

“A PROSPECTIVE, RANDOMIZED CONTROL STUDY COMPARING THE ANALGESIC EFFICACY OF CONTINUOUS INFUSION OF LOCAL ANESTHETIC VERSUS INTERMITTENT BOLUS THROUGH THORACIC PARAVERTEBRAL CATHETRISATION IN PATIENTS UNDERGOING ELECTIVE THORACOTOMY SURGERIES”

Dissertation submitted to

THE TAMIL NADU DR. M.G.R. MEDICAL UNIVERSITY

In partial fulfillment for the award of the degree of

DOCTOR OF MEDICINE

IN

ANAESTHESIOLOGY

BRANCH X



**INSTITUTE OF ANAESTHESIOLOGY AND CRITICAL CARE
MADRAS MEDICAL COLLEGE
CHENNAI- 600003
APRIL 2016**

CERTIFICATE

This is to certify that the dissertation entitled, “**A PROSPECTIVE, RANDOMIZED CONTROL STUDY COMPARING THE ANALGESIC EFFICACY OF CONTINUOUS INFUSION OF LOCAL ANESTHETIC VERSUS INTERMITTENT BOLUS THROUGH THORACIC PARAVERTEBRAL CATHETRISATION IN PATIENTS UNDERGOING ELECTIVE THORACOTOMY SURGERIES**” submitted by **Dr. S. DINESH KUMAR**, in partial fulfillment for the award of the degree of Doctor of Medicine in Anaesthesiology by the Tamil Nadu Dr. M.G.R. Medical University, Chennai., is a bonafide record of the work done by him in the **INSTITUTE OF ANAESTHESIOLOGY AND CRITICAL CARE**, Madras Medical College and government hospital, during the academic year 2013-2016.

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CERTIFICATE BY THE GUIDE

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DECLARATION

I hereby, solemnly declare that this dissertation entitled “**A PROSPECTIVE, RANDOMIZED CONTROL STUDY COMPARING THE ANALGESIC EFFICACY OF CONTINUOUS INFUSION OF LOCAL ANESTHETIC VERSUS INTERMITTENT BOLUS THROUGH THORACIC PARAVERTEBRAL CATHETRISATION IN PATIENTS UNDERGOING ELECTIVE THORACOTOMY SURGERIES**” is a bonafide record of the work done by me in the Institute of Anaesthesiology and Critical Care, Madras Medical College and Government General Hospital, Chennai, during the period 2013 – 2016 under the guidance of **DR. M.VELLINGIRI, M.D., D.A.**, Professor, Institute of Anaesthesiology and Critical Care, Madras Medical College, Chennai – 3 and submitted to **The Tamil Nadu Dr. M.G.R. Medical University, Guindy, Chennai – 32**, in partial fulfilment for the requirements for the award of the degree of M.D. Anaesthesiology (Branch X), examinations to be held on April 2016.

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

Place: Chennai

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Date:

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Above all I pay my gratitude to the Lord Almighty for blessing me to complete this work.

Originality GradeMark PeerMark

PVB continuous VS intermittent bolus

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INTRODUCTION

One of the most painful surgical incision is the Thoracotomy incision. The reduction in FRC and the ability to take a deep breathe and cough out sputum after Thoracotomy are greatly influenced by pain. These patients may not be able to clear the secretion even if they willing to, because of the pain. This may end up in atelectasis and finally pneumonia. The associated cardiac complications are also less if we provide adequate analgesia to the patient¹.

The lateral thoracotomy incision is very painful. The intensity of pain depends on the site and extent of the incision. Intercostal nerve disruption and the pleura and chest wall inflammation contribute to the discomfort. The location and number of the chest drainage also contribute to the pain. Few patients may get shoulder pain following thoracotomy surgeries¹.

Though thoracic epidural technique is considered as the gold standard for the pain relief in Thoracotomy surgeries, Thoracic Paravertebral Block has been gaining much attention these days because of its numerous advantages over thoracic epidural techniques.

Paravertebral space was described in the early part of twentieth century. Hugo sellheim of Leipzig successfully demonstrated Paravertebral block for the first time in 1905². Initially this technique was performed to describe the pain pathways of abdominal and thoracic region by Arthur Lawen. As it provides adequate unilateral pain relief with cardiovascular stability, this technique was widely used for lobectomy and thoracoplasty in Tuberculosis patients.

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INTRODUCTION

The objective of this report is to review the literature on the efficacy of PVB and the ability to block a deep breath and cough and apnea after the procedure are greatly influenced by pain. These patients may not be able to clear the secretions even if they swallow in between of the pain. This may lead to aspiration and finally pneumonia. The associated cardiac complications can also lead to poor risk outcome analysis to the patient.

The latest literature reviews is very limited. The intensity of pain depends on the site and extent of the incision, functional nerve receptors and the physical characteristics of the patient. The location and number of the above changes also contribute to the pain. This patient may get double pain following the necessary surgery.

Though there are several techniques in evidence as the gold standard for the pain relief in the necessary surgeries. Some researchers have been giving much attention to the effectiveness of its outcomes in comparison to other spinal techniques.

Pain relief is very much needed in the early part of health-care. The efficacy of Longly successfully demonstrated Transcutaneous Block for the first time in 1967. Initially, the technique was performed by doctors for the management of abdominal and thoracic region by Arthur Lomas. As it provides adequate analgesia with cardiovascular stability, this technique was widely used for laboratory and therapeutic in Tuberculosis patients.

Though it was widely used for providing pain relief to patients in the first half of twentieth century, later it started to give pain relief for emergency, deep brain function, cancer pain and non-pain. The procedure was widely used and pain due to tuberculous were also treated.

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AIM OF THE STUDY:

To compare the analgesic efficacy of thoracic paravertebral block using continuous infusion of local anesthetic versus intermittent bolus in patients undergoing elective thoracotomy surgeries

BACKGROUND:

Various techniques and drug regimens for thoracic paravertebral block have been evaluated for post-thoracotomy analgesia. In this study continuous infusion versus intermittent bolus of local anesthetics for thoracic paravertebral block have been compared in the patients undergoing elective thoracotomy surgeries. 64 patients have been selected and randomized in to two groups with 32 patients in each group. Paravertebral block was performed and catheter kept in the paravertebral space. Intra operative vitals were noted. Post operative vitals and Visual Analogue Score were observed and compared between the two groups.

RESULTS:

Systolic blood pressure, diastolic blood pressure and mean arterial pressure were lower in continuous infusion group than the intermittent bolus group during both intra operatively and post operatively which is statistically significant.

The visual analogue scale score post-operatively was meaningfully less in continuous infusion intervention group compared to intermittent bolus intervention group by 0.29 mean score points which is statistically significant.

CONCLUSION:

From this study we can conclude that continuous infusion of local anesthetic is really superior to intermittent bolus administration of local anesthetic in the paravertebral block as shown by continuous pain relief with absence of break through pain and better patient compliance in post operative physiotherapy and ability to cough out sputum.

KEY WORDS:

Analgesia, paravertebral block, thoracotomy surgeries, local anesthetics

INTRODUCTION

One of the most painful surgical incision is the Thoracotomy incision. The reduction in FRC and the ability to take a deep breath and cough out sputum after Thoracotomy are greatly influenced by pain. These patients may not be able to clear the secretion even if they willing to, because of the pain. This may end up in atelectasis and finally pneumonia. The associated cardiac complications are also less if we provide adequate analgesia to the patient¹.

The lateral thoracotomy incision is very painful. The intensity of pain depends on the site and extent of the incision. Intercostal nerve disruption and the pleura and chest wall inflammation contribute to the discomfort. The location and number of the chest drainage also contribute to the pain. Few patients may get shoulder pain following thoracotomy surgeries²⁹.

Though thoracic epidural technique is considered as the gold standard for the pain relief in thoracotomy surgeries. Thoracic paravertebral block has been gaining much attention these days because of its numerous advantages over thoracic epidural techniques.

Paravertebral space was described in the early part of twentieth century. Hugo sellheim of Leipzig successfully demonstrated Paravertebral block for the first time in 1905²⁴. Initially this technique was performed to describe the pain pathways of abdominal and thoracic region by Arthur Lawen. As it provides adequate unilateral pain relief with cardiovascular stability, this technique was widely used for lobectomy and thoracoplasty in Tuberculosis patients.

AIM OF THE STUDY

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THORACOTOMY

Thoracotomy incision has been used for following surgeries:

- CMC for stenotic mitral valve
- Lobectomy
- Pneumonectomy
- Occasionally for esophageal perforation repair

IMPORTANCE OF PAIN CONTROL IN THORACOTOMY SURGERY:

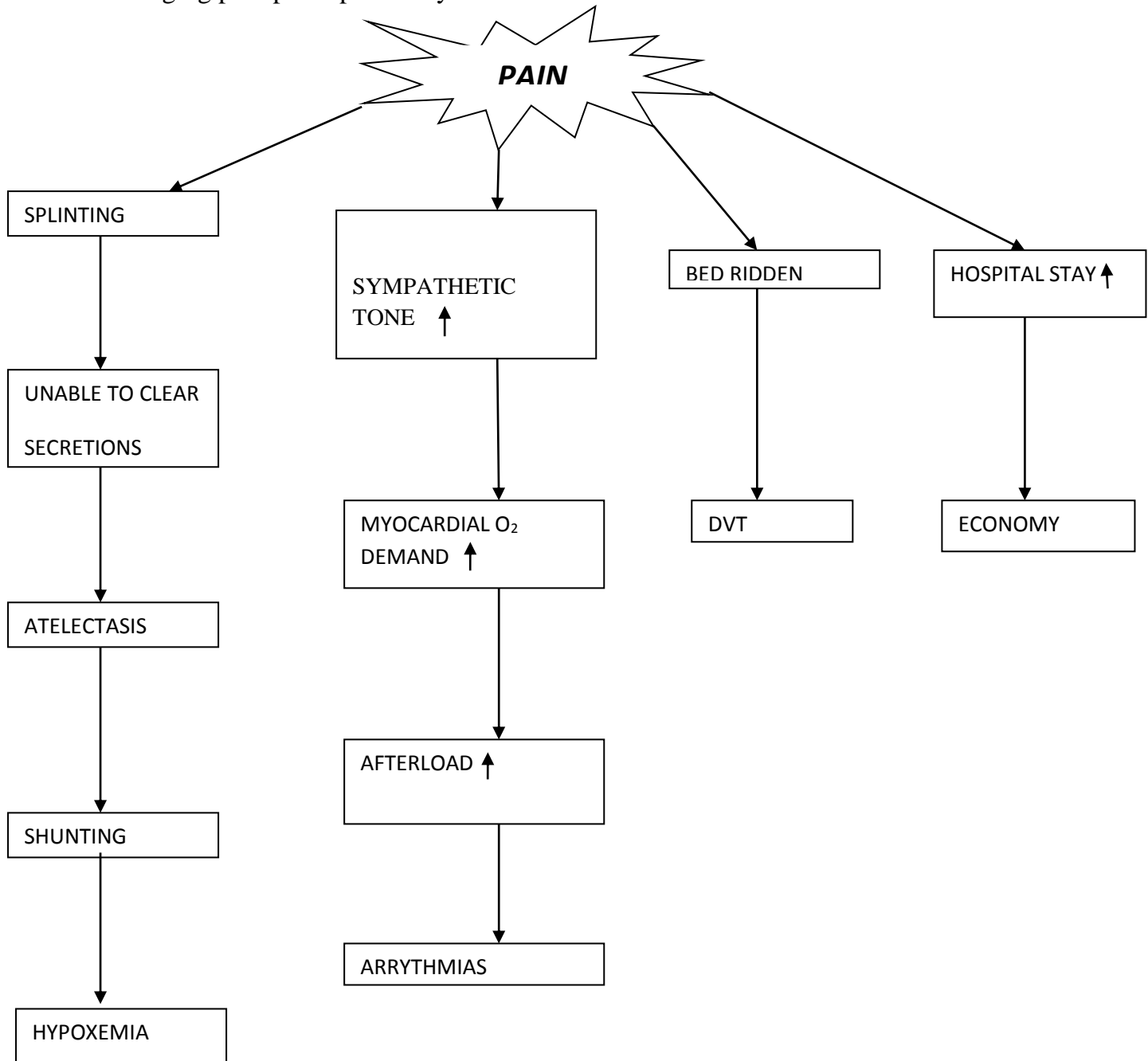
The importance of adequate pain management in the thoracic surgical patient cannot be overstated. Inadequate pain control in these high risk patients will results in

- Splinting,
- Poor respiratory effort and
- Inability to cough and clear secretions

All the above ultimately ends with airway closure, atelectasis, shunting and hypoxemia.

In addition acute pain increases sympathetic tone thereby causing tachycardia, hypertension, increasing myocardial oxygen demand, increased after load, myocardial dysfunction and arrhythmias.

It also delays mobilisation resulting in DVT and pulmonary embolism. It also increases ICU stay and overall hospital expenses. Hence there should be a proper plan for managing pain post operatively.



MODES OF ANALGESIA

PARENTERAL ANALGESICS

OPIOIDS – PROS & CONS:

A balance between drug induced respiratory suppression and adequate analgesia in patients with already compromised lung is quite a challenging task with opioids as the sole analgesic.

If at all used as sole analgesic, parenteral opioids can be given through PCA. Due to high intensity of pain, ultimately patient may require high dose of opioids which increases the risk of PONV and respiratory depression. Prolonged use of high dose may even cause dependency.

NSAID:

NSAID as sole analgesic for thoracotomy pain relief will be insufficient. It can be used in combination with opioids, thereby reducing the overall opioids requirement by 30%²⁵. It reduces the post operative inflammation. NSAIDs are useful in treating the ipsilateral shoulder pain that is often present post operatively and is poorly controlled with epidural analgesia²⁵

It may cause platelet dysfunction and thereby increase bleeding tendency. They may also cause kidney injury, gastric erosion and increased bronchial reactivity

Acetaminophen is an antipyretic/analgesic with COX inhibition and can be administered orally or rectally in the dose of up to 4g/day. It reduces shoulder pain and has low toxicity compared with more potent COX-inhibiting NSAIDs¹⁵.

KETAMINE:

Low-dose intramuscular ketamine (1mg/kg) is equivalent to the same dose of meperidine and cause less respiratory depression. It can also be given as low dose intravenous infusion and maybe useful in patients who are refractory to other therapies or if there is a contra indication to more common techniques⁵. The possibility of its psychomimetic effects are of concern in its regular use.

DEXMEDETOMIDINE:

It's a selective adrenergic alpha 2 agonist has been reported as a useful adjunct for post thoracotomy analgesia. It is associated with hypotension, but it seems to preserve renal function.

LOCAL ANESTHETICS / NERVE BLOCKS:

INTERCOSTAL NERVE BLOCKS:

Advantages

- Blocking the intercostal nerves supplying the dermatomes of surgical incision is an effective method of providing analgesia for thoracotomy surgeries. It can be done percutaneously or under direct vision when the chest is open.
- Single shot intercostal block with local anesthetics may provide adequate pain relief for extubation.

Disadvantages

- The duration of analgesia is restricted to the duration of action of the local anesthetic used. Also Indwelling intercostal catheters are difficult to position percutaneously
- Intercostal vessels lie close to the nerves and inadvertent injection of local anesthetic in to the vessels may precipitate local anesthetic toxicity.
- This block is associated with maximum risk of local anesthetic toxicity. Hence total Bupivacaine dose for a single time block should not exceed 1mg/kg²⁵.

INTRAPLEURAL ANALGESIA

The effectiveness of this block depends on the patient position, infusion volume, chest drain and the type of surgery. Local anesthetic infusion through the catheter placed in the surgical wound at the time of closure will reduce the opioids requirement post operatively.

EPIDURAL ANALGESIA:

Epidural analgesia is considered as gold standard for thoracotomy surgeries.

Advantages

- Excellent and continuous pain relief
- Avoidance of parenteral opioids side effect.

Disadvantages

- Requires technical expertise

- Hemodynamic instability due to sympathetic blockade.
- Technique cannot be performed in the presence of coagulopathy.
- Dural tap

PARAVERTEBRAL BLOCK:

Though it was initially used for providing post operative analgesia in the first half of twentieth century, later it extends to provide pain relief for angina pectoris, thigh bone fracture, cancer pain and rest pain. Herpes zoster neuralgia, renal colic and pain due to cholelithiasis were also treated with this technique¹⁰. Paravertebral block technique was also utilized for the management of supraventricular tachycardias.

Later, improvements in general anesthetic agents and techniques and the entry of thoracic epidural slowly replaced the Paravertebral block.

Eason and Wyatt re-explored Thoracic Paravertebral block by introducing a catheter in paravertebral space which allows repeated injections of local anesthetic agents and provide analgesia for a longer period than single time injection⁹.

With the advent of infusion pumps and the concern for local anesthetics toxicity, use of continuous infusion of low dose local anesthetics has been gaining popularity among the Anaesthesiologist. Continuous infusion techniques also helps to maintain constant pain relief and better patient compliance.

Paravertebral blocks are considered as the “unilateral epidurals,” as they block the spinal nerves on the side of anesthetic application, although they also have the potential for epidural spread (they can be bilateral if desired)¹⁹.

CRYOANALGESIA

Cryoanalgesia probe maybe used intraoperatively to freeze the intercostals nerves and produce long duration of analgesia because the nerve regeneration after cryoneurolysis may take nearly one month. Onset of analgesia is typically prolonged to 24 to 48 hrs after cryoneurolysis¹⁶.

ANATOMY AND PATHOPHYSIOLOGY OF PAIN IN THORACIC SURGERY

Nociceptive receptors transmit pain via C and A Δ fibres, which can be considered in three routes

- Intercostal nerves carry impulses from skin and intercostal muscles
- Vagus nerves carry stimuli from lung and mediastinum. Visceral pain is sensitive to stretch only.
- Parietal pleura is highly sensitive to noxious stimulus. Latissimusdorsi and serratus anterior are supplied by thoracodorsal and long thoracic nerves respectively. Chest wall muscles involved in Thoracotomy are Latissimusdorsi, Serratus anterior, Pectoralis major and Intercostal muscles

FACTORS AFFECTING ANALGESIC OUTCOME AFTER THORACOTOMY

- Surgical technique
- Choice of anesthetic modality
- Post operative level of care
- On going input from acute pain and physiotherapy
- Patient factors
- Psychological

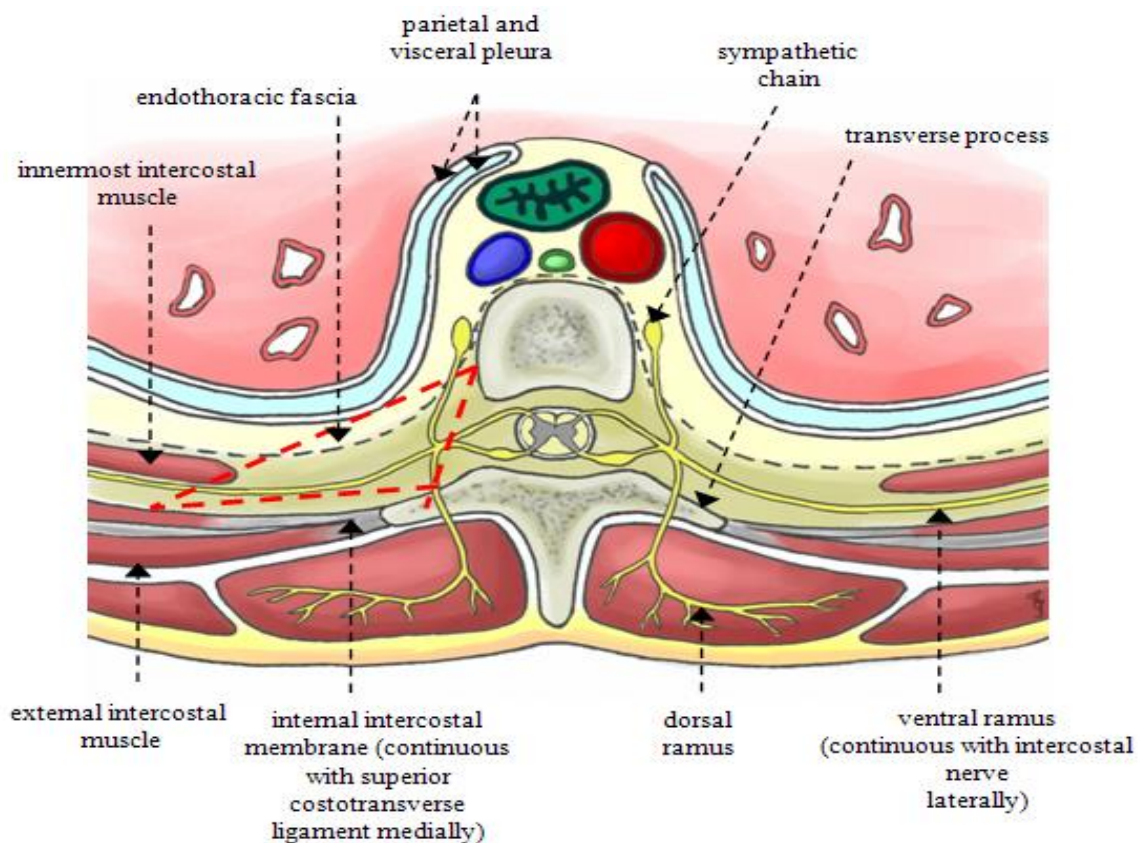
ANATOMY OF PARAVERTEBRAL SPACE

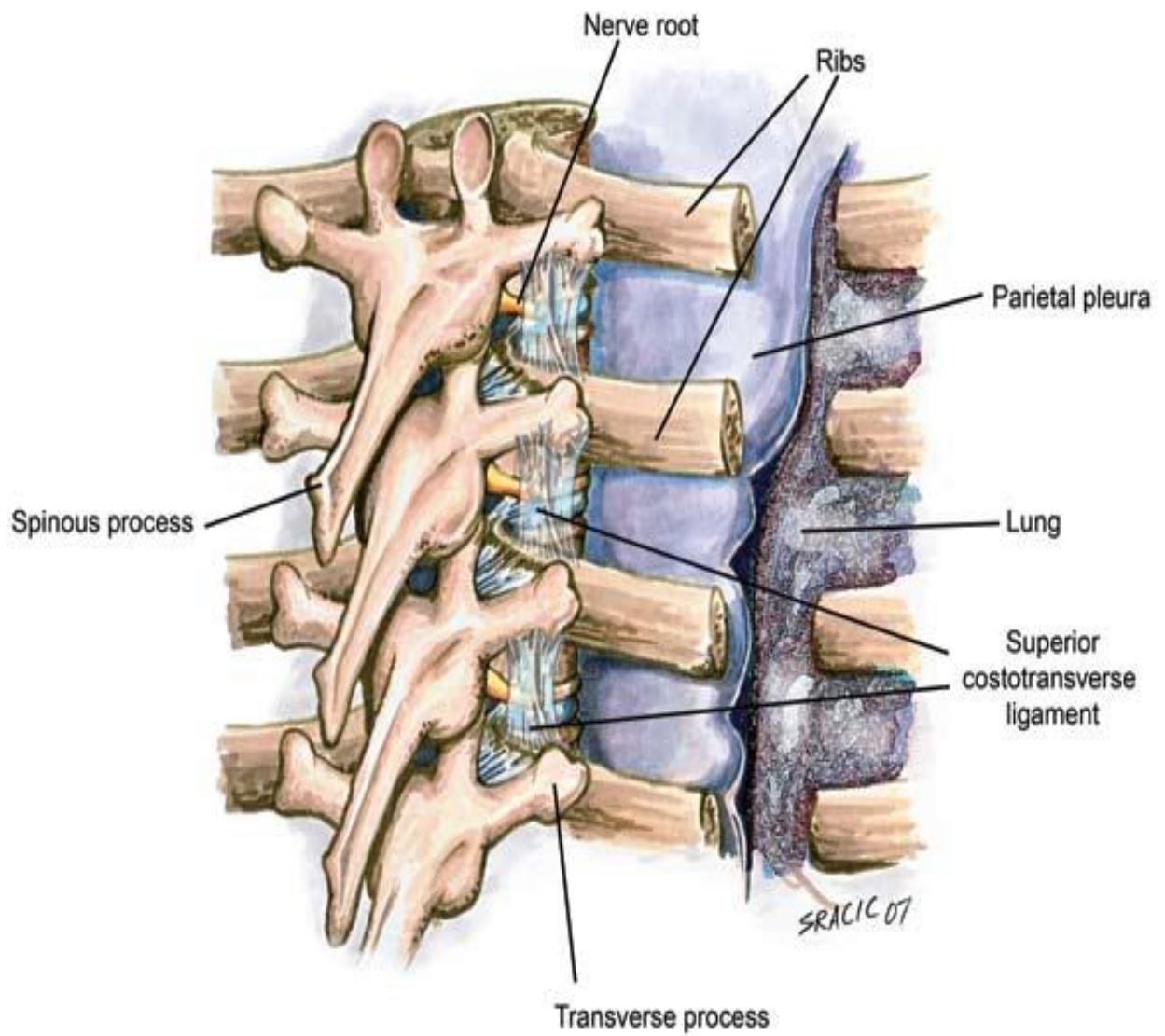
The Thoracic Paravertebral space starts from T1 and ends at T12. Its wedge shaped in all three dimensions.

Medially bounded by vertebral body, intervertebral disc and intervertebral foramina¹.

Anterolaterally bounded by parietal pleura and innermost intervertebral membrane¹.

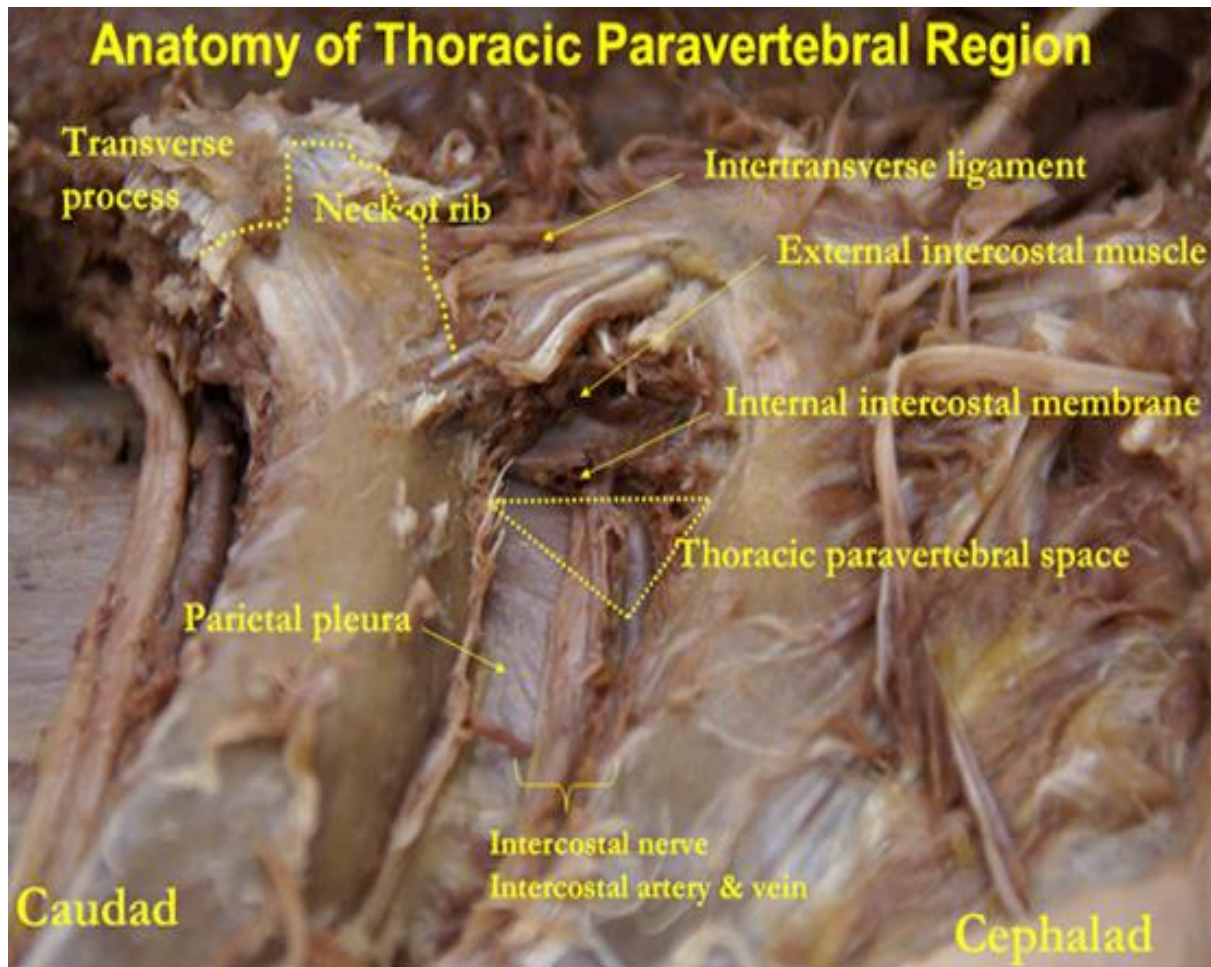
Posteriorly bounded by transverse process of vertebra, heads of ribs and superior costotransverse ligament¹.





The paravertebral space is divided into anterior subserous compartment and posterior subendothoracic compartment¹.

The contents of the Paravertebral space are spinal nerves, white and Grey rami communicans, sympathetic chain, intercostal nerves and fat²⁶.



PREPARATION

After obtaining the informed consent, patient is shifted into operation theatre and the following monitors are connected. Non invasive blood pressure cuff, Pulse Oximeter probe, ECG chest leads. A wide bore i.v cannula is placed. Once the resuscitation cart and trained staff are available, procedure can be started. Patient is positioned with head and back flexed in the lateral position with the operative side on top.

TECHNIQUE:

18g Tuohy needle is used. Under strict aseptic condition, the spinous processes are palpated and marked. About 2.5cm lateral to midline, skin is infiltrated with 1% Lignocaine and the needle is entered to hit the transverse process at around 3-6cm. Once transverse process is hit, needle is walked over it inferiorly just to pierce the superior costotransverse ligament and feeling for change in resistance once the paravertebral space is reached. Then the epidural catheter is threaded inside the space, keeping 4 to 5cm catheter inside the space. After 1% Lignocaine infiltration in the skin near the point of needle entry, tunnel is created and the catheter is fixed. Patient is turned back to supine position.

INDICATIONS:

- Thoracic surgery
- Fracture ribs
- Neuropathy
- Refractory angina pectoris

- Relief of cancer pain
- Control of hyperhidrosis.

CONTRAINDICATIONS

- Patient refusal
- Local anaesthetic allergy
- Severe coagulopathy
- Local sepsis
- Tumors in the paravertebral space
- Severe deformity of spine
- Ipsilateral diaphragmatic palsy¹
- Patients depending on intercostal muscles for respiration

COMPLICATIONS:

- Failure in inexperienced hands
- Inadvertent pleural puncture
- Pneumothorax
- In bilateral block epidural spread is more common when medial injections are given
- Ipsilateral horners syndrome

ADVANTAGES OF PVB OVER EPIDURAL¹:

- Easier to perform
- Fewer failed blocks
- Decreased risk of neuraxial hematomas
- Analgesia is comparable with epidural in terms of success and efficacy
- Can be performed in anaesthetized patient
- Less neurological problems
- No hypotension
- No urinary retention
- Less sedation, nausea, vomiting, constipation compared to opioids usage in epidural

ADVANTAGES OF PVB OVER INTRA PLEURAL BLOCK¹:

- It produces less serum LA concentration
- Reduce chronic pain by intense block of sympathetic nerves
- Reduced tumor recurrence
- Less morbidity

PHARMACOLOGY OF BUPIVACAINE

Bupivacaine is a long acting local anaesthetic belonging to amide group. Mepivacaine, Bupivacaine and Ropivacaine are characterized as piperidylidides¹⁶. Addition of butyl group to the piperidine nitrogen of mepivacaine results in bupivacaine, which is 35 times more lipid soluble and has potency and duration of action 3 to 4 times that of mepivacaine²⁷.

MECHANISM OF ACTION

Local anesthetics bind to specific sites in voltage gated Na⁺ current, thereby reducing excitability of neuronal, cardiac or central nervous system tissue¹⁷. Local anesthetics prevent transmission of nerve impulses (conduction blockade) by inhibiting passage of sodium ions through ion selective sodium channels in nerve membranes³. The sodium channel itself is a specific receptor for local anesthetic molecules. Failure of an increase in sodium channel ion permeability slows the rate of depolarization so that threshold potential is not reached and hence action potential is not reached²⁷. Local anesthetics does not alter the resting transmembrane potential or threshold potential

METABOLISM

Possible way of metabolism of Bupivacaine include aromatic hydroxylation, N-dealkylation, amide hydrolysis and conjugation²⁰. Only the N-dealkylated metabolite N-desbutylbupivacaine, has been measured in blood or urine after epidural or spinal anesthesia²⁰. The mean total urinary excretion of Bupivacaine and its dealkylation and hydroxylation metabolites account for >40% of total anesthetic dose²⁰. Alpha 1- acid glycoprotein is the most important plasma protein binding site of Bupivacaine and its

concentration is increased in many clinical situations, including post operative trauma⁶.

Bupivacaine has slow onset of action with average duration of action after infiltration ranges from 240 to 480 seconds⁸. Maximum single dose for infiltration is around 175mg and the Bupivacaine toxicity features manifest if the plasma concentration exceeds 3mcg/ml⁸. pK of Bupivacaine is 8.1 and it is 95% protein bounded⁸.

USES

- Topical anesthesia
- Local infiltration
- Peripheral nerve blockade
- Neuraxial anesthesia
- Paravertebral anesthesia

SIDE EFFECTS

- Allergy to Bupivacaine
- Cardiotoxicity – Precipitous hypotension, cardiac dysrhythmias and atrio-ventricular blocks². Premature ventricular contractions, widening of QRS complexes and ventricular tachycardias are the most common arrhythmias seen, though other arrhythmias including supraventricular tachycardia, atrio-ventricular block and ST-T wave changes can also occur but are less

common¹⁴. Cardiotoxic plasma concentration of Bupivacaine are 8 to 10mcg/ml²⁸.

- Neurotoxicity – vertigo, tinnitus, twitching, slurred speech and seizures
- Hepatotoxicity

REVIEW OF LITERATURES

1. **Richardson J et al**²³ in 1994 concluded that rise in plasma cortisol after the surgery was significantly low in paravertebral block and the respiratory function is preserved.

2. **Catale E et al**⁴ in 1996 did a study in anesthesiology and pain clinic department in Spain to determine the quality of continuous infusion versus bolus infusion of Bupivacaine after Thoracotomy. It is a prospective randomized controlled study done in 30 patients. The patients were given either a loading dose of 15ml of 0.375% Bupivacaine and an infusion of 5ml of 0.25% Bupivacaine every hour or 20ml of 0.375% Bupivacaine every 6hours.

Pain intensity was assessed at rest and continuously at intervals of 1, 4, 10, 20 and 48 hours by VAS. The vitals, need of rescue analgesia or higher dose Bupivacaine and level of blockade were noted. In both the groups Bupivacaine toxicity did not occur.

At the end it was found that continuous infusion offers a better analgesia than bolus dose in post thoracotomy

3. **Joshi GP et al**¹² in 2008 conducted a study evaluating the role of regional technique for post thoracotomy analgesia which concluded that continuous Paravertebral block provided analgesia as equivalent to epidural but lesser incidence of hypotension. Also the incidence of pulmonary complication were less with paravertebral block than systemic analgesia

4, **Kotze et al**¹ in 2009 did a metaanalysis to review and metaregression to compare the heterogeneous trials between various groups. They compared the 48hours post

operative analgesia in thoracotomy patients with continuous infusion or intermittent bolus of local anesthetics with or without additive in paravertebral block.

Pleural and muscular damage, intercostal nerve damage and costovertebral joint disruption causes pain in post operative thoracotomy patients. So it was found that optimal analgesia can be provided by multimodal approach like simple analgesics, systemic opioids, nerve blocks etc.

From their study, it was found that 50% decrease in post thoracotomy pain is obtained from higher dose of local anesthetics. So paravertebral block is an additional mode of analgesia to systemic opioids. But addition of opioid in paravertebral block did not offer any advantage. Also clonidine was also not effective. Single injection technique had unpredictable outcome though it was safe. Multiple injection technique was showing good outcome.

The risk of local anesthetic toxicity was balanced against by the improved analgesia and pulmonary mechanics from the higher local anesthetics doses. Toxic level of Bupivacaine was achieved when $>0.5\text{mg/kg/hour}$ was given and/or when 0.25mg/kg/hour infusion used for 24hours.

5. De Cosmo G et al⁷ in 2009 suggested continuous infusion of paravertebral block when thoracic epidural is contra-indicated or couldn't be performed. Whereas the other techniques are not as effective alternative as that of paravertebral block.

6. Norum HM et al¹⁸ in 2010 argued that epidural which was compared with paravertebral block were not optimally performed as they found catheter in thoracic epidural were kept too low.

7. **Pintaric TS et al**²¹ in 2011 concluded that paraartebral block is associated with lesser incidence of side effects, requires only fewer nursing staff and minimal monitoring than thoracic epidural.

8, According to **Pipanmekapom et al**²² in 2012, the use of continuous thoracic paravertebral block which was done under direct vision is found superior to thoracic epidural in difficult to access cases. It also offered less complications.

9, **Kevin king et al**¹³ in his review in 2012 states that thoracic epidural results in frequent difficulty in placing the catheter and failures when compared with paravertebral block. Also epidural is contraindicated in patients on anticoagulants. But not so in case of paravertebral block. Moreover paravertebral block does not cause hypotension and urinary retention as it does with epidural. It also required less monitoring and nursing care. So patients can be admitted in non-ICU units. Paravertebral block also aids in neurological assessment despite providing analgesia and improved respiratory mechanics when compared to epidural blockade.

10, **Gonulsagiroluet al**¹¹ in 2013 also says that though thoracic epidural and paravertebral block offers adequate analgesia for post thoracotomy cases, paravertebral blocks are easier and quicker to place technically and free of hypotension.

MATERIALS AND METHOD

After getting approval from our institution's ethics committee, this study was conducted among 64 patients belonging to ASA grade I and II who undergoes for elective thoracotomy surgery under general anaesthesia. The age of distribution was selected between 18 and 50 years with BMI ranging between 18 and 30 kg/m². All patients have undergone thorough preoperative examination.

The procedure was explained to the patient in their own language and consent was obtained. All patients underwent full examination like height, weight vitals like blood pressure, pulse rate and basic investigations like complete blood count which includes Hb and Platelets, renal function test that includes random blood sugar, blood urea nitrogen and serum creatinine, chest Xray and ECG. All major systems were examined and airway examination was also done. Visual Analogue Scale was explained to the patient with pictorial representation.

INCLUSION CRITERIA:

- Age : between 18 and 50 years
- BMI : between 18 and 30 kg/m²
- ASA: I and II
- Surgery : elective
- Mallampatti score: I and II
- Who have given valid informed consent

EXCLUSION CRITERIA:

- Patient's refusal
- Allergy to Local anaesthetics
- Coagulopathy
- Thoracic vertebral disease or deformity
- Systemic or local sepsis
- H/O seizures and any neurological deficit
- Psychiatric diseases
- Those patients not satisfying inclusion criteria

MATERIALS USED

- 18G Tuohy needle, epidural catheter
- Loss of resistance syringe
- 10ml syringe
- 1% Lignocaine preparation for skin infiltration
- Drugs – 0.25% Bupivacaine
- Continuous infusion syringe pump system
- Sterile drapes

- Monitors – ECG, NIBP, SPO₂, EtCO₂
- Visual analogue scale

Each patient have been randomly assigned into one of the two groups.

GROUP A:

Thirty two patients in this group received initial dose of 8ml of 0.25% Bupivacaine followed by continuous infusion at the rate 0.1ml/kg/hr of 0.25% Bupivacaine for up to 24 hours after the procedure.

GROUP B:

Thirty two patients in this group received the initial dose of 8ml of 0.25% Bupivacaine followed by intermittent bolus of 0.1ml/kg of 0.25% Bupivacaine hourly for 24 hours after the procedure.

After obtaining the informed consent patients were shifted inside the operation theatre and the monitors were connected. Intra venous access was obtained with 16G intravenous cannula. Patients were turned to lateral position with the operating side on top. The patients were made to bend their back and bring their knees to chest. This position was maintained by an assistant. The back was painted with povidone iodine and draped with sterile towels. Under strict aseptic precautions, thoracic spine was palpated and a skin wheel was created at 2.5cm lateral to T5 Thoracic spine with 1% Lignocaine. Tuohy needle was inserted till it hits the corresponding transverse process and then its walked over inferiorly and angulated slightly laterally. A change in resistance was felt when the needle pierces superior costotransverse ligament using

loss of resistance syringe. Epidural catheter was inserted through the needle. After adequate skin infiltration with 1% Lignocaine tunneling was done and catheter passed through it and fixed. Patient turned to supine position. 8ml of 0.25% Bupivacaine was given through the catheter after negative aspiration for blood and csf.

Patients were premedicated with 1.5mg of inj. Midazolam, 2mcg/kg of inj. Fentanyl and 0.2mg of inj. Glycopyrrolate. Induction was done with Inj. Thiopentone sodium 5mg/kg and Inj. Vecuronium 0.1mg/kg. Inj. Lignocard 1.5mg/kg was given 90seconds before intubation to attenuate the stress response. Patients were then intubated with appropriate sized double lumen tube and the position is confirmed and fixed. Bladder were catheterized and the surgery started after proper positioning.

Anesthesia was maintained with 1% Sevoflurane along with O₂ 40% and N₂O 60%. Group A patients received continuous infusion of 0.25% Bupivacaine at the rate of 0.1ml/kg/hour, whereas the Group B patients received an intermittent bolus of 0.1ml/kg of 0.25% Bupivacaine for up to 24 hours post operatively.

After the surgery is over, patients were turned supine and the volatile agents were cut off and ventilation was assisted. Once the arterial blood gas reports were within normal range and patients had recovered adequately from the neuromuscular blockade, they were reversed with inj. Glycopyrrolate 20mcg/kg/min and inj. Neostigmine 50mcg/kg. After adequate oral suctioning, patient was extubated. Visual analogue scoring was recorded.

Hypotension was defined as MAP declining 30% from its baseline value

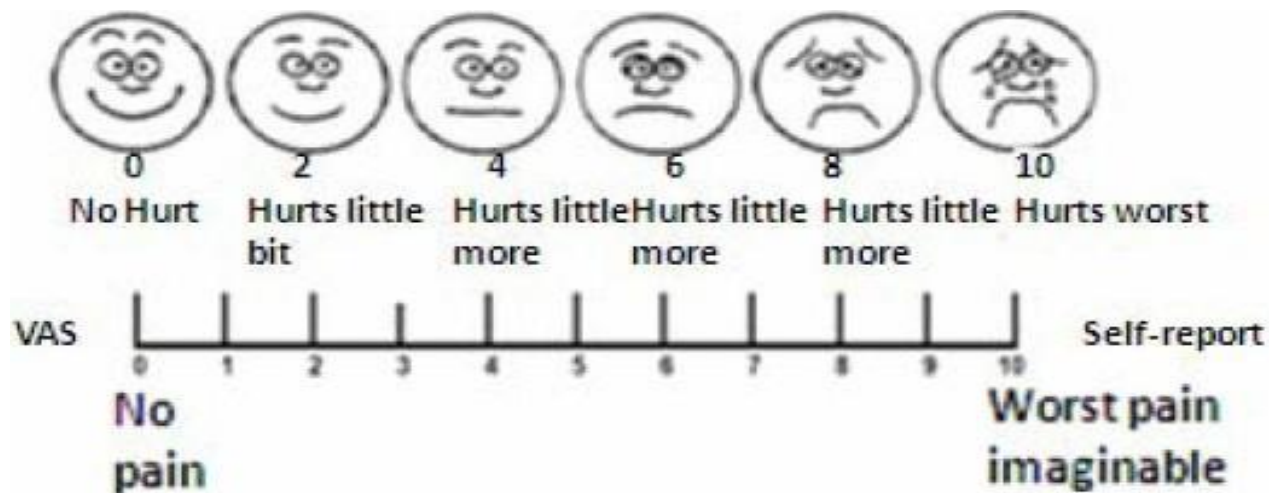
Paravertebral block was considered as a failure if patient experiences pain of VAS more than 4 and they were given rescue analgesia of inj. Tramadol 100mg. They were excluded from the study. All the patients were kept in post operative intensive care units. Intra operatively Patient's heart rate and blood pressure were noted for every 5 minutes till first hour and then for every 30 minutes till eight hours and then hourly till 24hour postoperative period. Post operatively VAS score was noted for every 30 minutes till 8 hours and then hourly till 24 hours postoperatively. Analgesia was considered as adequate when VAS score ranges from 0 to 4. And inj. Tramadol was given for rescue analgesia. Other complications of Bupivacaine were also closely monitored.

The following parameters were monitored:

VITALS:

Heart rate, systolic blood pressure, diastolic blood pressure and mean blood pressure and VAS score

VAS SCORE:



SIDE EFFECTS:

Reduction in MAP of $>30\%$ of baseline is considered as hypotension and is treated with i.v. fluids and titrated dose of inj.ephedrine 6mg.

Fall in heart rate to 40/min was considered as bradycardia and treated with inj. Atropine 0.6mg

OBSERVATION AND RESULTS

GROUPS

Groups	Intervention Used	Study Subjects
Continuous Infusion Group	<ul style="list-style-type: none">• Pre operative paravertebral block with continuous infusion of Bupivacaine	Patients undergoing elective thoracotomy surgeries
Intermittent Bolus Group	<ul style="list-style-type: none">• Pre operative Paravertebral block with intermittent bolus of Bupivacaine.	

Statistics

Descriptive statistics was done for all data and suitable statistical tests of comparison were done. Continuous variables were analysed with the unpaired t test and categorical variables were analysed with the Chi-Square Test and Fisher Exact Test. Statistical significance was taken as $P < 0.05$. The data was analysed using EpiInfo software (7.1.0.6 version; Center for disease control, USA) and Microsoft Excel 2010.

Sample Size Calculation

Sample size was determined based on

Study

Postoperative pain relief using intermittent intrapleural analgesia following thoracoscopic anterior correction for progressive adolescent idiopathic scoliosis

,

Authored by

Stephen AC Morris, et al

Published in

Scoliosis 2013, 8:18

In this study Pain scores significantly decreased following the administration of a bolus ($p < 0.0001$), with the mean pain score decreasing from 3.66 to 1.83 (50% reduction)

Description:

- The confidence level is estimated at 95%
- with a z value of 1.96
- the confidence interval or margin of error is estimated at +/-15
- Assuming that the sample will have the specified attribute p% =50 and q%=50

$$n = p\% \times q\% \times [z/e\%]^2$$

$$n = 50.4 \times 50 \times [1.96/15]^2$$

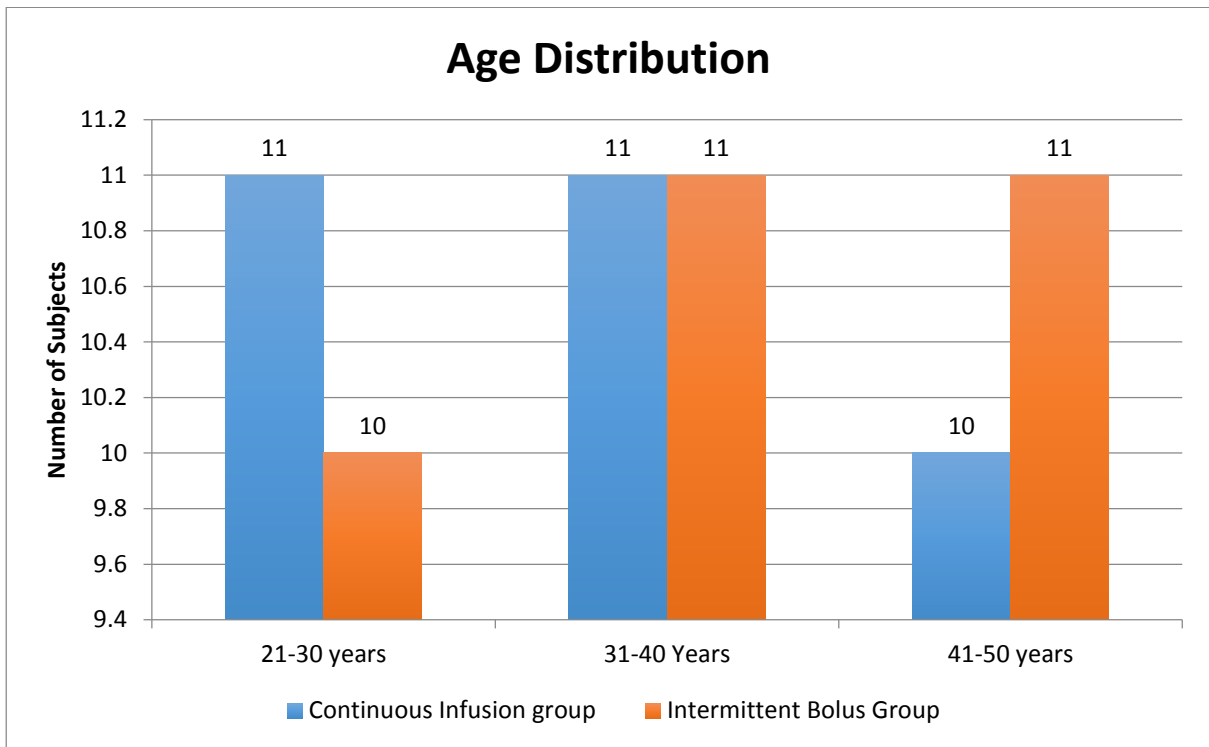
$$n = 42.68$$

Therefore 43 is the minimum sample size required for the study

In our study we have taken 64 as the sample size

(n=32 in continuous infusion Group and n=32 in intermittent bolus Group)

AGE

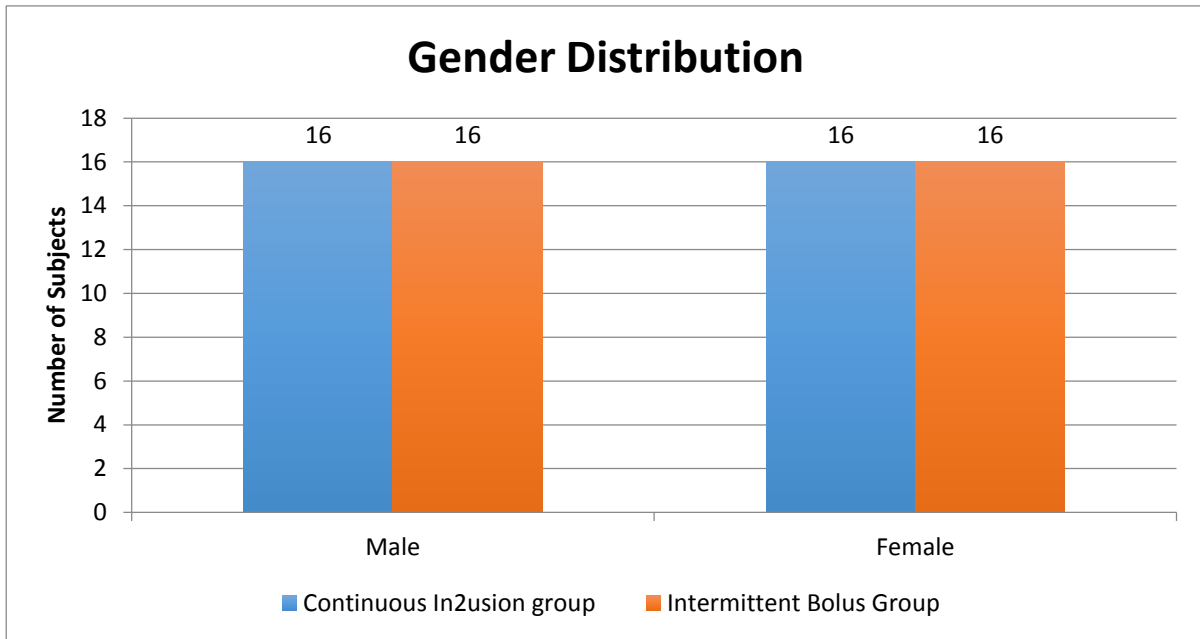


Age Distribution	Continuous Infusion group	%	Intermittent Bolus Group	%
≤ 20 Years	0	0.00	0	0.00
21-30 years	11	34.38	10	31.25
31-40 Years	11	34.38	11	34.38
41-50 years	10	31.25	11	34.38
Total	32	100	32	100

Age Distribution	Continuous Infusion group	Intermittent Bolus Group
N	32	32
Mean	34.59	34.31
SD	8.73	8.05
P value		0.8939
Unpaired t test		

Majority of the continuous infusion group patients belonged to the 31-40 years age group (n=11, 34.38%) with a mean age of 34.59 years. In the intermittent bolus group patients, majority belonged to the same age group as continuous infusion group (n=11, 34.38%) with a mean age of 34.31 years. The association between the intervention groups and age distribution is considered to be not statistically significant since $p > 0.05$ as per unpaired t test.

GENDER

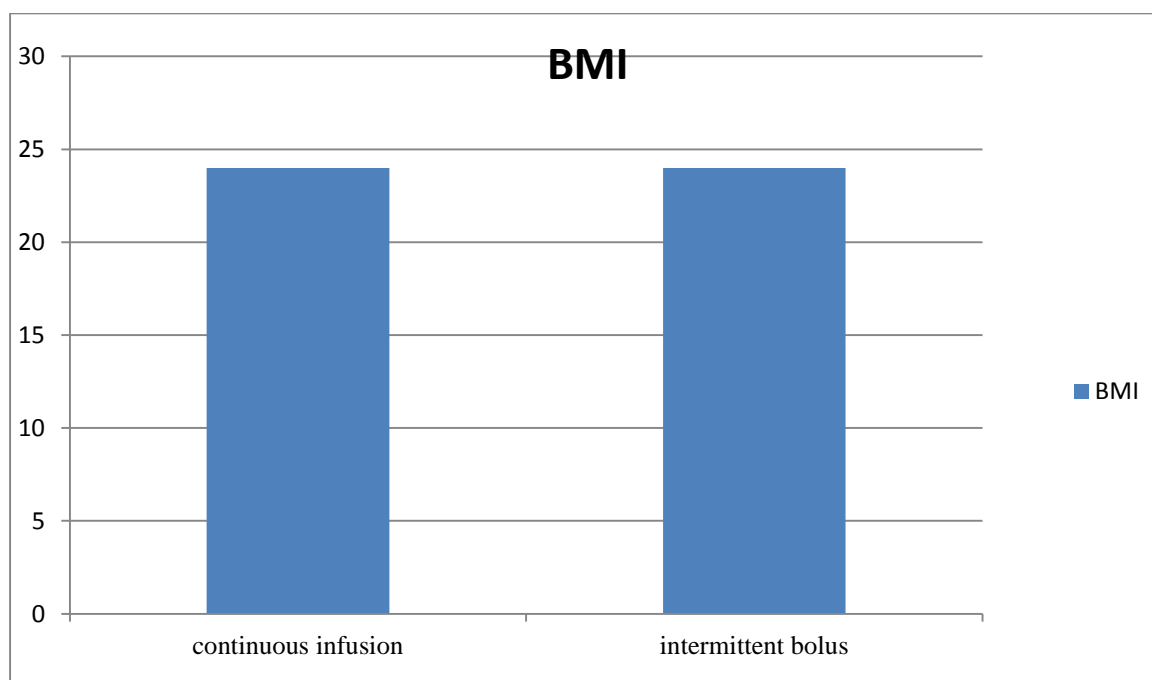


Gender Distribution	Continuous Infusion group	%	Intermittent Bolus Group	%
Male	16	50.00	16	50.00
Female	16	50.00	16	50.00
Total	32	100	32	100
P value	>0.9999			
Chi Squared Test				

Majority of the continuous infusion group patients belonged to the male gender group (n=16, 50%). In the intermittent bolus group patients, majority belonged to the male gender group (n=16, 50.00%). The association between the intervention groups and gender distribution is considered to be not statistically significant since $p > 0.05$ as per chi squared test.

BMI

GROUPS	N	MEAN	SD	P
CONTINUOUS INFUSION GROUP	32	24.221	1.1880	0.640
INTERMITTENT BOLUS GROUP	32	24.057	1.2045	



The mean BMI was 24.221 in continuous infusion Group and 24.057 in intermittent bolus Group. *By conventional criteria the association between the techniques and BMI is considered to be not statistically significant since $p > 0.05$.*

Since age, gender, and BMI are not statistically significant it means that there is no difference between the two groups. In other words ,the two group contain subjects with the *same basic demographic characteristics*.

From the above data, it has been ascertained that there is no significant demographic differences between the two groups. Hence it ensures comparability between the two groups.

ASA

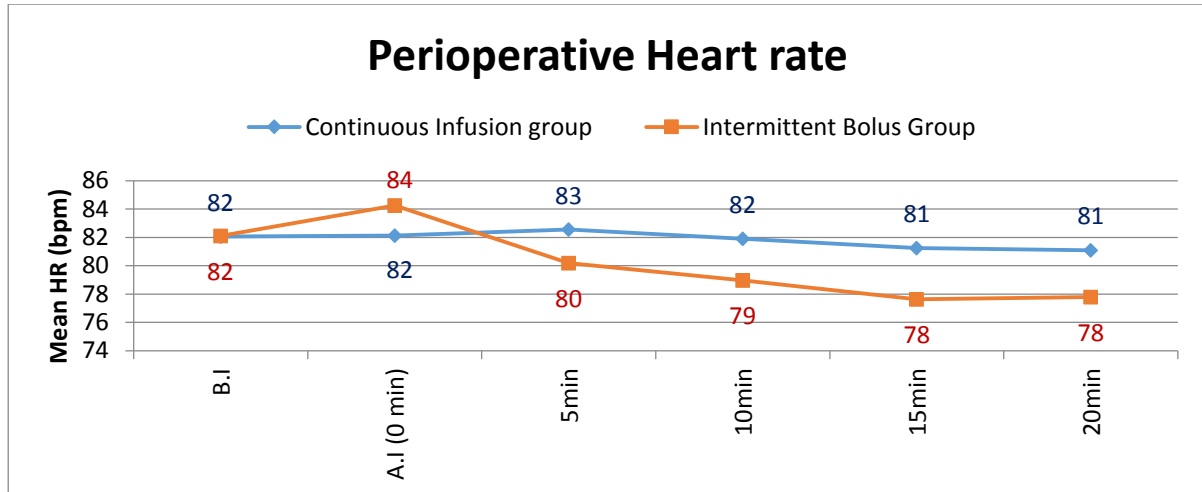
GROUP	ASA I		ASA II		P VALUE
	N	%	N	%	
CONTINUOUS INFUSION	15	46.875	17	53.125	1.00 BY CHI SQUARE TEST
INTERMITTENT GROUP	15	46.875	17	53.125	

In continuous infusion group, 15 patients belong to ASA I and 17 patients belong to ASA II. In the intermittent group, 15 patients belong to ASA I and 17 patients belong to ASA II.

The data is not statistically significant ($p > 0.05$) and hence the groups are comparable in terms of ASA PS status

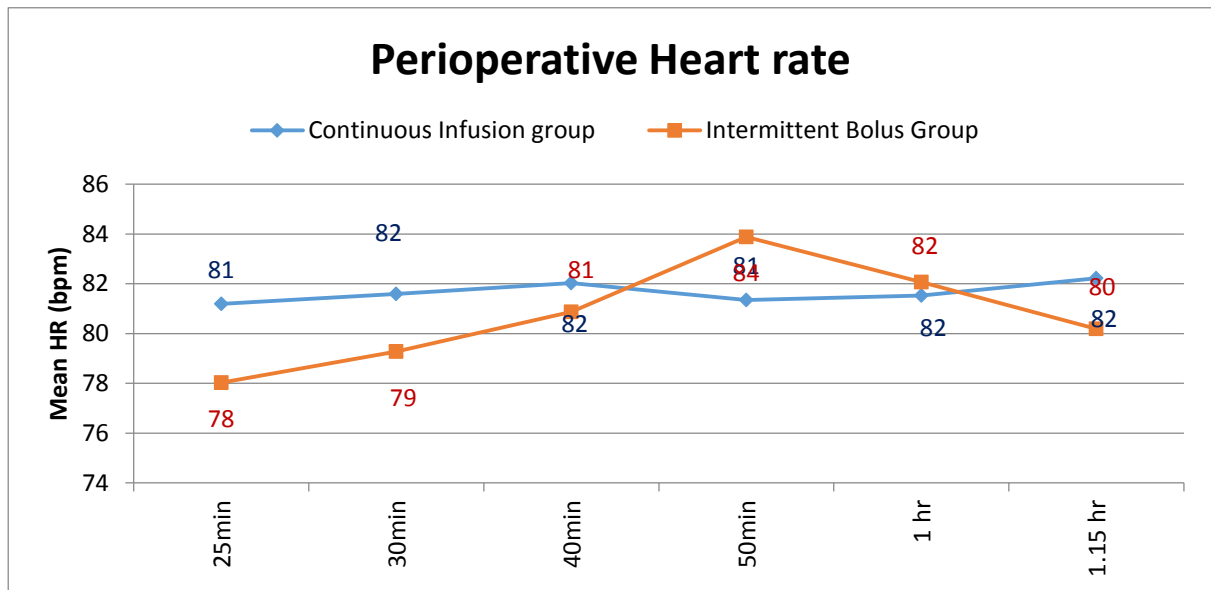
PERIOPERATIVE HEART RATE

0 Minutes to 20 minutes



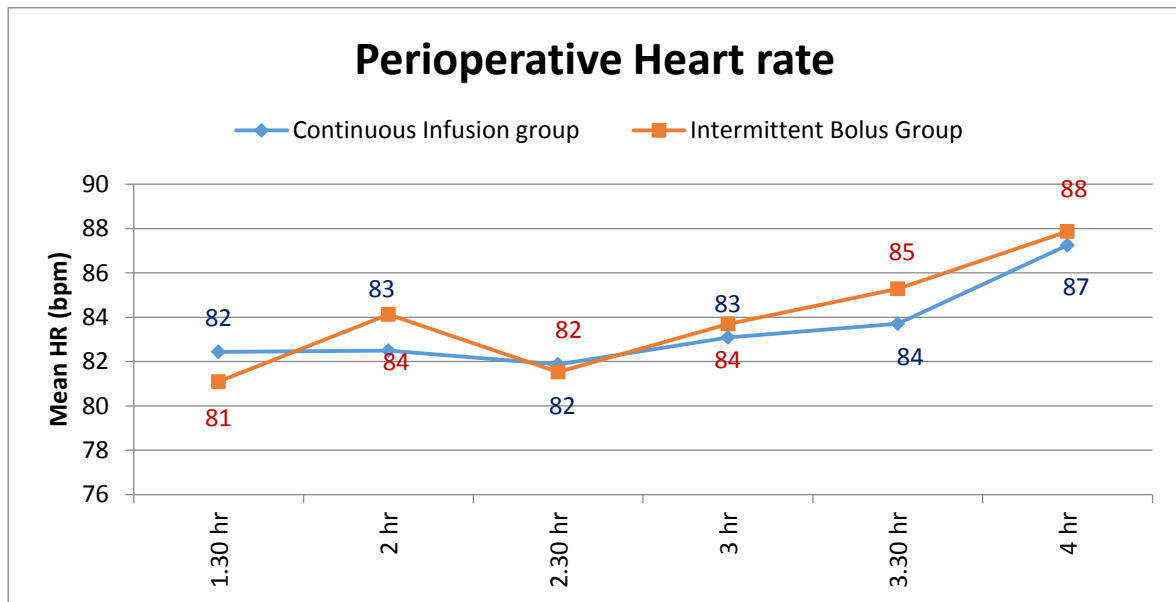
Perioperative Heart rate		B.I	A.I (0 min)	5min	10min	15min	20min
Continuous Infusion Group	N	32	32	32	32	32	32
	Mean	82.06	82.13	82.56	81.91	81.25	81.09
	SD	10.37	10.95	12.94	13.25	13.18	12.43
Intermittent Bolus Group	N	32	32	32	32	32	32
	Mean	82.09	84.25	80.19	78.97	77.63	77.78
	SD	9.99	9.35	8.28	9.68	10.15	10.42
P value Unpaired t test		0.9902	0.4072	0.3858	0.3155	0.2227	0.2526

25 Minutes – 1 Hour 15 Minutes



Perioperative Heart rate		25min	30min	40min	50min	1 hr	1.15 hr
Continuous Infusion Group	N	32	32	32	32	32	32
	Mean	81.59	82.03	81.34	81.53	82.22	81.09
	SD	13.38	13.88	13.00	13.26	12.51	12.43
Intermittent Bolus Group	N	32	32	32	32	32	32
	Mean	79.28	80.88	83.88	82.06	80.19	77.78
	SD	10.61	11.06	10.08	10.74	10.26	10.42
P value Unpaired t test		0.2677	0.4467	0.7137	0.3876	0.8608	0.4803

1 Hour 30 Minutes – 4 Hours

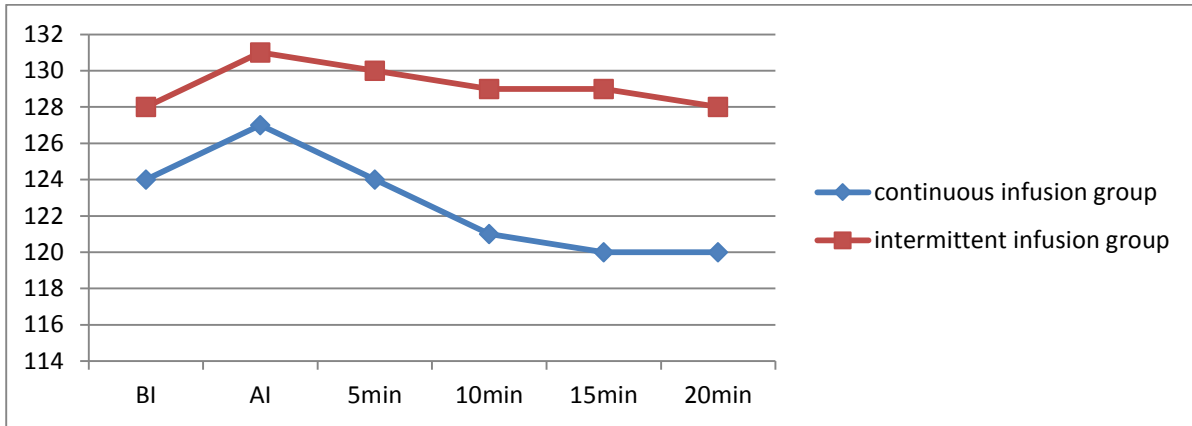


Perioperative Heart rate		1.30 hr	2 hr	2.30 hr	3 hr	3.30 hr	4 hr
Continuous Infusion Group	N	32	32	32	27	16	32
	Mean	82.50	81.88	83.09	83.70	87.25	81.09
	SD	13.30	12.05	14.24	13.12	11.54	12.43
Intermittent Bolus Group	N	32	32	32	21	15	32
	Mean	84.13	81.53	83.69	85.29	87.87	77.78
	SD	9.58	8.97	8.05	8.33	9.57	10.42
P value Unpaired t test		0.6666	0.577	0.8974	0.8382	0.6135	0.8722

Most of the continuous infusion group patients had mean perioperative heart rates ranging from 82.06 to 81.09 between baseline status and 4 hours perioperatively. Similarly the intermittent bolus group patients had mean heart rates ranging from 82.09 to 77.08 between baseline status and 4 hours perioperatively. By conventional criteria the association between the intervention groups and perioperative heart rate is considered to be not statistically significant since $p > 0.05$ as per unpaired t test.

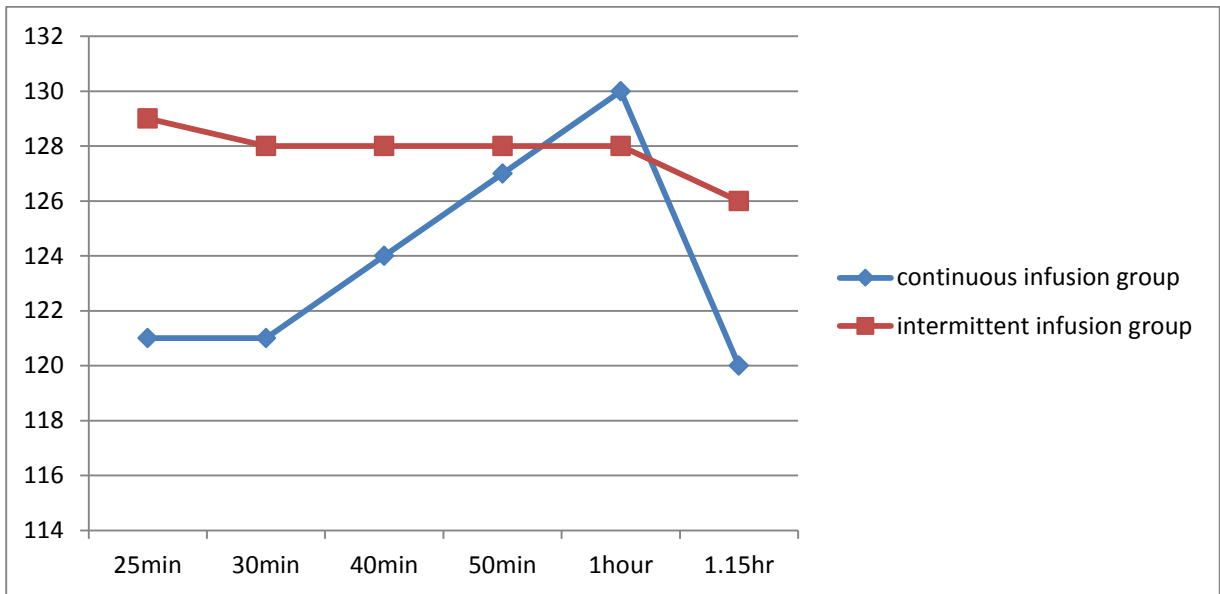
PERIOPERATIVE SYSTOLIC BP

Baseline - 20 Minutes



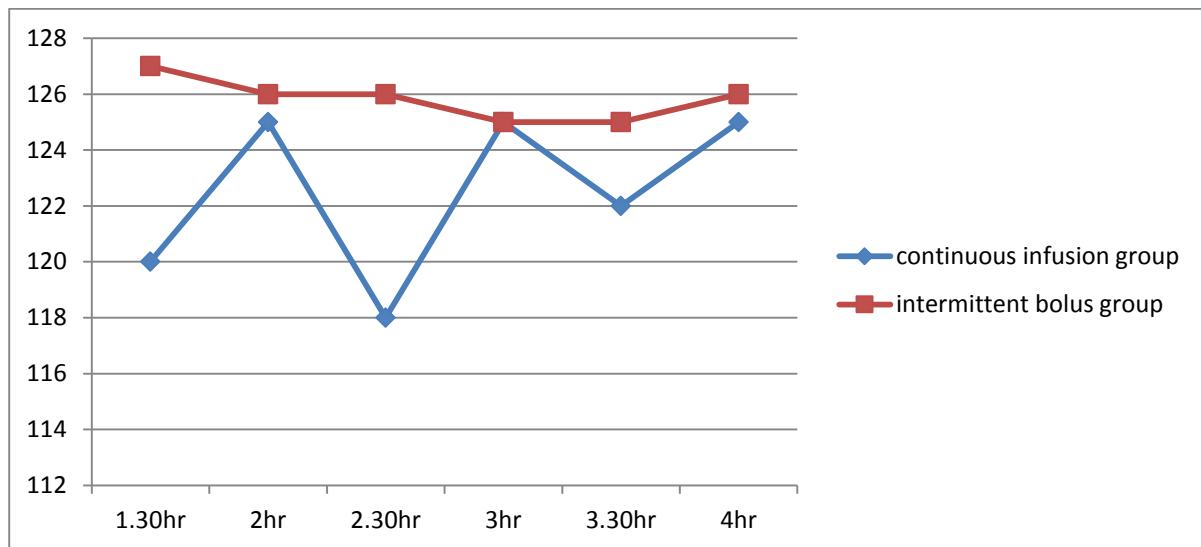
Perioperative Systolic BP		B.I	A.I (0 min)	5min	10min	15min	20min
Continuous Infusion Group	N	32	32	32	32	32	32
	Mean	123.59	126.69	123.50	121.44	119.84	120.16
	SD	11.18	8.85	9.38	10.12	10.79	9.80
Intermittent Bolus Group	N	32	32	32	32	32	32
	Mean	128.13	131.28	130.09	128.50	128.72	127.94
	SD	9.03	9.00	9.31	8.99	9.73	8.57
P value Unpaired t test		0.0795	0.0437	0.0064	0.0045	0.0010	0.0013

25 Minutes - 1 Hour 15 Minutes



Perioperative Systolic BP		25min	30min	40min	50min	1 hr	1.15 hr
Continuous Infusion Group	N	32	32	32	32	32	32
	Mean	121.16	121.31	124.13	127.22	129.75	119.63
	SD	9.32	10.27	10.86	10.04	9.40	21.83
Intermittent Bolus Group	N	32	32	32	32	32	32
	Mean	128.50	128.31	128.34	128.38	127.81	126.38
	SD	9.12	8.60	8.94	8.40	9.09	8.56
P value Unpaired t test		0.0023	0.0044	0.0949	0.6192	0.4051	0.1113

1 Hour 30 Minutes - 4 Hours

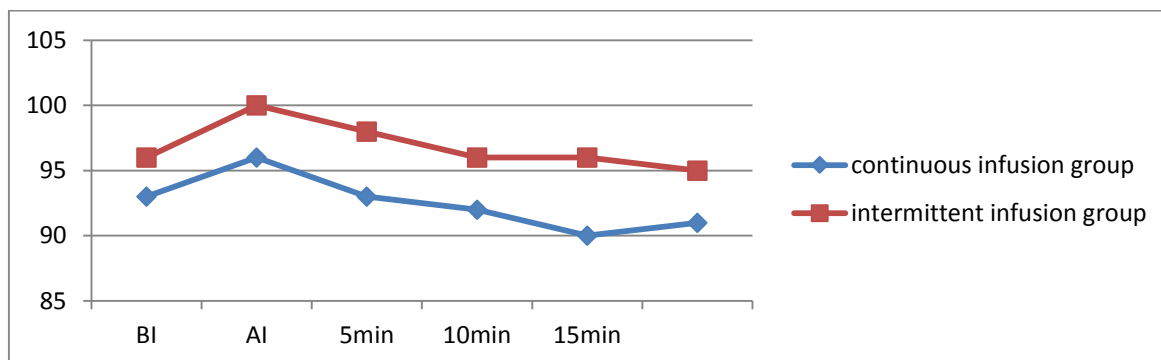


Perioperative Systolic BP		1.30 hr	2 hr	2.30 hr	3 hr	3.30 hr	4 hr
Continuous Infusion Group	N	32	32	32	32	21	15
	Mean	119.91	125.0	118.34	124.9	122.33	124.8
	n		6		1		7
	SD	11.50	10.23	11.26	9.22	9.39	9.01
Intermittent Bolus Group	N	32	32	32	32	27	17
	Mean	127.47	126.4	126.28	125.5	124.89	125.8
	n		4		0		8
	SD	8.25	9.31	9.75	11.43	11.23	10.90
P value Unpaired t test			0.576		0.819		0.775
		0.0038	0	0.0037	9	0.3953	0

The association between the intervention groups and perioperative systolic blood pressure is considered to be statistically significant between AI-30 minutes, 1st hour thirty minutes and 2nd hour thirty minutes since $p < 0.05$ as per unpaired t test indicating a true difference among intervention groups and the difference is significant. In patients belonging to intermittent bolus intervention group, the systolic blood pressure perioperatively is increased to an average of 128.57 mm Hg between AI-30 minutes, 1st hour thirty minutes and 2nd hour thirty minutes perioperatively in comparison with patients belonging to continuous infusion intervention group in whom the systolic blood pressure is an average of 121.37 mm Hg with a p-value of < 0.05 according to unpaired t-test. The systolic blood pressure perioperatively was meaningfully less in continuous infusion intervention group compared to intermittent bolus intervention group by 7.19 mm Hg. This significant difference of 1.06 times increase in systolic blood pressure perioperatively in intermittent bolus intervention group compared to continuous infusion intervention group is true and has not occurred by chance. In this study we can safely conclude that Pre operative paravertebral block with continuous infusion of Bupivacaine significantly reduces systolic blood pressure perioperatively compared to Pre operative Paravertebral block with intermittent bolus of Bupivacaine when used in patients undergoing elective thoracotomy surgeries

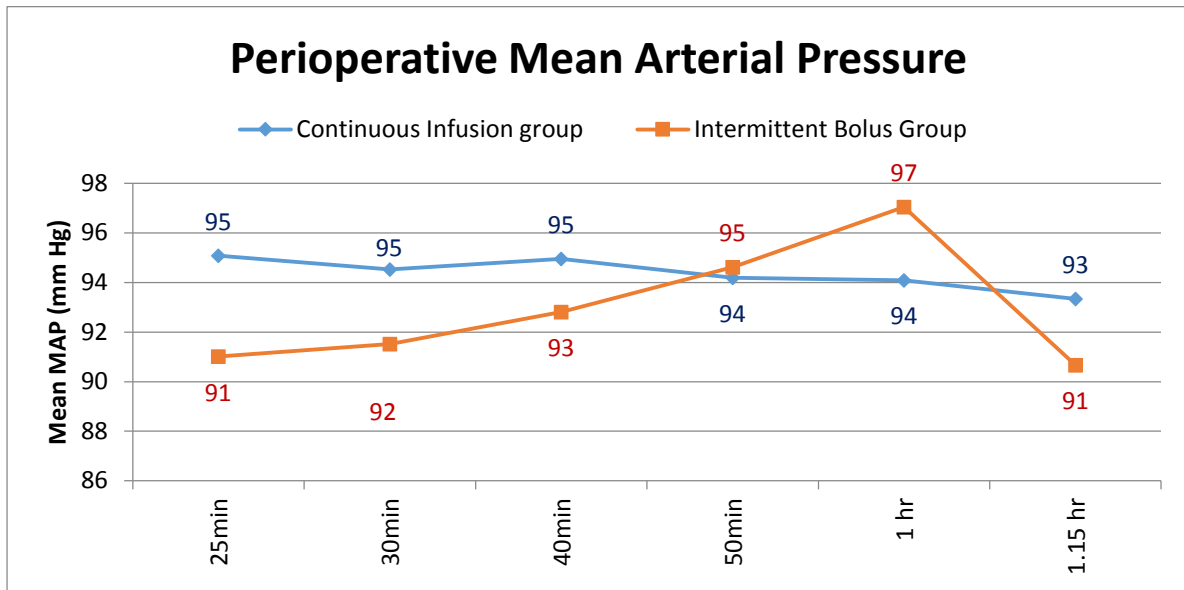
Perioperative Mean Arterial Pressure

Baseline - 20 Minutes



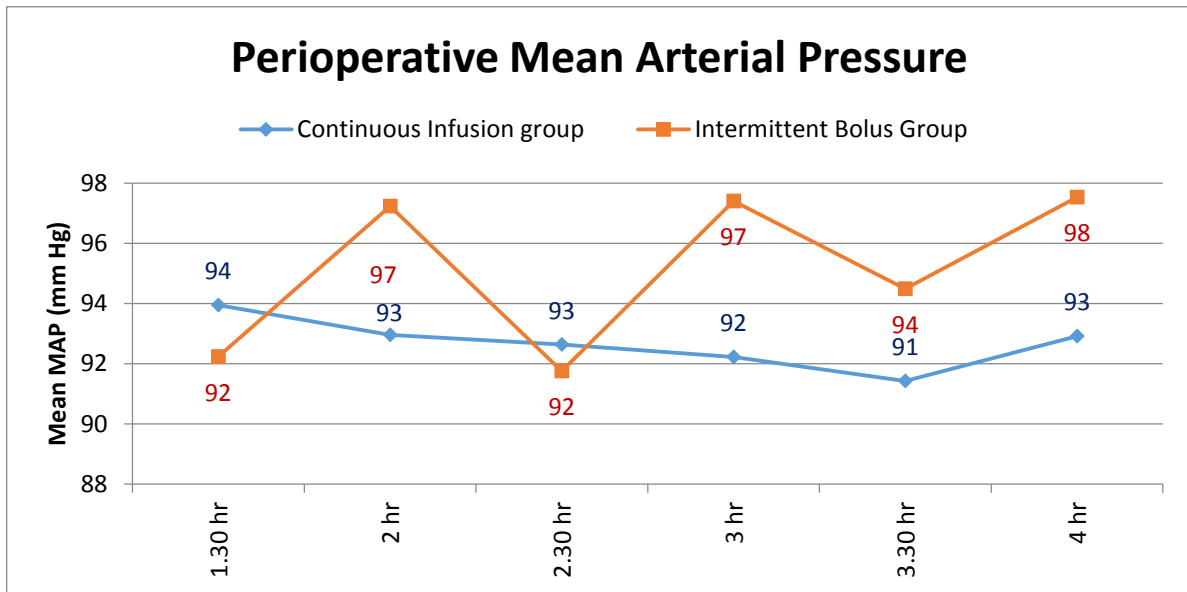
Perioperative Mean Arterial Pressure		B.I	A.I (0 min)	5min	10min	15min	20min
Continuous Infusion Group	N	32	32	32	32	32	32
	Mean	93.18	96.08	93.25	91.81	90.47	90.59
	SD	10.78	9.46	9.64	10.53	10.08	9.42
Intermittent Bolus Group	N	32	32	32	32	32	32
	Mean	95.58	100.11	97.86	95.92	95.59	95.29
	SD	10.35	9.31	9.70	8.99	8.88	8.37
P value Unpaired t test		0.3658	0.0906	0.061 0	0.098 8	0.034 8	0.039 1

25 Minutes – 1 Hour 15 Minutes



Perioperative Mean Arterial Pressure		25min	30min	40min	50min	1 hr	1.15 hr
Continuous Infusion Group	N	32	32	32	32	32	32
	Mean	95.08	94.52	94.95	94.19	94.08	93.33
	SD	8.72	8.48	8.95	8.46	9.31	8.52
Intermittent Bolus Group	N	32	32	32	32	32	32
	Mean	91.01	91.52	92.81	94.61	97.04	90.67
	SD	9.09	9.86	10.60	9.63	9.32	11.85
P value Unpaired t test		0.0722	0.1967	0.3875	0.8511	0.2087	0.3057

1 Hour 30 Minutes – 4 Hours

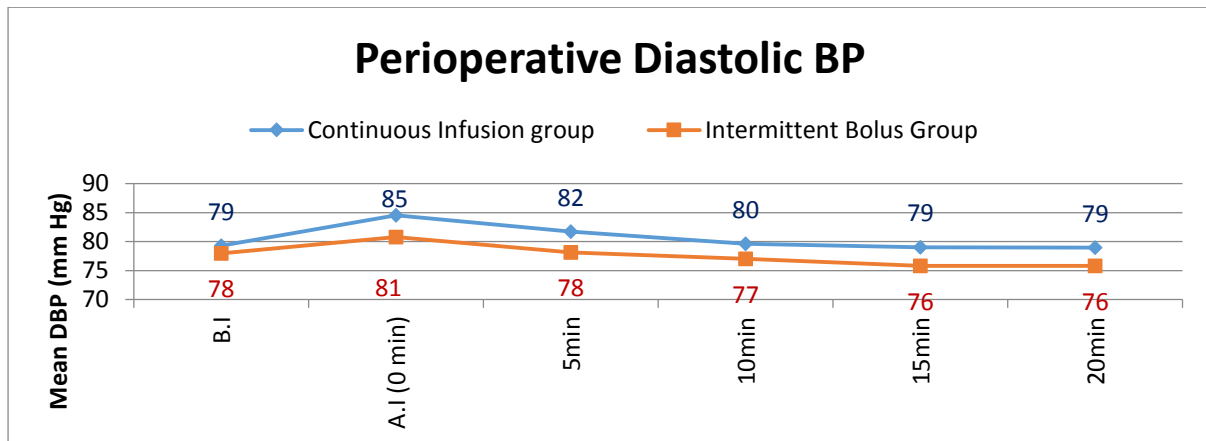


Perioperative Mean Arterial Pressure		1.30 hr	2 hr	2.30 hr	3 hr	3.30 hr	4 hr
Continuous Infusion Group	N	32	32	32	32	27	16
	Mean	93.95	92.96	92.64	92.23	91.43	92.92
	SD	9.30	9.62	8.98	10.93	9.97	11.68
Intermittent Bolus Group	N	32	32	32	32	21	15
	Mean	92.24	97.23	91.76	97.41	94.49	97.53
	SD	9.37	8.90	7.64	7.50	8.23	8.30
P value Unpaired t test		0.4669	0.070	0.676	0.031	0.250	0.213
			0	1	3	2	2

The association between the intervention groups and perioperative mean arterial pressure is considered to be statistically significant between 15-20 minutes and at 3 hours since $p < 0.05$ as per unpaired t test indicating a true difference among intervention groups and the difference is significant. In patients belonging to continuous infusion intervention group, the mean arterial pressure perioperatively is increased to an average of 94.37 mm Hg between between 15-20 minutes and at 3 hours perioperatively in comparison with patients belonging to intermittent bolus intervention group in whom the mean arterial pressure is an average of 92.82 mm Hg with a p-value of < 0.05 according to unpaired t-test. The mean arterial pressure perioperatively was meaningfully more in continuous infusion intervention group compared to intermittent bolus intervention group by 1.55 mm Hg. This significant difference of 1.1 times increase in mean arterial pressure perioperatively in continuous infusion intervention group compared to intermittent bolus intervention group is true and has not occurred by chance. In this study we can safely conclude that Pre operative paravertebral block with continuous infusion of Bupivacaine significantly decreases mean arterial pressure perioperatively compared to Pre operative Paravertebral block with intermittent bolus of Bupivacaine when used in patients undergoing elective thoracotomy surgeries

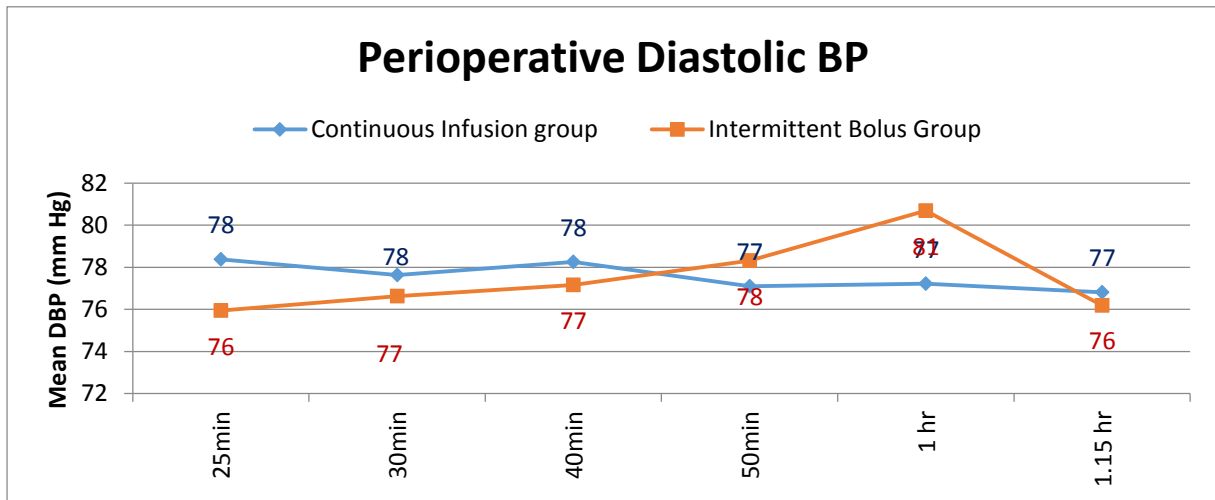
PERIOPERATIVE DIASTOLIC BP

Baseline - 20 Minutes



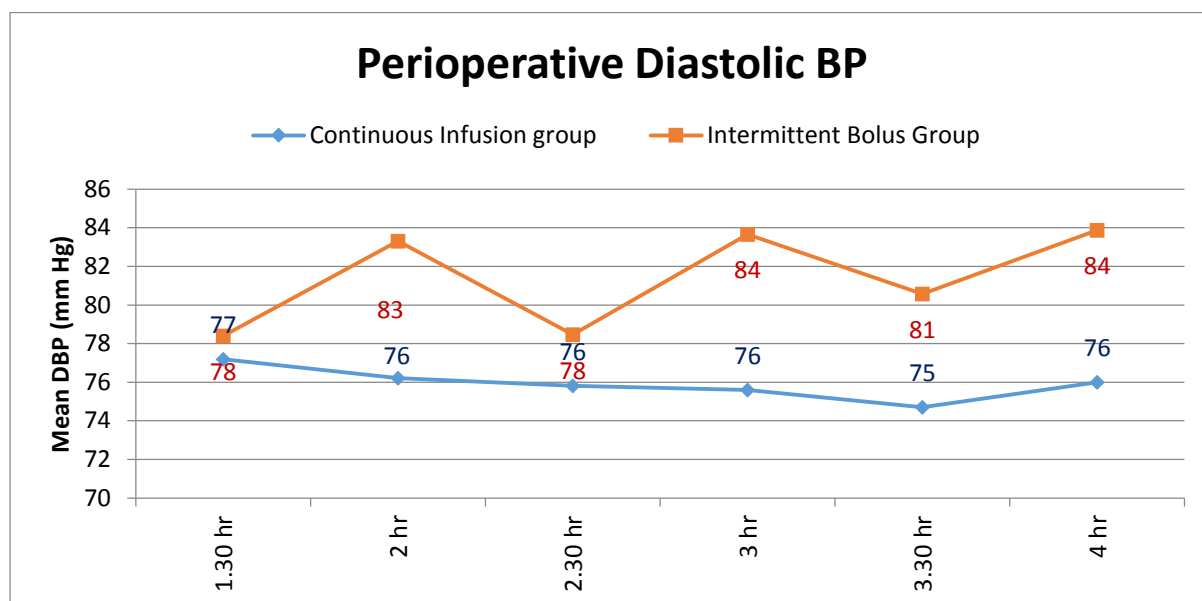
Perioperative Diastolic BP		B.I	A.I (0 min)	5min	10min	15min	20min
Continuous Infusion Group	N	32	32	32	32	32	32
	Mean	79.31	84.53	81.75	79.63	79.03	78.97
	SD	11.57	10.32	10.57	10.15	9.42	9.41
Intermittent Bolus Group	N	32	32	32	32	32	32
	Mean	77.97	80.78	78.13	77.00	75.78	75.81
	SD	10.84	10.12	10.39	11.50	11.12	10.23
P value Unpaired t test		0.6333	0.1474	0.1713	0.3368	0.2120	0.2039

25 Minutes – 1 Hour 15 Minutes



Perioperative Diastolic BP		25min	30min	40min	50min	1 hr	1.15 hr
Continuous Infusion Group	N	32	32	32	32	32	32
	Mean	78.38	77.63	78.25	77.09	77.22	76.81
	SD	9.57	9.38	9.96	9.66	10.23	9.54
Intermittent Bolus Group	N	32	32	32	32	32	32
	Mean	75.94	76.63	77.16	78.31	80.69	76.19
	SD	9.72	10.27	10.90	9.88	9.81	10.10
P value Unpaired t test		0.3162	0.6857	0.6767	0.6196	0.1711	0.8000

1 Hour 30 Minutes – 4 Hours

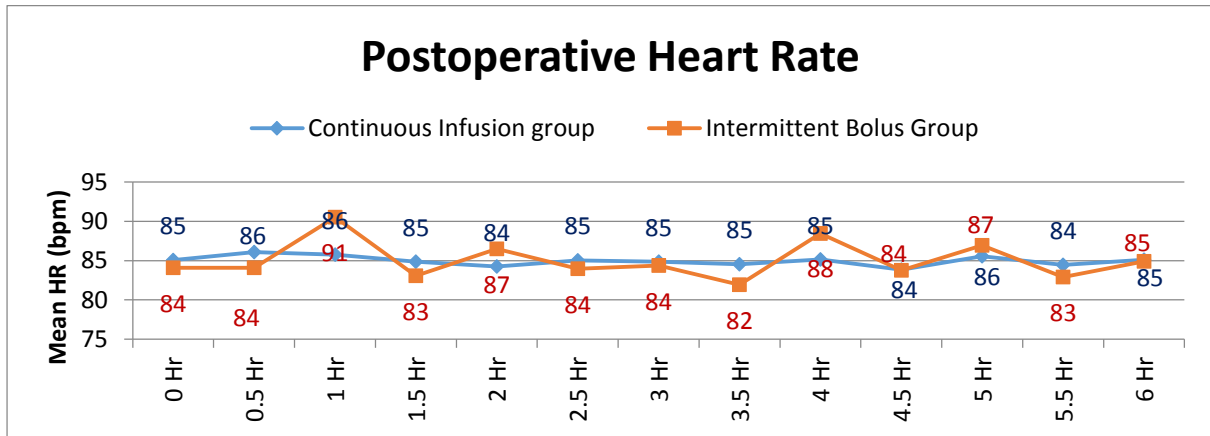


Perioperative Diastolic BP		1.30 hr	2 hr	2.30 hr	3 hr	3.30 hr	4 hr
Continuous Infusion Group	N	32	32	32	32	27	16
	Mean	77.19	76.22	75.81	75.59	74.70	76.00
	SD	10.68	10.49	9.61	11.45	10.39	13.10
Intermittent Bolus Group	N	32	32	32	32	21	15
	Mean	78.41	83.31	78.47	83.66	80.57	83.87
	SD	9.09	9.11	7.06	7.60	8.54	8.30
P value Unpaired t test		0.6248	0.0054	0.0128	0.0016	0.0372	0.0451

The association between the intervention groups and perioperative diastolic blood pressure is considered to be statistically significant between 2-4 hours since $p < 0.05$ as per unpaired t test indicating a true difference among intervention groups and the difference is significant. In patients belonging to continuous infusion intervention group, the diastolic blood pressure perioperatively is decreased to an average of 75.67 mm Hg between 2-4 hours perioperatively in comparison with patients belonging to intermittent bolus intervention group in whom the diastolic blood pressure is an average of 81.98 mm Hg with a p-value of < 0.05 according to unpaired t-test. The diastolic blood pressure perioperatively was meaningfully less in continuous infusion intervention group compared to intermittent bolus intervention group by 6.31 mm Hg. This significant difference of 8% decrease in diastolic blood pressure perioperatively in continuous infusion intervention group compared to intermittent bolus intervention group is true and has not occurred by chance. In this study we can safely conclude that Pre operative paravertebral block with continuous infusion of Bupivacaine significantly decreases diastolic blood pressure perioperatively compared to Pre operative Paravertebral block with intermittent bolus of Bupivacaine when used in patients undergoing elective thoracotomy surgeries

POSTOPERATIVE HEARTRATE

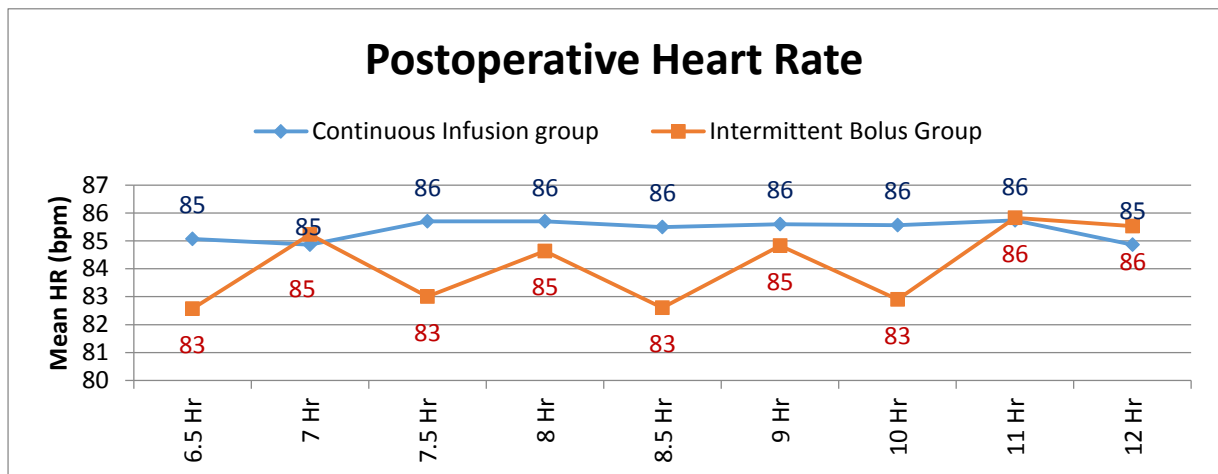
Baseline - 6 Hours



Postoperative Heart Rate		0 Hr	0.5 Hr	1 Hr	1.5 Hr	2 Hr	2.5 Hr	3 Hr
Continuous Infusion group	N	30	30	30	30	30	30	30
	Mean	85.07	86.10	85.77	84.87	84.27	85.03	84.87
	SD	8.08	7.70	7.95	7.40	7.01	7.51	7.04
Intermittent Bolus Group	N	30	30	30	30	30	30	30
	Mean	84.10	84.10	90.53	83.07	86.50	83.97	84.37
	SD	7.99	6.85	11.41	7.64	9.84	7.85	6.56
P value Unpaired t test		0.642	0.292	0.066	0.357	0.315	0.592	0.777
		9	5	0	9	9	9	0

Postoperative Heart Rate		3.5 Hr	4 Hr	4.5 Hr	5 Hr	5.5 Hr	6 Hr
Continuous In2usion group	N	30	30	30	30	30	30
	Mean	84.53	85.13	83.83	85.57	84.47	85.10
	SD	7.53	7.98	16.31	7.88	7.67	7.81
Intermittent Bolus Group	N	30	30	30	30	30	30
	Mean	81.93	88.47	83.77	86.93	82.90	84.90
	SD	6.56	10.36	8.85	9.40	8.11	9.61
P value Unpaired t test		0.1593	0.1683	0.9844	0.5441	0.4452	0.9298

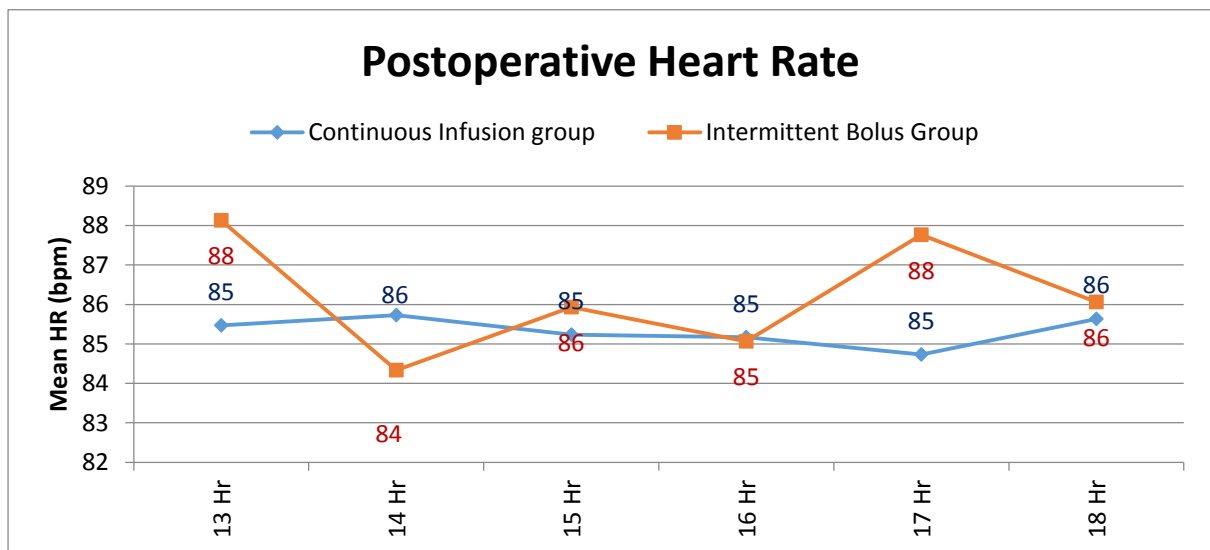
6 Hours - 12 Hours



Postoperative Heart Rate		6.5 Hr	7 Hr	7.5 Hr	8 Hr	8.5 Hr	9 Hr
Continuous Infusion group	N	30	30	30	30	30	30
	Mean	85.07	84.87	85.70	85.70	85.50	85.60
	SD	7.30	7.16	7.52	7.17	7.51	7.94
Intermittent Bolus Group	N	30	30	30	30	30	30
	Mean	82.57	85.23	83.00	84.63	82.60	84.83
	SD	7.35	10.73	8.28	10.24	6.37	9.27
P value Unpaired t test		0.1914	0.8769	0.1914	0.6423	0.1121	0.7321

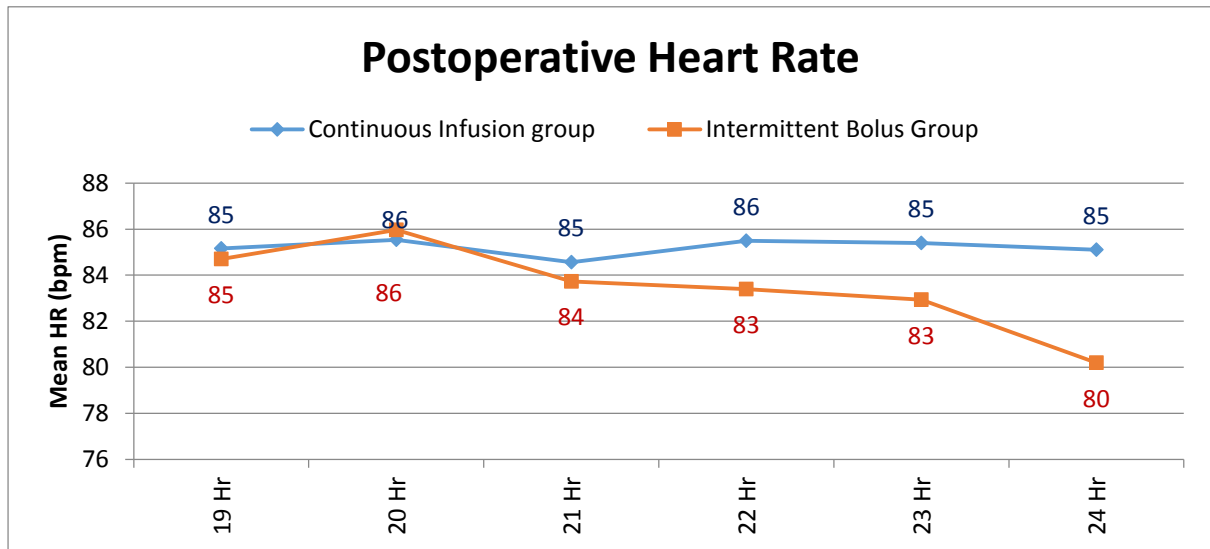
Postoperative Heart Rate		10 Hr	11 Hr	12 Hr
Continuous In2usion group	N	30	30	30
	Mean	85.57	85.73	84.87
	SD	7.46	6.72	7.58
Intermittent Bolus Group	N	30	30	30
	Mean	82.90	85.83	85.53
	SD	5.92	7.91	8.88
P value Unpaired t test		0.1310	0.9581	0.7556

2 Hours – 18 Hours



Postoperative Heart Rate		13 Hr	14 Hr	15 Hr	16 Hr	17 Hr	18 Hr
Continuous Infusion group	N	30	30	30	30	30	30
	Mean	85.47	85.73	85.23	85.17	84.73	85.63
	SD	7.38	8.05	7.06	7.74	7.20	6.71
Intermittent Bolus Group	N	30	30	30	30	30	30
	Mean	88.13	84.33	85.93	85.07	87.77	86.07
	SD	8.83	7.25	8.88	7.57	10.81	11.21
P value Unpaired t test		0.2097	0.4819	0.7367	0.9598	0.2067	0.8566

18 Hours - 24 Hours

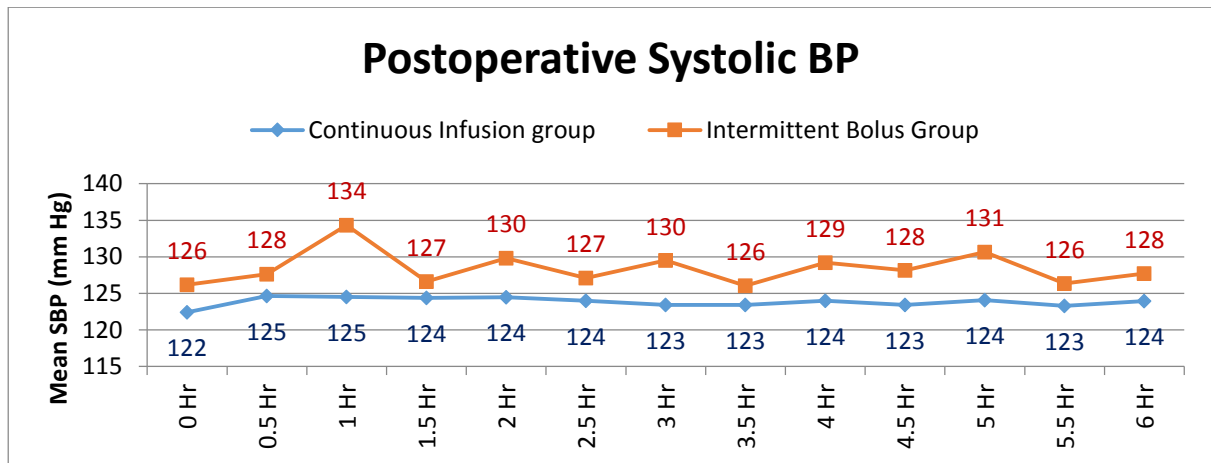


Postoperative Heart Rate		19 Hr	20 Hr	21 Hr	22 Hr	23 Hr	24 Hr
Continuous Infusion group	N	30	30	30	30	30	30
	Mean	85.17	85.53	84.57	85.50	85.40	85.10
	SD	6.98	7.85	7.72	7.67	7.69	7.05
Intermittent Bolus Group	N	30	30	30	30	30	30
	Mean	84.70	85.97	83.73	83.40	82.93	80.20
	SD	9.68	10.23	8.22	7.33	8.35	5.54
P value Unpaired t test		0.8313	0.8547	0.6870	0.2828	0.2386	0.4166

Most of the continuous infusion group patients had mean post-operative heart rates ranging from 85.07 to 85.10 between 0-24 hours post-operatively. Similarly the intermittent bolus group patients had mean heart rates ranging from 84.10 to 89.20 0-24 hours post-operatively. By conventional criteria the association between the intervention groups and post-operative heart rate is considered to be not statistically significant since $p > 0.05$ as per unpaired t test.

POSTOPERATIVE SYSTOLIC BP

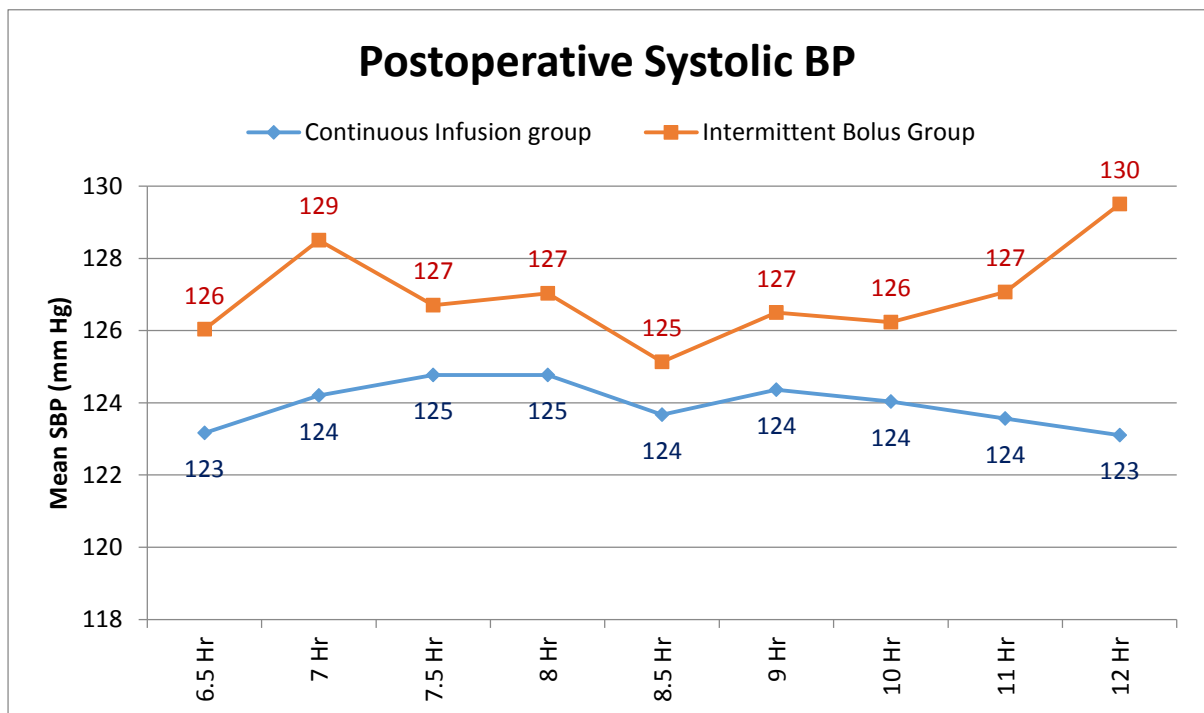
Baseline - 6 Hours



Postoperative Systolic BP		0 Hr	0.5 Hr	1 Hr	1.5 Hr	2 Hr	2.5 Hr	3 Hr
Continuous Infusion group	N	30	30	30	30	30	30	30
	Mean	124.67	124.50	124.37	124.47	124.00	123.43	123.43
	SD	9.41	9.19	9.96	10.07	9.67	8.59	8.59
Intermittent Bolus Group	N	30	30	30	30	30	30	30
	Mean	127.63	134.33	126.60	129.80	127.10	129.50	129.50
	SD	7.32	9.39	6.21	8.21	8.13	7.61	7.61
P value Unpaired t test		0.0865	0.1785	0.0001	0.3027	0.0285	0.1843	0.0053

Postoperative Systolic BP		3.5 Hr	4 Hr	4.5 Hr	5 Hr	5.5 Hr	6 Hr
Continuous In2usion group	N	30	30	30	30	30	30
	Mean	124.00	123.43	124.07	123.30	123.93	123.93
	SD	7.95	8.69	8.64	8.14	8.22	8.22
Intermittent Bolus Group	N	30	30	30	30	30	30
	Mean	129.20	128.13	130.67	126.37	127.73	127.73
	SD	10.39	8.28	8.18	7.64	7.67	7.67
P value Unpaired t test		0.2285	0.0338	0.3621	0.0036	0.1379	0.0692

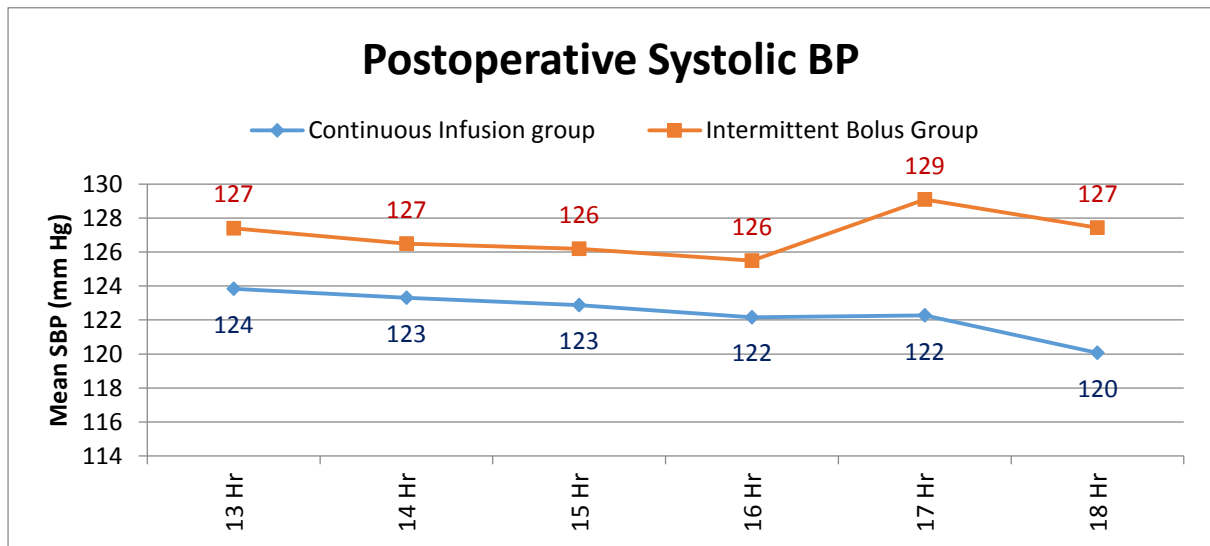
6 hours – 12 hours



Postoperative Systolic BP		6.5 Hr	7 Hr	7.5 Hr	8 Hr	8.5 Hr	9 Hr
Continuous Infusion group	N	30	30	30	30	30	30
	Mean	124.20	124.77	124.77	123.67	124.37	124.37
	SD	8.75	7.92	8.22	8.16	8.46	8.46
Intermittent Bolus Group	N	30	30	30	30	30	30
	Mean	128.50	126.70	127.03	125.13	126.50	126.50
	SD	7.08	5.93	9.50	5.26	7.45	0.3043
P value Unpaired t test		0.1147	0.0409	0.2892	0.3272	0.4120	0.3043

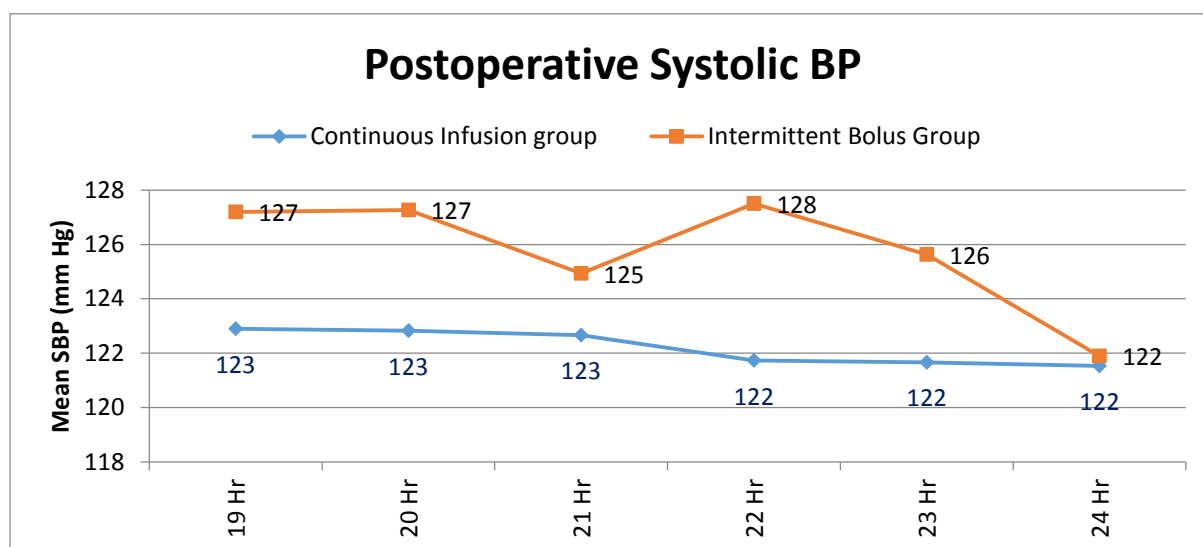
Postoperative H Systolic BP		10 Hr	11 Hr	12 Hr
Continuous Infusion group	N	30	30	30
	Mean	123.57	123.10	83.83
	SD	7.56	7.82	16.31
Intermittent Bolus Group	N	30	30	30
	Mean	127.07	129.50	83.77
	SD	8.55	7.04	8.85
P value Unpaired t test		0.1855	0.0983	0.0015

13 Hours – 18 Hours



Postoperative Systolic BP		13 Hr	14 Hr	15 Hr	16 Hr	17 Hr	18 Hr
Continuous Infusion group	N	30	30	30	30	30	30
	Mean	123.30	122.87	122.17	122.27	120.07	85.47
	SD	8.45	8.32	7.70	8.19	21.34	7.38
Intermittent Bolus Group	N	30	30	30	30	30	30
	Mean	126.50	126.20	125.50	129.10	127.43	88.13
	SD	5.53	7.36	6.06	10.19	8.26	8.83
P value Unpaired t test		0.1058	0.0887	0.1056	0.0678	0.0059	0.0860

18 Hours - 24 Hours



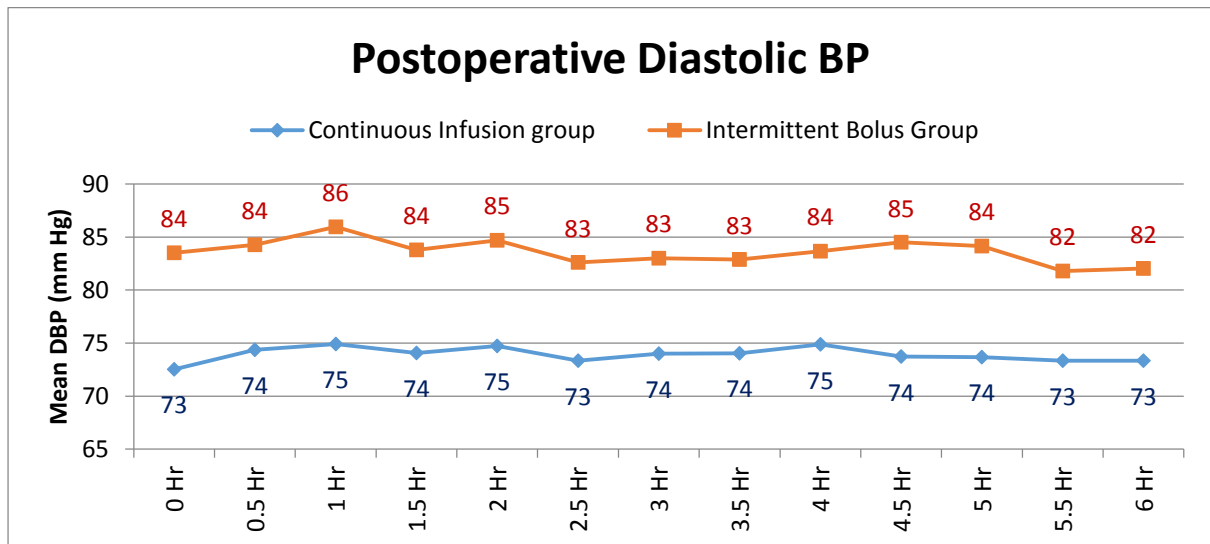
Postoperative Systolic BP		19 Hr	20 Hr	21 Hr	22 Hr	23 Hr	24 Hr
Continuous Infusion group	N	30	30	30	30	30	30
	Mean	122.83	122.67	121.73	121.67	121.53	121.53
	SD	8.54	7.62	8.23	8.52	8.18	8.18
Intermittent Bolus Group	N	30	30	30	30	30	30
	Mean	127.27	124.93	127.50	125.63	121.90	121.90
	SD	8.26	5.79	6.05	6.98	3.53	3.53
P value Unpaired t test		0.0545	0.0455	0.1999	0.0032	0.0535	0.8228

The association between the treatment groups and post-operative systolic blood pressure is considered to be statistically significant at 1st hour, 2nd hour, 3rd hour,

4thhour, 5th hour, 12th hour, 17th hour, 20th hour and 22nd hour since $p < 0.05$ as per unpaired t test indicating a true difference among intervention groups and the difference is significant. In patients belonging to continuous infusion intervention group, the systolic blood pressure post-operatively is decreased to an average of 137.18 mm Hg at 1st hour, 2nd hour, 3rd hour, 4th hour, 5th hour, 12th hour, 17th hour, 20th hour and 22nd hour post-operatively in comparison with patients belonging to intermittent bolus intervention group in whom the systolic blood pressure is an average of 143.93 mm Hg with a p-value of < 0.05 according to unpaired t-test. The systolic blood pressure post-operatively was meaningfully less in continuous infusion intervention group compared to intermittent bolus intervention group by 6.75 mm Hg. This significant difference of 5% reduction in systolic blood pressure post-operatively in continuous infusion intervention group compared to intermittent bolus intervention group is true and has not occurred by chance. In this study we can safely conclude that Pre operative paravertebral block with continuous infusion of Bupivacaine significantly reduces systolic blood pressure post-operatively compared to Pre operative Paravertebral block with intermittent bolus of Bupivacaine when used in patients undergoing elective thoracotomy surgeries

POSTOPERATIVE DIASTOLIC BP

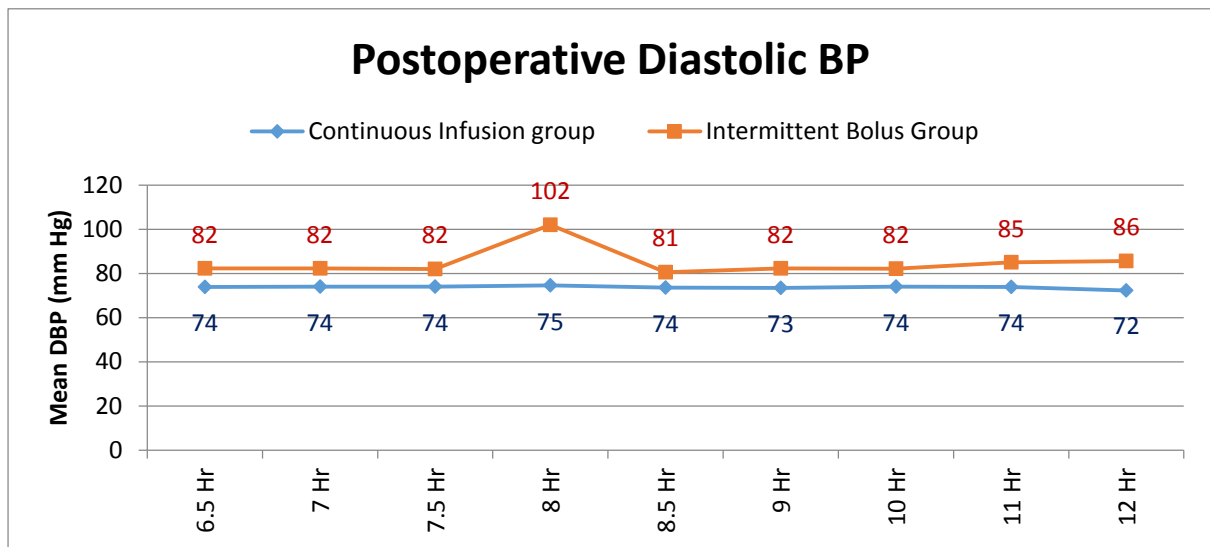
Baseline – 6 Hours



Postoperative Systolic BP		0 Hr	0.5 Hr	1 Hr	1.5 Hr	2 Hr	2.5 Hr	3 Hr
		Continuous Infusion group	N	30	30	30	30	30
	Mean	72.53	74.37	74.90	74.07	74.73	73.33	74.00
	SD	8.19	7.95	8.88	8.63	8.95	9.80	8.27
Intermittent Bolus Group	N	30	30	30	30	30	30	30
	Mean	83.50	84.27	85.97	83.80	84.70	82.60	83.00
	SD	7.06	5.89	6.29	6.44	7.04	6.79	6.64
P value Unpaired t test		0.000	0.000	0.000	0.000	0.000	0.000	0.000
		0	0	0	0	0	1	0

Postoperative Systolic BP		3.5 Hr	4 Hr	4.5 Hr	5 Hr	5.5 Hr	6 Hr
Continuous Infusion group	N	30	30	30	30	30	30
	Mean	74.03	74.87	73.73	73.67	73.33	73.33
	SD	8.72	9.01	9.43	8.76	7.75	8.05
Intermittent Bolus Group	N	30	30	30	30	30	30
	Mean	82.87	83.67	84.50	84.13	81.80	82.03
	SD	7.59	7.75	7.55	7.41	7.38	5.78
P value Unpaired t test		0.0001	0.0002	0.0000	0.0000	0.0001	0.0000

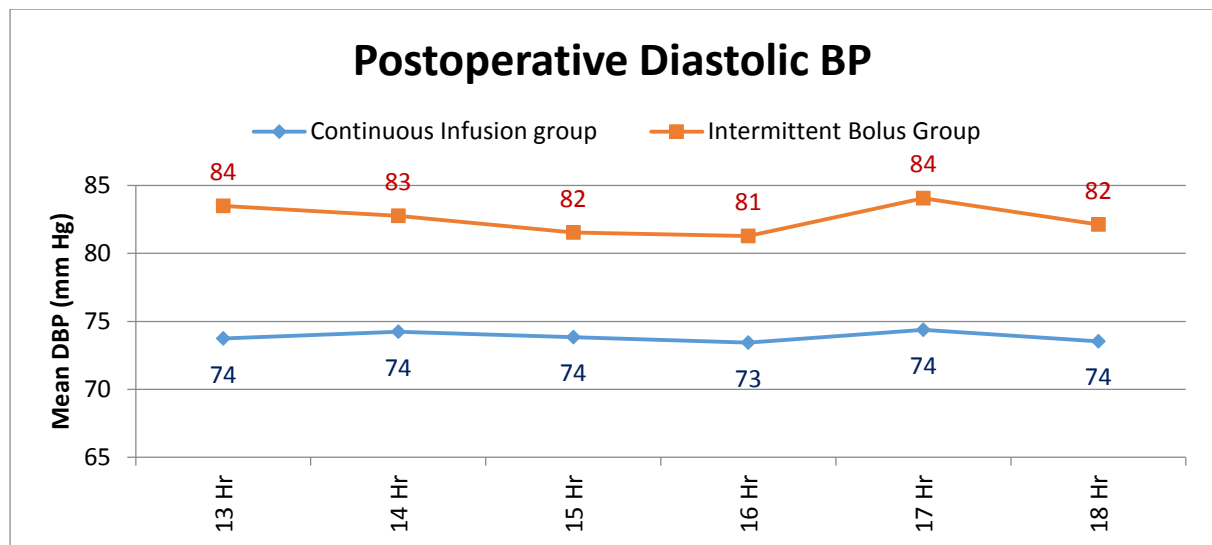
6 Hours - 12 Hours



Postoperative Diastolic BP		6.5 Hr	7 Hr	7.5 Hr	8 Hr	8.5 Hr	9 Hr
Continuous Infusion group	N	30	30	30	30	30	30
	Mean	73.93	74.00	74.03	74.57	73.60	73.40
	SD	8.97	9.66	9.11	8.59	8.38	9.19
Intermittent Bolus Group	N	30	30	30	30	30	30
	Mean	82.27	82.27	82.07	102.03	80.60	82.27
	SD	5.51	7.00	6.49	113.08	5.34	6.43
P value Unpaired t test		0.0001	0.0004	0.0002	0.0194	0.0003	0.0001

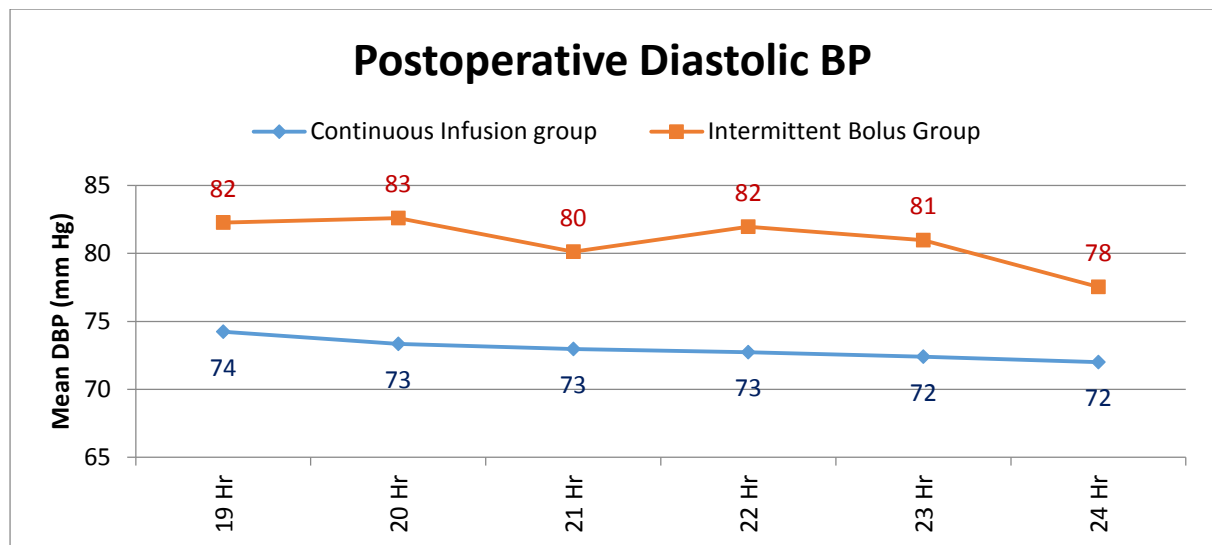
Postoperative Diastolic BP		10 Hr	11 Hr	12 Hr
Continuous In2usion group	N	30	30	30
	Mean	73.97	73.90	72.33
	SD	9.41	9.21	9.16
Intermittent Bolus Group	N	30	30	30
	Mean	82.17	85.03	85.67
	SD	5.29	7.73	7.05
P value Unpaired t test		0.0001	0.0000	0.0000

12 Hours - 18 Hours



Postoperative Diastolic BP		13 Hr	14 Hr	15 Hr	16 Hr	17 Hr	18 Hr
Continuous Infusion group	N	30	30	30	30	30	30
	Mean	73.73	74.23	73.83	73.43	74.37	73.53
	SD	8.82	8.44	8.33	8.14	9.69	8.75
Intermittent Bolus Group	N	30	30	30	30	30	30
	Mean	83.50	82.77	81.53	81.27	84.07	82.13
	SD	8.60	5.75	7.66	6.61	7.94	7.66
P value Unpaired t test		0.0001	0.0000	0.0004	0.0001	0.0001	0.0002

18 Hours - 24 Hours

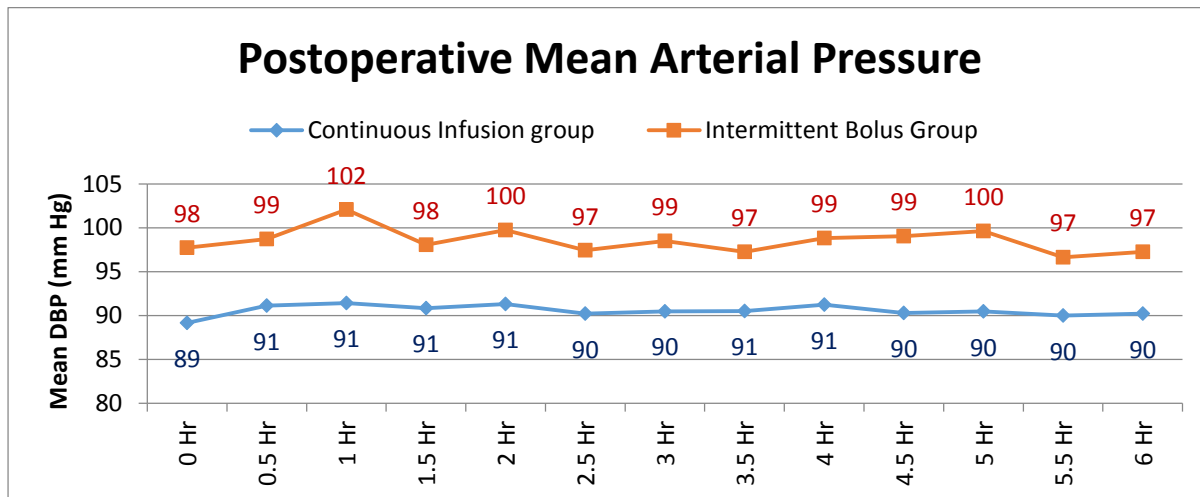


Postoperative Diastolic BP		19 Hr	20 Hr	21 Hr	22 Hr	23 Hr	24 Hr
Continuous Infusion group	N	30	30	30	30	30	30
	Mean	74.23	73.33	72.97	72.73	72.40	72.00
	SD	8.06	8.08	8.01	7.99	8.65	8.15
Intermittent Bolus Group	N	30	30	30	30	30	30
	Mean	82.27	82.60	80.13	81.97	80.97	77.53
	SD	7.52	6.11	5.14	5.54	7.06	5.22
P value Unpaired t test		0.0002	0.0000	0.0001	0.0000	0.0001	0.0029

The association between the treatment groups and post-operative diastolic blood pressure is considered to be statistically significant between 0 minutes to 24 hours since $p < 0.05$ as per unpaired t test indicating a true difference among intervention groups and the difference is significant. In patients belonging to continuous infusion intervention group, the diastolic blood pressure post-operatively is decreased to an average of 73.69 mm Hg between 0 minutes to 24 hours post-operatively in comparison with patients belonging to intermittent bolus intervention group in whom the systolic blood pressure is an average of 83.29 mm Hg with a p-value of < 0.05 according to unpaired t-test. The diastolic blood pressure post-operatively was meaningfully less in continuous infusion intervention group compared to intermittent bolus intervention group by 9.60 mm Hg. This significant difference of 12% reduction in diastolic blood pressure post-operatively in continuous infusion intervention group compared to intermittent bolus intervention group is true and has not occurred by chance. In this study we can safely conclude that Pre operative paravertebral block with continuous infusion of Bupivacaine significantly decreases diastolic blood pressure post-operatively compared to Pre operative Paravertebral block with intermittent bolus of Bupivacaine when used in patients undergoing elective thoracotomy surgeries

POSTOPERATIVE MEAN ARTERIAL PRESSURE

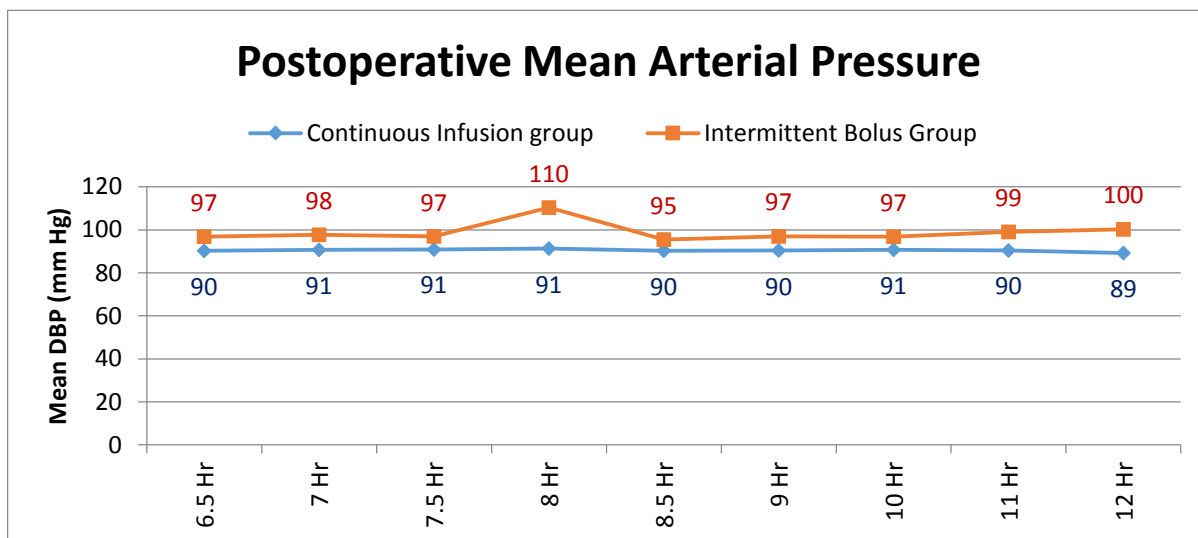
Baseline – 6 Hours



Postoperative Mean Arterial Pressure		0 Hr	0.5 Hr	1 Hr	1.5 Hr	2 Hr	2.5 Hr	3 Hr
Continuous Infusion group	N	30	30	30	30	30	30	30
	Mean	89.16	91.13	91.43	90.83	91.31	90.22	90.48
	SD	7.86	7.73	8.12	8.14	8.33	8.97	7.63
Intermittent Bolus Group	N	30	30	30	30	30	30	30
	Mean	97.73	98.72	102.0	98.07	99.73	97.43	98.50
	SD	6.63	5.68	6.26	5.79	6.51	6.46	6.01
P value Unpaired t test		0.000	0.000	0.000	0.000	0.000	0.000	0.000
		0	1	0	2	1	8	0

Postoperative Mean Arterial Pressure		3.5 Hr	4 Hr	4.5 Hr	5 Hr	5.5 Hr	6 Hr
Continuous group	N	30	30	30	30	30	30
	Mean	90.50	91.24	90.30	90.47	89.99	90.20
	SD	7.62	7.69	8.10	7.83	7.03	7.27
Intermittent Group	N	30	30	30	30	30	30
	Mean	97.27	98.84	99.04	99.64	96.66	97.27
	SD	6.29	7.95	7.07	6.24	6.68	5.41
P value Unpaired t test		0.000	0.000	0.000	0.000	0.000	0.000
		4	4	0	0	4	1

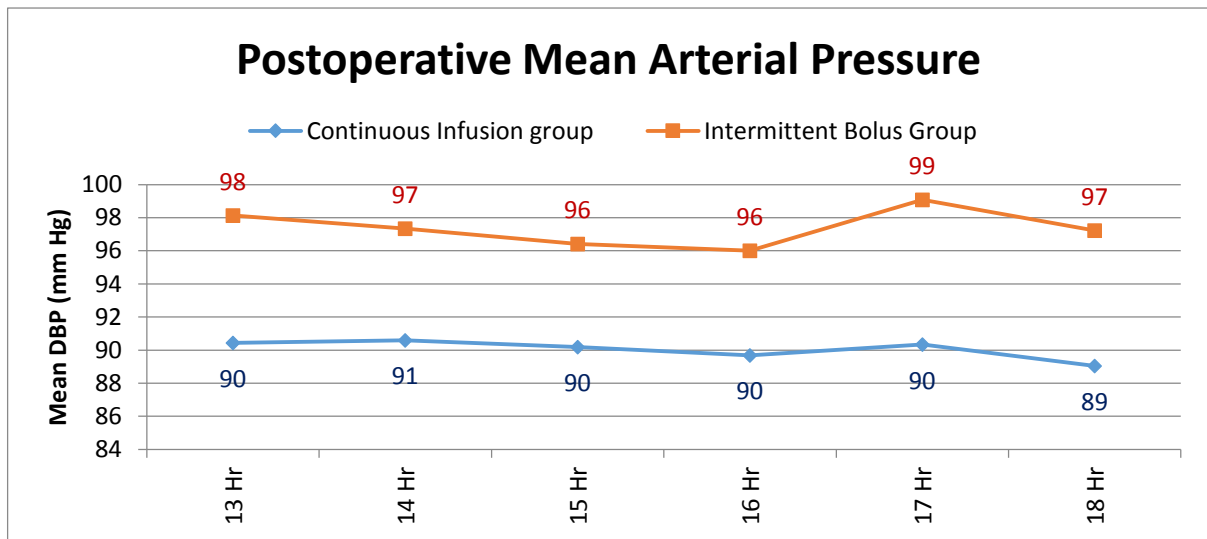
6 Hours – 12 Hours



Postoperative Mean Arterial Pressure		6.5 Hr	7 Hr	7.5 Hr	8 Hr	8.5 Hr	9 Hr
Continuous Infusion group	N	30	30	30	30	30	30
	Mean	90.34	90.73	90.94	91.30	90.29	90.39
	SD	7.55	8.36	7.95	7.78	7.61	8.07
Intermittent Bolus Group	N	30	30	30	30	30	30
	Mean	96.86	97.68	96.94	110.3	95.44	97.01
	SD	5.13	6.34	5.27	77.28	4.79	6.17
P value Unpaired t test		0.000	0.000	0.001	0.189	0.002	0.000
		3	6	2	0	9	8

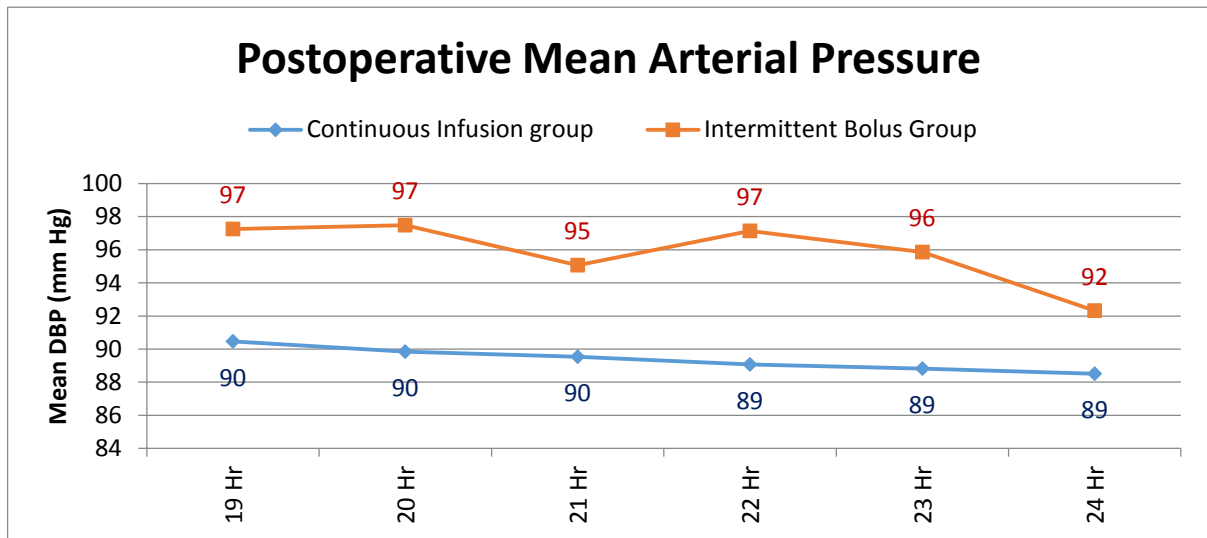
Postoperative Mean Arterial Pressure		10 Hr	11 Hr	12 Hr
Continuous Infusion group	N	30	30	30
	Mean	90.66	90.46	89.26
	SD	7.94	7.83	8.09
Intermittent Bolus Group	N	30	30	30
	Mean	96.86	99.04	100.28
	SD	4.27	7.68	6.72
P value Unpaired t test		0.0005	0.0001	0.0000

12 Hours - 18 Hours



Postoperative Mean Arterial Pressure		13 Hr	14 Hr	15 Hr	16 Hr	17 Hr	18 Hr
Continuous Infusion group	N	30	30	30	30	30	30
	Mean	90.43	90.59	90.18	89.68	90.33	89.04
	SD	8.03	7.76	7.77	7.26	8.27	10.68
Intermittent Bolus Group	N	30	30	30	30	30	30
	Mean	98.13	97.34	96.42	96.01	99.08	97.23
	SD	8.12	5.22	6.97	6.07	8.35	7.50
P value Unpaired t test		0.0005	0.0002	0.0018	0.0005	0.0001	0.0012

18 Hours – 24 Hours



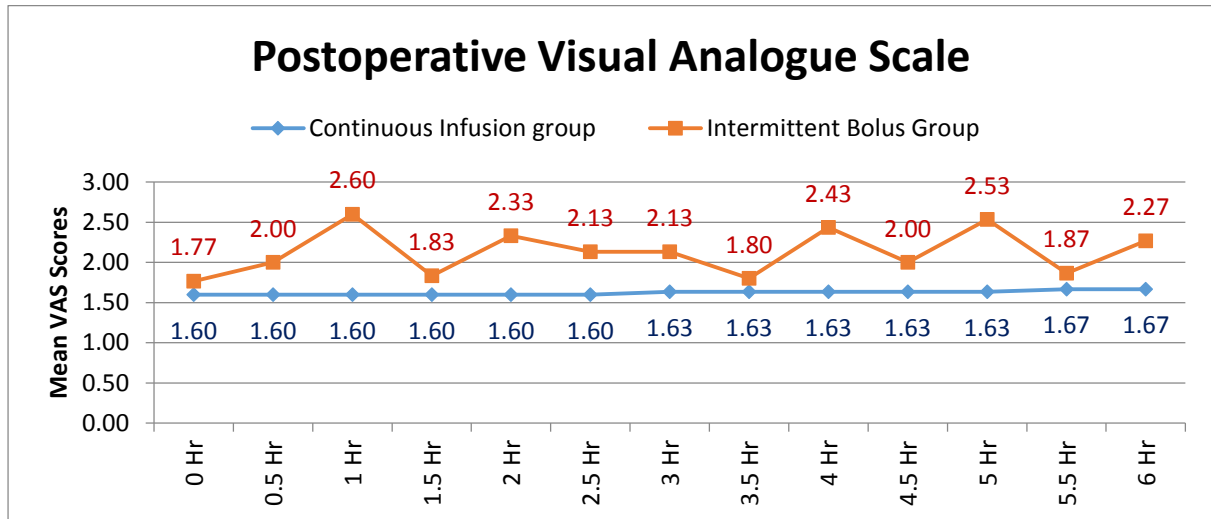
Postoperative Mean Arterial Pressure		19 Hr	20 Hr	21 Hr	22 Hr	23 Hr	24 Hr
Continuous Infusion group	N	30	30	30	30	30	30
	Mean	90.46	89.83	89.53	89.07	88.82	88.51
	SD	7.46	7.48	7.19	7.33	8.08	7.73
Intermittent Bolus Group	N	30	30	30	30	30	30
	Mean	97.24	97.49	95.07	97.14	95.86	92.32
	SD	7.44	6.39	4.81	4.99	6.69	3.93
P value Unpaired t test		0.0008	0.0001	0.0010	0.0000	0.0005	0.0204

The association between the treatment groups and post-operative mean arterial pressure is considered to be statistically significant between 0-7.5 hours and 8.5- 24

hours since $p < 0.05$ as per unpaired t test indicating a true difference among intervention groups and the difference is significant. In patients belonging to continuous infusion intervention group, the mean arterial pressure post-operatively is decreased to an average of 90.21 mm Hg between 0-7.5 hours and 8.5- 24 hours post-operatively in comparison with patients belonging to intermittent bolus intervention group in whom the mean arterial pressure is an average of 97.59 mm Hg with a p-value of < 0.05 according to unpaired t-test. The mean arterial pressure post-operatively was meaningfully less in continuous infusion intervention group compared to intermittent bolus intervention group by 7.38 mm Hg. This significant difference of 8% decrease in mean arterial pressure post-operatively in continuous infusion intervention group compared to intermittent bolus intervention group is true and has not occurred by chance. In this study we can safely conclude that Pre operative paravertebral block with continuous infusion of Bupivacaine significantly decreases mean arterial pressure post-operatively compared to Pre operative Paravertebral block with intermittent bolus of Bupivacaine when used in patients undergoing elective thoracotomy surgeries

VAS

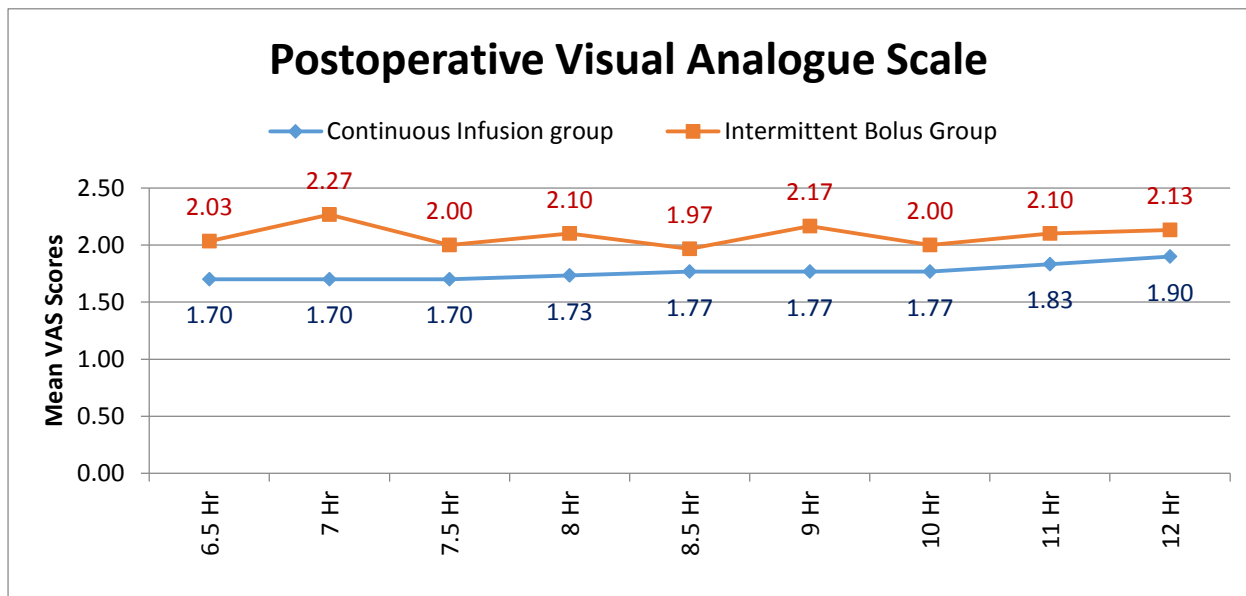
Baseline - 6 Hours



Postoperative Visual Analogue Scale		0 Hr	0.5 Hr	1 Hr	1.5 Hr	2 Hr	2.5 Hr	3 Hr
Continuous Infusion group	N	30	30	30	30	30	30	30
	Mean	1.60	1.60	1.60	1.60	1.60	1.60	1.63
	SD	0.50	0.50	0.50	0.50	0.50	0.50	0.49
Intermittent Bolus Group	N	30	30	30	30	30	30	30
	Mean	1.77	2.00	2.60	1.83	2.33	2.13	2.13
	SD	0.43	0.26	0.86	0.38	0.61	0.86	0.57
P value Unpaired t test		0.017	0.000	0.000	0.046	0.000	0.005	0.000
		0	3	0	1	0	1	6

Postoperative Visual Analogue Scale		3.5 Hr	4 Hr	4.5 Hr	5 Hr	5.5 Hr	6 Hr
Continuous If2usion group	N	30	30	30	30	30	30
	Mean	1.63	1.63	1.63	1.63	1.67	1.67
	SD	0.49	0.49	0.49	0.49	0.48	0.48
Intermittent Bolus Group	N	30	30	30	30	30	30
	Mean	1.80	2.43	2.00	2.53	1.87	2.27
	SD	0.48	0.77	0.64	0.57	0.63	0.69
P value Unpaired t test		0.1904	0.0000	0.0161	0.0000	0.0171	0.0003

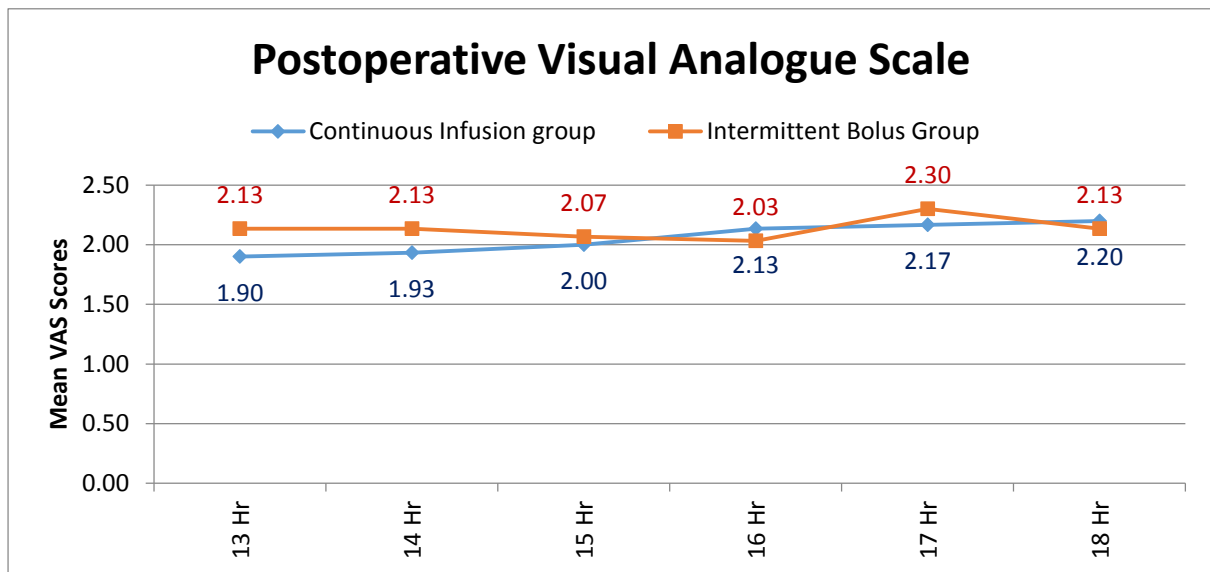
6 Hours - 12 Hours



Postoperative Visual Analogue Scale		6.5 Hr	7 Hr	7.5 Hr	8 Hr	8.5 Hr	9 Hr
Continuous Infusion group	N	30	30	30	30	30	30
	Mean	1.70	1.70	1.70	1.73	1.77	1.77
	SD	0.53	0.53	0.53	0.58	0.57	0.57
Intermittent Bolus Group	N	30	30	30	30	30	30
	Mean	2.03	2.27	2.00	2.10	1.97	2.17
	SD	0.32	0.74	0.45	0.80	0.41	0.65
P value Unpaired t test		0.005	0.001	0.022	0.048	0.125	0.113
		2	3	8	1	1	7

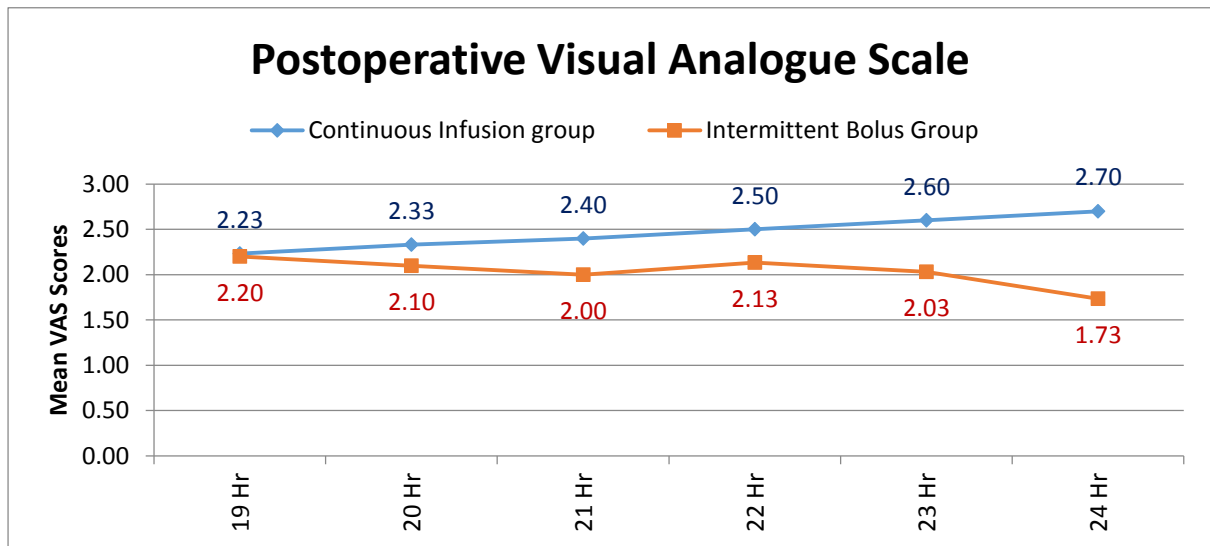
Postoperative Visual Analogue Scale		10 Hr	11 Hr	12 Hr
Continuous In2usion group	N	30	30	30
	Mean	1.77	1.83	1.90
	SD	0.57	0.59	0.61
Intermittent Bolus Group	N	30	30	30
	Mean	2.00	2.10	2.13
	SD	0.37	0.71	0.51
P value Unpaired t test		0.0656	0.1203	0.1120

12 Hours - 18 Hours



Postoperative Visual Analogue Scale		13 Hr	14 Hr	15 Hr	16 Hr	17 Hr	18 Hr
Continuous Infusion group	N	30	30	30	30	30	30
	Mean	1.90	1.93	2.00	2.13	2.17	2.20
	SD	0.61	0.58	0.53	0.57	0.53	0.48
Intermittent Bolus Group	N	30	30	30	30	30	30
	Mean	2.13	2.13	2.07	2.03	2.30	2.13
	SD	0.78	0.57	0.78	0.61	0.84	0.73
P value Unpaired t test		0.200	0.184	0.700	0.516	0.464	0.678
		1	9	6	7	6	7

8 Hours – 24 Hours



Postoperative Visual Analogue Scale		19 Hr	20 Hr	21 Hr	22 Hr	23 Hr	24 Hr
Continuous Infusion group	N	30	30	30	30	30	30
	Mean	2.23	2.33	2.40	2.50	2.60	2.70
	SD	0.43	0.55	0.56	0.57	0.56	0.65
Intermittent Bolus Group	N	30	30	30	30	30	30
	Mean	2.20	2.10	2.00	2.13	2.03	1.73
	SD	0.81	0.80	0.59	0.68	0.61	0.45
P value Unpaired t test		0.8424	0.1942	0.0093	0.0279	0.0005	0.0000

The association between the intervention groups and post-operative visual analogue scale score is considered to be statistically significant between 0 minutes to 3 hours, 4-8 hours and 21-24 hours since $p < 0.05$ as per unpaired t test indicating a true difference among intervention groups and the difference is significant. In patients belonging to continuous infusion intervention group, the visual analogue scale score post-operatively is decreased to an average of 1.83 mean score points 0 minutes to 3 hours, 4-8 hours and 21-24 hours post-operatively in comparison with patients belonging to intermittent bolus intervention group in whom the visual analogue scale score is an average of 2.11 mean score points with a p-value of < 0.05 according to unpaired t-test. The visual analogue scale score post-operatively was meaningfully less in continuous infusion intervention group compared to intermittent bolus intervention group by 0.29 mean score points. This significant difference of 14% reduction in mean visual analogue scale score post-operatively in continuous infusion intervention group compared to intermittent bolus intervention group is true and has not occurred by chance. In this study we can safely conclude that Pre operative paravertebral block with continuous infusion of Bupivacaine significantly decreases visual analogue scale score post-operatively compared to Pre operative Paravertebral block with intermittent bolus of Bupivacaine when used in patients undergoing elective thoracotomy surgeries

DISCUSSION

The aim of the study was to compare the analgesia and sideeffects of thoracic epidural block with thoracic paravertebral block for postoperative pain relief of thoracotomy.

In my study, after an initial bolus of 8ml of 0.25% Bupivacaine (20mg), 0.1ml/kg of 0.25% Bupivacaine was given either as continuous infusion or hourly intermittent bolus, with the total dose not exceeding 400mg per 24 hours. In A.Kotzeet al¹ study, out of 19 trials, patients in 12 trials received a Bupivacaine of 890-990mg in 24 hours while the patients in 7 trials received a Bupivacaine of 325-472.5mg in 24 hours. They concluded that higher dose Paravertebral bupivacaine was strongly predictive of lower VAS score at rest, when compared with lower dose regimens at 8 hour after operation. Although there was a trend to improved analgesia on coughing at all time points, the difference did not reach statistical significance. No trials making a direct comparison between different doses of a given LA was identified.

Where as in Catala E et al⁴ study, out of 30 patients, 15 received either 20 ml of 0.375% Bupivacaine every 6 hours and the rest of the 15 patients received a loading dose of 15 ml of 0.375% Bupivacaine plus an infusion of 5 ml of 0.25% Bupivacaine every hour. They found that the pain scores were significantly higher in the bolus group at rest and on movement. The Bupivacaine plasma concentration was low at 15hours.

In my study, following results were observed,

Most of the continuous infusion group patients had mean *perioperative heart rates* ranging from 82.06 to 81.09 whereas the intermittent bolus group patients had mean heart rates ranging from 82.09 to 77.08, which is *statistically insignificant*.

The continuous infusion group patients had mean *post-operative heart rates* ranging from 85.07 to 85.10 while the intermittent bolus group patients had mean heart rates ranging from 84.10 to 89.20, which is again *statistically insignificant*.

This signifies that both the techniques produce comparable level of analgesia.

The *systolic blood pressure perioperatively* was meaningfully less in continuous infusion intervention group compared to intermittent bolus intervention group by 7.19 mm Hg which is *statistically significant*

The *systolic blood pressure post-operatively* was meaningfully less in continuous infusion intervention group compared to intermittent bolus intervention group by 6.75 mm Hg which is again *statistically significant*

This signifies that both intra operatively and post operatively systolic blood pressure was better in continuous group than the intermittent group. This result correlates with **Kotzeet al¹** study.

The *diastolic blood pressure perioperatively* was meaningfully less in continuous infusion intervention group compared to intermittent bolus intervention group by 6.31 mm Hg which is *statistically significant*

The diastolic blood pressure post-operatively was meaningfully less in continuous infusion intervention group compared to intermittent bolus intervention group by 9.60 mm Hg which is *statistically significant*

This signifies that continuous infusion is better than intermittent bolus in maintaining diastolic pressure both intra operatively and post operatively as pointed out by **Kotze et al**¹ in their study

The *mean arterial pressure perioperatively* was meaningfully less in continuous infusion intervention group compared to intermittent bolus intervention group by 1.55 mm Hg which is *statistically significant*

The *meanarterial pressure post-operatively* was meaningfully less in continuous infusion intervention group compared to intermittent bolus intervention group by 7.38 mm Hg which is *statistically significant*

The fall in mean arterial pressure was more post operatively than intra operative values in continuous group than intermittent group which is consistent with study conducted by *Catala E et al*⁴ who concluded continuous group has better mean arterial blood pressure than intermittent group.

The visual analogue scale score post-operatively was meaningfully less in continuous infusion intervention group compared to intermittent bolus intervention group by 0.29 mean score points which is *statistically significant*. *With* Post-operative visual analogue scale score is considered to be statistically significant between 0 minutes to 3 hours, 4-8 hours and 21-24 hours since $p < 0.05$. This result correlates with *Catala E et al*⁴ study which showed statistically significant pain relief in continuous group at

8hr with 'p' value of 0.04 and at 24 hrs with 'p' value of 0.003. Kotzeet al¹ study also showed a slight improvement in VAS at 24hrs after operation when an infusion regime was used. The difference was 15mm at rest and 23mm upon coughing with 'p' value of 0.003 in both cases.

Thus both the techniques like continuous infusion and intermittent bolus provide comparable analgesia for post thoracotomy pain following paravertebral block but the episodes of break through pain episodes seen in intermittent bolus group were not present in the continuous group.

SUMMARY

We conducted a prospective randomized study comparing the analgesic efficacy of Thoracic Paravertebral block using continuous infusion versus intermittent bolus of Bupivacaine. In this study, 64 patients have been segregated in to two groups randomly and paravertebral block was given prior to the surgery. Of them,

Group A received continuous infusion of Bupivacaine and

Group B received intermittent bolus of bupivacaine.

Heart rate, systolic blood pressure, diastolic blood pressure, mean blood pressure and VAS score were monitored.

On the course of the study it was observed that both the technique provided comparable analgesia as evident from VAS score.

It was also observed that systolic blood pressure, diastolic blood pressure, mean arterial blood pressure and VAS score were less in continuous infusion group than the intermittent bolus group.

CONCLUSION

Thoracic epidural technique is still considered as the gold standard for post thoracotomy pain control. Paravertebral block was widely used as single shot injection technique but introduction of catheter insertion in the paravertebral space paved the way for continuous infusion of local anesthetic and hence longer duration of analgesia is achieved without major hemodynamic changes.

From this study we can conclude that continuous infusion of local anesthetic is really superior to intermittent bolus administration of local anesthetic in the paravertebral block as shown by continuous pain relief with absence of break through pain and better patient compliance in post operative physiotherapy and ability to cough out sputum.

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PROFORMA

Date:

Roll no:

Name:

Age:

Ht:Wt:

Sex:

IP No:

Diagnosis:

Surgical procedure:

PRE OP ASSESSMENT:

HISTORY: Any Co-morbid illness

H/O Documented Difficult Airway

H/O previous surgeries

EXAMINATION : CVS :

Hb :

RS :

MEASURES OF STUDY OUTCOME:

HR

SBP

DBP

MAP

PRE OP

PARAVERTEBRAL BLOCK

(CONTINUOUS/INTERMITTENT BOLUS):

POST – BUPIVACINE ADMIN

15 MIN:

30 MIN

45 MIN :

60 MIN:

DOSE OF OPIOID USED FOR RESCUE ANALGESIA:

COMPLICATIONS IN INTRA OPERATIVE PERIOD:

POST OPERATIVE PAIN SCORE:

(Assessed every 30 minutes for first 24hrs post op)

INFORMATION TO PARTICIPANTS

Investigator: Dr. S.DINESH KUMAR

Name of the Participant:

Title:

“ AProspective, randomized study Comparing the analgesic efficacy of continuous infusion of local anaesthetic versus intermittent bolus through thoracic paravertebral catheterisation in patients undergoing elective thoracotomy surgeries.”

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 analgesic efficacy of thoracic paravertebral block using continuous infusion versus intermittent bolus of bupivacaine in patients undergoing thoracotomy surgery.

What is the Purpose of the Research:

For thoracotomy surgeries, thoracic paravertebral space is identified and catheterized and then the patient is anaesthetized followed by bupivacaine administration through the catheter. This study is done to compare the paravertebral block with continuous infusion versus intermittent bolus of bupivacaine in patients undergoing thoracotomy procedures with respect to

- Intra-operative and post operative hemodynamics
- Post-operative VAS score

The Study Design:

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

Group 1- Pre operative paravertebral block with continuous infusion of Bupivacaine

Group 2- Pre operative Paravertebral block with intermittent bolus of Bupivacaine

Benefits

Thoracic paravertebral block provide good pain relief intra operatively and post operatively.

Maintenance of intra operative and post operative hemodynamics.

Reduces the opioid requirement intra operatively and post operatively.

Reduces the side effects of opioids including respiratory depression, nausea and vomiting.

Discomforts and risks

Discomfort during block- this will be reduced by local infiltration.

Hypotension ,bradycardia may occur – emergency drugs are readily available.

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 setting of 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 :“ AProspective, randomized study Comparing the analgesic efficacy of continuous infusion of local anaesthetic versus intermittent bolus through thoracic paravertebralcatheterisation in patients undergoing elective thoracotomy surgeries.”

Study center: INSTITUTE OF ANAESTHESIOLOGY AND CRITICAL CARE
RAJIV GANDHI GOVT. GENERAL HOSPITAL,
MADRAS MEDICAL COLLEGE,
CHENNAI 3

Participant name : Age: Sex: I.P.No:

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 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:

Signature / thumb impression of patient

Place:

Patient name:

Signature of the investigator:

Name of the investigator

ஆராய்ச்சி தகவல் தாள்

ஆராய்ச்சி தலைப்பு

நெஞ்சக அறுவை சிகிச்சையின்போது முதுகெலும்பு பக்க நரம்பியல் தடுப்பு ஊசி மூலமாக வலி நிவாரணம் பெறுவதற்கு தொடர் மருந்து உட்செலுத்தும் முறையையும், இடையிடையே மருந்து செலுத்தும் முறையையும் ஒப்பிடுவதற்காக செய்யும் ஆய்வு.

ஆராய்ச்சியாளர் பெயர் : மருத்துவர்.சௌ.தினேஷ் குமார்

பங்கேற்பாளர் பெயர் :

ஆராய்ச்சியின் நோக்கம்

நெஞ்சக அறுவை சிகிச்சையின்போது நெஞ்சுப் பகுதியில் உள்ள முதுகெலும்பின் பக்கவாட்டில் உள்ள இடைவெளியை கண்டுபிடித்து அதனுள் கதீட்டரை புகுத்தி நோயாளியை முழுமையாக மயக்கமடையச் செய்து அதன்பின் கதீட்டர் மூலமாக புபிவெகையின் என்ற மருந்துக் கலவை செலுத்தப்படுகிறது.

நெஞ்சக அறுவை சிகிச்சையின்போது முதுகெலும்பு பக்க நரம்பியல் தடுப்பு ஊசி மூலமாக வலி நிவாரணம் பெறுவதற்கு தொடர் மருந்து உட்செலுத்தும் முறையையும், இடையிடையே மருந்து செலுத்தும் முறையையும் ஒப்பிடுவதற்காக செய்யும் ஆய்வு கீழ்க்கண்ட கோணங்களில் ஒப்பிடப்படுகிறது.

- 1) அறுவை சிகிச்சையின்போதும், அறுவை சிகிச்சைக்குப் பின்னரும் நாடித்துடிப்பு மற்றும் இரத்த அழுத்த மாற்றங்கள்
- 2) அறுவை சிகிச்சைப்பின்னர் ஏற்படும் வலி நிவாரணத்தின் அளவு கணக்கிடப்படுகிறது.

ஆய்வு முறை

ஆய்வில் பங்குபெறும் நோயாளிகள் இரண்டு குழுக்களாகப் பிரிக்கப்படுவர்.

குழு-1 அறுவை சிகிச்சைக்கு முன்னர் முதுகெலும்பு பக்க நரம்பியல் தடுப்பூசி மூலமாக 0.25% புபிவெகையின் தொடர் மருந்து உட்செலுத்தும் முறையினால் கொடுக்கப்படும்.

குழு-2 அறுவை சிகிச்சைக்கு முன்னர் முதுகெலும்பு பக்க நரம்பியல் தடுப்பூசி மூலமாக 0.25% புபிவெகையின் மருந்தினை இடையிடையே மருந்து செலுத்தும் முறையினால் கொடுக்கப்படும்.

நன்மைகள்

முதுகெலும்பு பக்க நரம்பியல் தடுப்பூசி மூலம் மருந்து செலுத்தினால் அறுவை சிகிச்சையின்போதும் அறுவை சிகிச்சைக்கு பின்னரும் நீண்ட நேரம் வலி நிவாரணம் கிடைக்கும்.

அறுவை சிகிச்சையின்போது ஏற்படும் நாடித்துடிப்பு மற்றும் இரத்த அழுத்த மாற்றங்கள் குறைக்கப்படுகின்றன.

இதர வலி நிராவண மருந்துகளின் தேவைகள் வெகுவாக குறைக்கப்படுகின்றன.

பக்கவிளைவுகள்

ஊசி போடும்போது அசௌகரியம் ஏற்படலாம். மரத்துப்போகும் ஊசியின் மூலம் இது தவிர்க்கப்படும்.

குறைந்த இரத்த அழுத்தம், குறைந்த நாடித்துடிப்பு ஏற்படலாம். அதற்கு மாற்று மருந்துகள் உடனடியாக கொடுக்கப்படும்.

இந்த முறையான ஆய்வு ஏற்கனவே பல இடங்களில் நடத்தப்பட்டுள்ளது. மேலும் இதன் பாதுகாப்பு உறுதிசெய்யப்பட்டுள்ளது. நீங்கள் இந்த ஆய்வில் பங்குகொள்ள விரும்பவில்லை என்றால் எப்போதும் உபயோகிக்கப்படும் மருந்தே கொடுக்கப்படும். உங்கள் பாதுகாப்பே எங்களின் முக்கிய நோக்கம்.

இந்த ஆய்வு சம்பந்தமான எல்லா புள்ளி விவரங்கள் மற்றும் நோயாளிகளின் விவரங்கள் ரகசியமாக வைக்கப்படும். இந்த ஆய்வு சம்பந்தப்பட்ட எல்லா பரிசோதனைகள், மருந்துகள் மற்றும் மருத்துவ சேவைகள் அனைத்தும் நோயாளிகளுக்கு இலவசமாக வழங்கப்படும்.

ஆய்வாளரின் பெயர்

பங்குபெறுபவரின் பெயர்

ஆய்வாளரின் கையொப்பம்

பங்குபெறுபவரின் கையொப்பம்

ஆராய்ச்சி ஒப்புதல் படிவம்

ஆராய்ச்சியின் தலைப்பு

நெஞ்சக அறுவை சிகிச்சையின்போது முதுகெலும்பு பக்க நரம்பியல் தடுப்பு ஊசி மூலமாக வலி நிவாரணம் பெறுவதற்கு தொடர் மருந்து உட்செலுத்தும் முறையையும், இடையிடையே மருந்து செலுத்தும் முறையையும் ஒப்பிடுவதற்காக செய்யும் ஆய்வு

ஆய்வு நிலையம் : மயக்கவியல் துறை, சென்னை மருத்துவக் கல்லூரி
சென்னை - 3.

பங்கு பெறுவரின் பெயர் :

பங்குபெறுபவரின் எண் :

பங்குபெறுபவர் இதனை (✓) குறிக்கவும்

மேலே குறிப்பிட்டுள்ள மருத்துவ ஆய்வின் விவரங்கள் எனக்கு விளக்கப்பட்டது. என்னுடைய சந்தேகங்களை கேட்கவும், அதற்கான தகுந்த விளக்கங்களை பெறவும் வாய்ப்பளிக்கப்பட்டது.

நான் இவ்வாய்வில் தன்னிச்சையாகதான் பங்கேற்கிறேன். எந்த காரணத்தினாலோ எந்த கட்டத்திலும் எந்த சட்ட சிக்கலுக்கும் உட்படாமல் நான் இவ்வாய்வில் இருந்து விலகி கொள்ளலாம் என்றும் அறிந்து கொண்டேன்.

இந்த ஆய்வு சம்பந்தமாகவோ, இதை சார்ந்த மேலும் ஆய்வு மேற்கொள்ளும் போதும் இந்த ஆய்வில் பங்குபெறும் மருத்துவர் என்னுடைய மருத்துவ அறிக்கைகளை பார்ப்பதற்கு என் அனுமதி தேவையில்லை என அறிந்து கொள்கிறேன். நான் ஆய்வில் இருந்து விலகிக் கொண்டாலும் இது பொருந்தும் என அறிகிறேன்.

இந்த ஆய்வின் மூலம் கிடைக்கும் தகவல்களையும், பரிசோதனை முடிவுகளையும் மற்றும் சிகிச்சை தொடர்பான தகவல்களையும் மருத்துவர் மேற்கொள்ளும் ஆய்வில் பயன்படுத்திக்கொள்ளவும் அதை பிரசுரிக்கவும் என் முழு மனதுடன் சம்மதிக்கின்றேன்.

இந்த ஆய்வில் பங்கு கொள்ள ஒப்புக்கொள்கிறேன். எனக்கு கொடுக்கப்பட்ட அறிவுரைகளின்படி நடந்து கொள்வதுடன் 'இந்த ஆய்வை மேற்கொள்ளும் மருத்துவ அணிக்கு உண்மையுடன் இருப்பேன் என்று உறுதியளிக்கிறேன்.

நெஞ்சக அறுவை சிகிச்சையின்போது முதுகெலும்பு பக்க நரம்பியல் தடுப்பூசி மூலமாக வலி நிவாரணம் பெறுவதற்கு புபிவெகையின் என்ற மருந்து கலவையை தொடர் மருந்து உட்செலுத்தும் முறையில் அல்லது இடையிடையே மருந்து செலுத்தும் முறையில் கொடுக்கப்படும் என்பதை அறைந்துகொண்டேன். இதனால் உடலுக்கு எந்தவிதமான உபாதைகளும் இருக்காது என்பதை அறிந்துகொண்டு இந்த ஆய்வில் பங்குபெற முழு மனதுடன் சம்மதிக்கிறேன்.

பங்கேற்பவரின் கையொப்பம் இடம்..... தேதி.....

கட்டைவிரல் ரேகை

பங்கேற்பவரின் பெயர் மற்றும் விலாசம்

ஆய்வாளரின் கையொப்பம் இடம்..... தேதி.....

ஆய்வாளரின் பெயர்

INSTITUTIONAL ETHICS COMMITTEE
MADRAS MEDICAL COLLEGE, CHENNAI-3

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

CERTIFICATE OF APPROVAL

To
Dr.S.Dineshkumar
Postgraduate M.D.(Anaesthesiology)
Madras Medical College
Chennai 600 003

Dear Dr.S.Dineshkumar,


The Institutional Ethics Committee has considered your request and approved your study titled **"A prospective randomized study comparing the analgesic efficacy of continuous infusion of local anaesthetic versus intermittent bolus through thoracic paravertebral catheterization in patients undergoing elective thoracotomy surgeries" No.04022015.**

The following members of Ethics Committee were present in the meeting held on 03.02.2015 conducted at Madras Medical College, Chennai-3.

- | | |
|--|----------------------|
| 1. Dr.C.Rajendran, M.D., | : Chairperson |
| 2. Dr.R.Vimala, M.D., Dean, MMC, Ch-3 | : Deputy Chairperson |
| 3. Dr.B.Kalaiselvi, M.D., Vice-Principal, MMC, Ch-3 | : Member Secretary |
| 4. Dr.R.Nandini, M.D., Inst.of Pharmacology, MMC | : Member |
| 5. Dr.P.Ragumani, M.S., Professor, Inst.of Surgery, MMC | : Member |
| 6. Dr.Md.Ali, M.D., D.M., Prof. & HOD of Medl.G.E., MMC | : Member |
| 7. Dr.K.Ramadevi, Director, Inst.of Biochemistry, MMC | : Member |
| 8. Dr.Saraswathy, M.D., Director, Pathology, MMC, Ch-3 | : Member |
| 9. Dr.S.G.Sivachidambaram, M.D., Director i/c
Institute of Internal Medicine, MMC, Ch-3 | : Member |
| 10. Thiru S.Rameshkumar | : Lay Person |
| 11. Thiru S.Govindasamy, B.A., B.L., | : Lawyer |
| 12. Tmt.Arnold Saulina, M.A., 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
MEMBER SECRETARY
INSTITUTIONAL ETHICS COMMITTEE
MADRAS MEDICAL COLLEGE
CHENNAI-600 003

Continuous Infusion- Heart rate- Peri Operative

S. No.	Name	Age	Sex	B.I	A.I (0 min)	5 min	10 min	15 min	20 min	25 min	30 min	40 min	50 min	1 hr	1.15 hr	1.30 hr	2 hr	2.30 hr	3 hr	3.30 hr	4 hr
1	Mrs.Shalini	22	F	88	86	84	88	85	86	82	81	85	86	84	85	86	84	85	86	88	90
2	Mr.Gopi	33	M	76	79	77	74	74	76	75	74	73	72	74	72	76	78	78	77	78	
3	Mr.Bala	24	M	92	88	88	86	86	86	85	84	82	82	82	84	85	86	88	88	88	90
4	Mrs.Kavitha	38	F	94	86	84	85	84	86	86	88	86	85	85	86	85	85	86	88		
5	Mr.Kishore	34	M	68	62	62	63	63	63	65	62	64	62	62	64	66	65	68	72	70	
6	Mr.Palani	23	M	76	70	71	70	70	72	70	71	71	70	71	72	72	72	73	75	74	76
7	Mr.Gowtham	42	M	86	80	80	81	80	82	80	81	82	80	80	81	82	85	86	85	89	91
8	Mrs.Fathima	35	F	78	70	70	71	70	72	70	71	72	70	71	72	70	71	72	72	73	76
9	Mrs.Anandhi	25	F	88	90	92	94	92	90	92	93	92	94	91	92	94	95	94	96	97	92
10	Mr.Velu	43	M	90	92	94	93	95	96	94	98	96	94	95	98	96	94	95	91	94	95
11	Mr.Gunasekaran	31	M	86	85	84	85	86	84	88	86	85	85	84	82	83	87	86	84	82	
12	Mr.Nishanth	25	M	98	96	94	98	95	94	97	96	92	91	93	94	98	95	98	96	92	96
13	Mr.Sankaranathan	44	M	96	98	95	96	94	95	92	98	95	94	95	98	94	95	96	95	98	
14	Mrs.Narmada	26	F	76	76	79	72	75	74	78	76	73	75	71	72	79	75	74	76		
15	Mrs.Rajamma	48	F	74	79	75	72	70	76	72	79	73	69	76	75	72	73	79	75	72	
16	Mr.Vigneshwaran	32	M	77	79	75	76	79	73	72	79	76	75	75	76	74	76	75	75		
17	Mrs.Kowsalya	46	F	98	112	114	116	120	116	112	110	110	112	120	116	116	120	108	124	118	110
18	Mr.Mohan	28	M	65	66	68	64	65	67	68	61	65	64	68	67	64	68	65	62		
19	Mrs.Chellama	48	F	66	69	68	64	62	67	65	61	63	65	67	68	64	65	62	68	67	
20	Mrs.Anushya	37	F	84	85	86	84	81	82	83	87	89	84	85	82	86	84	82	81	86	87
21	Mr.Rajasekar	49	M	94	94	97	95	96	98	92	94	93	95	97	98	96	92	95	94		
22	Mrs.Chitra	29	F	78	79	76	72	75	78	76	73	72	75	74	79	75	75	74	76	72	
23	Mrs.Palaniyammal	46	F	77	79	75	76	71	72	76	74	73	75	76	79	75	73	72	76	79	
24	Mr.Subburaj	45	M	76	79	75	79	76	72	74	73	79	75	71	76	72	78	76	74	76	72
25	Mrs.Priyanka	23	F	84	85	86	84	86	82	82	84	86	89	87	84	86	86	84	82	86	81
26	Mrs.Andal	41	F	66	68	64	67	69	65	61	62	63	64	65	68	67	69	64	62	64	
27	Mr.Ganesh	25	M	79	83	84	86	87	82	81	85	86	84	86	82	81	85	86	84	82	81
28	Mrs.Santha	38	F	74	76	79	75	72	71	76	74	75	79	73	71	76	72	74	75	75	
29	Mr.Aravindasamy	36	M	88	92	118	110	103	102	106	112	126	116	110	108	125	114	106	122	110	106
30	Mr.Manikandan	37	M	94	88	86	85	82	84	83	87	89	81	83	85	86	86	84	89	87	85
31	Mrs.Ranjani	23	F	96	92	94	96	95	91	97	93	92	92	94	96	92	95	91	94	96	
32	Mrs.Usha kumari	31	F	64	65	68	64	62	61	68	64	67	69	64	69	65	62	64	65	67	68

Continuous Infusion - Diastolic BP- Peri Operative

S. No.	Name	Age	Sex	B.I	A.I (0 min)	5 min	10 min	15 min	20 min	25 min	30 min	40 min	50 min	1 hr	1.15 hr	1.30 hr	2 hr	2.30 hr	3 hr	3.30 hr	4 hr
1	Mrs.Shalini	22	F	92	90	88	86	84	85	82	86	88	86	84	82	80	82	81	80	78	76
2	Mr.Gopi	33	M	76	79	76	75	72	74	76	72	71	75	73	74	75	72	71	73	70	
3	Mr.Bala	24	M	86	89	86	82	85	84	83	82	84	86	85	84	87	85	86	84	82	80
4	Mrs.Kavitha	38	F	92	88	86	84	85	86	87	85	84	82	86	85	84	83	82	80		
5	Mr.Kishore	34	M	74	79	75	72	74	76	71	72	75	74	73	75	78	76	72	75	74	
6	Mr.Palani	23	M	62	68	65	62	64	68	65	61	64	62	65	67	64	62	65	61	63	60
7	Mr.Gowtham	42	M	60	63	65	62	64	63	61	62	65	61	63	64	62	61	59	59	58	56
8	Mrs.Fathima	35	F	88	93	89	86	85	86	82	84	83	81	82	80	83	81	82	80	80	78
9	Mrs.Anandhi	25	F	82	86	85	84	82	81	86	85	84	82	81	83	86	82	84	83	82	80
10	Mr.Velu	43	M	92	95	94	92	90	88	86	81	82	84	86	85	87	86	82	85	84	84
11	Mr.Gunasekaran	31	M	88	89	92	88	86	81	82	86	84	83	84	87	82	79	78	82	80	
12	Mr.Nishanth	25	M	90	95	92	89	86	85	87	84	86	82	85	84	89	86	85	81	82	84
13	Mr.Sankaranathan	44	M	74	79	76	75	78	72	71	76	75	79	73	72	74	78	76	72	70	
14	Mrs.Narmada	26	F	76	79	75	76	72	74	73	78	72	74	72	71	76	78	75	70		
15	Mrs.Rajamma	48	F	92	95	93	85	82	84	86	81	76	79	74	72	70	73	69	66	68	
16	Mr.Vigneshwaran	32	M	90	95	86	84	85	87	86	82	84	85	83	81	83	82	84	80		
17	Mrs.Kowsalya	46	F	72	96	98	102	100	98	98	96	100	96	102	96	98	102	98	106	98	100
18	Mr.Mohan	28	M	96	98	95	94	96	98	94	92	90	86	85	86	84	80	81	82		
19	Mrs.Chellama	48	F	84	89	82	80	79	75	76	78	76	74	75	76	78	76	75	76	74	
20	Mrs.Anushya	37	F	68	76	70	71	68	69	67	64	67	65	64	65	62	61	62	62	63	60
21	Mr.Rajasekar	49	M	60	65	63	62	65	64	65	68	66	61	59	57	59	54	58	56		
22	Mrs.Chitra	29	F	58	64	62	64	65	68	67	63	65	66	65	68	64	61	62	61	60	
23	Mrs.Palaniyammal	46	F	62	68	64	62	65	67	64	61	65	62	61	63	65	62	63	61	60	
24	Mr.Subburaj	45	M	70	76	72	70	69	67	68	69	64	67	65	68	64	68	66	69	68	64
25	Mrs.Priyanka	23	F	80	85	80	79	75	73	74	71	76	72	75	79	75	74	73	72	68	70
26	Mrs.Andal	41	F	88	95	90	86	84	87	85	86	82	84	86	82	79	75	74	71	72	
27	Mr.Ganesh	25	M	80	86	79	76	75	73	72	74	79	76	75	71	70	75	76	74	73	72
28	Mrs.Santha	38	F	82	88	83	80	79	76	75	78	74	72	76	75	71	72	76	75	74	
29	Mr.Aravindasamy	36	M	62	82	96	88	88	92	92	90	102	98	96	98	102	96	92	106	100	102
30	Mr.Manikandan	37	M	92	94	90	89	86	85	87	84	86	82	85	81	86	84	87	85	83	80
31	Mrs.Ranjani	23	F	88	92	86	84	85	86	82	81	85	83	84	82	86	84	80	79	82	
32	Mrs.Usha kumari	31	F	82	89	83	79	76	75	78	72	70	68	69	65	67	69	72	73	71	70

Continuous Infusion - Systolic BP- Peri Operative

S. No.	Name	Age	Sex	B.I	A.I (0 min)	5 min	10 min	15 min	20 min	25 min	30 min	40 min	50 min	1 hr	1.15 hr	1.30 hr	2 hr	2.30 hr	3 hr	3.30 hr	4 hr
1	Mrs.Shalini	22	F	132	130	128	126	125	123	129	124	128	126	125	120	120	127	126	124	123	128
2	Mr.Gopi	33	M	126	128	124	126	124	125	128	126	123	120	124	125	126	124	126	125	124	
3	Mr.Bala	24	M	134	139	136	132	135	134	136	132	135	134	135	134	136	135	134	138	136	130
4	Mrs.Kavitha	38	F	136	140	136	132	135	134	138	135	136	136	132	134	135	130	128	126		
5	Mr.Kishore	34	M	122	124	126	125	128	124	126	125	128	129	127	124	125	123	125	128	128	
6	Mr.Palani	23	M	118	120	122	125	128	126	124	126	125	125	120	124	123	125	124	125	129	128
7	Mr.Gowtham	42	M	122	128	124	126	128	129	127	124	125	126	121	120	125	124	125	124	128	124
8	Mrs.Fathima	35	F	126	125	129	124	128	126	124	128	127	128	126	128	124	128	124	126	125	124
9	Mrs.Anandhi	25	F	134	138	134	136	135	132	134	138	134	136	135	134	138	134	136	135	138	140
10	Mr.Velu	43	M	136	138	140	139	142	135	136	134	138	135	135	136	134	138	137	140	138	134
11	Mr.Gunasekaran	31	M	146	148	143	142	146	142	143	142	140	146	142	143	140	143	148	142	138	
12	Mr.Nishanth	25	M	138	143	149	150	146	140	143	144	143	146	142	141	140	140	142	138	134	136
13	Mr.Sankaranathan	44	M	136	139	138	134	136	132	135	134	139	135	132	134	138	136	135	137	134	
14	Mrs.Narmada	26	F	120	122	126	125	124	125	126	128	128	124	126	124	128	124	127	126		
15	Mrs.Rajamma	48	F	130	136	135	132	134	138	136	134	130	126	120	124	128	122	124	110	118	
16	Mr.Vigneshwaran	32	M	136	138	135	132	136	132	134	135	132	130	138	128	129	127	129	126		
17	Mrs.Kowsalya	46	F	128	140	142	130	142	142	142	136	130	136	148	132	132	144	142	148	146	146
18	Mr.Mohan	28	M	142	136	138	135	139	135	136	134	137	135	136	138	135	136	134	130		
19	Mrs.Chellama	48	F	136	139	134	132	130	135	134	136	132	135	130	132	128	125	129	130	128	
20	Mrs.Anushya	37	F	120	122	126	124	125	120	123	128	124	126	123	120	125	120	114	110	105	110
21	Mr.Rajasekar	49	M	110	115	110	112	114	110	113	115	110	113	116	112	114	109	107	104		
22	Mrs.Chitra	29	F	108	106	105	104	103	105	102	104	106	108	106	104	109	105	106	104	102	
23	Mrs.Palaniyammal	46	F	116	123	118	116	112	114	112	113	115	113	110	114	118	116	114	108	102	
24	Mr.Subburaj	45	M	126	132	130	128	124	126	125	121	123	125	129	124	123	126	123	122	120	118
25	Mrs.Priyanka	23	F	120	125	118	116	114	119	117	118	120	122	118	114	116	115	118	116	115	116
26	Mrs.Andal	41	F	136	139	128	126	125	128	126	125	128	124	127	125	126	124	125	126	124	
27	Mr.Ganesh	25	M	126	129	128	124	126	125	125	122	124	126	128	125	124	120	116	118	120	116
28	Mrs.Santha	38	F	128	132	130	129	124	126	128	125	123	124	128	126	122	120	118	115	114	
29	Mr.Aravindasamy	36	M	118	126	140	142	130	132	132	136	148	132	136	134	146	138	138	146	136	142
30	Mr.Manikandan	37	M	132	130	128	126	122	120	122	124	122	124	120	122	126	125	120	125	126	120
31	Mrs.Ranjani	23	F	136	139	134	136	135	132	130	135	130	135	129	124	126	128	125	127	126	
32	Mrs.Usha kumari	31	F	126	132	129	126	124	128	126	125	124	128	126	125	120	115	122	117	115	116

Continuous Infusion- Mean BP- Peri Operative

S. No.	Name	Age	Sex	B.I	A.I (0 min)	5 min	10 min	15 min	20 min	25 min	30 min	40 min	50 min	1 hr	1.15 hr	1.30 hr	2 hr	2.30 hr	3 hr	3.30 hr	4 hr
1	Mrs.Shalini	22	F	105	103	101	99	98	98	98	99	101	99	98	95	93	97	96	95	93	93
2	Mr.Gopi	33	M	93	95	92	92	89	91	93	90	88	90	90	91	92	89	89	90	88	
3	Mr.Bala	24	M	102	106	103	99	102	101	101	99	101	102	102	101	103	102	102	102	100	97
4	Mrs.Kavitha	38	F	107	105	103	100	102	102	104	102	101	100	101	101	101	99	97	95		
5	Mr.Kishore	34	M	90	94	92	90	92	92	89	90	93	92	91	91	94	92	90	93	92	
6	Mr.Palani	23	M	81	85	84	83	85	87	85	83	84	83	83	86	84	83	85	82	85	83
7	Mr.Gowtham	42	M	81	85	85	83	85	85	83	83	85	83	82	83	83	82	81	81	81	79
8	Mrs.Fathima	35	F	101	104	102	99	99	99	96	99	98	97	97	96	97	97	96	95	95	93
9	Mrs.Anandhi	25	F	99	103	101	101	100	98	102	103	101	100	99	100	103	99	101	100	101	100
10	Mr.Velu	43	M	107	109	109	108	107	104	103	99	101	101	102	102	103	103	100	103	102	101
11	Mr.Gunasekaran	31	M	107	109	109	106	106	101	102	105	103	104	103	106	101	100	101	102	99	
12	Mr.Nishanth	25	M	106	111	111	109	106	103	106	104	105	103	104	103	106	104	104	100	99	101
13	Mr.Sankaranathan	44	M	95	99	97	95	97	92	92	95	96	98	93	93	95	97	96	94	91	
14	Mrs.Narmada	26	F	91	93	92	92	89	91	91	95	91	91	90	89	93	93	92	89		
15	Mrs.Rajamma	48	F	105	109	107	101	99	102	103	99	94	95	89	89	89	89	87	81	85	
16	Mr.Vigneshwaran	32	M	105	109	102	100	102	102	102	100	100	100	101	97	98	97	99	95		
17	Mrs.Kowsalya	46	F	91	111	113	111	114	113	113	109	110	109	117	108	109	116	113	120	114	115
18	Mr.Mohan	28	M	111	111	109	108	110	110	108	106	106	102	102	103	101	99	99	98		
19	Mrs.Chellama	48	F	101	106	99	97	96	95	95	97	95	94	93	95	95	92	93	94	92	
20	Mrs.Anushya	37	F	85	91	89	89	87	86	86	85	86	85	84	83	83	81	79	78	77	77
21	Mr.Rajasekar	49	M	77	82	79	79	81	79	81	84	81	78	78	75	77	72	74	72		
22	Mrs.Chitra	29	F	75	78	76	77	78	80	79	77	79	80	79	80	79	76	77	75	74	
23	Mrs.Palaniyammal	46	F	80	86	82	80	81	83	80	78	82	79	77	80	83	80	80	77	74	
24	Mr.Subburaj	45	M	89	95	91	89	87	87	87	86	84	86	86	87	84	87	85	87	85	82
25	Mrs.Priyanka	23	F	93	98	93	91	88	88	88	87	91	89	89	91	89	88	88	87	84	85
26	Mrs.Andal	41	F	104	110	103	99	98	101	99	99	97	97	100	96	95	91	91	89	89	
27	Mr.Ganesh	25	M	95	100	95	92	92	90	90	90	94	93	93	89	88	90	89	89	89	87
28	Mrs.Santha	38	F	97	103	99	96	94	93	93	94	90	89	93	92	88	88	90	88	87	
29	Mr.Aravindasamy	36	M	81	97	111	106	102	105	105	105	117	109	109	110	117	110	107	119	112	115
30	Mr.Manikandan	37	M	105	106	103	101	98	97	99	97	98	96	97	95	99	98	98	98	97	93
31	Mrs.Ranjani	23	F	104	108	102	101	102	101	98	99	100	100	99	96	99	99	95	95	97	
32	Mrs.Usha kumari	31	F	97	103	98	95	92	93	94	90	88	88	88	85	85	84	89	88	86	85

Continuous Infusion- Heart rate - Post Op

S.N	Name	Age	Sex	0 Hr	0.5 Hr	1 Hr	1.5 Hr	2 Hr	2.5 Hr	3 Hr	3.5 Hr	4 Hr	4.5 Hr	5 Hr	5.5 Hr	6 Hr	6.5 Hr	7 Hr	7.5 Hr	8 Hr	8.5 Hr	9 Hr	10 Hr	11 Hr	12 Hr	13 Hr	14 Hr	15 Hr	16 Hr	17 Hr	18 Hr	19 Hr	20 Hr	21 Hr	22 Hr	23 Hr	24 Hr
1	Mrs.Shalini	22	F	92	92	90	92	92	92	90	88	86	88	92	90	90	88	86	84	88	90	92	90	88	90	91	88	86	84	85	87	89	86	84	95	90	92
2	Mr.Gopi	33	M	79	80	82	79	78	76	76	78	76	74	72	74	76	72	76	78	78	76	78	76	78	76	78	75	74	72	76	79	75	74	72	71	75	79
3	Mr.Bala	24	M	90	88	90	88	86	92	88	88	92	96	88	88	86	90	92	92	92	90	90	90	88	90	88	89	84	88	89	91	86	84	85	87	89	90
4	Mrs.Kavitha	38	F	86	86	84	86	82	82	84	82	84	84	86	84	86	82	82	80	82	78	80	82	84	88	89	84	86	87	85	86	84	88	82	84	86	88
5	Mr.Kishore	34	M	74	74	70	72	72	74	72	70	70	72	70	72	74	72	70	70	72	75	76	74	78	72	71	73	75	76	72	78	76	74	75	73	72	76
6	Mr.Palani	23	M	74	75	78	74	76	72	71	73	75	76	79	74	72	76	75	78	74	75	74	75	73	71	76	72	79	74	75	72	75	71	75	76	74	72
7	Mr.Gowtham	42	M	91	88	86	85	84	82	81	86	85	87	86	84	89	85	87	90	88	86	84	89	85	88	90	88	86	82	81	83	84	85	86	82	81	82
8	Mrs.Fathima	35	F	86	88	90	89	86	82	81	83	85	84	86	87	82	81	86	85	84	82	83	81	86	87	85	82	81	86	80	86	81	85	84	86	82	86
9	Mrs.Anandhi	25	F	92	96	95	92	94	98	93	91	93	95	96	98	96	95	97	99	96	95	92	94	96	91	98	96	93	95	92	94	93	98	95	96	95	92
10	Mr.Velu	43	M	94	94	96	92	95	93	94	92	98	95	93	94	92	97	96	95	96	92	98	94	92	96	92	95	98	94	92	91	95	96	92	96	95	94
11	Mr.Gunasekaran	31	M	82	85	84	86	87	88	88	82	84	86	85	81	83	85	84	87	89	90	92	88	86	85	82	81	83	84	85	84	82	81	85	87	89	90
12	Mr.Nishanth	25	M	94	96	94	92	93	95	91	96	94	98	96	92	95	94	91	93	92	98	95	94	96	92	91	95	94	96	92	97	95	94	96	92	91	92
13	Mr.Sankaranathan	44	M	94	96	95	92	91	94	96	95	98	94	95	92	91	95	93	94	92	98	99	96	91	92	93	95	94	96	98	95	96	92	94	96	95	92
14	Mrs.Narmada	26	F	80	82	86	84	85	86	82	81	82	86	85	84	85	86	82	81	85	86	82	81	85	84	87	86	89	87	85	84	86	82	81	83	80	82
15	Mrs.Rajamma	48	F	80	82	83	84	85	81	83	82	81	86	82	81	89	85	84	83	82	80	81	82	86	84	82	87	82	81	86	85	81	83	80	82	84	80
16	Mr.Vigneshwaran	32	M	82	86	81	82	84	83	85	81	82	86	84	82	89	87	88	85	81	82	86	83	81	80	84	86	82	81	83	82	84	86	82	81	86	82
17	Mrs.Kowsalya	46	F	93	95	91	96	94	98	96	92	95	96	94	92	93	95	92	98	95	94	96	94	92	93	95	92	96	95	92	94	96	91	98	98	95	96
18	Mr.Mohan	28	M	72	76	72	71	75	76	79	78	75	76	71	77	72	76	75	75	79	79	71	72	76	73	74	75	78	72	75	76	74	72	71	75	78	80
19	Mrs.Chellama	48	F	74	75	72	76	78	79	74	72	75	76	78	72	71	76	72	79	75	72	71	73	76	74	75	79	75	72	71	76	72	74	72	75	71	72
20	Mrs.Anushya	37	F	88	86	82	81	86	85	84	89	85	84	82	83	81	87	82	86	85	82	81	86	84	82	83	85	81	85	86	84	82	86	84	85	89	84
21	Mr.Rajasekar	49	M	96	95	96	98	92	94	93	91	96	92	95	96	94	92	93	95	98	91	92	97	96	95	93	92	91	95	90	99	95	96	94	92	96	94
22	Mrs.Chitra	29	F	96	95	96	92	91	98	94	96	93	92	95	97	98	92	91	96	95	94	98	95	96	92	91	98	97	95	96	92	91	94	92	96	95	92
23	Mrs.Palaniyammal	46	F	84	82	84	86	81	82	86	83	85	88	89	87	85	81	82	86	84	85	86	82	88	82	81	86	85	84	82	89	87	88	85	86	85	84
24	Mr.Subburaj	45	M	86	85	86	82	81	83	84	86	88	85	81	82	83	84	86	85	85	85	84	86	84	87	89	86	86	85	81	82	86	89	87	85	85	86
25	Mrs.Priyanka	23	F	88	90	88	86	82	81	86	84	87	86	89	82	85	81	86	82	84	87	86	85	84	82	86	89	88	84	85	85	86	81	82	86	85	80
26	Mrs.Andal	41	F	74	76	75	72	71	74	79	78	75	75	76	74	75	78	79	80	82	84	86	82	79	75	76	74	78	80	81	82	86	84	83	81	82	82
27	Mr.Ganesh	25	M	78	79	86	85	82	81	84	86	83	85	82	81	84	87	88	86	85	82	84	85	84	86	82	81	85	86	84	87	88	88	85	86	84	88
28	Mrs.Santha	38	F	82	85	86	82	81	85	86	84	85	86	82	81	88	86	84	85	86	82	84	87	82	86	89	82	86	84	85	84	85	86	85	84	85	84
29	Mr.Aravindasamy	36	M	85	88	89	87	85	81	82	86	89	87	85	81	82	86	85	88	89	82	81	86	86	82	88	82	81	86	85	84	82	89	87	88	85	86
30	Mr.Manikandan	37	M	96	98	96	95	92	93	91	95	94	98	96	92	96	95	92	94	96	98	94	95	96	95	95	98	94	95	96	92	91	95	96	96	96	92
31	Mrs.Ranjani	23	F	96	98	96	95	94	92	96	95	96	98	97	95	91	93	92	96	92	95	94	95	95	96	98	99	94	95	96	92	95	98	99	96	95	96
32	Mrs.Usha kumari	31	F	72	75	74	76	72	78	75	71	72	75	79	78	75	74	75	72	74	76	75	78	79	75	74	72	75	78	75	75	76	74	75	72	70	

Continuous Infusion -Diastolic BP - Post Op

S. No	Name	Age	Sex	0 Hr	0.5 Hr	1 Hr	1.5 Hr	2 Hr	2.5 Hr	3 Hr	3.5 Hr	4 Hr	4.5 Hr	5 Hr	5.5 Hr	6 Hr	6.5 Hr	7 Hr	7.5 Hr	8 Hr	8.5 Hr	9 Hr	10 Hr	11 Hr	12 Hr	13 Hr	14 Hr	15 Hr	16 Hr	17 Hr	18 Hr	19 Hr	20 Hr	21 Hr	22 Hr	23 Hr	24 Hr
1	Mrs.Shalini	22	F	76	75	76	78	74	72	79	71	73	79	76	74	72	71	76	78	75	77	72	73	74	75	78	75	76	74	75	72	72	71	76	74	72	72
2	Mr.Gopi	33	M	70	72	76	75	74	72	71	76	78	75	72	74	73	71	72	79	75	74	78	75	72	69	68	71	72	74	76	73	75	74	76	72	75	74
3	Mr.Bala	24	M	80	83	85	81	86	84	87	82	86	85	84	82	81	86	87	85	86	84	82	89	87	82	81	86	83	80	84	85	88	86	82	81	87	82
4	Mrs.Kavitha	38	F	80	82	86	84	87	82	81	86	89	85	84	83	80	79	77	81	83	84	86	85	82	81	83	84	86	82	85	81	80	79	78	76	75	78
5	Mr.Kishore	34	M	74	76	75	72	74	73	71	78	76	72	75	74	71	75	79	78	75	73	71	72	77	75	71	72	76	74	72	79	72	71	72	76	78	78
6	Mr.Palani	23	M	60	62	65	64	68	67	63	61	65	62	69	64	63	62	60	59	57	62	64	66	68	62	64	68	67	65	69	68	64	66	68	65	62	60
7	Mr.Gowtham	42	M	56	59	54	53	57	51	56	57	52	51	56	58	54	52	53	59	58	57	51	52	56	54	58	53	59	57	51	53	58	56	57	53	56	60
8	Mrs.Fathima	35	F	78	76	75	72	79	74	76	73	78	72	74	75	76	78	75	72	76	74	76	72	74	73	75	78	72	71	76	72	76	74	75	73	72	76
9	Mrs.Anandhi	25	F	80	82	86	84	85	87	83	82	81	83	80	82	84	86	85	84	86	86	82	81	87	85	86	82	84	80	86	82	83	84	85	86	82	80
10	Mr.Velu	43	M	84	86	84	82	85	87	86	84	83	85	87	86	82	81	84	86	87	86	85	89	84	85	86	82	81	87	86	85	84	82	86	84	85	82
11	Mr.Gunasekaran	31	M	80	83	84	86	82	85	81	86	84	85	86	82	81	87	86	82	83	84	86	82	85	87	89	86	84	86	82	81	86	83	85	84	86	80
12	Mr.Nishanth	25	M	84	83	82	80	82	86	84	83	85	83	81	82	84	86	88	85	84	83	81	86	84	82	83	85	84	86	85	82	83	79	78	82	81	80
13	Mr.Sankaranathan	44	M	70	72	76	75	73	71	76	75	73	72	79	74	76	72	75	76	73	74	75	73	72	76	75	78	75	73	79	78	76	75	74	76	72	70
14	Mrs.Narmada	26	F	70	73	75	76	78	72	74	76	75	79	78	72	76	74	73	75	71	76	78	75	74	72	76	71	75	76	74	73	75	74	72	71	70	70
15	Mrs.Rajamma	48	F	68	69	65	67	62	64	68	63	65	61	60	64	68	67	63	65	69	65	64	68	62	61	65	67	68	66	63	65	68	64	65	66	65	67
16	Mr.Vigneshwaran	32	M	80	83	84	86	88	82	80	81	87	86	84	82	83	85	86	84	85	81	83	87	86	82	80	79	78	82	84	86	82	78	75	76	78	80
17	Mrs.Kowsalya	46	F	92	98	96	94	95	94	94	97	95	96	94	93	98	92	91	93	94	96	92	91	90	95	94	98	96	97	94	95	98	92	93	95	98	94
18	Mr.Mohan	28	M	82	83	85	84	86	87	82	81	83	86	85	84	86	87	85	86	89	85	81	85	86	82	87	86	82	83	89	85	84	86	82	84	82	80
19	Mrs.Chellama	48	F	74	76	75	73	78	72	74	76	79	72	71	75	79	76	72	74	76	75	79	72	73	74	75	79	76	72	71	75	78	75	74	76	73	76
20	Mrs.Anushya	37	F	60	62	65	67	63	64	68	62	61	65	64	63	68	67	66	63	64	65	62	61	60	59	62	64	63	65	61	62	64	63	62	64	62	62
21	Mr.Rajasekar	49	M	60	63	65	62	64	62	63	65	68	61	62	64	63	65	61	63	64	65	62	61	67	61	62	64	63	64	62	61	65	64	62	61	60	60
22	Mrs.Chitra	29	F	60	63	62	65	64	61	62	67	62	64	65	68	61	63	67	65	68	64	63	66	61	60	65	67	63	64	62	61	63	67	62	63	64	60
23	Mrs.Palaniyammal	46	F	60	63	65	62	64	61	65	63	68	69	64	62	65	67	62	60	65	61	63	62	64	60	68	64	62	65	69	67	63	62	61	62	64	60
24	Mr.Subburaj	45	M	70	68	63	65	62	61	64	63	67	65	61	64	68	67	65	62	67	62	61	64	63	67	62	61	60	62	65	64	68	63	62	67	60	60
25	Mrs.Priyanka	23	F	70	72	68	65	69	64	63	61	65	62	63	65	64	62	61	63	68	67	65	64	62	63	61	68	64	62	61	63	65	64	68	66	64	68
26	Mrs.Andal	41	F	72	74	76	75	72	71	76	78	74	75	76	72	71	75	76	78	75	72	74	73	72	70	75	77	79	76	78	75	76	74	72	75	73	70
27	Mr.Ganesh	25	M	72	76	75	79	72	73	74	76	78	75	73	74	72	76	79	75	71	72	76	75	78	74	75	79	75	76	72	74	76	78	75	72	73	76
28	Mrs.Santha	38	F	74	72	73	71	70	75	76	74	72	71	70	73	69	68	69	70	73	72	71	76	75	72	73	74	78	76	73	72	71	75	76	74	72	70
29	Mr.Aravindasamy	36	M	94	97	95	96	94	93	98	94	95	94	94	97	96	92	91	95	94	98	96	97	94	95	98	96	94	95	94	94	97	95	96	94	94	93
30	Mr.Manikandan	37	M	80	82	86	85	81	83	79	76	78	75	73	76	74	77	75	76	78	75	73	74	72	71	73	70	72	71	76	72	74	75	73	72	75	71
31	Mrs.Ranjani	23	F	82	85	86	82	84	86	85	87	86	85	82	81	83	84	87	86	82	80	86	83	85	82	84	81	87	82	89	85	84	86	85	81	86	88
32	Mrs.Usha kumari	31	F	70	76	75	72	79	71	73	78	75	72	76	71	73	72	76	72	74	73	72	78	75	74	72	76	71	72	76	75	74	72	71	70	68	70

Continuous Infusion - Systolic BP - Post Op

S. No	Name	Age	Sex	0 Hr	0.5 Hr	1 Hr	1.5 Hr	2 Hr	2.5 Hr	3 Hr	3.5 Hr	4 Hr	4.5 Hr	5 Hr	5.5 Hr	6 Hr	6.5 Hr	7 Hr	7.5 Hr	8 Hr	8.5 Hr	9 Hr	10 Hr	11 Hr	12 Hr	13 Hr	14 Hr	15 Hr	16 Hr	17 Hr	18 Hr	19 Hr	20 Hr	21 Hr	22 Hr	23 Hr	24 Hr
1	Mrs.Shalini	22	F	128	130	126	125	126	123	125	124	125	120	123	126	125	124	128	126	124	125	126	128	129	124	126	128	126	125	124	125	126	128	130	129	128	126
2	Mr.Gopi	33	M	124	128	126	125	124	123	123	127	126	123	125	128	125	126	128	126	124	125	129	123	125	124	128	123	125	124	126	125	127	126	125	122	120	124
3	Mr.Bala	24	M	130	135	136	132	134	136	132	138	132	134	139	132	130	134	137	130	135	132	134	130	136	135	138	134	136	130	132	135	137	137	130	135	132	130
4	Mrs.Kavitha	38	F	126	128	123	125	126	124	128	124	126	128	126	124	126	129	128	130	132	129	128	126	128	124	129	130	129	128	126	128	129	130	129	125	127	130
5	Mr.Kishore	34	M	128	126	129	124	126	125	128	123	124	128	126	124	126	125	129	127	126	125	124	128	122	120	126	125	122	120	122	126	123	125	128	122	125	126
6	Mr.Palani	23	M	128	128	130	135	136	129	124	125	128	124	123	126	125	126	124	121	120	123	125	126	124	123	120	128	126	124	123	128	122	124	126	125	120	122
7	Mr.Gowtham	42	M	124	122	126	124	128	129	123	125	127	126	125	122	123	126	128	124	123	121	123	126	124	120	119	123	124	126	127	124	123	125	126	125	122	124
8	Mrs.Fathima	35	F	124	122	126	125	124	123	125	129	124	128	123	126	124	123	126	128	127	126	124	129	125	123	127	125	126	128	124	126	128	126	124	128	126	122
9	Mrs.Anandhi	25	F	126	128	130	129	126	127	130	129	126	124	128	123	127	126	130	126	125	124	128	126	124	127	123	125	129	124	128	126	130	122	126	122	125	124
10	Mr.Velu	43	M	134	135	138	132	130	128	126	124	130	135	120	128	129	130	135	129	128	130	135	137	130	134	136	132	129	135	127	130	131	134	128	130	132	134
11	Mr.Gunasekaran	31	M	136	142	130	139	146	139	138	136	132	135	134	132	137	135	130	131	135	129	124	126	127	123	124	128	126	120	124	126	125	127	123	126	129	128
12	Mr.Nishanth	25	M	136	138	140	142	143	146	139	135	134	136	137	132	135	130	135	139	142	143	138	136	135	132	134	138	137	132	131	135	126	128	125	128	129	130
13	Mr.Sankaranathan	44	M	134	138	136	139	128	126	124	127	125	126	129	124	123	121	120	122	126	128	124	126	129	127	126	124	123	121	120	125	129	127	126	124	129	128
14	Mrs.Narmada	26	F	126	122	128	124	120	123	126	127	123	125	129	124	123	120	126	124	128	120	126	120	124	129	127	125	123	121	120	126	124	123	127	129	125	126
15	Mrs.Rajamma	48	F	118	129	128	126	124	123	129	127	126	125	123	128	126	127	125	129	124	129	127	123	125	124	126	127	125	121	120	126	125	124	123	120	118	118
16	Mr.Vigneshwaran	32	M	126	128	130	135	132	136	128	124	126	120	125	126	124	123	121	125	128	126	124	123	128	128	126	122	120	119	123	125	127	126	125	128	126	126
17	Mrs.Kowsalya	46	F	126	124	127	125	126	138	136	139	128	129	124	123	121	120	122	126	128	124	126	129	126	124	123	121	123	121	129	127	126	124	129	124	127	125
18	Mr.Mohan	28	M	130	135	132	136	134	138	132	135	139	134	136	135	137	134	139	135	136	134	138	132	135	134	138	136	135	137	132	133	134	138	135	132	131	130
19	Mrs.Chellama	48	F	128	130	126	122	124	120	126	127	123	125	129	124	122	121	126	128	124	120	123	128	126	124	125	127	120	129	124	125	123	126	128	120	126	122
20	Mrs.Anushya	37	F	110	115	113	117	116	112	116	112	116	115	119	113	114	116	112	119	115	110	121	126	122	124	119	116	118	113	116	115	112	116	113	109	105	110
21	Mr.Rajasekar	49	M	106	108	106	103	105	104	106	102	108	106	104	102	105	106	102	109	107	106	104	102	108	103	104	106	103	108	103	104	102	105	106	104	109	106
22	Mrs.Chitra	29	F	102	106	105	103	104	109	102	105	107	106	102	105	108	106	102	101	105	107	103	104	106	105	109	101	103	105	100	104	106	105	103	101	104	102
23	Mrs.Palaniyammal	46	F	102	104	106	105	103	107	106	104	102	101	105	103	102	104	109	104	106	105	103	108	103	104	102	105	106	108	103	104	109	103	104	105	100	102
24	Mr.Subburaj	45	M	118	116	114	113	115	112	116	123	120	125	126	128	129	124	123	126	128	127	120	124	126	120	118	116	115	113	117	112	115	114	118	116	110	112
25	Mrs.Priyanka	23	F	116	119	120	126	124	125	123	127	129	124	123	128	126	124	126	127	128	123	120	119	117	116	115	118	115	120	122	119	117	116	118	119	115	118
26	Mrs.Andal	41	F	124	126	128	123	127	126	125	120	124	127	129	123	128	124	120	126	127	120	126	123	125	124	126	125	128	124	126	127	123	126	124	122	120	122
27	Mr.Ganesh	25	M	116	118	120	122	126	124	128	123	129	124	126	127	129	124	123	125	124	120	126	127	120	123	124	125	126	123	128	124	123	127	125	122	126	122
28	Mrs.Santha	38	F	114	118	116	114	112	116	117	119	115	113	118	120	124	126	127	129	124	126	128	123	121	125	128	127	126	124	129	127	125	126	124	128	126	122
29	Mr.Aravindasamy	36	M	122	124	120	126	127	128	130	126	122	124	120	122	121	126	128	124	120	123	128	126	124	127	120	120	123	128	126	124	125	127	120	129	124	125
30	Mr.Manikandan	37	M	120	122	126	124	128	129	123	124	126	127	125	124	128	120	123	127	120	126	128	124	120	126	127	120	125	124	128	123	127	120	125	120	122	118
31	Mrs.Ranjani	23	F	126	128	126	124	127	125	123	124	129	126	128	127	125	123	124	128	126	127	123	121	120	128	126	124	123	127	129	124	121	118	120	122	125	126
32	Mrs.Usha kumari	31	F	112	116	115	118	116	113	112	114	119	113	117	115	113	118	120	122	126	124	129	127	123	120	119	116	117	112	114	115	118	113	116	114	118	116

Continuous Infusion - Mean BP - Post Op

S. No	Name	Age	Sex	0 Hr	0.5 Hr	1 Hr	1.5 Hr	2 Hr	2.5 Hr	3 Hr	3.5 Hr	4 Hr	4.5 Hr	5 Hr	5.5 Hr	6 Hr	6.5 Hr	7 Hr	7.5 Hr	8 Hr	8.5 Hr	9 Hr	10 Hr	11 Hr	12 Hr	13 Hr	14 Hr	15 Hr	16 Hr	17 Hr	18 Hr	19 Hr	20 Hr	21 Hr	22 Hr	23 Hr	24 Hr	
1	Mrs.Shalini	22	F	93	93	93	94	91	89	94	89	90	93	92	91	90	89	93	94	91	93	90	91	92	91	94	93	93	91	91	90	90	90	94	92	91	90	
2	Mr.Gopi	33	M	88	91	93	92	91	89	88	93	94	91	90	92	90	89	91	95	91	91	95	91	90	87	88	88	90	91	93	90	92	91	92	89	90	91	
3	Mr.Bala	24	M	97	100	102	98	102	101	102	101	101	101	102	99	97	102	104	100	102	100	99	103	103	100	100	102	101	97	100	102	104	103	98	99	102	98	
4	Mrs.Kavitha	38	F	95	97	98	98	100	96	97	99	101	99	98	97	95	96	94	97	99	99	100	99	97	95	98	99	100	97	99	97	96	96	95	92	92	95	
5	Mr.Kishore	34	M	92	93	93	89	91	90	90	93	92	91	92	91	89	92	96	94	92	90	89	91	92	90	89	90	91	89	89	95	89	89	91	91	94	94	
6	Mr.Palani	23	M	83	84	87	88	91	88	83	82	86	83	87	85	84	83	81	80	78	82	84	86	87	82	83	88	87	85	87	88	83	85	87	85	81	81	
7	Mr.Gowtham	42	M	79	80	78	77	81	77	78	80	77	76	79	79	77	77	78	81	80	78	75	77	79	76	78	76	81	80	76	77	80	79	80	77	78	81	
8	Mrs.Fathima	35	F	93	91	92	90	94	90	92	92	93	91	90	92	92	93	92	91	93	91	92	91	91	90	92	94	90	90	92	90	93	91	91	91	90	91	
9	Mrs.Anandhi	25	F	95	97	101	99	99	100	99	98	96	97	96	96	98	99	100	98	99	99	97	96	99	99	98	96	99	95	100	97	99	97	99	98	96	95	
10	Mr.Velu	43	M	101	102	102	99	100	101	99	97	99	102	98	100	98	97	101	100	101	101	102	105	99	101	103	99	97	103	100	100	100	99	100	99	101	99	
11	Mr.Gunasekaran	31	M	99	103	99	104	103	103	100	103	100	102	102	99	100	103	101	98	100	99	99	97	99	99	101	100	98	97	96	96	99	98	98	98	100	96	
12	Mr.Nishanth	25	M	101	101	101	101	102	106	102	100	101	101	100	99	101	101	104	103	103	103	100	103	101	99	100	103	102	101	100	100	97	95	94	97	97	97	
13	Mr.Sankaranathan	44	M	91	94	96	96	91	89	92	92	90	90	96	91	92	88	90	91	91	92	91	91	91	93	92	93	91	89	93	94	94	92	91	92	91	89	
14	Mrs.Narmada	26	F	89	89	93	92	92	89	91	93	91	94	95	89	92	89	91	91	90	91	94	90	91	91	93	89	91	91	89	91	91	90	90	90	88	89	
15	Mrs.Rajamma	48	F	85	89	86	87	83	84	88	84	85	82	81	85	87	87	84	86	87	86	85	86	83	82	85	87	87	84	82	85	87	84	84	84	83	84	
16	Mr.Vigneshwaran	32	M	95	98	99	102	103	100	96	95	100	97	98	97	97	98	98	98	99	96	97	99	100	97	95	93	92	94	97	99	97	94	92	93	94	95	
17	Mrs.Kowsalya	46	F	103	107	106	104	105	109	108	111	106	107	104	103	106	101	101	104	105	105	103	104	102	105	104	106	105	105	106	106	107	103	105	105	108	104	
18	Mr.Mohan	28	M	98	100	101	101	102	104	99	99	102	102	102	101	103	103	103	102	105	101	100	101	102	99	104	103	100	101	103	101	101	103	100	100	98	97	
19	Mrs.Chellama	48	F	92	94	92	89	93	88	91	93	94	90	90	91	93	91	90	92	92	90	94	91	91	91	92	95	91	91	89	92	93	92	92	91	91	91	
20	Mrs.Anushya	37	F	77	80	81	84	81	80	84	79	79	82	82	80	83	83	81	82	81	80	82	83	81	81	81	81	81	81	81	79	80	80	81	79	79	76	78
21	Mr.Rajasekar	49	M	75	78	79	76	78	76	77	77	81	76	76	77	77	79	75	78	78	79	76	75	81	75	76	78	76	79	76	75	77	78	77	75	76	75	
22	Mrs.Chitra	29	F	74	77	76	78	77	77	75	80	77	78	77	80	77	77	79	77	80	78	76	79	76	75	80	78	76	78	75	75	77	80	76	76	77	74	
23	Mrs.Palaniyammal	46	F	74	77	79	76	77	76	79	77	79	80	78	76	77	79	78	75	79	76	76	77	77	75	79	78	77	79	80	79	78	76	75	76	76	74	
24	Mr.Subburaj	45	M	86	84	80	81	80	78	81	83	85	85	83	85	88	86	84	83	87	84	81	84	84	85	81	79	78	79	82	80	84	80	81	83	77	77	
25	Mrs.Priyanka	23	F	85	88	85	85	87	84	83	83	86	83	83	86	85	83	83	84	88	86	83	82	80	81	79	85	81	81	81	81	82	82	81	85	84	81	85
26	Mrs.Andal	41	F	89	91	93	91	90	89	92	92	91	92	94	89	90	91	91	94	92	88	91	90	90	88	92	93	95	92	94	92	92	91	89	91	89	87	
27	Mr.Ganesh	25	M	87	90	90	93	90	90	92	92	95	91	91	92	91	92	94	92	89	88	93	92	92	90	91	94	92	92	91	91	92	94	92	89	91	91	
28	Mrs.Santha	38	F	87	87	87	85	84	89	90	89	86	85	86	89	87	87	88	90	90	90	90	92	90	90	91	92	94	92	92	90	89	92	92	92	90	87	
29	Mr.Aravindasamy	36	M	103	106	103	106	105	105	109	105	104	104	103	105	104	103	103	105	103	106	107	107	104	106	105	104	104	106	105	104	106	106	106	104	106	104	104
30	Mr.Manikandan	37	M	93	95	99	98	97	98	94	92	94	92	90	92	92	91	91	93	92	92	91	91	88	89	91	87	90	89	93	89	92	90	90	88	91	87	
31	Mrs.Ranjani	23	F	97	99	99	96	98	99	98	99	100	99	97	96	97	97	99	100	97	96	98	96	97	97	98	95	99	97	102	98	96	97	97	95	99	101	
32	Mrs.Usha kumari	31	F	84	89	88	87	91	85	86	90	90	86	90	86	86	87	91	89	91	90	91	94	91	89	88	89	86	85	89	88	89	86	86	85	85	85	

Intermittent Bolus- Heart rate- Peri Operative

S. No.	Name	Age	Sex	B.I	A.I (0 min)	5min	10mi n	15mi n	20mi n	25mi n	30mi n	40mi n	50mi n	1 hr	1.15 hr	1.30 hr	2 hr	2.30 hr	3 hr	3.30 hr	4 hr
1	Mr.Murugan	25	M	88	92	90	94	90	90	94	92	93	95	94	90	92	90	94	92	98	102
2	Mr.Vinayagam	36	M	92	94	86	88	90	92	90	92	92	96	96	90	88	92	88	92		
3	Mrs.Uma maheshwari	27	F	86	92	88	86	82	80	82	82	90	88	84	86	88	86	88	88		
4	Mr.Gowes Basha	38	M	92	92	82	84	82	82	80	82	80	86	94	84	84	86	84	88		
5	Mrs.Lakshmi	32	F	80	82	76	72	74	72	76	72	74	72	72	76	82	80	72	84	84	
6	Mrs.Muniyammal	42	F	68	64	60	58	62	62	66	64	72	78	78	72	70	74	78	76	78	82
7	Mr.Thirtharaj	28	M	76	76	74	74	72	70	68	64	68	62	66	64	60	72	68	68		
8	Mrs.Shenbagam	43	F	92	90	86	88	82	84	84	86	82	88	96	80	82	84	84	82	86	
9	Mr.Harish	23	M	90	90	88	86	82	84	84	86	82	88	86	80	82	84	84	86		
10	Mrs.Mala	32	F	96	92	84	82	80	82	80	81	81	80	84	80	81	80	82	84	86	84
11	Mrs.Mercy	35	F	85	92	88	96	98	98	94	99	106	98	93	92	99	105	98	93	98	102
12	Mr.Suresh pandi	26	M	84	82	80	82	82	80	84	86	86	88	84	86	84	88	86	90	88	
13	Mr.Marimuthu	44	M	86	88	90	88	92	88	86	84	92	92	84	86	88	92	88	92		
14	Mr.Ponniah	42	M	78	78	75	74	74	74	76	78	82	86	90	88	90	92	90	90	88	90
15	Mrs.Priya	22	F	64	66	68	72	72	74	78	76	78	80	78	72	72	78	76	78		
16	Mrs.Jeenath	38	F	92	90	82	80	80	82	78	74	78	86	80	82	82	82	80	80	82	82
17	Mrs.Jayapradha	41	F	90	92	90	86	82	81	80	86	86	90	90	82	84	88	85	86		
18	Mr.Peter	21	M	86	88	82	80	78	76	74	78	72	86	80	81	81	88	82	84	86	
19	Mrs.Chinnamma	45	F	85	84	81	80	76	72	72	80	82	85	87	87	86	85	82	85	86	89
20	Mrs.Punitha	31	F	84	88	80	78	78	78	76	78	78	82	80	82	80	82	82	84	88	89
21	Mr.Ranket palra	28	M	76	80	78	72	72	71	70	72	74	78	70	71	72	76	74	76	78	82
22	Mrs.Saroja	47	F	65	72	72	70	66	64	62	65	66	69	60	62	68	72	68	70		
23	Mr.Kumar	22	M	92	96	90	82	80	82	84	86	86	94	90	88	84	88	80	92		
24	Mrs.Selvi	42	F	90	86	80	80	78	82	80	86	86	92	90	86	82	90	84	90	88	
25	Mrs.Sasi rekha	33	F	82	90	82	80	82	80	84	84	84	86	86	88	86	88	84	82	86	86
26	Mr.Velu	41	M	78	86	80	78	72	72	70	72	74	78	72	70	74	76	74	78	76	74
27	Mr.Shanmugam	22	M	68	74	72	66	60	62	62	64	64	68	62	64	68	72	70	78	74	76
28	Mrs.Jothi	44	F	58	64	64	60	62	58	62	60	62	65	68	64	62	68	66	69		
29	Mrs.Rekha	39	F	66	72	70	66	62	64	62	66	64	66	62	60	65	71	68	70	68	
30	Mr.Kalyanam	43	M	92	98	96	99	102	105	108	106	110	102	98	105	109	113	106	103	105	108
31	Mr.Sampath	34	M	78	78	72	68	64	70	71	72	76	88	82	80	82	80	78	80	82	84
32	Mr.Venkatesan	32	M	88	88	80	78	76	78	80	84	88	92	90	88	88	90	86	88	86	88

Intermittent Bolus- Diastolic BP- Peri Operative

S. No.	Name	Age	Sex	B.I	A.I (0 min)	5min	10min	15min	20min	25min	30min	40min	50min	1 hr	1.15 hr	1.30 hr	2 hr	2.30 hr	3 hr	3.30 hr	4 hr
1	Mr.Murugan	25	M	76	78	76	72	74	76	74	76	78	78	80	76	82	90	84	92	90	92
2	Mr.Vinayagam	36	M	88	90	84	84	83	84	86	86	86	88	90	84	86	90	82	90		
3	Mrs.Uma maheshwari	27	F	77	78	72	70	68	72	72	70	72	74	76	76	78	80	80	82		
4	Mr.Gowes Basha	38	M	90	92	90	90	88	86	88	84	86	88	92	88	84	88	82	90		
5	Mrs.Lakshmi	32	F	82	84	82	82	80	82	80	84	82	82	82	80	82	86	80	90	88	
6	Mrs.Muniyammal	42	F	62	66	64	64	63	61	66	66	68	76	82	76	76	78	76	80	86	78
7	Mr.Thirtharaj	28	M	70	76	70	72	72	74	72	70	71	73	74	72	72	76	70	78		
8	Mrs.Shenbagam	43	F	92	94	90	92	90	88	86	88	88	88	94	90	86	92	82	92	90	
9	Mr.Harish	23	M	94	94	90	88	86	84	86	86	88	92	96	90	92	94	84	86		
10	Mrs.Mala	32	F	90	92	88	86	84	80	81	82	86	85	88	82	84	90	81	90	84	90
11	Mrs.Mercy	35	F	72	78	76	75	78	83	86	92	96	90	88	91	90	94	88	86	89	90
12	Mr.Suresh pandi	26	M	76	80	78	74	76	76	76	72	74	78	82	78	82	88	83	86	72	
13	Mr.Marimuthu	44	M	74	76	72	70	72	76	80	82	80	82	84	80	82	84	80	80		
14	Mr.Ponniah	42	M	68	72	70	68	66	68	70	72	70	72	72	68	66	72	71	74	72	70
15	Mrs.Priya	22	F	62	64	64	60	62	64	62	62	64	66	70	64	71	74	68	72		
16	Mrs.Jeenath	38	F	88	92	90	86	84	82	82	84	86	86	90	84	86	86	77	88	80	88
17	Mrs.Jayapradha	41	F	84	88	82	84	82	80	82	80	84	86	86	80	84	88	80	88		
18	Mr.Peter	21	M	80	84	80	82	80	82	80	78	76	74	78	68	78	82	82	84	80	
19	Mrs.Chinnamma	45	F	90	92	90	98	86	82	80	84	82	86	92	82	80	90	80	90	84	88
20	Mrs.Punitha	31	F	84	86	82	82	80	82	81	85	85	87	90	81	85	94	83	92	82	90
21	Mr.Ranket palra	28	M	72	74	78	70	68	69	72	72	70	72	70	64	72	84	81	88	80	86
22	Mrs.Saroja	47	F	68	72	72	70	72	70	68	78	70	71	72	70	72	78	73	80		
23	Mr.Kumar	22	M	92	90	92	90	90	86	86	80	80	81	84	80	81	86	81	88		
24	Mrs.Selvi	42	F	90	94	90	92	86	84	82	86	86	85	86	80	78	84	82	88	86	
25	Mrs.Sasi rekha	33	F	80	82	84	80	80	78	76	74	76	74	78	72	78	84	82	84	80	82
26	Mr.Velu	41	M	76	82	80	76	74	72	70	72	78	78	80	70	80	86	80	82	76	78
27	Mr.Shanmugam	22	M	62	66	60	58	54	56	56	54	56	58	60	58	62	66	68	70	62	66
28	Mrs.Jothi	44	F	56	60	52	50	50	51	56	58	56	58	64	60	61	62	62	66		
29	Mrs.Rekha	39	F	60	64	62	60	60	62	60	61	60	62	62	56	58	64	62	66	64	
30	Mr.Kalyanam	43	M	78	86	84	87	95	96	94	97	100	96	92	90	93	98	95	93	95	96
31	Mr.Sampath	34	M	72	71	70	68	60	60	62	61	59	62	66	60	62	70	72	76	72	80
32	Mr.Venkatesan	32	M	90	88	86	84	82	80	78	76	76	78	82	88	86	88	80	86	80	84

Intermittent Bolus- Systolic BP- Peri Operative

S. No.	Name	Age	Sex	B.I	A.I (0 min)	5min	10min	15min	20min	25min	30min	40min	50min	1 hr	1.15 hr	1.30 hr	2 hr	2.30 hr	3 hr	3.30 hr	4 hr
1	Mr.Murugan	25	M	126	128	126	124	122	124	126	118	126	130	136	126	130	136	126	128	126	132
2	Mr.Vinayagam	36	M	136	138	132	130	128	126	130	130	132	132	136	130	128	132	126	130		
3	Mrs.Uma maheshwari	27	F	120	122	124	122	126	120	122	120	120	122	128	122	120	124	120	122		
4	Mr.Gowes Basha	38	M	136	136	136	130	128	130	132	130	134	140	144	136	132	136	128	128		
5	Mrs.Lakshmi	32	F	124	126	124	120	118	120	122	126	126	132	136	130	130	128	134	136	130	
6	Mrs.Muniyammal	42	F	110	118	116	111	110	110	108	106	112	118	126	120	122	120	120	126	118	120
7	Mr.Thirtharaj	28	M	116	126	120	120	118	116	112	110	116	120	128	121	120	116	118	122		
8	Mrs.Shenbagam	43	F	140	146	140	138	136	138	132	134	134	136	142	136	124	138	132	140	138	
9	Mr.Harish	23	M	144	142	140	136	132	130	133	136	139	146	148	138	132	136	128	136		
10	Mrs.Mala	32	F	142	136	130	132	132	132	130	126	126	128	136	128	120	128	120	132	128	130
11	Mrs.Mercy	35	F	116	120	124	124	122	128	130	133	143	135	130	128	135	140	135	133	136	139
12	Mr.Suresh pandi	26	M	122	126	120	118	112	118	120	122	122	126	130	122	120	126	116	118	120	
13	Mr.Marimuthu	44	M	124	124	124	126	122	124	122	122	128	132	136	124	124	130	120	130		
14	Mr.Ponniah	42	M	118	118	110	112	111	112	114	114	112	114	122	116	112	118	116	126	120	112
15	Mrs.Priya	22	F	106	116	106	100	102	104	102	106	108	110	118	108	106	112	100	116		
16	Mrs.Jeenath	38	F	133	136	132	130	130	128	126	130	136	142	140	126	124	130	126	132	120	126
17	Mrs.Jayapradha	41	F	132	126	122	120	116	115	121	122	124	130	130	130	136	136	124	128		
18	Mr.Peter	21	M	128	128	120	120	120	118	121	122	124	128	128	126	122	129	120	130	130	
19	Mrs.Chinnamma	45	F	130	136	130	128	120	122	124	130	132	136	136	122	120	128	112	129	118	128
20	Mrs.Punitha	31	F	132	130	130	132	128	122	126	128	136	140	144	131	126	132	126	130	122	130
21	Mr.Ranket palra	28	M	126	126	116	112	106	112	120	118	116	118	118	108	100	110	102	116	112	120
22	Mrs.Saroja	47	F	110	118	106	102	111	116	121	120	122	122	120	120	122	124	108	120		
23	Mr.Kumar	22	M	130	132	126	126	122	124	122	120	122	130	126	120	120	122	120	128		
24	Mrs.Selvi	42	F	132	136	136	130	132	128	126	128	134	134	134	122	116	122	120	122	128	
25	Mrs.Sasi rekha	33	F	120	126	126	122	106	108	110	112	122	116	111	11	100	108	100	118	110	116
26	Mr.Velu	41	M	112	120	126	122	124	116	118	106	112	128	126	120	112	118	102	110	112	118
27	Mr.Shanmugam	22	M	106	110	110	112	116	118	116	112	114	116	118	104	100	108	96	96	100	108
28	Mrs.Jothi	44	F	100	108	106	100	94	96	102	104	104	110	121	120	116	122	116	120		
29	Mrs.Rekha	39	F	110	116	114	106	100	101	101	100	102	106	110	101	98	108	100	110	116	
30	Mr.Kalyanam	43	M	122	128	124	127	130	135	138	141	146	138	135	140	146	149	140	139	135	138
31	Mr.Sampath	34	M	120	130	130	132	137	132	130	128	122	126	126	116	104	116	112	120	124	130
32	Mr.Venkatesan	32	M	132	126	126	122	124	122	120	128	126	130	133	126	120	120	124	126	126	126

Intermittent Bolus- Mean BP- Peri Operative

S. No.	Name	Age	Sex	B.I	A.I (0 min)	5min	10min	15min	20min	25min	30min	40min	50min	1 hr	1.15 hr	1.30 hr	2 hr	2.30 hr	3 hr	3.30 hr	4 hr
1	Mr.Murugan	25	M	93	95	93	89	90	92	91	90	94	95	99	93	98	105	98	104	102	105
2	Mr.Vinayagam	36	M	104	106	100	99	98	98	101	101	101	103	105	99	100	104	97	103		
3	Mrs.Uma maheshwari	27	F	91	93	89	87	87	88	89	87	88	90	93	91	92	95	93	95		
4	Mr.Gowes Basha	38	M	105	107	105	103	101	101	103	99	102	105	109	104	100	104	97	103		
5	Mrs.Lakshmi	32	F	96	98	96	95	93	95	94	98	97	99	100	97	98	100	98	105	102	
6	Mrs.Muniyammal	42	F	78	83	81	80	79	77	80	79	83	90	97	91	91	92	91	95	97	92
7	Mr.Thirtharaj	28	M	85	93	87	88	87	88	85	83	86	89	92	88	88	89	86	93		
8	Mrs.Shenbagam	43	F	108	111	107	107	105	105	101	103	103	104	110	105	99	107	99	108	106	
9	Mr.Harish	23	M	111	110	107	104	101	99	102	103	105	110	113	106	105	108	99	103		
10	Mrs.Mala	32	F	107	107	102	101	100	97	97	97	99	99	104	97	96	103	94	104	99	103
11	Mrs.Mercy	35	F	87	92	92	91	93	98	101	106	112	105	102	103	105	109	104	102	105	106
12	Mr.Suresh pandi	26	M	91	95	92	89	88	90	91	89	90	94	98	93	95	101	94	97	88	
13	Mr.Marimuthu	44	M	91	92	89	89	89	92	94	95	96	99	101	95	96	99	93	97		
14	Mr.Ponniah	42	M	85	87	83	83	81	83	85	86	84	86	89	84	81	87	86	91	88	84
15	Mrs.Priya	22	F	77	81	78	73	75	77	75	77	79	81	86	79	83	87	79	87		
16	Mrs.Jeenath	38	F	103	107	104	101	99	97	97	99	103	105	107	98	99	101	93	103	93	101
17	Mrs.Jayapradha	41	F	100	101	95	96	93	92	95	94	97	101	101	97	101	104	95	101		
18	Mr.Peter	21	M	96	99	93	95	93	94	94	93	92	92	95	87	93	98	95	99	97	
19	Mrs.Chinnamma	45	F	103	107	103	108	97	95	95	99	99	103	107	95	93	103	91	103	95	101
20	Mrs.Punitha	31	F	100	101	98	99	96	95	96	99	102	105	108	98	99	107	97	105	95	103
21	Mr.Ranket palra	28	M	90	91	91	84	81	83	88	87	85	87	86	79	81	93	88	97	91	97
22	Mrs.Saroja	47	F	82	87	83	81	85	85	86	92	87	88	88	87	89	93	85	93		
23	Mr.Kumar	22	M	105	104	103	102	101	99	98	93	94	97	98	93	94	98	94	101		
24	Mrs.Selvi	42	F	104	108	105	105	101	99	97	100	102	101	102	94	91	97	95	99	100	
25	Mrs.Sasi rekha	33	F	93	97	98	94	89	88	87	87	91	88	89	52	85	92	88	95	90	93
26	Mr.Velu	41	M	88	95	95	91	91	87	86	83	89	95	95	87	91	97	87	91	88	91
27	Mr.Shanmugam	22	M	77	81	77	76	75	77	76	73	75	77	79	73	75	80	77	79	75	80
28	Mrs.Jothi	44	F	71	76	70	67	65	66	71	73	72	75	83	80	79	82	80	84		
29	Mrs.Rekha	39	F	77	81	79	75	73	75	74	74	74	77	78	71	71	79	75	81	81	
30	Mr.Kalyanam	43	M	93	100	97	100	107	109	109	112	115	110	106	107	111	115	110	108	108	110
31	Mr.Sampath	34	M	88	91	90	89	86	84	85	83	80	83	86	79	76	85	85	91	89	97
32	Mr.Venkatesan	32	M	104	101	99	97	96	94	92	93	93	95	99	101	97	99	95	99	95	98

Intermittent Bolus - Heart rate -Post op

S. No.	Name	Age	Sex	0 Hr	0.5 Hr	1 Hr	1.5 Hr	2 Hr	2.5 Hr	3 Hr	3.5 Hr	4 Hr	4.5 Hr	5 Hr	5.5 Hr	6 Hr	6.5 Hr	7 Hr	7.5 Hr	8 Hr	8.5 Hr	9 Hr	10 Hr	11 Hr	12 Hr	13 Hr	14 Hr	15 Hr	16 Hr	17 Hr	18 Hr	19 Hr	20 Hr	21 Hr	22 Hr	23 Hr	24 Hr	
1	Mr.Murugan	25	M	102	99	104	106	116	110	108	102	96	95	116	106	102	100	112	108	108	108	102	100	102	116	110	106	102	100	110	102	100	98	98	98	98	94	
2	Mr.Vinayagam	36	M	92	92	106	90	92	92	90	88	92	96	96	86	92	92	90	96	92	90	86	82	92	92	92	90	92	96	98	100	112	96	92	92	96	90	
3	Mrs.Uma maheshv	27	F	88	88	96	82	82	92	80	88	88	88	92	80	82	88	86	88	94	86	84	84	88	88	98	82	80	88	86	86	82	84	84	78	89	84	
4	Mr.Gowes Basha	38	M	88	87	92	87	80	84	84	78	84	76	84	84	92	84	82	76	78	82	84	86	86	84	98	84	77	88	92	84	76	84	82	82	82	82	
5	Mrs.Lakshmi	32	F	84	84	84	76	84	77	84	86	99	83	77	77	77	76	92	88	82	80	96	92	84	84	88	94	98	84	84	99	82	82	90	80	80	82	
6	Mrs.Muniyammal	42	F	82	82	86	82	82	82	82	84	80	72	82	78	82	80	72	72	70	80	72	80	86	84	110	88	112	80	114	112	112	114	112	89	92	86	
7	Mr.Thirtharaj	28	M	68	68	68	70	71	70	78	70	92	76	72	72	70	71	66	64	62	74	84	80	72	72	99	76	80	82	92	80	80	110	90	88	84	76	
8	Mrs.Shenbagam	43	F	86	82	84	82	94	82	94	80	92	90	90	91	92	93	110	88	80	76	78	70	86	82	82	84	82	84	82	82	90	110	82	82	80	80	
9	Mr.Harish	23	M	86	86	82	82	77	82	74	82	80	78	80	78	77	78	88	78	79	82	81	80	80	92	80	84	84	84	80	77	82	80	76	78	82	82	
10	Mrs.Mala	32	F	84	82	80	76	82	80	80	78	110	82	80	78	90	76	78	78	106	80	76	78	84	88	82	82	92	88	84	92	84	79	80	88	84	74	
11	Mrs.Mercy	35	F	91	92	93	110	88	80	82	84	82	94	82	94	80	92	90	90	91	88	80	76	78	70	86	82	82	84	82	84	82	82	110	82	82	80	
12	Mr.Suresh pandi	26	M	88	84	110	82	90	80	82	84	86	82	89	84	82	80	106	82	84	82	89	86	88	86	80	84	94	80	86	80	79	82	84	90	80	82	
13	Mr.Marimuthu	44	M	92	90	92	90	91	88	89	90	116	92	92	82	80	81	82	80	82	88	82	88	90	80	90	99	88	79	82	88	84	84	80	82	80	82	
14	Mr.Ponniah	42	M	90	88	100	86	98	88	84	79	84	88	94	86	84	82	84	86	78	84	98	82	90	110	90	94	86	106	98	116	96	82	82	89	110	76	
15	Mrs.Priya	22	F	78	80	106	82	100	94	86	70	84	82	78	86	106	80	92	80	82	80	82	82	78	82	89	84	84	76	78	100	78	82	92	82	82	80	
16	Mrs.Jeenath	38	F	82	80	78	78	78	78	76	77	74	72	88	74	72	74	76	80	74	76	78	78	82	82	80	88	80	82	100	78	82	90	84	90	84	82	
17	Mrs.Jayapradha	41	F	86	84	99	82	99	80	84	82	82	84	82	92	84	82	84	82	84	82	84	82	90	84	80	84	84	92	82	90	80	82	82	80	82	82	
18	Mr.Peter	21	M	86	84	99	82	99	80	84	82	82	84	84	92	84	82	84	82	84	82	84	82	84	84	82	80	84	86	110	82	82	82	92	86	82	82	
19	Mrs.Chinnamma	45	F	89	84	86	87	88	86	88	79	102	86	84	84	86	86	88	86	84	84	84	84	84	78	82	82	84	76	82	86	84	78	84	86	84	78	76
20	Mrs.Punitha	31	F	90	90	90	88	96	98	88	96	88	116	84	98	88	88	96	94	90	84	116	80	82	84	86	76	82	84	84	74	82	80	76	74	74	82	
21	Mr.Ranket palra	28	M	82	80	78	76	78	82	80	82	94	80	82	78	92	94	87	82	82	84	82	82	94	94	88	78	99	88	78	88	80	84	78	92	84	84	
22	Mrs.Saroja	47	F	70	82	80	84	80	82	84	80	82	80	78	72	82	80	80	78	76	78	76	72	77	76	90	74	84	89	76	74	88	74	74	72	73	70	
23	Mr.Kumar	22	M	92	90	88	80	86	88	84	86	86	84	85	80	87	87	83	84	83	85	85	86	82	86	89	90	90	92	97	82	84	76	78	82	74	76	
24	Mrs.Selvi	42	F	88	92	96	88	86	84	86	78	110	82	92	76	78	80	76	78	76	78	98	88	88	86	81	81	76	82	94	80	76	96	88	94	88	82	
25	Mrs.Sasi rekha	33	F	88	86	88	86	88	86	82	76	88	86	84	86	82	81	84	92	94	84	77	92	98	82	92	80	94	88	84	86	98	84	84	80	82	84	
26	Mr.Velu	41	M	76	74	74	80	82	80	82	80	82	83	81	80	81	82	80	82	80	81	80	82	76	76	74	74	72	76	74	76	74	76	70	72	76	74	
27	Mr.Shanmugam	22	M	74	92	92	88	86	84	80	80	82	74	92	94	96	92	92	92	90	92	91	90	70	78	92	76	76	70	70	68	76	78	78	66	64	66	
28	Mrs.Jothi	44	F	70	72	100	72	72	74	96	80	74	74	76	82	69	68	72	72	102	76	76	78	84	80	82	80	78	78	80	78	78	80	76	82	80	76	
29	Mrs.Rekha	39	F	68	70	72	68	72	72	78	76	78	76	88	68	70	70	70	78	100	76	78	78	100	88	98	88	86	80	88	84	82	84	78	82	82	82	
30	Mr.Kalyanam	43	M	88	86	84	80	80	82	80	81	80	82	76	76	74	92	91	90	70	78	92	76	76	70	70	70	68	76	78	78	78	66	64	92	94	96	
31	Mr.Sampath	34	M	85	82	94	98	82	82	80	81	85	92	96	81	82	82	81	80	79	80	82	81	84	82	80	82	82	76	80	76	80	82	80	76	82	76	
32	Mr.Venkatesan	32	M	89	89	112	82	84	82	84	84	82	80	110	82	106	88	84	84	84	84	80	82	100	82	80	84	84	92	84	84	84	80	84	92	84	82	

Intermittent Bolus- Diastolic BP- Post Operative

S. No	Name	Age	Sex	0 Hr	0.5 Hr	1 Hr	1.5 Hr	2 Hr	2.5 Hr	3 Hr	3.5 Hr	4 Hr	4.5 Hr	5 Hr	5.5 Hr	6 Hr	6.5 Hr	7 Hr	7.5 Hr	8 Hr	8.5 Hr	9 Hr	10 Hr	11 Hr	12 Hr	13 Hr	14 Hr	15 Hr	16 Hr	17 Hr	18 Hr	19 Hr	20 Hr	21 Hr	22 Hr	23 Hr	24 Hr	
1	Mr.Murugan	25	M	94	96	99	96	104	102	98	96	89	92	96	90	92	94	90	88	88	90	88	86	92	106	105	92	94	90	92	86	84	82	80	82	84	84	
2	Mr.Vinayagam	36	M	90	90	94	90	90	82	80	84	80	84	84	78	82	84	86	88	76	77	90	90	90	92	94	88	96	94	92	90	96	88	90	88	86	84	
3	Mrs.Uma maheshwari	27	F	82	82	90	72	71	90	76	72	74	72	90	72	82	87	82	84	90	80	78	82	82	84	90	84	76	82	82	88	80	76	74	90	90	72	
4	Mr.Gowes Basha	38	M	92	90	96	78	80	82	82	96	84	72	82	80	90	82	78	88	86	82	80	82	92	88	88	80	78	76	90	92	68	78	76	78	70	72	
5	Mrs.Lakshmi	32	F	88	84	80	80	90	68	90	88	99	88	80	84	84	78	90	80	80	92	92	90	92	90	86	96	84	84	80	76	82	84	86	82	84	82	
6	Mrs.Muniyammal	42	F	80	84	90	82	82	82	90	82	84	80	76	90	92	80	80	76	80	82	80	76	78	76	96	88	94	80	96	102	98	96	94	92	90	82	
7	Mr.Thirtharaj	28	M	80	80	82	82	92	84	90	100	90	84	84	82	84	82	76	74	72	80	92	80	80	82	94	82	70	72	90	68	70	94	82	80	90	82	
8	Mrs.Shenbagam	43	F	92	94	96	94	100	92	94	86	80	84	92	90	84	84	99	96	79	80	92	80	90	88	84	82	90	82	84	84	90	96	82	82	90	92	
9	Mr.Harish	23	M	88	84	84	86	84	78	88	78	80	80	82	84	86	84	90	84	82	82	80	84	82	90	84	82	80	82	80	76	82	84	74	82	82	80	
10	Mrs.Mala	32	F	92	90	90	88	84	82	88	80	102	90	80	90	84	90	90	84	78	78	76	80	90	92	90	84	92	82	80	82	90	80	82	88	82	76	
11	Mrs.Mercy	35	F	90	100	90	84	84	82	84	82	76	74	72	80	80	80	82	82	92	84	90	100	74	72	80	92	80	80	82	94	82	70	72	90	68	70	
12	Mr.Suresh pandi	26	M	74	74	96	76	74	76	74	74	74	72	74	70	70	76	94	72	74	74	72	74	76	88	70	80	84	84	90	82	76	82	80	88	78	70	
13	Mr.Marimuthu	44	M	82	80	82	88	84	82	82	80	99	86	78	78	80	80	78	76	78	80	82	80	80	82	80	88	82	80	82	90	82	84	76	82	80	80	
14	Mr.Ponniah	42	M	74	76	78	88	74	76	68	72	72	88	66	68	72	69	72	69	68	72	72	72	72	92	80	90	72	96	82	88	94	82	80	90	101	78	
15	Mrs.Priya	22	F	74	76	78	96	82	74	72	70	74	74	70	72	72	74	72	70	72	70	72	70	72	78	84	90	72	72	98	72	78	82	80	76	72	76	
16	Mrs.Jeenath	38	F	86	82	80	80	80	78	76	78	70	89	76	78	82	84	76	82	76	74	78	76	90	90	88	80	76	78	100	78	90	80	78	78	76	78	
17	Mrs.Jayapradha	41	F	86	84	82	84	90	84	82	80	82	86	84	80	82	84	84	86	82	84	82	82	92	90	76	80	82	90	82	90	82	84	82	82	82	80	
18	Mr.Peter	21	M	82	84	86	88	84	84	82	82	82	82	84	82	84	82	84	82	82	84	80	86	92	90	92	88	90	90	100	92	90	86	82	82	84	76	
19	Mrs.Chinnamma	45	F	90	88	86	84	86	82	84	80	84	86	84	84	86	84	82	84	86	84	86	84	80	82	84	82	80	78	72	78	82	90	92	80	76	78	
20	Mrs.Punitha	31	F	92	88	86	84	82	84	86	84	84	99	88	86	84	84	82	84	83	84	96	86	88	84	86	76	82	82	82	76	78	92	80	82	76	72	
21	Mr.Ranket palra	28	M	88	80	82	80	80	86	84	92	82	84	90	92	82	84	82	84	86	82	84	86	90	92	84	80	84	80	76	90	82	76	80	84	82	68	
22	Mrs.Saroja	47	F	82	88	86	86	88	84	86	88	85	87	86	82	87	88	87	84	85	86	84	85	80	82	76	78	80	84	86	84	82	82	84	86	84	80	
23	Mr.Kumar	22	M	90	88	86	76	88	88	86	88	84	88	94	76	84	86	84	86	88	84	86	88	77	78	68	78	76	74	72	74	68	72	76	74	68	74	
24	Mrs.Selvi	42	F	86	90	88	76	88	88	86	88	84	88	94	76	84	86	84	86	88	84	86	88	86	80	82	80	76	80	88	84	82	80	78	82	84	82	
25	Mrs.Sasi rekha	33	F	84	78	78	80	82	72	76	72	82	84	82	84	82	82	80	92	90	82	72	90	90	86	82	84	88	78	82	84	88	82	80	82	82	80	
26	Mr.Velu	41	M	80	82	78	84	86	84	86	84	84	86	84	86	84	86	84	86	82	84	82	84	86	78	78	78	78	76	78	78	76	78	76	78	76	78	76
27	Mr.Shanmugam	22	M	70	90	92	90	88	84	82	84	84	70	86	84	82	84	82	86	84	82	84	76	72	74	76	74	76	74	80	74	74	76	74	73	74	76	
28	Mrs.Jothi	44	F	71	80	82	80	82	92	82	88	90	90	96	80	68	68	68	78	78	68	78	86	78	72	72	74	76	78	76	74	76	78	74	76	78	76	
29	Mrs.Rekha	39	F	70	72	76	72	74	72	74	72	74	76	90	72	74	76	70	71	700	75	76	78	100	92	90	92	94	82	80	82	82	80	80	82	80	82	78
30	Mr.Kalyanam	43	M	72	82	84	82	84	82	82	80	92	90	82	72	78	80	82	72	76	72	82	84	82	84	82	84	82	90	90	86	82	84	88	82	80	78	
31	Mr.Sampath	34	M	82	90	90	92	88	84	86	84	92	94	80	82	80	82	78	78	82	80	84	82	82	82	78	77	72	68	74	74	82	76	74	68	76	68	
32	Mr.Venkatesan	32	M	84	84	86	82	84	82	80	84	86	100	92	102	82	84	84	84	86	82	84	82	100	90	68	76	72	90	76	76	84	78	78	90	72	72	

Intermittent Bolus- Systolic BP- Post Operative

S. No	Name	Age	Sex	0 Hr	0.5 Hr	1 Hr	1.5 Hr	2 Hr	2.5 Hr	3 Hr	3.5 Hr	4 Hr	4.5 Hr	5 Hr	5.5 Hr	6 Hr	6.5 Hr	7 Hr	7.5 Hr	8 Hr	8.5 Hr	9 Hr	10 Hr	11 Hr	12 Hr	13 Hr	14 Hr	15 Hr	16 Hr	17 Hr	18 Hr	19 Hr	20 Hr	21 Hr	22 Hr	23 Hr	24 Hr
1	Mr.Murugan	25	M	132	136	138	136	152	149	138	130	126	134	140	138	136	138	140	132	134	130	124	124	130	148	140	130	130	128	139	120	118	122	124	126	124	126
2	Mr.Vinayagam	36	M	132	130	150	132	130	128	126	132	130	130	132	126	130	132	130	132	120	122	132	132	132	132	132	140	130	128	128	136	150	126	130	136	130	126
3	Mrs.Uma maheshw	27	F	124	124	136	120	122	133	116	124	124	124	130	116	122	124	126	124	133	124	122	124	126	126	130	126	118	126	126	136	126	128	124	116	140	126
4	Mr.Gowes Basha	38	M	130	130	150	110	120	126	126	116	122	116	122	126	130	126	126	116	122	124	126	122	124	126	130	124	118	126	136	130	118	126	126	128	124	120
5	Mrs.Lakshmi	32	F	132	132	130	120	130	118	136	130	146	133	128	122	126	124	136	126	126	133	136	133	132	130	128	140	120	126	128	120	126	122	126	122	122	126
6	Mrs.Muniyammal	42	F	122	122	130	126	122	122	136	126	122	116	136	126	136	126	126	116	136	126	116	126	126	124	144	124	146	120	146	156	148	149	143	130	130	120
7	Mr.Thirtharaj	28	M	124	122	124	124	136	124	136	122	144	136	124	122	124	120	126	118	120	116	138	120	122	126	146	122	120	118	136	120	126	146	120	126	130	120
8	Mrs.Shenbagam	43	F	138	136	136	134	142	132	136	132	126	126	136	138	126	128	140	136	118	118	128	121	122	126	124	124	136	124	124	126	136	146	126	126	136	126
9	Mr.Harish	23	M	138	136	133	130	130	120	130	116	128	122	124	122	124	124	136	126	124	124	124	124	126	133	126	122	124	126	124	120	122	126	116	122	120	126
10	Mrs.Mala	32	F	132	132	130	120	126	124	133	126	146	130	126	126	125	130	130	126	142	124	118	120	126	136	126	126	133	124	126	136	126	118	126	132	126	116
11	Mrs.Mercy	35	F	136	124	136	122	144	136	124	122	124	120	126	120	126	118	120	116	138	120	126	130	126	122	122	136	126	122	116	136	126	136	126	126	116	126
12	Mr.Suresh pandi	26	M	122	124	144	124	136	124	126	124	126	126	136	120	120	118	144	136	128	116	120	130	126	130	116	122	136	128	136	126	116	124	126	136	124	122
13	Mr.Marimuthu	44	M	134	130	128	126	130	126	129	130	150	130	126	120	118	120	122	126	122	126	122	126	124	116	126	139	124	116	126	136	126	124	111	124	126	122
14	Mr.Ponniah	42	M	114	114	126	120	130	120	126	110	126	122	130	116	120	122	116	122	110	120	130	122	114	146	120	130	124	144	124	136	144	126	126	136	150	120
15	Mrs.Priya	22	F	118	126	146	130	144	138	126	116	116	120	120	130	126	122	124	126	126	122	126	122	116	126	136	130	116	120	160	124	120	126	122	126	122	124
16	Mrs.Jeenath	38	F	134	134	130	128	126	128	126	136	106	146	130	126	126	128	126	124	126	130	132	132	130	132	130	128	120	126	146	126	130	133	126	136	126	126
17	Mrs.Jayapradha	41	F	130	130	140	130	140	130	130	132	120	126	126	118	130	126	126	128	126	126	124	126	140	130	116	120	120	130	126	136	126	124	124	126	126	126
18	Mr.Peter	21	M	132	140	136	138	138	138	138	134	133	130	136	133	132	133	136	132	130	132	133	132	130	132	130	128	130	130	140	130	130	128	136	128	128	118
19	Mrs.Chinamma	45	F	136	134	133	132	133	132	130	134	138	132	130	132	130	132	130	130	132	130	132	133	124	130	130	132	120	126	128	130	120	132	130	132	116	118
20	Mrs.Punitha	31	F	132	130	130	130	136	140	136	126	132	150	126	130	132	134	126	133	136	132	146	132	130	132	132	118	134	132	134	116	136	132	120	126	118	126
21	Mr.Ranget palra	28	M	122	122	124	126	124	126	122	136	124	126	124	138	138	124	126	124	124	126	122	126	136	138	126	120	136	124	113	133	126	118	126	135	127	118
22	Mrs.Saroja	47	F	116	116	118	126	116	120	122	122	118	118	120	114	122	120	118	116	118	126	122	124	126	122	116	124	136	134	124	126	136	128	124	126	124	120
23	Mr.Kumar	22	M	120	122	124	116	122	120	126	122	122	136	116	126	120	120	126	122	124	124	124	120	116	126	122	124	122	124	116	124	126	116	126	124	116	123
24	Mrs.Selvi	42	F	122	130	136	120	120	126	122	116	150	120	136	110	120	120	116	126	106	120	136	120	124	124	126	126	118	126	136	126	118	136	130	138	124	116
25	Mrs.Sasi rekha	33	F	114	111	126	122	124	103	122	106	126	124	124	126	128	122	126	133	138	126	106	136	140	130	126	128	133	123	126	124	136	120	124	126	120	120
26	Mr.Velu	41	M	120	120	126	133	130	128	130	138	136	133	132	132	130	128	122	126	122	124	124	126	122	124	124	122	124	126	122	126	122	124	122	126	124	122
27	Mr.Shanmugam	22	M	118	140	142	133	133	130	136	136	137	116	136	134	134	136	141	138	134	136	128	126	116	126	136	126	126	118	119	120	122	130	122	120	118	116
28	Mrs.Jothi	44	F	116	126	156	128	126	128	155	130	126	130	140	140	116	110	126	124	126	116	126	130	116	118	120	122	120	122	116	120	112	120	126	122	120	122
29	Mrs.Rekha	39	F	120	120	122	126	122	126	122	126	122	126	136	122	124	126	126	124	156	122	124	126	144	130	136	126	126	118	120	122	126	126	116	122	126	122
30	Mr.Kalyanam	43	M	130	126	130	140	140	116	110	126	124	126	116	126	128	126	128	155	130	126	130	140	140	116	110	126	130	116	118	120	122	120	122	116	120	122
31	Mr.Sampath	34	M	132	130	140	130	132	128	126	128	130	140	142	130	132	132	130	133	126	126	128	126	122	126	118	126	122	116	122	116	124	126	124	116	126	118
32	Mr.Venkatesan	32	M	130	130	146	128	122	126	122	126	124	126	156	132	155	136	132	126	126	133	126	126	150	140	110	126	124	136	126	126	124	116	126	136	126	126

Intermittent Bolus- Mean BP- Post Operative

S. No	Name	Age	Sex	0 Hr	0.5 Hr	1 Hr	1.5 Hr	2 Hr	2.5 Hr	3 Hr	3.5 Hr	4 Hr	4.5 Hr	5 Hr	5.5 Hr	6 Hr	6.5 Hr	7 Hr	7.5 Hr	8 Hr	8.5 Hr	9 Hr	10 Hr	11 Hr	12 Hr	13 Hr	14 Hr	15 Hr	16 Hr	17 Hr	18 Hr	19 Hr	20 Hr	21 Hr	22 Hr	23 Hr	24 Hr
1	Mr.Murugan	25	M	107	109	112	109	120	118	111	107	101	106	111	106	107	109	107	103	103	103	100	99	105	120	117	105	106	103	108	97	95	95	95	97	97	98
2	Mr.Vinayagam	36	M	104	103	113	104	103	97	95	100	97	99	100	94	98	100	101	103	91	92	104	104	104	105	107	105	107	105	104	105	114	101	103	104	101	98
3	Mrs.Uma maheshw	27	F	96	96	105	88	88	104	89	89	91	89	103	87	95	99	97	97	104	95	93	96	97	98	103	98	90	97	97	104	95	93	91	99	107	90
4	Mr.Gowes Basha	38	M	105	103	114	89	93	97	97	103	97	87	95	95	103	97	94	97	98	96	95	95	103	101	102	95	91	93	105	105	85	94	93	95	88	88
5	Mrs.Lakshmi	32	F	103	100	97	93	103	85	105	102	115	103	96	97	98	93	105	95	95	106	107	104	105	103	100	111	96	98	96	91	97	97	99	95	97	97
6	Mrs.Muniyammal	42	F	94	97	103	97	95	95	105	97	97	92	96	102	107	95	95	89	99	97	92	93	94	92	112	100	111	93	113	120	115	114	110	105	103	95
7	Mr.Thirtharaj	28	M	95	94	96	96	107	97	105	107	108	101	97	95	97	95	93	89	88	92	107	93	94	97	111	95	87	87	105	85	89	111	95	95	103	95
8	Mrs.Shenbagam	43	F	107	108	109	107	114	105	108	101	95	98	107	106	98	99	113	109	92	93	104	94	101	101	97	96	105	96	97	98	105	113	97	97	105	103
9	Mr.Harish	23	M	105	101	100	101	99	92	102	91	96	94	96	97	99	97	105	98	96	96	95	97	97	104	98	95	95	97	95	91	95	98	88	95	95	95
10	Mrs.Mala	32	F	105	104	103	99	98	96	103	95	117	103	95	102	98	103	103	98	99	93	90	93	102	107	102	98	106	96	95	100	102	93	97	103	97	89
11	Mrs.Mercy	35	F	105	108	105	97	104	100	97	95	92	89	90	93	95	93	95	93	107	96	102	110	91	89	94	107	95	94	93	108	97	92	90	102	84	89
12	Mr.Suresh pandi	26	M	90	91	112	92	95	92	91	91	91	90	95	87	87	90	111	93	92	88	88	93	93	102	85	94	101	99	105	97	89	96	95	104	93	87
13	Mr.Marimuthu	44	M	99	97	97	101	99	97	98	97	116	101	94	92	93	93	93	93	93	95	95	95	95	93	95	105	96	92	97	105	97	97	88	96	95	94
14	Mr.Ponniah	42	M	87	89	94	99	93	91	87	85	90	99	87	84	88	87	87	87	82	88	91	89	86	110	93	103	89	112	96	104	111	97	95	105	117	92
15	Mrs.Priya	22	F	89	93	101	107	103	95	90	85	88	89	87	91	90	90	89	89	90	87	90	87	87	94	101	103	87	88	119	89	92	97	94	93	89	92
16	Mrs.Jeenath	38	F	102	99	97	96	95	95	93	97	82	108	94	94	97	99	93	96	93	93	96	95	103	104	102	96	91	94	115	94	103	98	94	97	93	94
17	Mrs.Jayapradha	41	F	101	99	101	99	107	99	98	97	95	99	98	93	98	98	98	100	97	98	96	97	108	103	89	93	95	103	97	105	97	97	96	97	97	95
18	Mr.Peter	21	M	99	103	103	105	102	102	101	99	99	98	101	99	100	99	101	99	98	100	98	101	105	104	105	101	103	103	113	105	103	100	100	97	99	90
19	Mrs.Chinnamma	45	F	105	103	102	100	102	99	99	98	102	101	99	100	101	100	98	99	101	99	101	100	95	98	99	99	93	94	91	95	95	104	105	97	89	91
20	Mrs.Punitha	31	F	105	102	101	99	100	103	103	98	100	116	101	101	100	101	97	100	101	100	113	101	102	100	101	90	99	99	99	89	97	105	93	97	90	90
21	Mr.Ranket palra	28	M	99	94	96	95	95	99	97	107	96	98	101	107	101	97	97	97	99	97	97	99	105	107	98	93	101	95	88	104	97	90	95	101	97	85
22	Mrs.Saroja	47	F	93	97	97	99	97	96	98	99	96	97	97	93	99	99	97	95	96	99	97	98	95	95	89	93	99	101	99	98	100	97	97	99	97	93
23	Mr.Kumar	22	M	100	99	99	89	99	99	99	99	97	104	101	93	96	97	98	98	100	97	99	99	90	94	86	93	91	91	87	91	87	87	93	91	84	90
24	Mrs.Selvi	42	F	98	103	104	91	99	101	98	97	106	99	108	87	96	97	95	99	94	96	103	99	99	95	97	95	90	95	104	98	94	99	95	101	97	93
25	Mrs.Sasi rekha	33	F	94	89	94	94	96	82	91	83	97	97	96	98	97	95	95	106	106	97	83	105	107	101	97	99	103	93	97	97	104	95	95	97	95	93
26	Mr.Velu	41	M	93	95	94	100	101	99	101	102	101	102	100	101	99	100	97	99	95	97	96	98	98	93	93	93	93	93	93	94	91	93	91	94	92	93
27	Mr.Shanmugam	22	M	86	107	109	104	103	99	100	101	102	85	103	101	99	101	102	103	101	100	99	93	87	91	96	91	93	89	93	89	90	94	90	89	89	89
28	Mrs.Jothi	44	F	86	95	107	96	97	104	106	102	102	103	111	100	84	82	87	93	94	84	94	101	91	87	88	90	91	93	89	89	88	92	91	91	92	91
29	Mrs.Rekha	39	F	87	88	91	90	90	90	90	90	90	93	105	89	91	93	89	89	519	91	92	94	115	105	105	103	105	94	93	95	97	95	92	95	95	93
30	Mr.Kalyanam	43	M	91	97	99	101	103	93	91	95	103	102	93	90	95	95	97	100	94	90	98	103	101	95	91	98	98	99	99	97	95	96	99	93	93	93
31	Mr.Sampath	34	M	99	103	107	105	103	99	99	99	105	109	101	98	97	99	95	96	97	95	99	97	95	97	91	93	89	84	90	88	96	93	91	84	93	85
32	Mr.Venkatesan	32	M	99	99	106	97	97	97	94	98	99	109	113	112	106	101	100	98	99	99	98	97	117	107	82	93	89	105	93	93	97	91	94	105	90	90

Intermittent Bolus- VAS Score- Post Op

S. No.	Name	Age	Sex	0 Hr	0.5 Hr	1 Hr	1.5 Hr	2 Hr	2.5 Hr	3 Hr	3.5 Hr	4 Hr	4.5 Hr	5 Hr	5.5 Hr	6 Hr	6.5 Hr	7 Hr	7.5 Hr	8 Hr	8.5 Hr	9 Hr	10 Hr	11 Hr	12 Hr	13 Hr	14 Hr	15 Hr	16 Hr	17 Hr	18 Hr	19 Hr	20 Hr	21 Hr	22 Hr	23 Hr	24 Hr		
1	Mr.Murugan	25	M	2	2	2	2	4	6	2	2	2	2	3	2	2	2	3	2	2	2	2	2	2	2	2	4	3	2	2	2	3	2	2	2	2	2	2	
2	Mr.Vinayagam	36	M	2	2	4	2	2	2	1	2	3	2	2	1	2	2	3	2	1	1	2	2	2	2	2	3	2	2	2	3	4	2	2	3	2	2		
3	Mrs.Uma maheshv	27	F	2	2	3	1	2	3	1	2	2	2	3	1	2	2	2	2	3	2	2	2	2	2	3	2	1	2	2	3	2	2	2	2	1	3	2	
4	Mr.Gowes Basha	38	M	2	2	4	1	2	2	2	1	2	1	2	2	3	2	2	1	2	2	2	2	2	2	3	2	1	2	3	2	1	2	2	2	2	2	2	
5	Mrs.Lakshmi	32	F	2	2	2	1	2	1	2	2	4	3	2	2	2	2	3	2	2	3	3	3	2	2	2	3	1	2	2	1	2	2	3	2	2	2		
6	Mrs.Muniyammal	42	F	2	2	3	2	2	2	3	2	2	1	3	2	3	2	2	1	3	2	1	2	2	2	4	2	4	2	4	4	4	4	4	4	3	3	2	
7	Mr.Thirtharaj	28	M	2	2	2	2	3	2	3	2	4	3	2	2	2	2	1	1	1	2	3	2	2	2	4	2	2	2	3	2	2	4	2	2	2	2	2	
8	Mrs.Shenbagam	43	F	2	2	2	2	3	2	3	2	2	2	3	3	2	2	4	3	1	1	2	1	2	2	2	2	3	2	2	2	3	4	2	2	3	2	2	
9	Mr.Harish	23	M	2	2	2	2	2	1	2	1	2	2	2	2	3	2	3	2	2	2	2	2	2	3	2	2	2	2	2	2	1	2	2	1	2	2	2	
10	Mrs.Mala	32	F	2	2	2	1	2	2	3	2	4	2	2	2	3	2	2	2	4	2	1	2	2	3	2	2	3	2	2	3	2	1	2	3	2	1	2	
11	Mrs.Mercy	35	F	2	3	1	2	2	2	3	1	2	2	2	2	3	2	2	2	2	2	3	2	1	2	2	2	3	2	1	2	2	3	2	2	2	2	2	
12	Mr.Suresh pandi	26	M	2	2	4	2	3	2	2	2	2	2	3	2	2	2	4	2	2	1	3	2	2	2	1	2	3	2	3	2	1	2	2	3	2	2	2	
13	Mr.Marimuthu	44	M	2	2	2	2	2	2	2	2	4	2	2	1	1	1	1	2	2	2	2	2	2	2	1	2	3	2	1	2	3	2	2	1	2	2	2	
14	Mr.Ponniah	42	M	2	2	3	2	3	2	2	1	2	2	3	2	2	2	2	2	1	2	3	2	2	4	2	3	2	4	2	3	4	1	2	3	4	1	2	
15	Mrs.Priya	22	F	1	2	4	2	4	3	2	1	2	2	3	3	4	2	3	2	3	2	2	2	1	2	3	2	1	2	4	2	2	2	2	2	2	2	2	
16	Mrs.Jeenath	38	F	2	2	2	2	2	2	2	2	2	1	3	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2	4	2	2	3	2	3	2	2	2	
17	Mrs.Jayapradha	41	F	2	2	3	2	3	2	2	2	2	2	2	1	2	2	2	2	2	2	2	2	3	2	1	2	2	3	2	3	2	2	2	2	2	2	2	
18	Mr.Peter	21	M	1	2	2	2	2	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	4	2	2	2	3	2	2	1	2
19	Mrs.Chinnamma	45	F	2	2	2	2	2	2	2	1	3	2	2	2	2	2	2	2	2	2	2	2	2	1	2	2	2	1	2	2	2	1	2	2	2	2	1	1
20	Mrs.Punitha	31	F	2	2	2	2	3	3	2	3	2	4	2	3	2	2	3	3	2	2	4	2	2	2	2	1	2	2	2	1	2	2	1	2	2	1	1	2
21	Mr.Ranket palra	28	M	2	2	2	2	2	2	2	2	3	2	2	2	3	3	2	2	2	2	2	2	3	3	2	1	3	2	1	3	2	1	2	3	2	2	2	
22	Mrs.Saroja	47	F	1	2	2	2	2	2	2	2	2	2	2	1	2	2	2	2	2	2	2	2	1	2	2	1	2	3	3	2	2	3	2	2	2	2	1	2
23	Mr.Kumar	22	M	2	2	2	1	2	2	2	2	2	2	3	1	2	2	2	2	2	2	2	2	1	2	2	2	2	2	2	1	2	2	1	2	2	2	1	2
24	Mrs.Selvi	42	F	1	2	3	2	2	2	2	1	4	2	3	1	2	2	1	2	1	2	3	2	2	2	2	2	1	2	3	2	1	3	2	3	2	3	2	1
25	Mrs.Sasi rekha	33	F	2	2	2	2	2	1	2	1	2	2	2	2	2	2	2	3	3	2	1	3	3	2	2	2	3	2	2	2	3	2	2	2	1	2	2	
26	Mr.Velu	41	M	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
27	Mr.Shanmugam	22	M	1	3	3	2	2	2	2	2	2	1	3	3	3	3	3	2	3	3	2	2	1	2	3	2	2	1	1	1	2	2	2	1	1	1	1	1
28	Mrs.Jothi	44	F	1	2	4	2	2	2	4	2	2	2	3	1	1	2	2	2	1	2	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
29	Mrs.Rekha	39	F	2	2	2	2	2	2	2	2	2	2	3	2	2	2	2	2	4	2	2	2	4	2	3	2	2	1	2	2	2	2	1	2	2	2	2	2
30	Mr.Kalyanam	43	M	2	2	1	2	2	3	2	2	2	2	2	1	2	3	2	2	2	2	3	2	3	2	2	1	2	2	3	2	2	2	2	2	4	2	3	2
31	Mr.Sampath	34	M	2	2	3	2	2	2	2	2	2	3	3	2	2	2	2	2	2	2	2	2	2	2	1	2	2	1	2	1	2	2	2	2	1	2	1	2
32	Mr.Venkatesan	32	M	2	2	4	2	2	2	2	2	2	2	4	2	4	2	2	2	2	2	2	2	4	2	1	2	2	3	2	2	2	1	2	3	2	2	2	