவாரண தன்மையை ஒப்பிடுதல் .

1. அறுவை சிகிச்சிக்கு பின் வலி நிவாரணத்தின் கால அளவு.
2. அறுவை சிகிச்சி முடித்து டிஸ்சார் ஆவதற்கு ஏற்ற வகையில் உடல் தன்மை முன்னேறுவதற்கான கால அளவு.
3. அறுவை சிகிச்சையின் பொழுதும் , அதன் பின்பும், நாடி துடிப்பு, இரத்த அழுத்தம்.
4. வலி மருந்து கொடுத்ததிலிருந்து அறுவை சிகிச்சைக்கு தொடங்குவதற்கு ஏற்ப வலிநிவாரண தன்மை ஏற்படுவதற்கான கால அளவு.
5. அறுவை சிகிச்சியின் பொழுது இதர வலி நிவாரணிகளின் தேவை.

ஆய்வு முறை :

ஆய்வில் பங்குபெறும் நோயாளிகள் இரண்டு குழுக்களாக பிரிக்கப்படுவர்.

குழு 1 பேரா வேர்ட்பற்றல் ப்ளாக்

குழு 2 சப் அரக்னாய்டு ப்ளாக்

நன்மைகள் :

1. அறுவை சிகிச்சை பிறகு வலி நிவாரணம் நீண்ட நேரத்திற்கு நீடிக்கிறது.
2. அறுவை சிகிச்சிக்கு பிறகு விரைவில் வீடு திரும்ப முடியும்.
3. அறுவை சிகிச்சியின் பொழுது நாடித்துடிப்பு மற்றும் இரத்த அழுத்தம் சீராக செயல்பட உதவுகிறது.

பக்க விளைவுகள் :

ஊசி போடும் பொழுது அசௌகரியம் ஏற்படலாம். மறுத்து போகும் ஊசி மூலம் இது தவிர்க்கப்படும். இரத்த அழுத்தம், நாடி துடிப்பு குறையலாம். அதற்கு மாற்று மருந்து உடனடியாக கொடுக்கப்படும்.

இந்த முறையான ஆய்வு ஏற்க்கனவே பல இடங்களில் நடத்தப்பட்டுள்ளது . மேலும் இதன் பாதுகாப்பு உறுதிபடுத்தப்பட்டுள்ளது . நீங்கள் இந்த ஆய்வில் பங்கு கொள்ள விரும்பவில்லை என்றால் எப்பொழுதும் உபயோகிக்கும் மருந்தே கொடுக்கப்படும். உங்களின் பாதுகாப்பே எண்களின் முக்கிய நோக்கம் .

இந்த ஆய்வு சம்மந்தமான எல்லா புள்ளிவிவரங்கள் மற்றும் நோயாளிகளின் விவரங்கள் ரகசியமாக வைக்கப்படும். இந்த ஆய்வு சம்மந்தப்பட்ட எல்லா பரிசோதனைகள், மருந்துகள் மற்றும் சேவைகள் அனைத்தும் நோயாளிகளுக்கு இலவசமாக வழங்கப்படும்.

ஆய்வாளரின் பெயர்.

பங்குபெறுபவரின் பெயர்.

ஆய்வாளரின் கையொப்பம்

பங்குபெறுபவரின் கையொப்பம்.

ஆராய்ச்சி ஒப்புதல் படிவம்

ஆராய்ச்சியின் தலைப்பு

"குடலிறக்க நோய் அறுவை சிகிச்சியின் பொழுது பேரா வேரடற்றல் ப்ளாக் மற்றும் சப் அரக்னாய்டு ப்ளாக் மூலம் வலி நிவாரண தன்மையை ஒப்பிடுதல்"

ஆய்வு மையம் : மயக்கவியல் துறை , சென்னை மருத்துவ கல்லூரி , சென்னை -3

பங்குபெறுபவரின் பெயர் :

பங்குபெறுபவரின் எண் :

பங்குபெறுபவர் இதனை (/) செய்யவும் :

மேலே குறிப்பிட்டுள்ள மருத்துவ ஆய்வுகள் பற்றி எனக்கு விளக்கப்பட்டுள்ளது. என்னுடைய சந்தேகங்களை கேட்கவும், அதற்கான விளக்கங்களை பெறவும் வாய்ப்பளிக்கப்பட்டது.

நான் இவ்வாய்வில் தன்னிச்சியாக தான் பங்கேற்கிறேன் . எந்த காரணத்தினாலோ எந்த கட்டத்திலும் எந்த சட்ட சிக்கலுக்கும் உள்ளாகாமல் நான் இவ்வாய்வில் இருந்து விலகி கொள்ளலாம் என்றும் அறிந்து கொண்டேன் .

இந்த ஆய்வு சம்மந்தமாகவோ, இதை சார்ந்த மேலும் ஆய்வு மேற்கொள்ளும் பொழுதும் இந்த ஆய்வில் பங்குபெறும் மருத்துவர் என்னுடைய மருத்துவ அறிக்கைகளை பார்ப்பதற்கு என் அனுமதி தேவையில்லை என அறிந்து கொள்கிறேன். நான் இந்த ஆய்வில் இருந்து விலகிக்கொண்டாலும் இது பொருந்தும் என அறிகிறேன்.

இந்த ஆய்வின் மூலம் கிடைக்கும் தகவல்களையும் , பரிசோதனை முடிவுகளையும் மற்றும் சிகிச்சை தொடர்பான தகவல்களையும் மருத்துவர் மேற்கொள்ளும் ஆய்வில் பயன்படுத்திக்கொள்ளவும் அதை பிரசுரிக்கவும் என் முழுமனதுடன் சம்மதிக்கிறேன்.

இந்த ஆய்வில் பங்குகொள்ள ஒப்புக்கொள்கிறேன். எனக்கு கொடுக்கப்பட்ட அறிவுரைகளின் படி நடந்துகொள்வதுடன் இந்த ஆய்வை மேற்கொள்ளும் மருத்துவ அணிக்கு உண்மையுடன் இருப்பேன் என உறுதியளிக்கிறேன் .

பங்குபெறுபவரின் கையொப்பம்..... இடம்தேதி

கட்டை விரல் ரேகை

பங்குபெறுபவரின் பெயர் மற்றும் விலாசம்

ஆய்வாளரின் கையொப்பம்..... இடம்தேதி

ஆய்வாளரின் பெயர்.....

PROFORMA

Title:

“Comparison of safety and efficacy of Unilateral paravertebral block with Subarachnoid block for Inguinal hernia repair ”

DATE: IP NO: AIRWAY DEVICE:

NAME:

AGE: SEX:

DIAGNOSIS:

SURGICAL PROCEDURE:

Ht: CVS: HB:

Wt: RS:

PRE OP ASSESSMENT: ASSESSMENT NO:

HISTORY:

Any Co-morbid illness

H/O Documented Difficult Airway

H/O previous surgeries

INFORMED CONSENT IN TAMIL:

RANDOMIZATION: Tick the following

1) Paravertebral block group

2) Subarachnoid block group

IV line

PREMEDICATION

MONITORS

Hemodynamics: Pre op & intra operative

Events	Time (min)	Systolic BP (mmHg)	Diastolic BP (mmHg)	MAP (mmHg)	Heart rate Beats/min	SPO2 %
Baseline						
Block						
Incision						
End of procedure						

Intra operative

TIME(MIN)	0	5	10	15	20	25	30	45	60	75	90	105	120	135	150	165	180
HR (Beats/min)																	
SBP (mmHg)																	
DBP(mmHg)																	
MAP(mmHg)																	
SPO2 %																	
FENTANYL (mcg)																	

POST OPERATIVE

<u>TIME(hrs)</u>	<u>0</u>	<u>0.5</u>	<u>1</u>	<u>1.5</u>	<u>2</u>	<u>2.5</u>	<u>3</u>	<u>3.5</u>	<u>4</u>	<u>4.5</u>	<u>5</u>	<u>5.5</u>	<u>6</u>	<u>10</u>	<u>14</u>	<u>18</u>	<u>22</u>	<u>24</u>
<u>VAS</u>																		
<u>Duration of post op analgesia (min)</u>																		
<u>Modified post anaesthetic discharge score</u>																		
<u>Time to reach discharge criteria</u>																		
<u>HR(Beats/min)</u>																		
<u>SBP(mmHg)</u>																		
<u>DBP(mmHg)</u>																		
<u>MAP(mmHg)</u>																		
<u>Spo2 %</u>																		
<u>Resque analgesics (tramodal in mg)</u>																		

MEASURES OF STUDY OUTCOME

COMPLICATIONS IN INTRA OPERATIVE PERIOD:

COMPLICATIONS IN INTRA OPERATIVE PERIOD:

MASTER CHART

GROUP- 1 (PARAVER TEBRAL BLOCK)	S.NO	Name	Age	Sex	IP.NO	DIAGNOSIS	Base line (Before Block)				
							Heart rate	Systoli c BP	Diastoli c BP	MAP	SPO2
							1	KANNAN	39	M	33689
2	RAVI	38	M	32003	RT INGUINAL HERNIA	74	126	92	103	99	
3	SIVA SANKAR	37	M	36084	LT INGUINAL HERNIA	88	134	68	90	98	
4	KUMAR	48	M	33848	RT INGUINAL HERNIA	86	110	76	87	100	
5	APPADURAI	57	M	40434	RT INGUINAL HERNIA	96	128	94	105	100	
6	ANNAMALAI	61	M	44278	RT INGUINAL HERNIA	86	104	82	89	99	
7	PRABUDOSS	48	M	34090	LT INGUINAL HERNIA	98	116	72	86	99	
8	SUNDHAR	45	M	34994	RT INGUINAL HERNIA	94	128	68	93	99	
9	KATHIRVEL	41	M	33635	RT INGUINAL HERNIA	86	136	72	93	99	
10	RAJKUMAR	47	M	35151	RT INGUINAL HERNIA	84	108	94	98	100	
11	ANBU	53	M	46643	RT INGUINAL HERNIA	78	124	64	84	98	
12	MUNIYAPPAN	38	M	56781	RT INGUINAL HERNIA	76	138	96	110	98	
13	DEVARAJ	34	M	52735	RT INGUINAL HERNIA	82	106	78	87	99	
14	ANNADURAI	54	M	61867	LT INGUINAL HERNIA	94	128	74	92	99	
15	BASKAR	54	M	66420	RT INGUINAL HERNIA	101	134	90	104	99	
16	PREMKUMAR	38	M	66197	LT INGUINAL HERNIA	92	138	92	107	99	
17	ANJIAH	50	M	45920	LT INGUINAL HERNIA	84	108	86	93	98	
18	DURAI	38	M	47862	RT INGUINAL HERNIA	94	116	64	81	98	
19	THANGADUR AI	37	M	49272	RT INGUINAL HERNIA	84	124	84	97	100	
20	ANANADHA KRISHAN	38	M	45962	RT INGUINAL HERNIA	82	138	96	110	99	
21	JAYAKUMAR	52	M	50368	LT INGUINAL HERNIA	78	126	78	94	99	
22	CHINNAPPAN	65	M	50679	LT INGUINAL HERNIA	68	126	86	99	99	
23	RAMASAMY	60	M	55945	LT INGUINAL HERNIA	76	118	74	88	98	
24	SIVALINGAM	45	M	58511	LT INGUINAL HERNIA	92	126	98	107	98	
25	NATESAN	45	M	58583	RT INGUINAL HERNIA	86	106	96	99	100	
26	APPASAMY	59	M	62139	RT INGUINAL HERNIA	72	128	82	97	100	
27	ELANGO	38	M	67583	RT INGUINAL HERNIA	64	114	78	90	99	
28	SURESH	40	M	33229	RT INGUINAL HERNIA	82	126	68	87	98	
29	VARADHAN	58	M	51089	RT INGUINAL HERNIA	76	136	82	100	98	
30	ELUMALAI	58	M	48991	RT INGUINAL HERNIA	74	142	78	99	98	

PARAVERTEBRAL BLOCK

INTRA OPERATIVE

Heart Rate											SYSTOLIC BP										
0 min	5 min	10 min	15 min	20 min	25 min	30 min	45 min	60 min	75 min	90 min	0 min	5 min	10 min	15 min	20 min	25 min	30 min	45 min	60 min	75 min	90 min
74	72	68	72	80	68	74	60	74	76	86	110	100	112	114	112	110	112	114	120	122	116
84	74	74	68	74	74	76	76	64	84	94	132	122	128	126	122	118	120	118	122	124	124
86	94	68	86	68	84	84	74	82	82	92	140	128	134	130	128	124	122	124	118	120	118
74	84	84	76	64	76	72	90	70	62	76	118	100	116	118	120	118	120	126	120	118	120
98	86	76	86	68	82	60	76	76	72	94	134	120	130	128	124	120	122	124	126	120	124
64	72	62	82	70	68	84	84	64	68	76	110	98	112	114	116	122	118	126	120	128	126
84	86	64	84	62	64	78	70	82	6	82	124	114	120	122	124	126	124	128	130	122	124
82	70	68	66	74	82	82	64	86	74	94	134	118	130	128	130	128	124	130	134	132	134
68	84	62	84	68	64	64	68	62	68	76	140	136	134	132	128	124	118	126	130	128	126
76	82	60	68	64	64	66	72	70	72	92	110	102	108	106	104	106	110	116	120	118	114
74	74	76	62	84	68	82	80	76	64	76	126	110	120	118	120	124	120	124	128	116	112
96	86	84	84	82	64	72	76	68	60	94	140	122	138	132	128	126	122	126	130	128	118
74	90	82	76	80	68	76	84	72	78	72	110	94	112	110	112	116	120	124	128	126	126
80	92	76	84	68	60	68	70	74	64	76	130	102	126	126	124	120	118	118	120	124	120
76	76	84	62	60	72	64	64	68	72	68	140	120	134	132	128	126	120	126	124	128	126
82	94	74	86	64	76	62	76	62	68	90	142	122	136	130	132	128	124	130	128	132	134
76	82	68	82	72	64	74	80	84	74	74	146	96	110	112	110	112	110	118	120	122	122
74	76	68	76	90	84	64	74	72	76	84	124	102	120	118	120	118	116	122	124	126	124
86	90	74	82	82	60	62	86	64	82	62	132	106	126	124	124	124	128	120	126	128	130
90	68	60	64	68	82	80	64	76	68	82	140	124	136	134	130	128	134	136	134	132	130
76	84	76	68	74	64	76	82	90	62	64	132	108	124	120	118	122	132	116	122	124	122
86	62	68	64	84	76	74	84	76	70	76	134	106	120	116	120	118	122	124	126	122	124
76	76	90	62	76	72	68	74	90	68	92	120	112	120	118	116	120	126	124	126	118	120
74	80	76	68	82	64	72	62	74	62	84	130	116	124	120	118	122	128	130	134	128	126
72	84	84	74	68	62	64	74	98	76	76	110	100	110	118	122	128	130	132	124	126	122
68	86	64	68	64	76	68	68	76	68	74	130	114	130	126	128	130	136	128	130	132	134
68	90	84	62	82	82	62	64	94	76	68	122	110	120	124	122	134	132	130	136	134	128
74	76	68	74	60	64	64	84	86	74	82	130	120	130	128	126	132	136	132	138	136	132
82	74	82	64	72	84	62	84	84	70	76	142	122	134	134	130	126	126	128	126	126	124
68	64	68	62	86	68	82	74	68	74	74	144	132	140	142	140	136	134	130	132	128	132

PARAVERTEBRAL BLOCK

INTRA OPERATIVE

DIASTOLIC BP											MAP										
0 min	5 min	10 min	15 min	20 min	25 min	30 min	45 min	60 min	75 min	90 min	0 min	5 min	10 min	15 min	20 min	25 min	30 min	45 min	60 min	75 min	90 min
72	62	70	74	72	78	80	84	82	80	78	84	74	84	87	85	88	90	94	94	94	90
94	88	92	88	82	86	84	82	84	82	80	106	99	104	100	95	96	96	94	96	96	94
72	68	70	72	70	68	70	72	74	76	76	94	88	91	91	89	86	87	89	88	90	90
78	70	74	72	74	74	72	74	70	72	68	91	80	88	87	89	88	88	91	86	87	85
96	90	94	90	88	86	82	86	82	84	78	108	100	106	102	100	97	95	98	96	101	93
84	78	80	78	80	78	80	82	86	88	76	92	84	90	90	92	92	92	96	97	101	92
76	70	72	70	72	70	74	76	74	78	82	92	84	88	87	89	88	90	93	92	92	96
64	60	60	64	66	66	72	72	70	74	68	87	79	83	85	87	96	89	91	91	93	90
76	68	70	72	70	74	70	76	76	74	66	97	90	91	92	89	90	86	92	94	92	86
98	86	96	92	88	82	78	84	80	82	78	102	91	100	96	93	90	88	94	93	94	90
62	54	64	60	62	60	64	60	72	66	72	83	72	82	79	81	81	82	81	90	82	85
98	88	92	88	92	88	86	86	90	86	78	112	99	107	102	104	100	98	99	103	100	91
82	76	78	80	78	74	78	72	70	74	82	91	82	89	90	89	88	92	89	89	91	96
76	70	72	70	72	68	72	76	62	76	68	94	80	90	88	89	85	87	90	81	92	85
92	88	92	88	86	84	82	80	86	82	78	108	98	106	102	100	98	94	95	98	97	94
90	86	88	86	88	86	78	82	84	76	82	107	98	104	100	102	100	93	98	98	94	99
88	80	86	84	82	84	72	82	80	78	68	107	85	94	93	91	93	84	94	93	92	86
74	68	76	72	76	70	68	72	72	68	72	90	79	90	87	90	86	84	88	89	87	89
90	80	88	84	88	86	76	82	82	74	82	104	88	100	97	100	98	93	94	96	92	99
98	92	94	92	92	84	86	82	86	82	84	112	102	108	106	104	98	102	100	102	98	99
82	72	80	78	82	80	72	78	82	74	68	98	84	94	92	94	94	92	90	95	90	86
92	84	88	86	86	80	78	84	84	80	78	106	91	98	96	97	92	92	97	92	94	93
80	74	78	76	72	76	74	80	76	76	82	93	86	92	90	86	90	91	94	92	90	94
98	82	92	88	86	78	72	82	80	78	80	108	93	102	98	96	92	90	98	98	94	95
96	92	92	90	92	84	82	90	82	80	78	100	94	98	99	102	98	98	104	96	95	92
88	80	90	88	90	84	80	82	88	82	76	96	91	103	100	102	99	98	97	102	98	95
84	72	82	84	82	76	76	78	80	80	78	96	84	94	97	95	95	94	95	98	98	94
76	70	78	80	82	78	86	84	82	86	90	94	86	95	96	96	96	102	100	100	102	104
84	80	86	84	82	78	80	84	82	84	78	103	94	102	100	98	94	95	98	96	98	93
82	80	86	82	90	82	88	86	86	90	88	102	97	104	102	106	100	103	100	101	102	102

PARA VERTEBRAL BLOCK

INTRA OPERATIVE

SPO2											INJ.FENTANYL (mcg)											
0 mi n	5 mi n	10 mi n	15 mi n	20 mi n	25 mi n	30 mi n	45 mi n	60 mi n	75 mi n	90 mi n	0 mi n	5 mi n	10 mi n	15 mi n	20 mi n	25 mi n	30 mi n	45 mi n	60 mi n	75 mi n	90 mi n	
99	99	99	99	99	99	99	99	99	99	99	0	0	0	0	0	0	0	0	0	0	0	0
99	99	99	99	99	99	99	99	99	99	99	0	0	0	0	0	0	0	0	0	0	0	0
99	99	99	99	99	99	99	99	98	99	99	0	0	0	0	0	0	0	0	0	0	0	0
99	99	99	99	99	99	99	99	98	98	99	0	0	0	0	0	0	0	0	0	0	0	0
99	99	99	98	99	99	99	98	98	98	99	0	0	0	0	0	0	0	0	0	0	0	0
99	99	99	98	98	99	99	98	98	98	99	0	0	0	0	0	0	0	0	0	0	0	0
99	99	99	98	98	98	99	98	99	98	99	0	0	0	0	0	0	0	0	0	0	0	0
99	99	99	99	98	98	99	99	99	98	99	0	0	0	0	0	0	0	0	0	0	0	0
99	99	99	99	99	98	99	99	99	99	99	0	0	0	0	0	0	0	0	0	0	0	0
99	99	99	99	99	99	99	99	99	99	99	0	0	0	0	0	0	0	0	0	0	0	0
100	99	99	100	100	100	99	99	99	99	99	0	0	0	0	0	0	0	0	0	0	0	0
100	100	99	100	100	100	99	99	99	99	99	0	0	0	0	0	0	0	0	0	0	0	0
99	99	98	99	99	99	99	99	99	99	99	0	0	0	0	0	0	0	0	0	0	0	0
99	99	98	99	99	99	98	99	99	99	99	0	0	0	0	0	0	0	0	0	0	0	0
99	99	98	99	99	99	98	99	99	99	99	0	0	0	0	0	0	0	0	0	0	0	0
99	99	98	99	99	99	98	99	99	99	99	0	0	0	0	0	0	0	0	0	0	0	0
99	99	99	99	99	99	98	98	98	99	99	0	0	0	0	0	0	0	0	0	0	0	0
99	100	100	100	99	99	99	98	98	99	99	0	0	0	0	0	0	0	0	0	0	0	0
99	99	99	99	99	99	99	98	99	99	99	0	0	0	0	0	0	0	0	0	0	0	0
99	99	99	99	99	99	99	99	99	99	99	0	0	0	0	0	0	0	0	0	0	0	0
99	99	99	99	99	99	99	99	99	98	99	0	0	0	0	0	0	0	0	0	0	0	0
99	99	99	99	99	99	99	99	99	98	99	0	0	0	0	0	0	0	0	0	0	0	0
99	99	99	99	99	99	99	99	99	98	99	0	0	0	0	0	0	0	0	0	0	0	0
99	99	99	99	99	99	99	99	99	99	99	0	0	0	0	0	0	0	0	0	0	0	0
99	99	99	99	99	99	99	99	99	99	99	0	0	0	0	0	0	0	0	0	0	0	0
99	98	98	99	99	99	99	99	99	99	99	0	0	0	0	0	0	0	0	0	0	0	0
99	98	99	99	99	99	99	99	99	99	99	0	0	0	0	0	0	0	0	0	0	0	0
99	99	99	99	99	99	99	99	99	99		0	0	0	0	0	0	0	0	0	0	0	0

PARAVERTEBRAL BLOCK

POST OP

Modified post- anesthetic discharge scoring																		TIME TO REACH DISCHARGE CRITERIA(hrs)
0 hrs	0.5 hrs	1 hr	1.5 hrs	2 hr	2.5 hrs	3 hr	3.5 hrs	4 hr	4.5 hrs	5 hr	5.5 hrs	6 hr	10 hrs	14 hrs	18 hrs	22 hrs	24 hrs	
8	8	8	8	9	9	9	9	10	10	10	10	10	10	10	10	10	10	2
8	8	8	8	8	8	8	8	10	10	10	10	10	10	10	10	10	10	4
7	7	7	7	7	7	7	7	10	10	10	10	10	10	10	10	10	10	4
8	8	8	8	8	8	8	8	10	10	10	10	10	10	10	10	10	10	4
7	7	7	7	7	7	7	7	10	10	10	10	10	10	10	10	10	10	4
8	8	8	8	9	9	9	9	10	10	10	10	10	10	10	10	10	10	2
8	8	8	8	9	9	9	9	10	10	10	10	10	10	10	10	10	10	2
8	8	8	8	8	8	8	8	10	10	10	10	10	10	10	10	10	10	4
6	6	6	7	7	8	9	9	10	10	10	10	10	10	10	10	10	10	3
8	8	8	8	8	8	8	8	10	10	10	10	10	10	10	10	10	10	4
8	8	8	8	8	8	8	8	10	10	10	10	10	10	10	10	10	10	4
6	6	7	7	7	8	9	9	10	10	10	10	10	10	10	10	10	10	3
7	7	7	7	8	8	9	9	10	10	10	10	10	10	10	10	10	10	3
8	8	8	8	9	9	9	9	10	10	10	10	10	10	10	10	10	10	2
8	8	8	8	9	9	9	9	10	10	10	10	10	10	10	10	10	10	2
8	8	8	8	8	8	8	8	10	10	10	10	10	10	10	10	10	10	4
8	8	8	8	8	8	8	8	10	10	10	10	10	10	10	10	10	10	4
7	8	8	8	8	8	8	8	10	10	10	10	10	10	10	10	10	10	4
7	8	8	8	8	8	8	8	10	10	10	10	10	10	10	10	10	10	4
8	8	8	8	9	9	9	9	10	10	10	10	10	10	10	10	10	10	2
8	8	8	8	9	9	9	9	10	10	10	10	10	10	10	10	10	10	2
7	8	8	8	9	9	9	9	10	10	10	10	10	10	10	10	10	10	2
8	8	8	8	9	9	9	9	10	10	10	10	10	10	10	10	10	10	2
7	8	8	8	9	9	9	9	10	10	10	10	10	10	10	10	10	10	2
8	8	8	8	8	8	8	8	10	10	10	10	10	10	10	10	10	10	4
8	8	8	8	9	9	9	9	10	10	10	10	10	10	10	10	10	10	2
8	8	8	8	8	8	8	8	10	10	10	10	10	10	10	10	10	10	4
8	8	8	8	8	8	8	8	10	10	10	10	10	10	10	10	10	10	4
8	8	8	8	9	9	9	9	10	10	10	10	10	10	10	10	10	10	2
8	8	8	8	8	8	8	8	10	10	10	10	10	10	10	10	10	10	4
8	8	8	8	8	8	8	8	10	10	10	10	10	10	10	10	10	10	4
8	8	8	8	9	9	9	9	10	10	10	10	10	10	10	10	10	10	2
8	8	8	8	8	8	8	8	10	10	10	10	10	10	10	10	10	10	4

SAB

PRE OP

GROUP- 2 (SUBARACHNOID BLOCK)										
S.N O	Name	Age	Sex	IP.NO	DIAGNOSIS	Base line (Before Block)				
						Heart Rate	Systolic BP	Diastoli c BP	MAP	SPO2
1	KATHIR VEL	41	M	33635	RT INGUINAL HERNIA	72	110	66	80	99
2	PUNNIYA KODI	37	M	33923	RT INGUINAL HERNIA	84	136	88	104	99
3	MUBARAK BAIG	46	M	38945	LT INGUINAL HERNIA	94	124	68	86	99
4	RAJENDRAN	53	M	39957	RT INGUINAL HERNIA	76	100	74	82	99
5	ALAGESWARAN	52	M	48561	RT INGUINAL HERNIA	82	134	76	95	99
6	BALAJI	48	M	55240	RT INGUINAL HERNIA	94	124	84	97	99
7	AIYYAPPAN	53	M	58311	RT INGUINAL HERNIA	86	106	76	104	99
8	MANI	55	M	60454	RT INGUINAL HERNIA	82	130	92	104	99
9	DEVASAGAYAM	50	M	63083	LT INGUINAL HERNIA	76	122	76	91	98
10	VELU	47	M	33503	LT INGUINAL HERNIA	92	108	84	92	99
11	KAILASH	56	M	60576	LT INGUINAL HERNIA	68	106	68	80	99
12	RAGAVAN	47	M	62387	RT INGUINAL HERNIA	62	134	74	94	100
13	GANABATHY	42	M	58362	LT INGUINAL HERNIA	76	142	86	104	100
14	RAGUBATHY	53	M	53865	LT INGUINAL HERNIA	92	106	74	84	100
15	PALANI	63	M	63542	RT INGUINAL HERNIA	84	132	84	100	100
16	SHANMUGAM	49	M	49364	LT INGUINAL HERNIA	76	126	92	103	100
17	SARAVANAN	56	M	54976	RT INGUINAL HERNIA	96	134	68	90	99
18	MANIKANDAN	45	M	54637	LT INGUINAL HERNIA	102	126	72	90	99
19	JAYAPAL	60	M	62512	LT INGUINAL HERNIA	80	124	74	90	99
20	VIJAYAKUAMR	59	M	61375	RT INGUINAL HERNIA	72	126	84	98	99
21	KANTHAN	32	M	47502	RT INGUINAL HERNIA	86	124	86	98	99
22	SANKARAI AH	58	M	47303	RT INGUINAL HERNIA	94	106	72	83	99
23	KRISHNAN	62	M	60095	RT INGUINAL HERNIA	72	108	74	85	99
24	NAGARAJ	62	M	59983	RT INGUINAL HERNIA	68	116	86	96	99
25	KONDAIAH	58	M	63041	LT INGUINAL HERNIA	96	126	84	98	99
26	THANIKACHALAM	60	M	58650	RT INGUINAL HERNIA	78	104	76	85	100
27	KALIMUTHU	64	M	57833	RT INGUINAL HERNIA	92	136	84	101	100
28	RAMESH	52	M	61226	LT INGUINAL HERNIA	68	128	86	100	100
29	PANDIAN	60	M	82961	LT INGUINAL HERNIA	64	132	76	94	100
30	VELAYUDAM	46	M	83956	LT INGUINAL HERNIA	74	116	74	88	100

SAB

INTRA OP

Heart Rate											SYSTOLIC BP										
0 min	5 min	10 min	15 min	20 min	25 min	30 min	45 min	60 min	75 min	90 min	0 min	5 min	10 min	15 min	20 min	25 min	30 min	45 min	60 min	75 min	90 min
84	72	78	84	84	92	72	68	78	84	76	132	102	106	104	104	106	108	110	120	118	122
80	76	87	82	68	87	68	74	84	68	78	140	108	112	108	104	104	104	110	120	116	118
96	76	68	94	72	67	64	94	86	62	76	138	100	116	120	118	116	118	120	126	124	122
86	82	94	76	94	86	84	76	68	64	74	124	96	102	104	106	106	110	112	122	122	124
80	74	74	84	76	80	86	82	84	84	94	142	106	110	108	110	112	110	114	122	124	120
98	72	76	95	84	68	92	74	86	86	86	138	110	114	116	110	110	108	110	124	120	124
88	64	84	87	92	76	76	68	84	72	82	128	96	102	104	104	108	110	106	118	128	126
88	68	75	68	76	64	70	68	76	86	72	142	100	104	110	106	108	108	110	116	120	124
82	74	72	84	74	76	78	74	64	70	76	134	96	100	106	106	110	112	114	118	118	120
92	76	84	86	72	74	68	76	74	94	84	120	94	102	106	104	102	104	110	118	120	122
76	74	76	82	84	82	94	68	86	76	72	124	92	104	100	102	100	102	104	120	122	124
72	72	82	76	82	68	84	68	82	84	64	140	106	108	108	110	112	108	110	124	122	124
84	86	68	94	76	72	68	74	68	74	92	148	108	106	110	106	108	110	112	126	124	120
98	84	74	82	92	84	68	86	74	76	84	126	96	100	102	104	102	104	106	114	118	118
86	76	94	80	86	86	82	62	72	74	74	146	116	120	122	120	126	124	126	124	120	124
80	74	92	64	84	72	72	82	80	72	82	134	132	130	132	134	130	128	130	126	120	124
100	74	86	76	72	68	90	68	68	84	64	142	110	116	114	112	114	112	114	114	116	118
98	82	74	84	76	64	76	64	72	60	86	130	102	110	108	110	110	108	110	122	118	120
86	76	76	68	84	76	82	86	62	76	76	132	104	106	108	112	100	102	104	110	110	112
82	84	74	96	76	84	86	84	68	74	68	134	106	110	106	108	106	110	114	120	122	120
84	84	78	76	84	68	87	82	76	84	74	136	108	116	120	118	120	122	124	128	122	120
86	86	84	84	72	84	92	68	64	74	68	124	96	102	108	106	110	108	110	122	124	122
76	70	86	74	90	68	76	72	74	86	76	114	96	104	106	108	110	108	112	118	122	124
78	60	72	68	74	62	84	74	62	76	84	126	94	100	104	110	108	110	112	122	122	126
102	82	86	72	75	78	72	64	76	82	76	128	100	106	110	108	112	110	108	118	122	124
86	86	84	94	68	72	68	68	82	80	84	134	106	112	114	106	110	108	110	116	118	120
98	76	94	68	74	68	62	90	84	76	62	146	104	110	118	120	116	116	118	120	122	120
78	84	76	72	92	62	76	62	70	84	76	134	108	114	116	122	116	120	122	120	122	120
76	68	84	68	74	74	74	82	64	70	84	142	112	118	122	124	120	118	122	128	130	132
78	82	74	94	90	68	76	74	72	64	74	126	96	102	108	106	110	112	110	112	114	116

SAB

INTRA OP

DIASTOLIC BP											MAP										
0 min	5 min	10 min	15 min	20 min	25 min	30 min	45 min	60 min	75 min	90 min	0 min	5 min	10 min	15 min	20 min	25 min	30 min	45 min	60 min	75 min	90 min
84	62	66	66	66	66	70	72	78	80	82	100	75	79	78	78	79	82	84	92	92	95
88	60	64	64	64	66	70	72	76	76	80	105	76	80	78	77	78	81	84	90	89	92
82	62	68	72	70	72	72	74	80	82	80	100	74	84	88	86	86	87	89	95	96	94
80	62	68	72	70	70	74	72	76	80	82	94	73	79	82	82	82	87	85	91	94	96
88	70	72	70	68	70	76	74	78	82	82	106	82	84	82	82	84	87	87	92	96	94
84	72	74	74	68	66	70	74	76	82	78	102	84	87	88	82	80	82	80	92	94	93
80	60	64	66	62	64	66	68	76	82	78	96	72	76	78	76	78	80	80	90	97	94
88	56	62	66	62	64	70	72	72	76	78	106	70	76	80	76	78	82	84	86	90	93
82	52	58	60	62	64	70	72	80	82	80	99	66	72	75	76	79	81	86	92	94	93
78	54	58	60	64	66	70	68	72	68	78	92	67	72	75	77	78	81	82	87	85	92
82	56	60	62	64	62	68	70	76	76	80	96	68	74	74	76	74	79	81	90	91	94
88	66	70	68	72	68	70	72	72	74	76	105	79	82	81	84	82	82	84	89	90	92
86	70	72	72	70	72	74	72	76	78	80	106	82	83	84	82	84	86	85	92	93	93
82	66	72	72	68	70	72	70	74	76	82	96	76	81	82	80	80	82	82	87	90	94
84	62	68	72	72	70	74	76	76	80	82	104	80	85	88	88	88	90	92	92	93	96
78	72	74	70	72	72	76	80	76	82	78	96	92	92	80	92	91	93	96	92	94	93
86	62	68	70	72	68	70	74	78	82	80	104	78	84	84	85	83	84	87	90	93	92
82	64	68	72	70	68	72	74	82	82	82	98	76	82	84	83	82	84	86	95	94	94
80	60	66	74	68	64	74	76	80	78	80	97	74	79	85	82	76	83	85	90	88	90
82	64	70	68	72	70	76	80	82	80	82	99	78	83	80	84	82	87	91	94	94	94
86	62	68	72	72	70	78	82	78	82	84	102	77	84	88	87	86	92	96	94	95	96
78	62	68	74	68	70	72	76	80	82	84	93	73	79	85	8	83	84	87	94	96	96
72	58	64	66	62	64	76	74	82	80	82	86	70	77	79	77	79	86	86	94	94	95
80	62	68	72	74	70	78	80	76	78	80	95	72	78	82	86	82	88	90	91	92	95
78	60	70	70	74	72	82	80	82	80	82	94	73	82	83	85	85	91	89	94	94	96
82	62	68	72	70	70	78	84	78	82	84	99	76	82	86	82	83	88	92	90	94	96
86	62	64	68	72	70	76	82	78	82	80	106	76	79	84	88	85	89	94	92	95	93
84	60	66	64	70	72	76	80	82	80	82	100	76	82	81	87	86	90	94	94	94	94
88	72	78	82	80	82	80	82	84	80	82	106	85	91	95	94	94	92	95	98	96	98
82	60	68	74	76	74	76	78	88	84	80	96	72	79	85	86	86	88	88	96	94	92

