

**“A PROSPECTIVE, RANDOMIZED STUDY COMPARING  
ULTRASOUND GUIDED TRANSVERSUS ABDOMINIS PLANE  
BLOCK AND ULTRASOUND GUIDED ILIOINGUINAL,  
ILIOHYPOGASTRIC NERVE BLOCKS IN PATIENTS  
UNDERGOING OPEN INGUINAL HERNIA REPAIR”**

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in partial fulfilment for the award of the degree of

**DOCTOR OF MEDICINE**

IN

*ANAESTHESIOLOGY*

**BRANCH X**



**INSTITUTE OF ANAESTHESIOLOGY & CRITICAL CARE**

**MADRAS MEDICAL COLLEGE**

**CHENNAI- 600 003**

**APRIL 2015**

## **CERTIFICATE**

This is to certify that the dissertation entitled, “A Prospective, randomized study comparing ultrasound guided transversus abdominis plane block and ultrasound guided ilioinguinal, iliohypogastric nerve blocks in patients undergoing open inguinal hernia repair” submitted by Dr. VENKATESH KUMAR.R in partial fulfilment for the award of the degree of doctor of medicine in anaesthesiology by The tamilnadu Dr. M.G.R Medical University, Chennai is bonofide record of the work done by him in the INSTITUTE OF ANAESTHESIOLOGY & CRITICAL CARE, Madras Medical College, during the academic year 2012-2015.

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## **DECLARATION**

I hereby declare that the dissertation entitled, “A Prospective, randomized study comparing ultrasound guided transversus abdominis plane block and ultrasound guided ilioinguinal, iliohypogastric nerve blocks in patients undergoing open inguinal hernia repair” has been prepared by me under the Guidance of **Prof. Dr.S.ANANTHAPPAN, M.D., D.A.**, Professor of Anaesthesiology, Institute of Anaesthesiology and Critical Care, Madras Medical College, Chennai, in partial fulfilment of the regulations for the award of the degree of MD in anaesthesiology, examination to be held on April 2015.

This study was conducted at Institute of Anaesthesiology and Critical Care, Rajiv Gandhi Govt. General Hospital, Madras Medical College, Chennai.

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

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## **LIST OF ABBREVIATIONS**

NSAIDS	-	Non Steroidal Anti Inflammatory Drugs
VAS	-	Visual Analogue pain Scale
TAP	-	Transversus Abdominis Plane
IIH	-	Ilioinguinal, Iliohypogastric
LTOP	-	Lumbar Triangle Of Petit
ASIS	-	Anterior Superior Iliac Spine
PONV	-	Post Operative Nausea and Vomiting
PCA	-	Patient Controlled Analgesia
BMI	-	Body mass index
HR	-	Heart rate
ECG	-	Electro Cardiogram
NIBP	-	Non Invasive Blood Pressure

## INTRODUCTION

*For all the happiness mankind can gain  
Lies not in pleasure but in relief from pain*

(Dryden - The Roman Emperor)

Pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage. Postoperative pain is the main adverse outcome that distresses the patient, prolongs the hospital stay and increases the incidence of admission after surgery.

Inguinal hernia repair is one of the commonest surgeries performed. Provision of effective post-operative pain control is the key to

- ❖ Improve patient comfort and satisfaction
- ❖ Facilitate early mobilization
- ❖ Reduce risk of deep vein thrombosis
- ❖ Facilitate faster recovery and less likelihood of the development of neuropathic pain
- ❖ Reduce cost of care



Opioids and NSAIDS are commonly used for post – operative pain relief for inguinal hernia repair. Though opioids provide effective analgesia, they have side effects such as nausea, vomiting, urinary retention, pruritus and respiratory depression, hence require close monitoring. Transversus abdominis plane block and Ilioinguinal, Iliohypogastric nerve blocks were performed successfully in the past with effective post- operative analgesia devoid of systemic side effects.

*“Almost all cases of hernia with the exception of those in young children could undoubtedly be subjected to radical operation under local anaesthesia”* quoted by Harvey Cushing reported in annals of surgery in 1900. This shows over 100 years the attribute of regional anaesthesia for lower abdominal and inguinal hernia surgeries were appreciated.

Rafi et al in the year of 2001 first described Transversus abdominis plane block. Transversus abdominis plane block provide analgesia to pain arising from skin, abdominal muscles of anterior abdominal wall, and parietal peritoneum.

Both Transversus abdominis plane block as well as Ilioinguinal, iliohypogastric nerve blocks were proven to reduce

post-operative VAS score as well as opioid consumption devoid of significant systemic side effects. Performing these blocks under ultrasound guidance is absolutely safe.

With these we conducted a prospective randomized study comparing analgesic efficacy of ultrasound guided Transversus abdominis plane block and ultrasound guided Ilioinguinal,Iliohipogastric nerve blocks in patients undergoing elective unilateral open inguinal hernia repair.

## ***AIM OF THE STUDY***

## **AIM OF THE STUDY**

Our aim of the study is to compare ultrasound guided transversus abdominis plane block and ultrasound guided ilioinguinal, iliohypogastric nerve blocks for open inguinal hernia repair with respect to,

- ❖ Intra - operative hemodynamics ,
- ❖ Intra - operative opioid requirement,
- ❖ Post - operative visual analogue scale pain score.

# ***THE ULTRASONOGRAM***

## **THE ULTRASONOGRAM**

Over half a century ultrasound has been extensively used to image human body. In 1942 Dr.Karl Theodore Dussik, an Austrian neurologist was the first one to use ultrasound as medical diagnostic tool to image brain.Later the practical technology and its application has been developed by Prof Ian Donald from Scotland. Now a days ultrasound became one of the most extensively used imaging technologies because it is less portable, free from radiation risk, in expensive. Ultrasound images are tomographic and can be real time.

### **PRINCIPLES**

The principle of ultrasonogram is based on Piezoelectric effect,which was discovered by the Curie brothers in 1880 when they subjected quartz to mechanical stress generating an electrical charge on the surface.They also discovered reverse Piezoelectric effect by electrical application produces vibration on quartz.

Based on these effects modern medical ultrasound is based on pulse-echo approach.Ultrasound transducer has piezoelectric crystals which produces small ultrasound pulses on electrical stimuli. These pulse waves penetrates body tissues of different

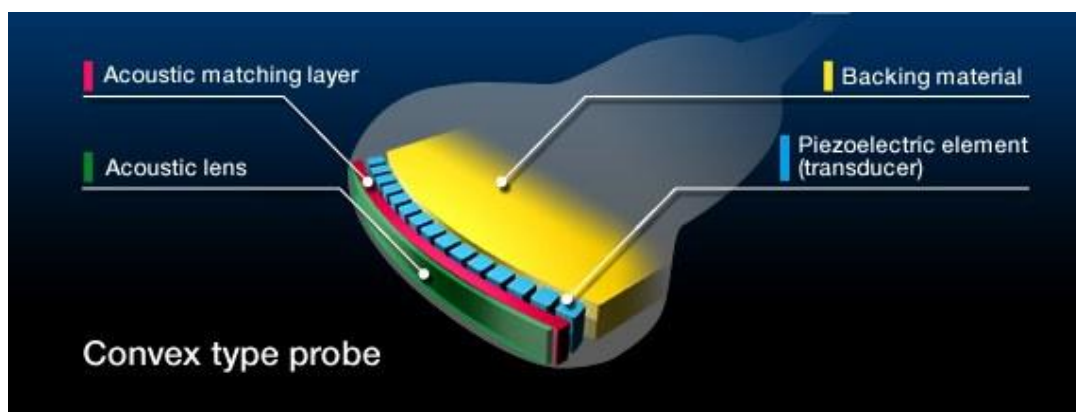
acoustic impedance. Some waves are reflected back to transducer, some penetrates deeper. The returned echo signals are combined and processed to produce an image. Hence the ultrasound transducer works as both pulse generator and microphone.

The frequencies of ultrasound waves are more than upper limit of audible human hearing i.e more than 20kHz. Audible human hearing ranges between 20 – 20000Hz.

The frequency of ultrasound waves used in most medical devices ranges between 1 -20 MHz

## **ULTRASOUND TRANSDUCERS**

Modern medical ultrasound transducer is based on Pulse – Echo approach. The ultrasound transducer consists of backing material, piezoelectric elements, Electrodes and Acoustic lens.



*So the transducer converts*

- ❖ Electricity-- Piezoelectric element oscillation—ultrasonic waves
- ❖ Ultrasonic waves --Piezoelectric element –electricity

## **PULSE AND ECHO**

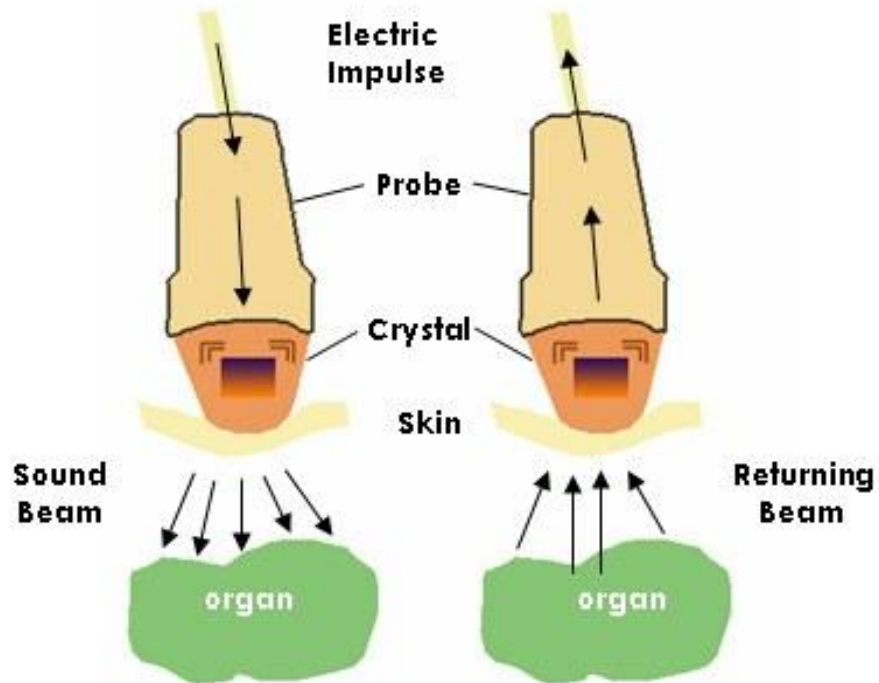
Ultrasound waves are generated in pulses which have 2 or 3 sound cycles of same frequency. Pulsing is not operator controlled rather determined by probe crystals.

When these pulse traverse through tissues

- ❖ Partly reflected back to transducer
- ❖ Partly transmitted deep
- ❖ Partly scattered
- ❖ Partly transformed to heat

Echo is the ultrasonic waves reflected back to the transducer. The amount of echo depends on acoustic impedance of different tissues. These Echo signals are combined and processed to generate an image.





## WAVELENGTH AND FREQUENCY

Frequency is number of complete cycles per unit time, measured in Hertz. 1Hz = one cycle per second.

Wavelength is distance between consecutive sound cycles; the wavelength and frequency are inversely related. So

### *High frequency (8 – 12 MHz)*

- ❖ Gives high resolution
- ❖ Has short wavelength, hence less depth of penetration
- ❖ Suitable for superficial structures

### *Low frequency (2 – 5 MHz)*

- ❖ Gives low resolution
- ❖ Has long wavelength, hence depth of penetration is more
- ❖ Suitable to image deep structures

### **SPATIAL RESOLUTION**

Spatial resolution is how physically close two objects can be and visualised separately. Commonly used spatial resolution is equal or less than 1 mm.

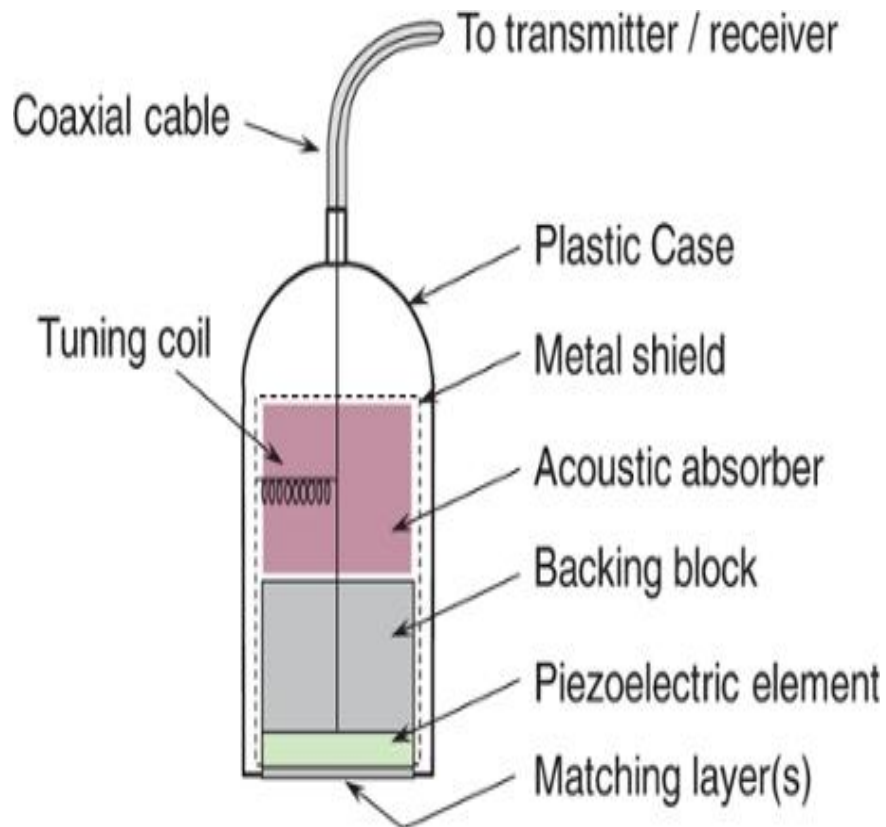
- ❖ Axial resolution – along the beam of sound waves
- ❖ Lateral resolution – perpendicular to beam of sound waves

### **MACHINE COMPONENTS**

There are four main components in ultrasound machine,

1. Transducer
2. CPU
3. Control Panel
4. Monitor

## TRANSDUCER:



(TRANSDUCER AND ITS COMPONENTS)

## TYPES OF TRANSDUCERS

- ❖ *Curved array*
- ❖ *Linear array*
- ❖ *Phased array*

***Curved array:***

A curvilinear probe uses low frequency ultrasound to produce less resolution images than linear probe.



***Linear array***

A linear probe uses high frequency ultrasound to produce high resolution images of superficial structures.



### ***Phased array***

It gives more depth to allow deep structures through small acoustic window.



### **DISPLAY MODES**

- ❖ B mode – gives two dimensional images
- ❖ M mode – gives two dimensional image and allows motion recording
- ❖ Doppler – measures frequency shift in echo
- ❖ Colour Doppler – corresponding to frequency shift colours are used.
- ❖ Red –blood flow toward the probe
- ❖ Blue –blood flow away from the probe.

Ultrasound has been extensively used more than 20 years for medical purposes and has excellent safety profile. Since it is non-ionizing radiation, ultrasound is absolutely safe. Though it can produce heat and air pockets in tissues, long-term effects of heat and air pockets are not known<sup>30</sup>.

***ANATOMY OF THE ANTERIOR  
ABDOMINAL WALL***

## **ANATOMY OF THE ANTERIOR ABDOMINAL WALL**

### **MUSCLES OF THE ANTERIOR ABDOMINAL WALL**

Anterior abdominal wall consists of four large muscles on either side of the midline namely, External oblique, Internal oblique, Transversus addominis and Rectus abdominis. Two small muscles namely Pyramidalis and cremaster. Among these both oblique muscles and Transversus addominis are related to Transversus addominis plane block as well as Ilioinguinal, Iliohypogastric nerve blocks.

#### **EXTERNAL OBLIQUE MUSCLE**

- ❖ Largest and superficial among three muscles
- ❖ Originates from inferior surfaces of lower 8 ribs
- ❖ Lower fibers run inferiorly and insert into iliac crest
- ❖ Upper and middle fibers run infero- anteriorly, end in a thick aponeurosis
- ❖ External oblique aponeurosis along with aponeurosis of internal oblique and Transversus addominis form linea alba in the midline.



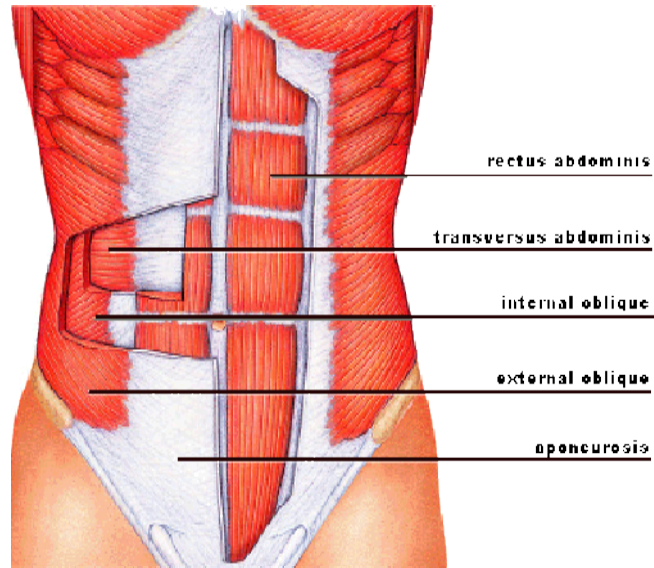
## **INTERNAL OBLIQUE MUSCLE**

- ❖ Smaller and thinner than external oblique.
- ❖ Originates from iliac crest and inguinal ligament.
- ❖ Inserts anteriorly into linea alba, superiorly into cartilages of lower six ribs.

## **TRANSVERSUS ADDOMINIS MUSCLE**

- ❖ Innermost of all three muscles.
- ❖ Originates from Iliac crest, Inguinal ligament, Lumbo dorsal fascia, and inner surface of lower six ribs.
- ❖ It runs transversely and ends in broad aponeurosis, inserts into linea alba along with aponeurosis of external and internal oblique.

**Anterior View of the Abdominal Muscles**



## **BLOOD SUPPLY OF ANTERIOR ABDOMINAL WALL**

- ❖ Superior epigastric artery
- ❖ Musculophrenic artery
- ❖ Both are terminal branches of Internal thoracic artery
- ❖ Inferior epigastric artery
- ❖ Deep circumflex iliac artery
- ❖ Both are branches of External iliac artery

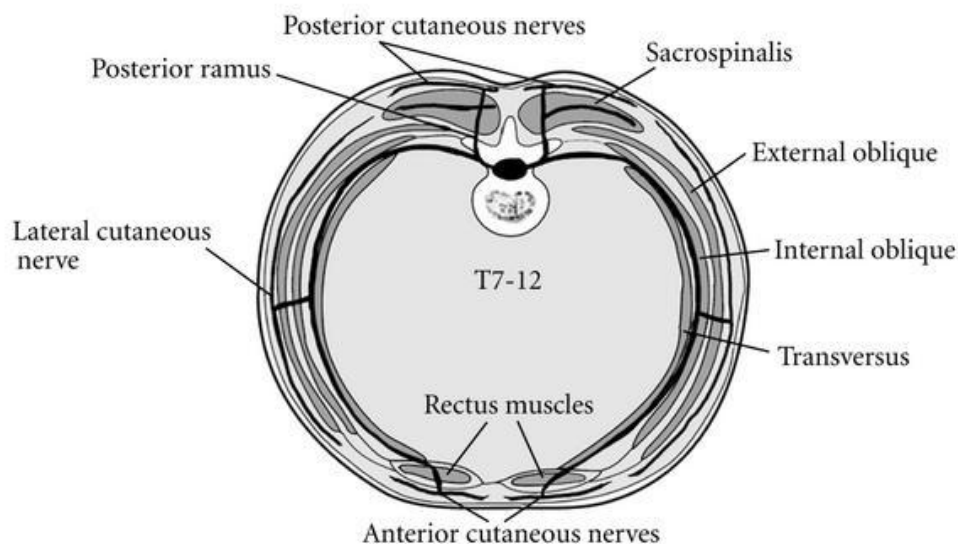
## DEEP NERVES OF THE ANTERIOR ABDOMINAL WALL

The anterior abdominal wall is supplied by anterior rami of T7 – L1.

T7 – T11 : lower five intercostal nerves

T12 : Subcostal nerve

L1 : Ilioinguinal and Iliohypogastric branches.



- ❖ The anterior primary rami of spinal nerves T7 – T11 travel anteriorly in the intercostal spaces .They leave the intercostal spaces between the slips of origin of transversus abdominis and enter directly or behind costal cartilages of 7, 8,9,10 ribs into abdominal wall.

- ❖ In the abdominal wall it travels between transversus abdominis and internal oblique muscles.
- ❖ It gives off lateral cutaneous branch in the mid axillary line which pierces both oblique muscles and divides into anterior and posterior branch supplying skin from lateral edge of rectus muscle to erector spinae muscle behind.
- ❖ Anterior rami continue its course in-between transversus abdominis and internal oblique muscles, pierces the posterior lamina of the internal oblique aponeurosis, then enters rectus sheath, passes behind and pierces the rectus muscle and anterior rectus sheath. Finally emerges out as anterior cutaneous nerve to supply the skin of anterior abdominal wall.
- ❖ The anterior primary rami of T 12 is the Subcostal nerve. It enters abdomen by passing behind the lateral arcuate ligament and follows the same course in the abdomen as of lower Intercostal nerves. In addition it supplies Pyramidalis and its lateral cutaneous branch supplies the gluteal region.
- ❖ The anterior rami of L1 divides into Ilioinguinal and Iliohypogastric nerves in front of quadratus lumborum. It

penetrates transversus abdominis and courses between transversus abdominis and internal oblique.

- ❖ Iliohypogastric nerve pierces internal oblique and runs deep to external oblique and become cutaneous branch by piercing external oblique aponeurosis about 2.5 cm above superficial inguinal ring, ends by supplying suprapubic skin. Its lateral cutaneous branch supplies skin over gluteal region.
- ❖ Ilioinguinal nerve pierces internal oblique just below and medial to Iliohypogastric nerve does. It runs through inguinal canal with spermatic cord or round ligament and becomes cutaneous by emerging through superficial inguinal ring to supply skin over scrotal region. Ilioinguinal nerve has no lateral cutaneous branch.

***TRANSVERSUS ABDOMINIS  
PLANE BLOCK***

## **TRANSVERSUS ABDOMINIS PLANE BLOCK**

Transversus abdominis plane block is performed to deposit local anaesthetic solutions in the neuro-fascial plane between internal oblique and Transversus abdominis muscle to block the nerves travel in this plane. By blocking these nerves, innervation to abdominal skin, abdominal muscles, and parietal peritoneum are temporarily blocked. Since it doesn't block visceral pain, additional analgesics are required. Since TAP block requires high volume of local anaesthetic solution careful titration is needed to avoid toxicity.

### **TECHNIQUES**

- ❖ Landmark method
- ❖ Ultrasound guided
- ❖ Surgeon assisted

### **LUMBAR TRIANGLE OF PETIT (LTOP)**

It is the anatomical deficiency in the abdominal wall situated in the mid axillary line between iliac crest and lower costal margin.

LTOP is the only area in the abdominal wall where the direct accessibility of internal oblique is possible. It is bounded

Anteriorly – by Lateral border of External oblique

Posteriorly – by lateral border of Latissimus dorsi

Base – by iliac crest



Layers (superficial to deep) – Skin, subcutaneous tissue, External oblique aponeurosis, Internal oblique, and Transversus abdominis.

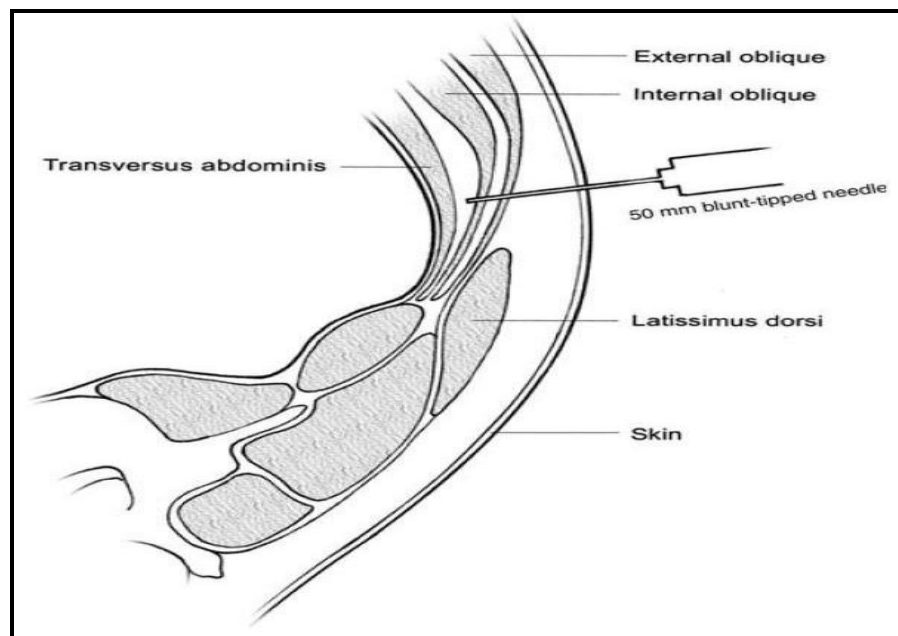
LTOP is the important landmark to perform blind Transversus abdominis plane block.



## LANDMARK METHOD

- ❖ Patient is positioned supine with arm above the level of head to make out Latissimus dorsi more prominent, so that the LTOP. By palpating iliac crest LTOP is identified and marked.
- ❖ Since TAP is relatively avascular plane strict aseptic precautions to be followed. Skin is disinfected with povidine iodine solution and sterile drapping is done.
- ❖ Needle entry site has been infiltrated with 2 ml of 2% lignocaine solution.
- ❖ By standing same or opposite side of the block, a 22 gauge 2 inch blunt tip needle is inserted with 90 degree angle with the skin in the middle of LTOP.
- ❖ Two significant pops will be felt. First one is felt when the needle pierces External oblique fascial layer and second felt when the needle pierces internal oblique aponeurosis to enter TAP. Usually TAP is reached 1.5 – 2 cm from skin.

- ❖ In TAP sterile local anaesthetic solution is injected after negative aspiration. The block usually starts to work in 20 – 30 mins.
- ❖ Unilateral TAP block is performed for abdominal incision which are not crossing the midline (inguinal hernia, appendicectomy)



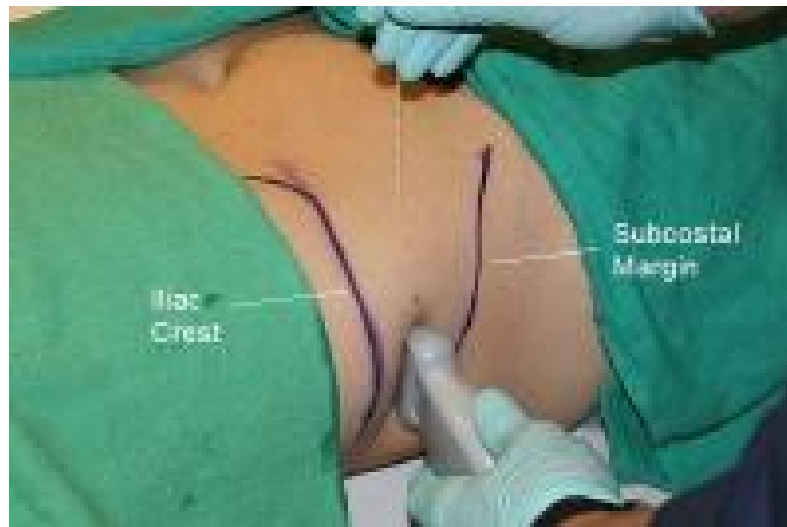
### **ULTRASOUND GUIDED TAP BLOCK**

Ultrasound guided Transversus abdominis plane block is more accurate, has more success rate, and devoid of complications when compared to blind technique.

- ❖ In standard ultrasound guided TAP block the 6 – 13 MHz linear array probe is placed between iliac crest and costal

margin on the lateral abdominal wall under strict aseptic precautions.

- ❖ Probe is aligned, rotated, and tilted in such a way to obtain clear optimized image of three muscle layers and TAP is identified.
- ❖ After skin infiltration with 2% lignocaine a 22 gauge 3.5 inch needle is inserted with in-plane technique.
- ❖ Needle tip and shaft is identified and sterile local anesthetic solution is deposited in TAP.
- ❖ Saline can be used to hydrodissect the transversus abdominis plane to visualise the needle tip easier.
- ❖ A concave shaped echoluscent deposition of anaesthetic solution in the plane which pushes the transversus abdominis down indicates good technique.



*(Ultrasound Guided Transversus Abdominis Plane Block)*



*(Ultrasound Guided Transversus Abdominis Plane Block With Needle in Situ)*

## **SURGEON ASSISTED METHOD**

It is done along with blind technique. In this method injection site is observed for peritoneal bulge via laparoscopic camera. Peritoneal bulge is the sign of correct deposition of the drug. During dissection drug can be deposited in plane under direct visualisation.

***ILIOINGUINAL AND  
ILIOHYPOGASTRIC NERVE  
BLOCKS***

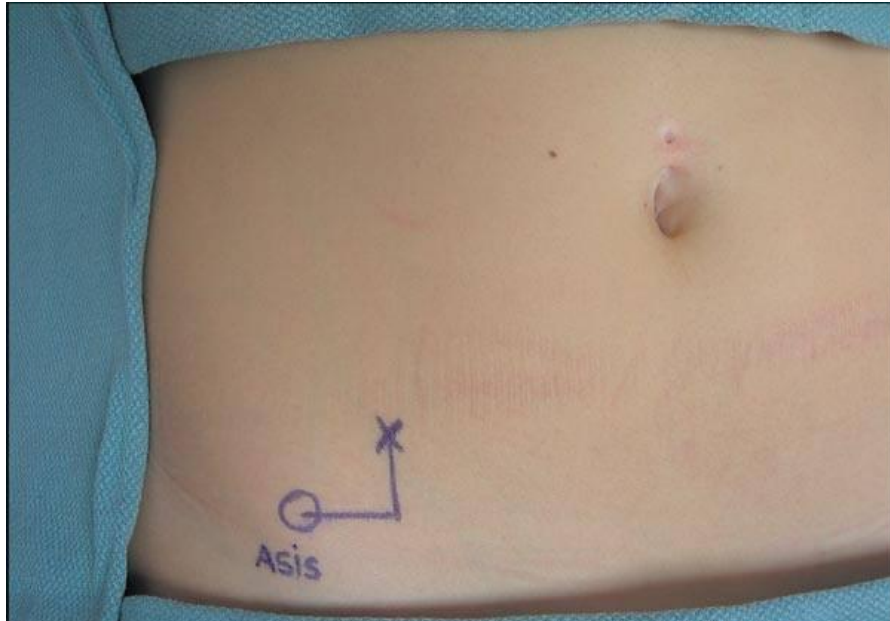
## **ILIOINGUINAL AND ILIOHYPOGASTRIC NERVE BLOCKS**

Both the ilioinguinal and iliohypogastric nerves originate from L1 spinal root. The efficacy of these nerve blocks was proven to provide post-operative analgesia in lower abdominal surgeries. The cutaneous nerve supply of iliohypogastric is the skin over the inguinal region. The ilioinguinal nerve runs anterior and inferior to the superficial inguinal ring and supplies the skin over the superomedial aspect of thigh. It can be performed both blind as well as ultrasound guided.

### **BLIND METHOD**

Patient is positioned supine, under strict aseptic precautions skin is disinfected with povidine iodine, needle entry point is located 2 cm medial and 2 cm superior to anterior superior iliac spine. Skin is infiltrated with 2 % lignocaine. A 22 gauge 2 inch blunt tipped needle is inserted perpendicular to the skin. First pop indicates the needle pierces external oblique fascial layer to reach the plane between external and internal oblique, where half of the local anaesthetic solution titrated with patient weight is injected. While advancing the needle, second pop indicates the needle pierces internal oblique fascial layer to reach the plane between

internal oblique and transversus abdominis to reach TAP, where the remaining half of the local anaesthetic solution is deposited. Since the anatomical variability of both of these nerves, the failure rates range between 10 – 30 %.



*(Landmark for Ilioinguinal, Iliohypogastric nerve blocks)*

## **ULTRASOUND GUIDED METHOD**

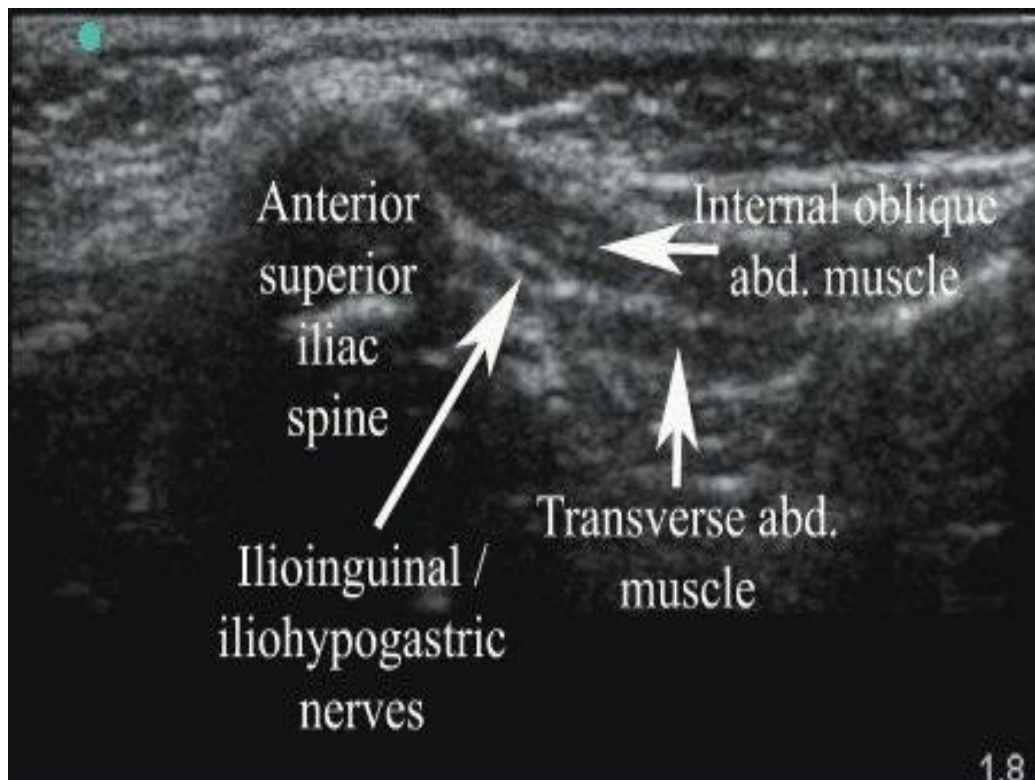
- ❖ The patient is placed in supine. Skin is disinfected with povidine iodine.
- ❖ The ilioinguinal, iliohypogastric nerves are superficially located, so high frequency 6 – 13 MHz linear array probe is placed posterior and superior to the anterior superior iliac spine (ASIS) perpendicular to ilioinguinal, iliohypogastric nerve course.



- ❖ The probe is aligned, rotated, and tilted to optimise the image.
- ❖ Iliac crest is identified. Both nerves are located within 1.5 cm from iliac crest in the plane between internal oblique and transversus abdominis muscle.
- ❖ The deep circumflex iliac artery can be revealed with colour doppler close proximity to these nerves.
- ❖ Then 22 gauge 3.5 inch needle is inserted with in- plane technique. Needle tip and shaft is visualised in the plane close to the nerves and local anaesthetic solution is deposited after negative aspiration.
- ❖ Hydrodissection with saline can be done to confirm needle tip position and drug spread. The block will be achieved in 20 – 30 minutes.



*(Probe position for ultrasound guided ilioinguinal iliohypogastric nerve blocks)*



***PHARMACOLOGY OF  
BUPIVACAINE***

## PHARMACOLOGY OF BUPIVACAINE

Bupivacaine is a local anaesthetic belongs to amide group. Local anaesthetics are the drugs that inhibit sensory, motor and autonomic nerve function when injected or applied near the neural tissue.

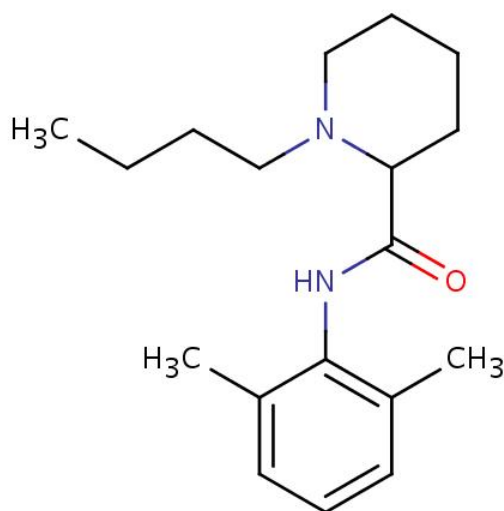
These drugs consist of

- ❖ A lipophilic,unsaturated aromatic ring
- ❖ A hydrophilic,tertiary amine
- ❖ A hydrocarbon chain (includes ester or amide) separates the aromatic ring and the tertiary amine.
- ❖ These drugs are weak bases

Onset of action depends on lipid solubility, relative concentration of nonionized lipid soluble and ionized water soluble form expressed as pKa.Local anaesthetic with pKa closer to physiological pH will have a greater concentration of nonionized base that permeates the nerve cell membrane rapidly.

## BUPIVACAINE

It is a synthetic amide group of local anaesthetic drug, Synthesized by **A.F.Ekenstam in 1957** and marketed as **Marcaine** in 1963. It is chemically designated as 1 – butyl – N – 2, 6 dimethylphenyl – 2 piperidine decarboxamide.



### PHYSICO – CHEMICAL PROFILE

- ❖ Molecular weight (base) : 288
- ❖ Molecular weight of chloride salt : 325
- ❖ pKa : 8.1
- ❖ Melting point : 258<sup>0</sup>C
- ❖ Lipid solubility : 28
- ❖ Plasma protein binding : 95 %

The base is hardly soluble in water, but the hydrochloride is readily soluble in water.

The drug is stable and can withstand autoclaving

It is more potent and long acting than lidocaine

### **MECHANISM OF ACTION**

- ❖ Bupivacaine exerts its effect by inhibiting the passage of sodium ions through ion-selective sodium channels in the nerve membrane.
- ❖ Bupivacaine binds to the sodium channel in inactivated (closed) state selectively from inner side and also prevent their change to resting (closed) or Activated (open) state in response to nerve stimuli.
- ❖ It slows down the rate of depolarization so that the threshold potential is not reached and action potential is not propagated.
- ❖ Bupivacaine enters to its receptor site only when sodium channels are in activated (open) to produce frequency dependent blockade.

- ❖ At some extent bupivacaine act on voltage dependent potassium channels also.

## **PHARMACOKINETICS**

- ❖ The onset of action is 5-7minutes,
- ❖ Maximum blockade is obtained 15-25 minutes
- ❖ Duration of blockade is 240 – 480 minutes
- ❖ Toxic plasma concentration is > 3 microgram/ ml
- ❖ Elimination half time is 210 minutes
- ❖ Clearance is 0.47 L/min
- ❖ Volume of distribution is 73 litres

## **METABOLISM**

Bupivacaine is degraded in liver, by Dealkylation, Hydroxylation, Conjugation and Amide hydrolysis. Only the dealkylated metabolite is measured in blood and urine after spinal and epidural administration. Only 10% of the drug is excreted unchanged in the urine. So renal disease is unlikely to alter the kinetics of bupivacaine.

## **ADVERSE REACTIONS**

The principle adverse effect is allergic reaction, Manifests as pruritus, urticaria, laryngeal edema etc. These reactions are more common in ester group of local anaesthetics also can be due to methylparaben, the preservative.

## **SYSTEMIC TOXICITY**

Excess plasma concentration due to accidental intravascular injection, Drug over dosage, or slow metabolism accounts for systemic toxicity.

## **CARDIOVASCULAR SYSTEM**

Accidental IV injection of Bupivacaine causes precipitous hypotension, dysarrhythmias and atrioventricular blocks. After IV injection the plasma protein binding sites become saturated quickly so unbound drug diffuses into cardiac conduction system and produces conduction blocks and arrhythmias. Cardiotoxic plasma concentration of Bupivacaine is 8 – 10 microgram / ml.



## **CENTRAL NERVOUS SYSTEM**

Bupivacaine toxicity causes excitation characterized by restlessness, anxiety, dizziness, tinnitus, blurred vision, tremors and convulsions, Followed by drowsiness and unconsciousness.

Transient neurological symptoms, Cauda Equina syndrome and Anterior spinal artery syndrome are possible documented complications.

## **CLINICAL APPLICATIONS**

- ❖ Central neuraxial blocks
- ❖ Peripheral nerve blocks
- ❖ Local Infiltration

## **PREPARATIONS**

- ❖ 0.25 %, 0.5% solutions as 10 ml and 20 ml vials
- ❖ 0.5 % Bupivacaine with 80 mg dextrose in 4 ml ampule for intrathecal injection.

# ***REVIEW OF LITERATURE***

## REVIEW OF LITERATURE

### *1. C.Aveline et al<sup>5</sup>, 2011*

C.Aveline et al conducted a randomized single blinded comparative study between ultrasound guided transversus abdominis plane block and conventional Ilioinguinal, Iliohypogastric nerve blocks in patients undergoing open inguinal hernia repair. 273 patients belong to ASA PS 1 - 3 were randomly allocated into two groups receiving either transversus abdominis plane block or conventional ilioinguinal, iliohypogastric nerve blocks.

This randomized study was conducted to compare the efficacy of ultrasound guided transversus abdominis plane block and conventional ilioinguinal, iliohypogastric nerve blocks on immediate postop analgesia as well as chronic pain in patients undergoing day care inguinal hernia repair.

Patients were given 0.5 % levobupivacaine (1.5 mg / kg) as either ultrasound guided transversus abdominis plane block or conventional Ilioinguinal, Iliohypogastric nerve blocks depending on the group they were allocated

Both groups were given general anaesthesia after locoregional procedures and airway was maintained with Laryngeal mask airway of appropriate size. Both groups were received 1 g paracetamol IV every 6 hours, ketoprofen 150 mg every 12 hours.

Postoperative pain score were recorded, patients who have pain score of more than 30 mm received inj. Morphine. Two telephone interviews were performed after 3 and 6 months of surgery to record chronic pain. Intra- operative dose of sufentanil, morphine requirement, and Local anaesthetic complication, leg weakness due to temporary femoral nerve palsy, urinary retention, and sleep quality using a 10-point scale were also recorded and all the parameters were compared between two groups.

Median pain scores and Morphine requirement were less in transversus abdominis plane block group than Ilioinguinal iliohypogastric nerve block group

This study concluded that ultrasound guided transversus abdominis plane block reduce immediate post-operative pain as well as opioid requirement compared to conventional ilioinguinal, iliohypogastric nerve blocks. But ultrasound guided transversus

abdominis plane block doesnot prevent occurrence of chronic pain after inguinal hernia repair.

## **2. G Niraj et al<sup>6</sup>, 2009**

Niraj et al has conduced a randomized double blinded comparative study to evaluate analgesic efficacy of ultrasound guided transversus abdominis plane block in patients undergoing open appendicectomy. 52 patients randomly allotted in two groups, both groups were given general anaesthesia. One group received ultrasound guided transversus abdominis plane block with 20ml of 0.5 % bupivacaine after induction.

Post-operatively all patients were given oral acetaminophen 1 gm every 6<sup>th</sup> hour and oral diclofenac 50 mg if required. IV morphine is given as patient controlled analgesia 1 mg bolus with 5 minutes lockout period.

24 hour morphine consumption and post-operative visual analogue score for pain has been recorded along with PONV. The mean morphine consumption was 28 mg in TAP group compared with 40 mg in control group with P value of 0.002.

Thus the study concluded that Transversus abdominis plane block has significantly reduced immediate post-operative pain, morphine consumption as well as PONV.

### ***3.Safaraz M khan et al<sup>22</sup>, 2012***

Safaraz has conducted a prospective randomized double blinded study to evaluate perioperative analgesic efficacy of ultrasound guided transversus abdominis plane block. 32 patients undergoing lower abdominal surgeries (inguinal hernia repair, open appendicectomy) were randomly allocated in two groups.

Patients in Group 1 were received standard general anaesthesia while Patients in Group 2 were received general anaesthesia followed by ultrasound guided unilateral transversus abdominis plane block with 12 ml of 0.5 % bupivacaine. Two groups were monitored for intra-operative fentanyl requirement, post –operative meperidine requirement and post –operative pain scores.

The mean intra-operative fentanyl requirement in group 1 is 193 microgram compared to 75 micrograms in group 2. Mean post –operative meperidine requirement in group 1 is 46.5 mg compared

to 7.5 in group 2. Post-operative pain score is 5 and 0.75 in group 1 and 2 respectively.

The study concluded that ultrasound guided transversus abdominis plane block reduced opioid consumption peri-operatively and significantly reduced post-operative pain scores compared to control.

#### ***4. Abdurrahman Demirci et al<sup>23</sup>, 2012***

Abdurrahman Demirci has conducted a study comparing post-operative analgesic efficacy of Ilioinguinal, iliohypogastric nerve blocks between ultrasound guided and landmark method. 40 patients of ASA PS 1 or 2 were allocated randomly in two groups. The patients in group 1 were given general anaesthesia followed by landmark method Ilioinguinal, Iliohypogastric nerve blocks with 20 ml of 0.5 % bupivacaine. The patients in group two were given general anaesthesia followed by ultrasound guided Ilioinguinal, Iliohypogastric nerve blocks with 20ml of 0.5 % bupivacaine.

Post-operative VAS score at rest and at pain as well as opioid requirement were significantly less in ultrasound guided Ilioinguinal, Iliohypogastric nerve blocks. So this study concluded that ultrasound guided Ilioinguinal, Iliohypogastric nerve blocks

provide more effective analgesia when compared to landmark method.

### **5. Sooyoung Cho et al<sup>15</sup>, 2013**

Has conducted a randomized, double blinded, controlled clinical trial comparing post-operative analgesic efficacy of ultrasound guided transversus abdominis plane block with control. In this study 44 patients belongs to ASA PS 1 or 2 were randomly allocated into two groups.

Both groups were received standard general anaesthesia and TAP block group received ultrasound guided transversus abdominis plane block with 20 ml of 0.5 % levobupivacaine after induction of anaesthesia. All patients were given standard post-operative analgesic regime. Post-operative pain is assessed with verbal numerical rating scale at rest and at cough. Post-operative nausea and vomiting also recorded, which were comparatively less than control group.

This study has concluded that ultrasound guided transversus abdominis plane block provide excellent post-operative analgesia during first 12 hours after open appendicectomy.



**6. A Ebru Salman et al<sup>10</sup>, 2013**

Conducted a prospective randomized double blinded study to evaluate the analgesic efficacy of semi- blind approach of transversus abdominis plane block in patients undergoing open inguinal hernia repair. 64 patients of ASA PS 1-3 were allocated in two groups and both groups were received subarachnoid block with 3.5 ml of 0.5 % hyperbaric bupivacaine. The first group was received placebo block and the second group was received semi blind transversus abdominis plane block after placing prolene mesh.

All patients were given IV paracetamol 1 gm 6<sup>th</sup> hourly. Post –operative visual analogue pain scale score was recorded upto 24 hours. IV Morphine 0.05mg/kg was given at any point of time if VAS score is more than 30mm as rescue analgesia. Post-operative nausea, vomiting, morphine consumption were documented.

Visual analogue pain scale score and Post- operative opioid consumption were significantly less in semi blind transversus abdominis plane block compared to placebo. Thus the study has concluded that Semi blind transversus abdominis plane block provide effective post - operative analgesia and reduce post - operative opioid requirement in unilateral open inguinal hernia repair.

### ***7. Jumaana M Baaj et al<sup>27</sup>,2010***

They conducted a randomized double blinded placebo controlled study in 40 patients undergoing elective caesarean section. The patients were allocated in two groups, all were received subarchinoid block with 10mg of heavy bupivacaine and 20 micrograms fentanyl.

At the end of surgery the first group was received transversus abdominis plane block with saline and second group received transversus abdominis plane block with 20 ml of 0.25 % bupivacaine bilaterally. Both received IV morphine as patient controlled analgesia.

This study has concluded that post-operative VAS score was less and 24 hour morphine consumption was reduced in bupivacaine group (26 mg) than the control group (63mg).

### ***8. McDonnell et al<sup>8</sup>,2008***

They conducted a prospective randomized study comparing analgesic effect of TAP block with placebo. They carried out this study in 50 parturients posted for caesarean section. parturients were randomly assigned into two groups, 25 each.

Both group received spinal anaesthesia and surgery carried out.at the end of the surgery, One group received TAP block with ropivacaine 1.5mg/kg, while other group received placebo.

All patients received patient controlled analgesia IV morphine post operatively. VAS score, first dose of morphine, 24 hours opioid consumption were recorded. The mean morphine requirement in TAP group was  $18\pm 14$ mg, whereas in control group the mean morphine requirement was  $66\pm 24$ mg.

The first dose of morphine also delayed in TAP group. It was 220 minutes in TAP group and around 90 minutes in control group. This study concluded that TAP block reduces 48 hour opioid requirement after elective caesarean delivery.

### ***9. S Tolchard et al<sup>29</sup>, 2012***

Compared the efficacy of subcostal transversus abdominis plane block with port site local anaesthetic infiltration in laparoscopic cholecystectomy.43 patients undergoing laparoscopic cholecystectomy were randomly allocated to receive either ultrasound guided subcostal transversus abdominis plane block (n= 21) or port site infiltration of 0.5 % bupivacaine 1mg / kg. Post – operative VAS score, opioid requirement were documented. It was

concluded that ultrasound guided subcostal transversus abdominis plane block significantly reduce post-operative opioid requirement and visual pain analogue score.

***10. A El- Dawlatly et al<sup>9</sup>. 2009***

Conducted a randomized double blinded study comparing ultrasound guided bilateral transversus abdominis plane block with conventional systemic analgesia in patients undergoing laparoscopic cholecystectomy.

Forty two patients were randomized into two groups to receive general anaesthesia either with or without ultrasound guided bilateral transversus abdominis plane block (30 ml of 0.5 % bupivacaine). Post-operative morphine demand using a patient controlled analgesia and intraoperative opioid demand were recorded.

It was concluded that ultrasound guided bilateral transversus abdominis plane block significantly reduces post –operative opioid demand.

***11. Tery T Tan et al<sup>26</sup>, 2012***

Forty patients undergoing caesarean section were randomly allocated into two groups to receive general anaesthesia either with or without ultrasound guided bilateral transversus abdominis plane

block (20 ml of 0.25 % levobupivacaine). All patients were received intravenous morphine through Patient controlled analgesia (PCA). They recorded 24 hour morphine consumption, VAS score, post-operative nausea and vomiting.

They concluded that 24 hour morphine consumption was less in group received ultrasound guided bilateral transversus abdominis plane block. No difference in VAS score and post-operative nausea, vomiting among two groups.

### ***12. Peterson et al***

In his review article he cited about seven randomized trials, where in transversus abdominis plane block (both blind and ultrasound guided) was given to patients undergoing surgeries with incision below umbilicus.

All of these proved that TAP block reduces 24 hour morphine consumption, improve VAS score also reduces post –operative nausea and vomiting.

### **13. Abualhassan A Abdellatif et al<sup>25</sup>, 2013**

Compared ultrasound guided ilioinguinal, iliohypogastric nerve blocks with caudal block in fifty children undergoing unilateral groin repair. And showed, the average time to first rescue

analgesia was longer in ilioinguinal iliohypogastric block group  $253\pm 102.6$  min as compared to  $219.6\pm 48.4$  min in caudal block group. He concluded that post-operative analgesic efficacy of ultrasound guided ilioinguinal, iliohypogastric nerve blocks are as effective as caudal block in unilateral groin surgeries.

## ***MATERIALS AND METHODS***

## **MATERIALS AND METHODS**

This study was conducted at Rajiv Gandhi Government General Hospital, Chennai 600003, on 60 patients undergoing elective unilateral open inguinal hernia repair. The study was conducted after obtaining Ethics committee approval. Informed written consent was obtained from the patients who were included in the study.

### **STUDY DESIGN**

The study was a Prospective, Randomized, comparative study. Sixty patients presenting for elective open inguinal hernia repair were randomly assigned to two groups. Only patients meeting the selection criteria were included in the study. Randomisation done by alternating patients to either Transversus abdominis plane block group (Group 1) or Ilioinguinal, Iliohypogastric nerve blocks group (Group 2)

Group 1 Pre operative ultrasound guided transversus abdominis plane block with 0.5% bupivacaine.

Group-2 Pre-operative ultrasound guided ilioinguinal, iliohypogastric nerve blocks with 0.5% bupivacaine.



All patients were given general anaesthesia and airway was maintained with laryngeal mask airway of appropriate size.

## **SELECTION OF CASES**

### ***Inclusion criteria:***

- ❖ Age - 18-60 years
- ❖ ASA - I & II
- ❖ Surgery - Elective, unilateral, Lichenstein repair
- ❖ Mallampatti scores - I & II
- ❖ Who have given valid informed consent.

### ***Exclusion criteria:***

- ❖ Not satisfying inclusion criteria
- ❖ Lack of written informed consent
- ❖ BMI >35 kg/m
- ❖ Skin infection at the puncture site,
- ❖ Patients posted for emergency surgery
- ❖ Patients with difficult airway
- ❖ Severe coagulopathy

- ❖ Contra-indication to diclofenac, paracetamol, or LA agents,
- ❖ Chronic hepatic or renal failure,
- ❖ Preoperative opioid or non-steroidal anti-inflammatory drugs for chronic pain treatment.
- ❖ Pregnant female

### **MATERIALS REQUIRED**

- ❖ Patient Monitors – HR, ECG, NIBP, SPO<sub>2</sub>.
- ❖ Portable ultrasound unit,
- ❖ Linear array transducer probe 6-13MHz, Sterile towel cover over transducer cable, sterile probe cover and Betadine(as conducting medium)
- ❖ 22 gauge 3.5 inch needle and 20 ml syringe,
- ❖ Antiseptic skin preparation and sterile gloves,
- ❖ Drugs – 2% lignocaine, 0.5% Bupivacaine, inj.Fentanyl, inj.Glycopyrrolate, Inj. propofol, Sevoflurane, and emergency drugs.

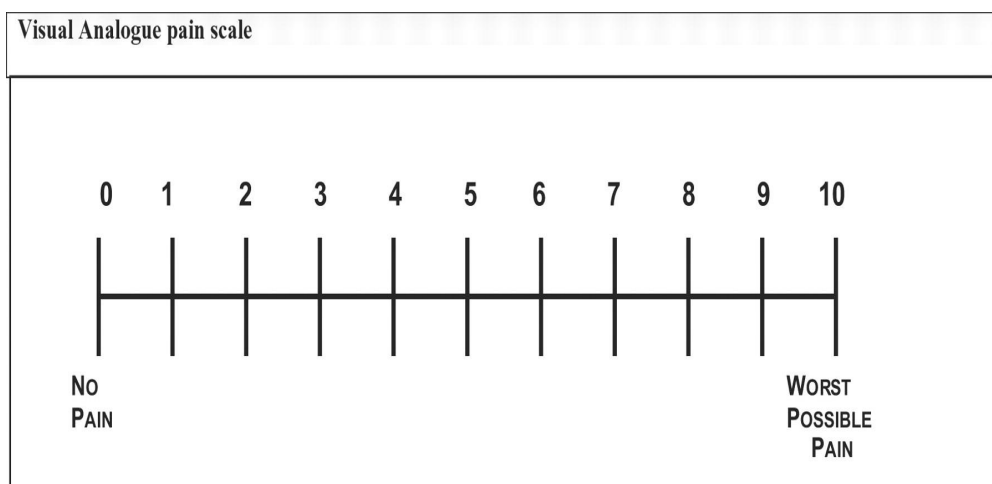
## VISUAL ANALOUGE PAIN SCORE<sup>14</sup>

It is a printed horizontal card of 10 cm in length, with two verbal descriptors as 'no pain' at one end and 'worst possible pain' at other end.

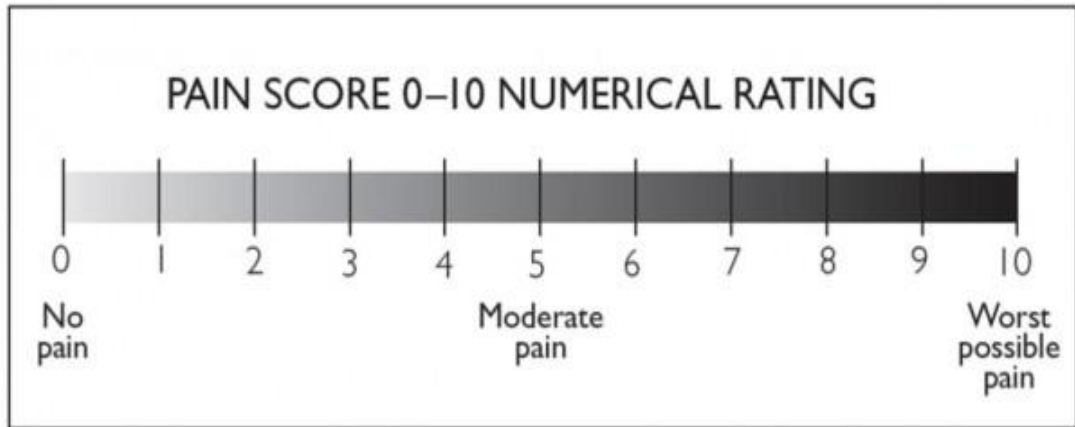
The patients are asked to mark on the line the point at which they feel, represents their perception of their current pain state.

It is interpreted as

- ❖ None(0-4mm),
- ❖ Mild(5-44mm),
- ❖ Moderate(45-74mm),
- ❖ Severe(75-100mm).



## OTHER PAIN RATING SCALES:



### Numerical Pain Rating Scale

#### Wong-Baker FACES™ Pain Rating Scale



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### Wong – Baker Faces Pain Rating Scale

## OUTCOMES MEASURED

### *Primary*

- ❖ Post-operative visual analogue scale pain score,
- ❖ Intra operative hemodynamics.

### *Secondary*

- ❖ Intra operative opioid requirement.

## METHODOLOGY

- ❖ All patients were assessed in our pre anaesthetic assessment clinic. Patients satisfying inclusion criteria were included in the study with their informed consent.
- ❖ Sixty patients were randomly assigned into two groups of 30 each. Randomisation done by alternating patients to either Transversus abdominis plane block group ( Group 1) or Ilioinguinal, Iliohypogastric nerve blocks group ( Group 2)
- ❖ **Group 1:- pre operative ultrasound guided transversus abdominis plane block with 0.5 % bupivacaine<sup>6</sup>.**
- ❖ **Group 2:- pre-operative ultrasound guided ilioinguinal, iliohypogastric nerve blocks with 0.5% bupivacaine<sup>6</sup>.**

- ❖ In the operating room, all basic monitors were connected to the patient (ECG, SPO<sub>2</sub>, non invasive BP). Baseline vitals were recorded.
- ❖ Patients were given according to their group, either ultrasound guided transversus abdominis plane block with 0.5 % bupivacaine<sup>6</sup> or ultrasound guided ilioinguinal, iliohypogastric nerve blocks with 0.5 % bupivacaine<sup>6</sup>.

#### ***Ultrasound guided transversus abdominis plane block***

- ❖ Patient in supine position, the 6 – 13 MHz linear array probe<sup>5</sup> is placed between iliac crest and costal margin on the lateral abdominal wall under strict aseptic precautions.
- ❖ Probe is aligned, rotated, and tilted in such a way to obtain clear optimized image of three muscle layers and TAP is identified.
- ❖ After skin infiltration with 2% lignocaine a 22 gauge 3.5 inch needle is inserted with in-plane technique.

- ❖ Needle shaft is identified and Saline is used to hydrodissect the transversus abdominis plane to visualise the needle tip easier.
- ❖ Sterile inj bupivacaine 0.5 % (20 ml)<sup>6</sup> is deposited in TAP.
- ❖ Correct placement of the drug is identified by a concave shaped echoluscent deposition of anaesthetic solution in the plane which pushes the transversus abdominis down.

***Ultrasound guided ilioinguinal, iliohypogastric nerve blocks***

- ❖ Patient in supine position. Skin is disinfected with povidine iodine.
- ❖ Under strict aseptic precautions the high frequency 6 – 13 MHz linear array probe<sup>5</sup> is placed posterior and superior to the anterior superior iliac spine (ASIS) perpendicular to ilioinguinal, iliohypogastric nerve course.
- ❖ The probe is aligned, rotated, and tilted to optimise the needle image.

- ❖ Iliac crest is identified. Both nerves are located within 1.5 cm from iliac crest in the plane between internal oblique and transversus abdominis muscle.
- ❖ The deep circumflex iliac artery can be revealed with colour Doppler close proximity to these nerves.
- ❖ Then 22 gauge 3.5 inch needle is inserted with in- plane technique. Needle tip and shaft is visualised in the plane close to the nerves and 0.5 % bupivacaine solution (20 ml) is deposited after negative aspiration.
- ❖ All patients were given inj cefotaxim 1gm IV, inj.Glycopyrrolate 0.2 mg IV, inj.Fentanyl 2 microgram / kg IV and induced with inj.Propofol 1.5 – 2mg/kg IV. Airway maintained with appropriate size laryngeal mask airway. Anaesthesia maintained with sevoflurane 1-2%, 50% N<sub>2</sub>O with O<sub>2</sub>.
- ❖ Intra-operative hemodynamics and fentanyl requirements were recorded.when mean arterial pressure exceeds 20% more than baseline inj.fentanyl 20 microgram is given.



- ❖ At the end of procedure patients were extubated, and post operatively received standard analgesic regime.(oral paracetamol 1 gm 6<sup>th</sup> hourly, oral diclofenac 50mg)<sup>6</sup>
- ❖ Patients were monitored for Visual analogue pain scale (VAS) and incidence of side effects for 24 hours post-operatively. Inj tramadol 75 mg IV was used as rescue analgesic when VAS scores more than four.

## **STATISTICAL ANALYSIS**

Descriptive statistics was done for all data and suitable statistical tests of comparison were done. Continuous variables were analysed with the 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.

## ***OBSERVATION AND RESULTS***

## OBSERVATION AND RESULTS

### TREATMENT GROUPS

<b>Treatment Groups</b>	<b>Name of Group</b>	<b>Treatment</b>	<b>Number of Subjects</b>
Group A	TAP	Ultrasound guided transversus abdominis plane block in patients undergoing open inguinal hernia repair	30
Group B	IIH	Ultrasound guided ilioinguinal, iliohypogastric nerve blocks in patients undergoing open inguinal hernia repair	30

### STATISTICS

Descriptive statistics was done for all data and suitable statistical tests of comparison were done. Continuous variables were analysed with the 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 on the basis of a pilot study in which the reduction in post-operative pain score (visual analogue scale) was measured as 15%. We calculated a minimum sample size of 24 patients was required in each group, assuming a type 1 error (two-tailed) of 0.05 and a margin of error of 10%. Therefore, the final sample selected was n=30 in Group A and n=30 in Group B.

$$n = \frac{t^2 \times p(1-p)}{m^2}$$

### *Description*

**n** = required sample size

**t** = confidence level at 95% (standard value of 1.96)

**p** = estimated prevalence of malnutrition in the project area

**m** = margin of error at 10% (standard value of 0.05)

$$n = \frac{(1.96)^2 \times 0.15(1-0.15)}{(0.1)^2}$$

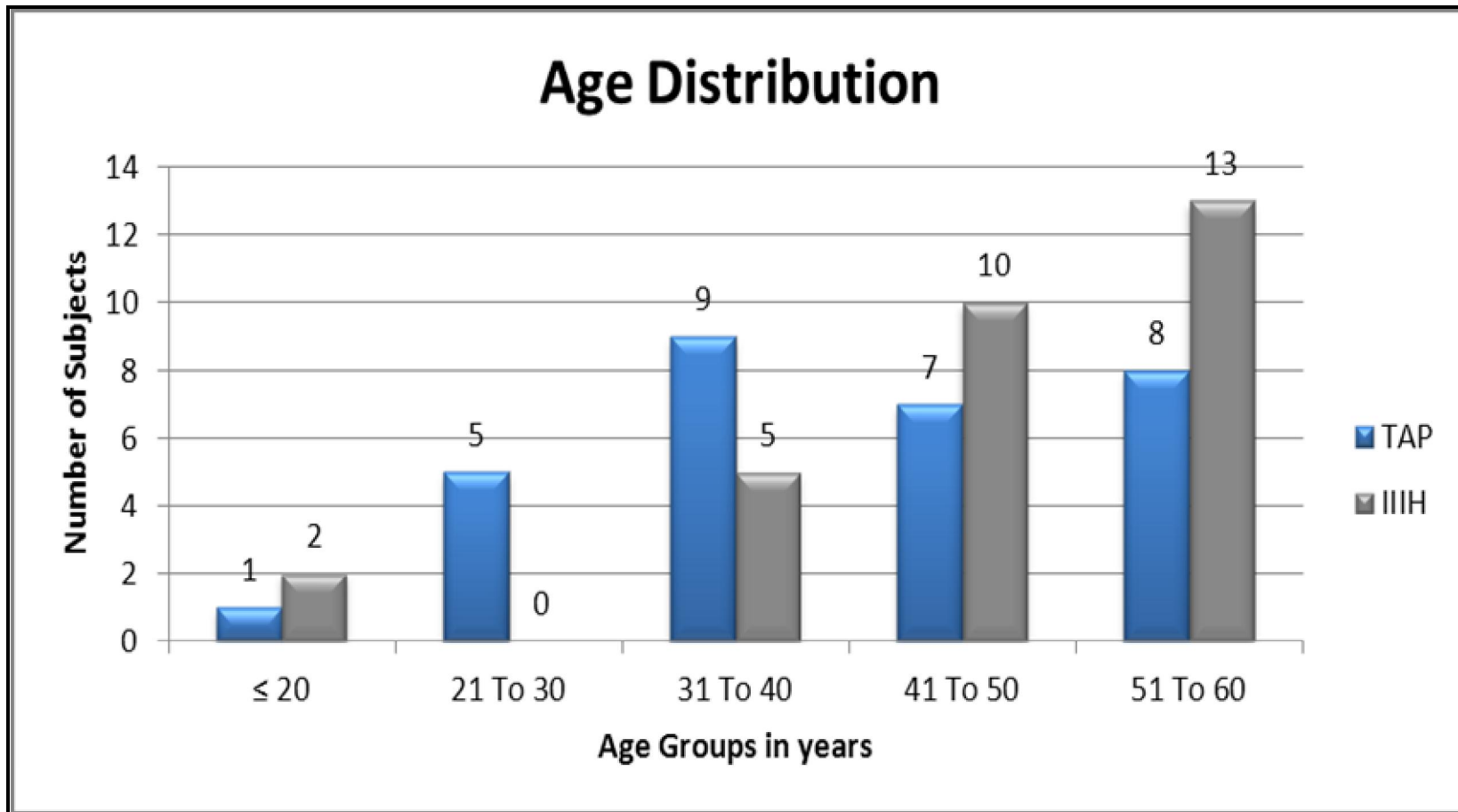
$$\begin{aligned} n &= \frac{3.8146 \times 0.1275}{0.01} \\ &= 24 \text{ per group} \end{aligned}$$

## AGE

Age Distribution	TAP	%	IIIH	%
≤ 20	1	3.33	2	6.67
21 To 30	5	16.67	0	0.00
31 To 40	9	30.00	5	16.67
41 To 50	7	23.33	10	33.33
51 To 60	8	26.67	13	43.33
Total	30	100	30	100

Age Distribution	TAH	IIIH
N	30	30
Mean	42.23333	47.43333
SD	12.86718	10.61776
P value Unpaired t test	0.093309858	

By conventional criteria the association between the treatment groups, age is considered to be not statistically significant since  $p > 0.05$ .

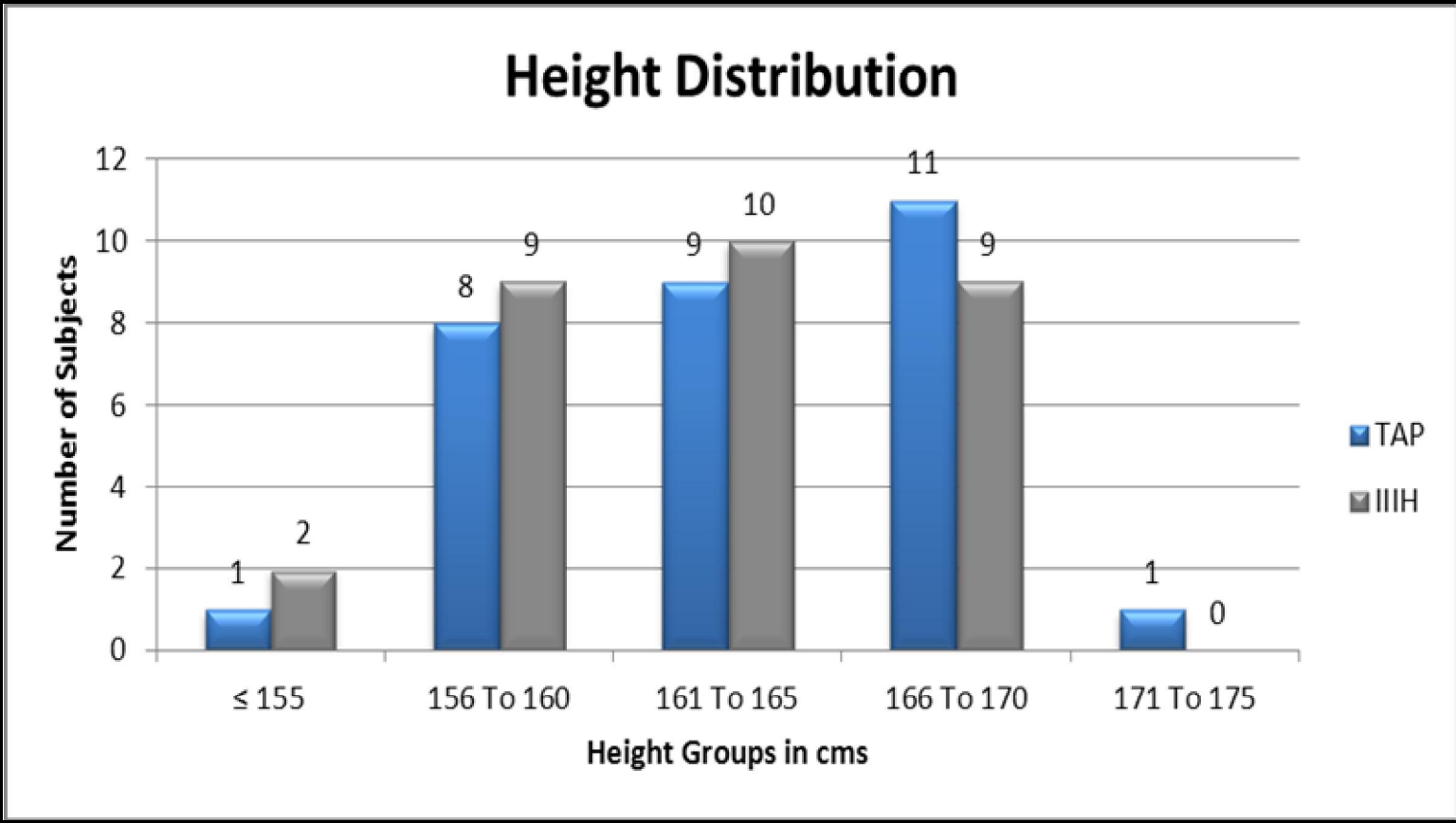


## HEIGHT

Height Distribution	TAP	%	IIH	%
≤ 155	1	3.33	2	6.67
156 To 160	8	26.67	9	30.00
161 To 165	9	30.00	10	33.33
166 To 170	11	36.67	9	30.00
171 To 175	1	3.33	0	0.00
Total	30	100	30	100

Height Distribution	TAH	IIH
N	30	30
Mean	163.9	162.6667
SD	4.566369	4.528327
P value Unpaired t test	0.297881227	

By conventional criteria the association between the treatment groups, height is considered to be not statistically significant since  $p > 0.05$ .





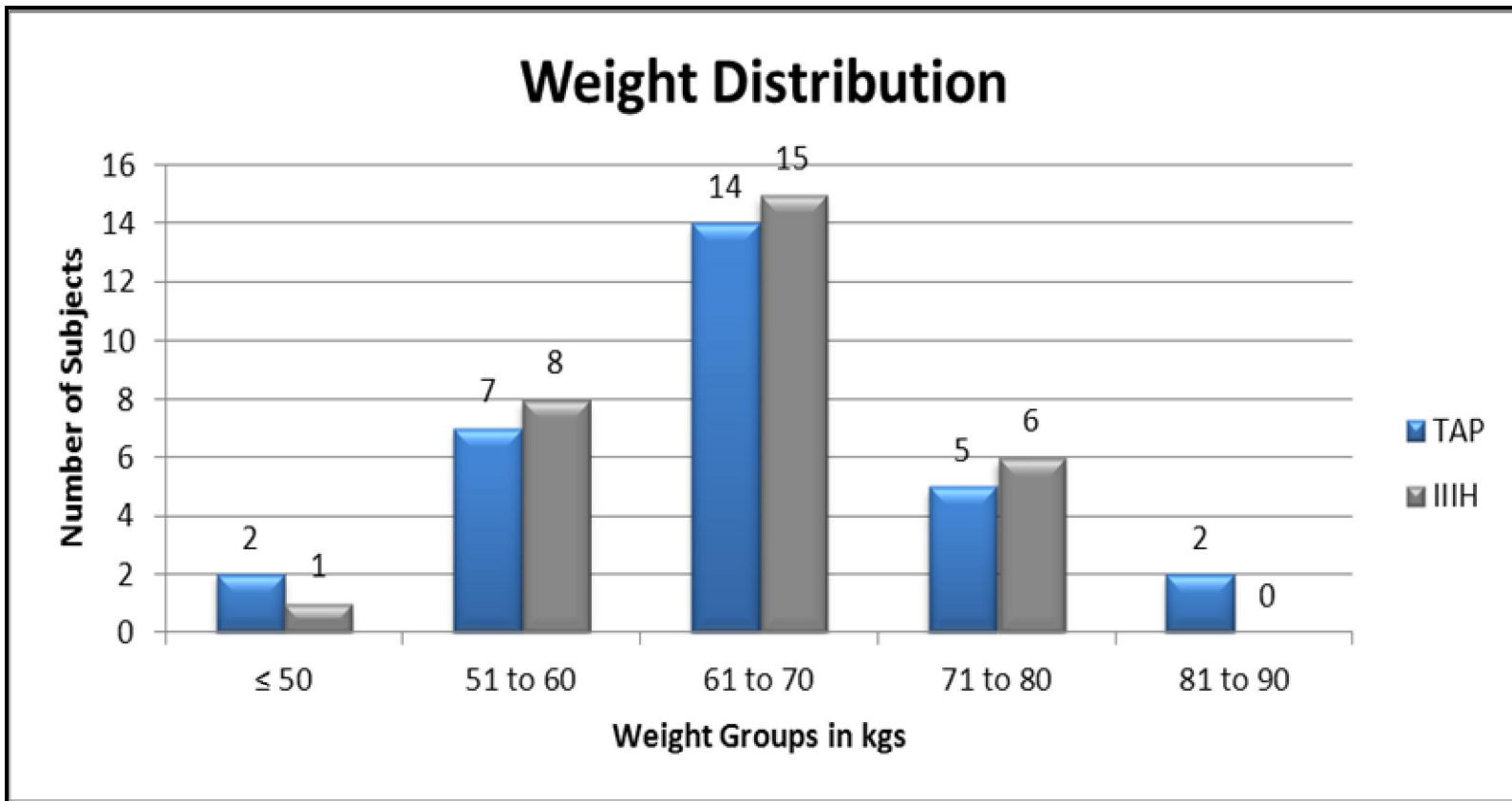
## WEIGHT

Weight Distribution	TAP	%	IIIH	%
≤ 50	2	6.67	1	3.33
51 to 60	7	23.33	8	26.67
61 to 70	14	46.67	15	50.00
71 to 80	5	16.67	6	20.00
81 to 90	2	6.67	0	0.00
Total	30	100	30	100

Weight Distribution	TAH	IIIH
N	30	30
Mean	65.33333	64.5
SD	8.599652	7.319082
P value Unpaired t test	0.687597772	

By conventional criteria the association between the treatment groups, weight is considered to be not statistically significant since  $p > 0.05$ .

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

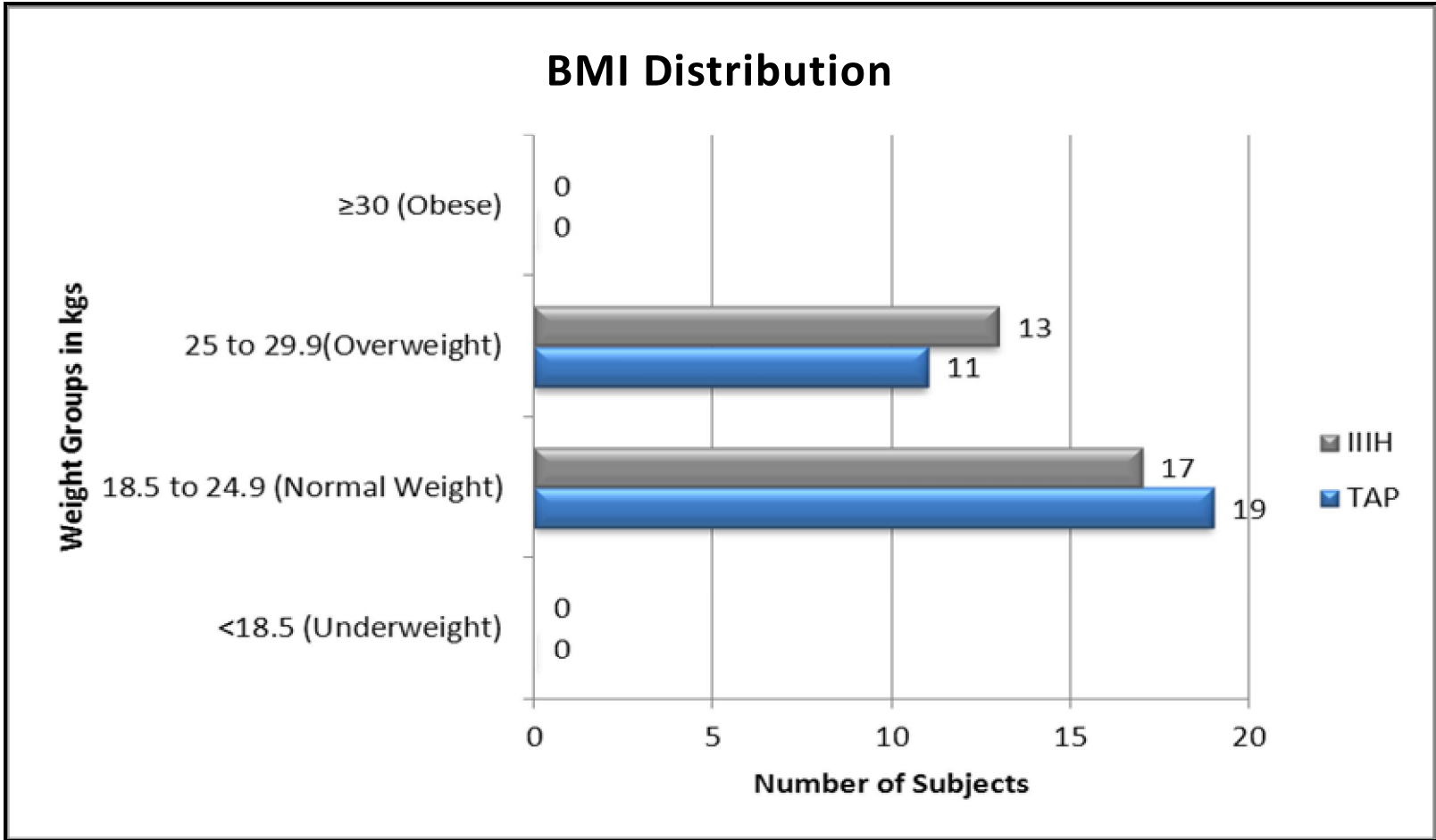


## BMI

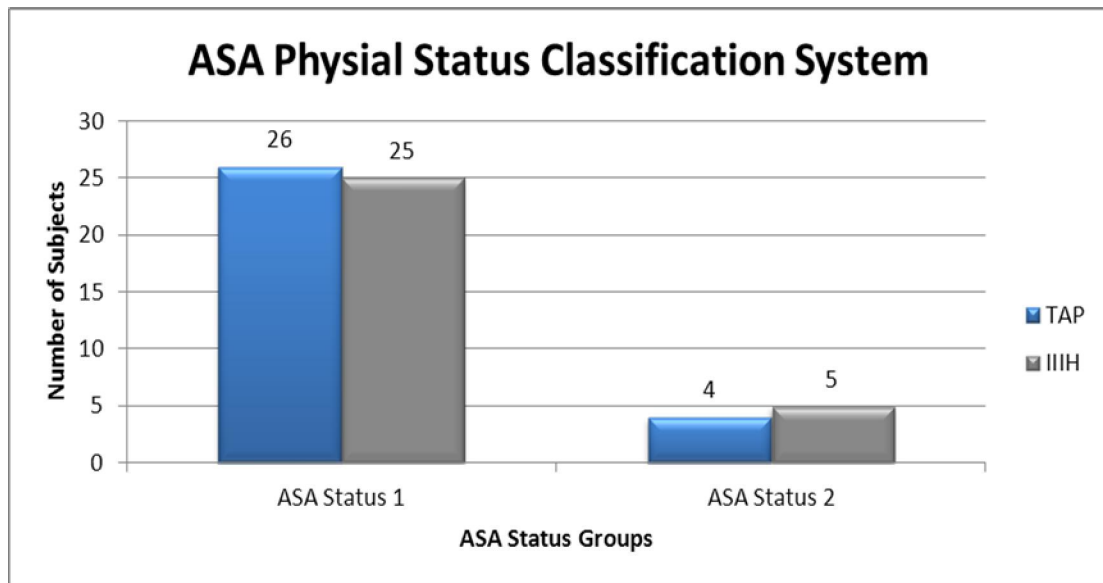
<b>BMI Distribution</b>	<b>TAP</b>	<b>%</b>	<b>IIH</b>	<b>%</b>
<18.5 (Underweight)	0	0.00	0	0.00
18.5 to 24.9 (Normal Weight)	19	63.33	17	56.67
25 to 29.9(Overweight)	11	36.67	13	43.33
≥30 (Obese)	0	0.00	0	0.00
Total	28	93.33333	30	100

<b>BMI Distribution</b>	<b>TAH</b>	<b>IIH</b>
N	30	30
Mean	24.24	24.31233
SD	2.315094	1.874395
P value Unpaired t test	0.894670801	

By conventional criteria the association between the treatment groups, BMI is considered to be not statistically significant since  $p > 0.05$ .



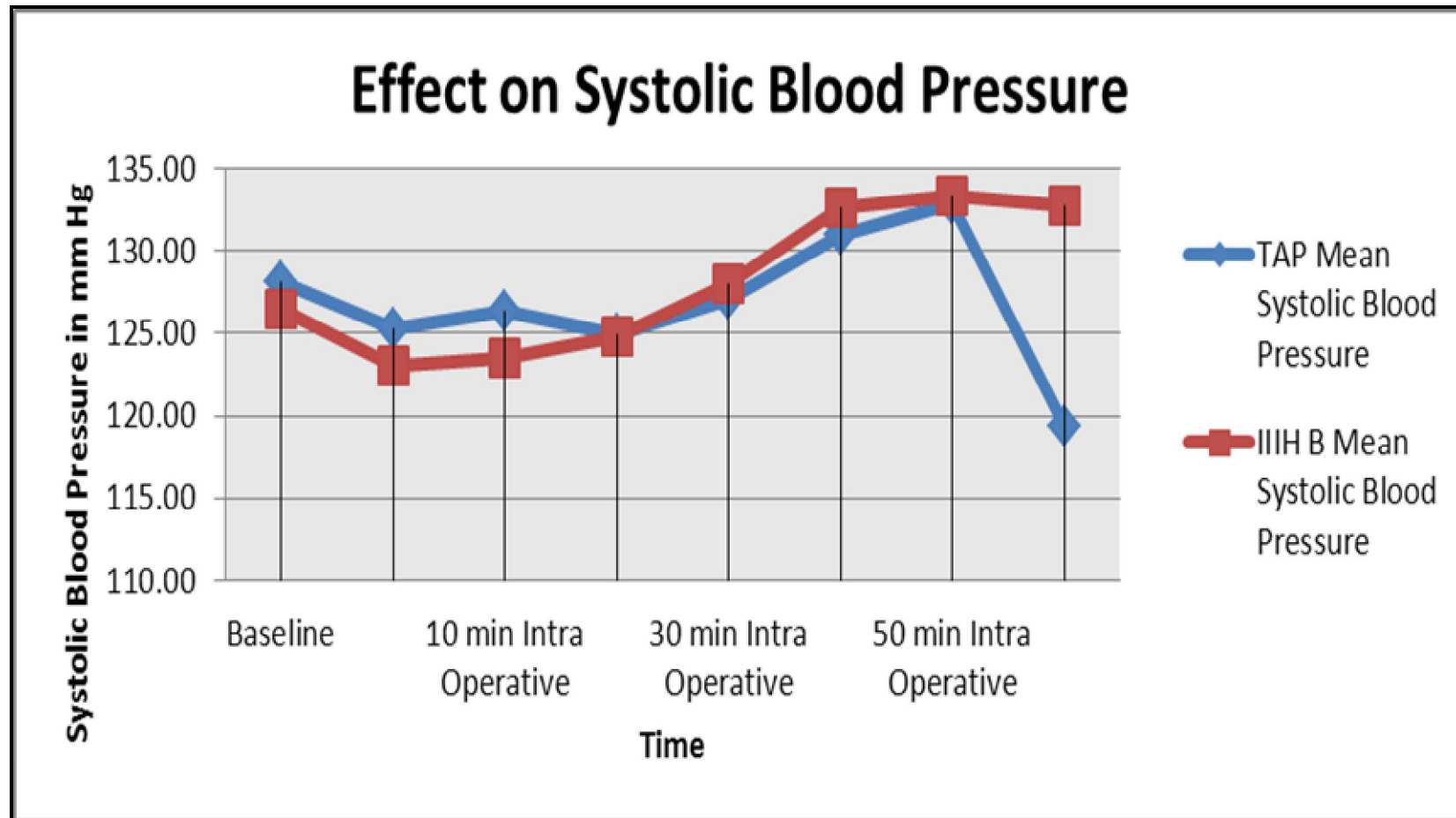
## ASA



Physical Status Classification	TAP	%	IIIH	%
ASA Status 1	26	86.67	25	83.33
ASA Status 2	4	13.33	5	16.67
Total	30	100	30	100
Chi squared statistic	0.131			
Degrees of freedom	1			
P value Chi squared test without Yates correction	0.7177			

By conventional criteria the association between the treatments groups, ASA status groups is considered to be not statistically significant since  $p > 0.05$ .

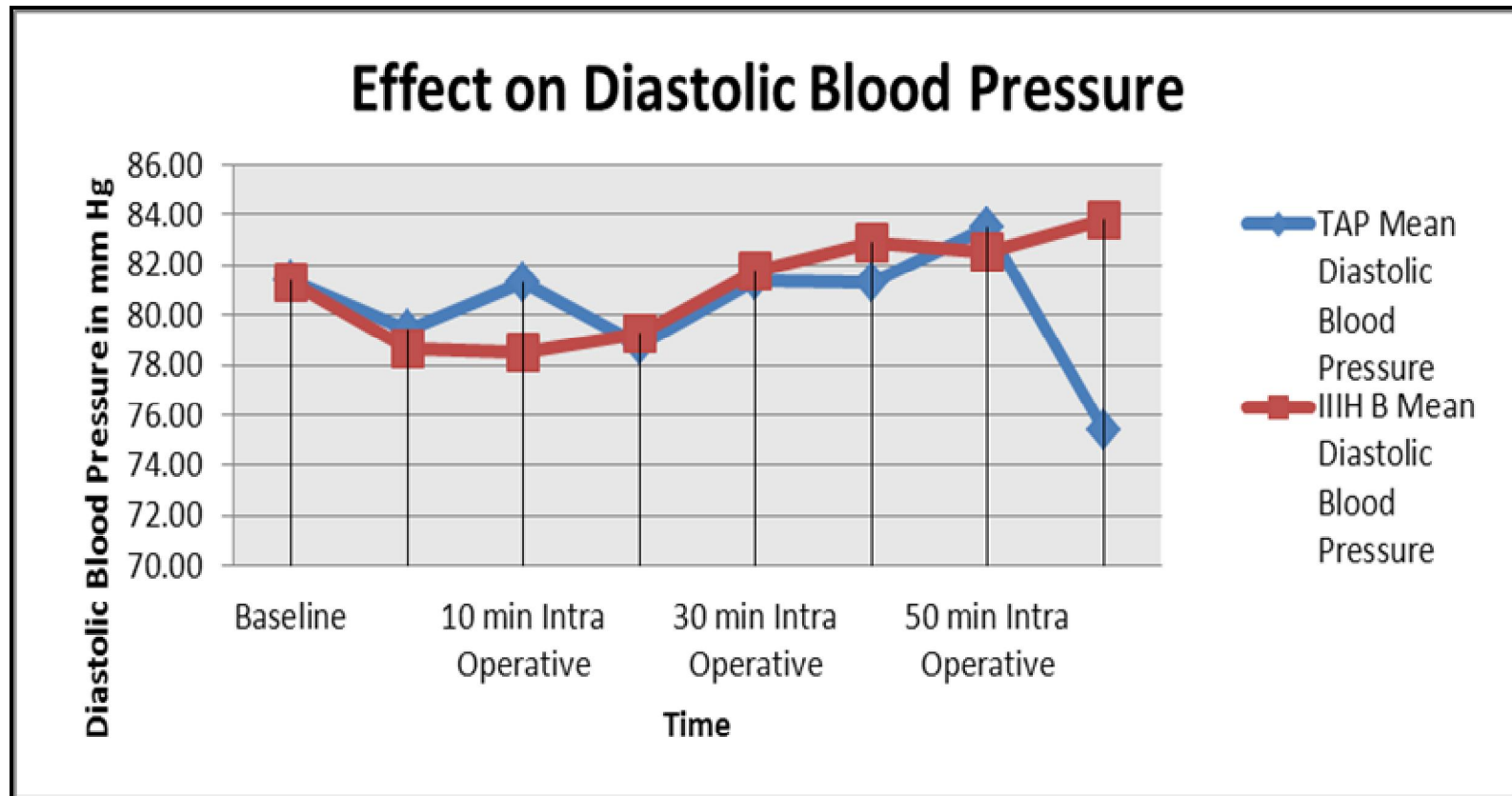
## SBP



<b>Systolic Blood Pressure</b>		<b>Baseline</b>	<b>5 min Intra Operative</b>	<b>10 min Intra Operative</b>	<b>20 min Intra Operative</b>	<b>30 min Intra Operative</b>	<b>40 min Intra Operative</b>	<b>50 min Intra Operative</b>	<b>60 min Intra Operative</b>
<b>TAP</b>	N	30	30	30	30	30	30	30	30
	Mean	128.1	125.3333	126.4	124.9333	127.1	130.9333	132.9	119.4
	SD	6.910013	7.033581	6.167769	9.161137	7.716306	8.403338	11.17062	9.103239
<b>IIIH</b>	N	30	30	30	30	30	30	30	30
	Mean	126.5	123.0333	123.5333	124.7667	128	132.6333	133.3333	132.7667
	SD	7.366045	9.305109	9.630173	8.177696	8.060119	9.327317	7.312405	5.399127
<b>P value Unpaired t test</b>		0.389153	0.284938	0.175963	0.941001	0.660294	0.461312	0.85962	0.5200

By conventional criteria the association between the treatment groups, the effect on systolic blood pressure is considered to be not statistically significant since  $p > 0.05$ .

## DBP

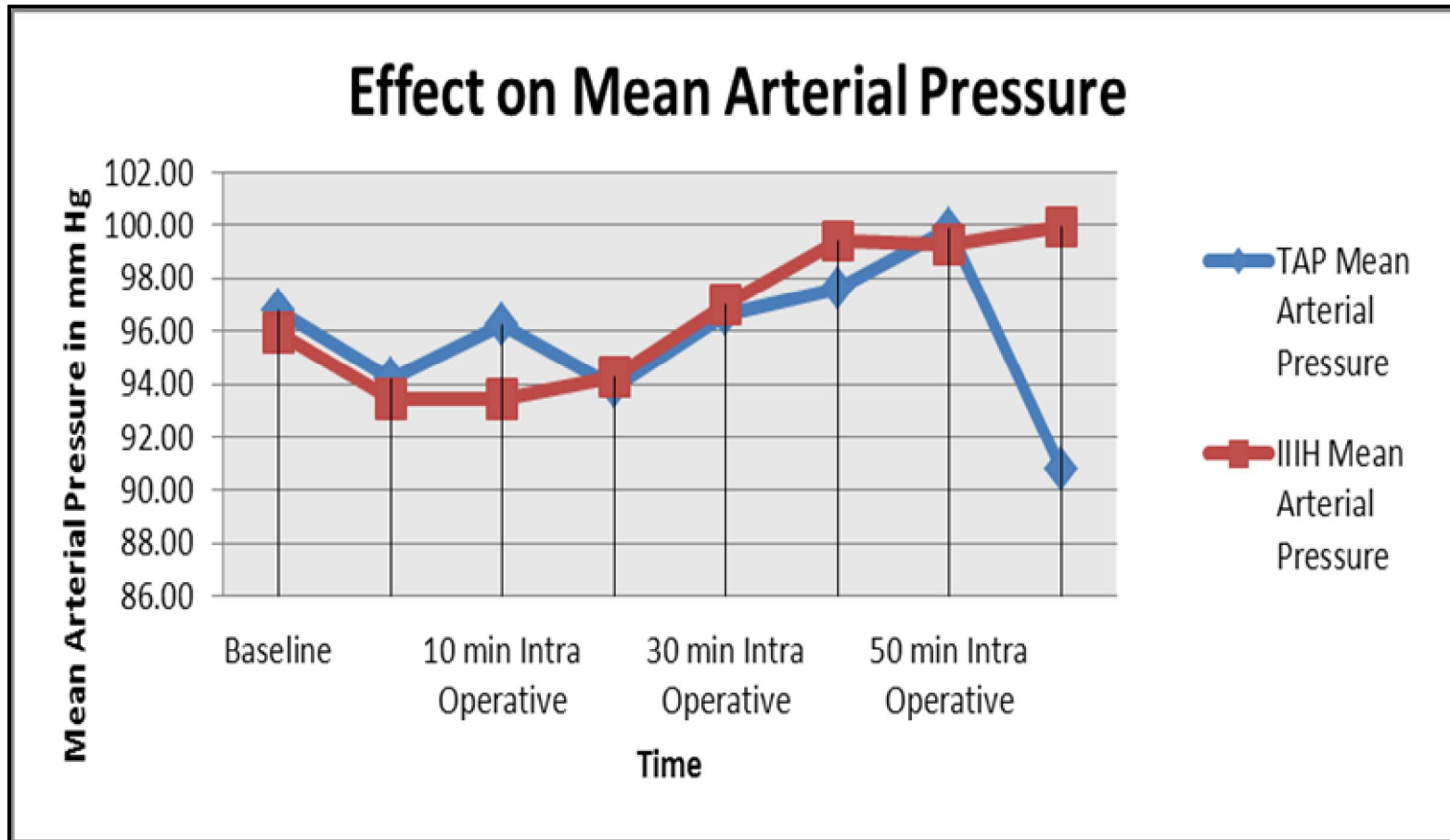




Diastolic Blood Pressure		Baseline	5 min Intra Operative	10 min Intra Operative	20 min Intra Operative	30 min Intra Operative	40 min Intra Operative	50 min Intra Operative	60 min Intra Operative
TAP	N	30	30	30	30	30	30	30	30
	Mean	81.4	79.43333	81.26667	78.83333	81.36667	81.33333	83.5	75.36667
	SD	5.537334	5.618217	4.456172	6.888688	6.071319	6.503757	7.262326	4.930436
IIII	N	30	30	30	30	30	30	30	30
	Mean	81.3	78.66667	78.53333	79.23333	81.76667	82.86667	82.53333	83.8
	SD	4.235727	5.597619	5.787819	4.438727	4.636313	6.218622	6.688814	5.460832
P value Unpaired t test		0.937668	0.598493	0.045238	0.790311	0.775359	0.354527	0.593843	0.6132

By conventional criteria the association between the treatment groups, the effect on diastolic blood pressure is considered to be not statistically significant since  $p > 0.05$ .

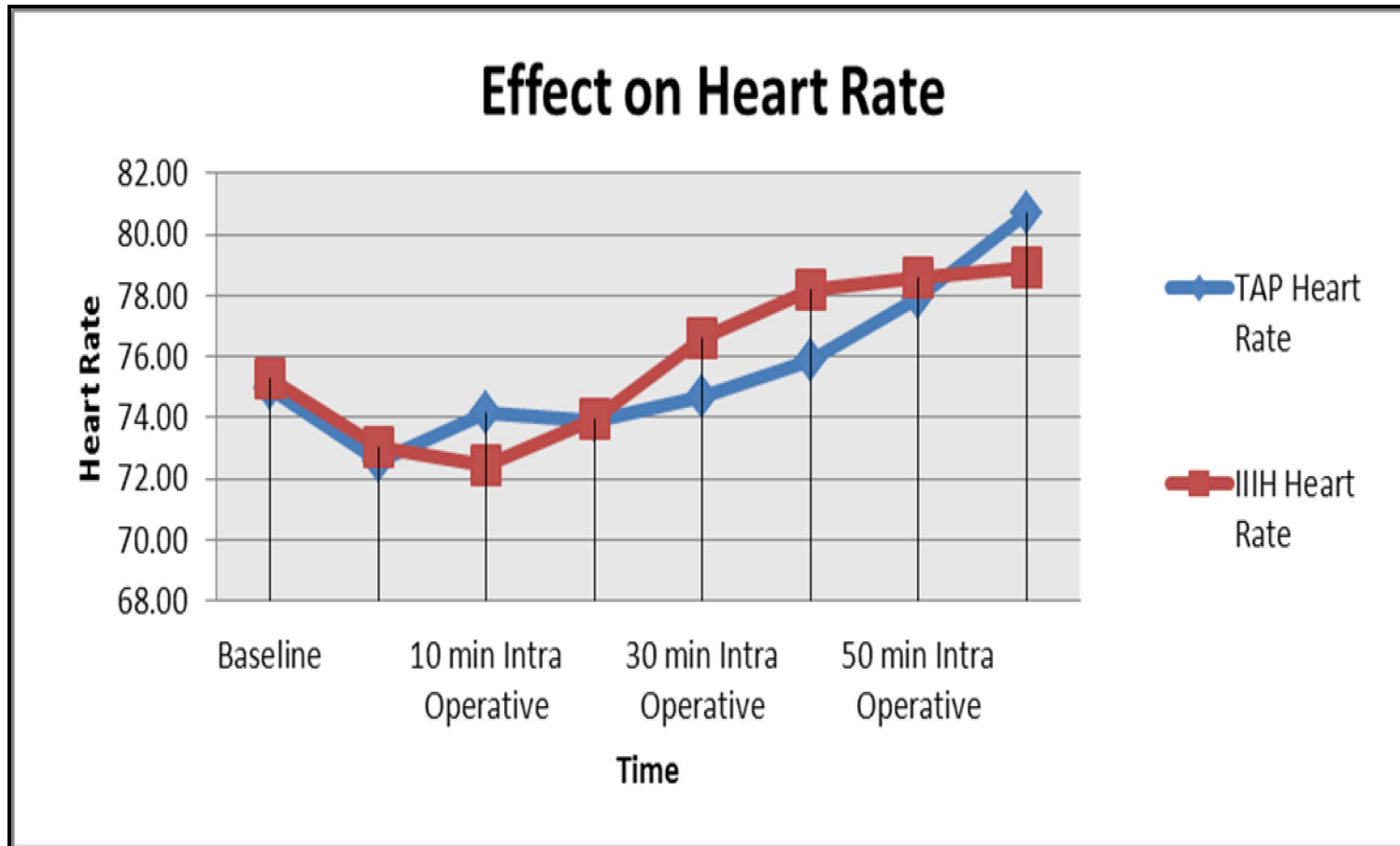
## MAP



Mean Arterial Pressure		Baseline	5 min Intra Operative	10 min Intra Operative	20 min Intra Operative	30 min Intra Operative	40 min Intra Operative	50 min Intra Operative	60 min Intra Operative
TAP	N	30	30	30	30	30	30	29	30
	Mean	96.79333	94.21	96.24	93.86333	96.59	97.58	99.88276	90.76667
	SD	5.347635	5.062598	5.008655	6.983551	6.451161	6.368641	8.136385	6.009667
IIII	N	30	30	30	30	30	30	30	30
	Mean	95.96	93.41	93.42333	94.26333	96.97	99.44	99.26	99.95333
	SD	4.602818	6.379782	6.415051	4.806639	5.437238	6.856238	6.416821	5.412994
P value Unpaired t test		0.520304	0.592734	0.063299	0.79711	0.80604	0.280821	0.745906	0.4332

By conventional criteria the association between the treatment groups, the effect on mean arterial pressure is considered to be not statistically significant since  $p > 0.05$ .

## HEART RATE



Heart Rate		Baseline	5 min Intra Operative	10 min Intra Operative	20 min Intra Operative	30 min Intra Operative	40 min Intra Operative	50 min Intra Operative	60 min Intra Operative
TAP	N	30	30	30	30	30	30	30	30
	Mean	0.9	1.333333	2.133333	2.766667	3.233333	2.966667	2.766667	2.533333
	SD	0.803012	0.711159	0.681445	0.897634	0.971431	1.098065	0.8172	0.681445
IIIH	N	30	30	30	30	30	30	30	30
	Mean	0.666667	1.366667	2.2	2.8	2.966667	3.3	2.766667	2.066667
	SD	0.660895	0.808717	0.761124	0.761124	0.927857	1.055364	0.773854	0.583292
P value Unpaired t test		0.22427	0.865977	0.722086	0.877269	0.281423	0.235497	1.000	0.6094

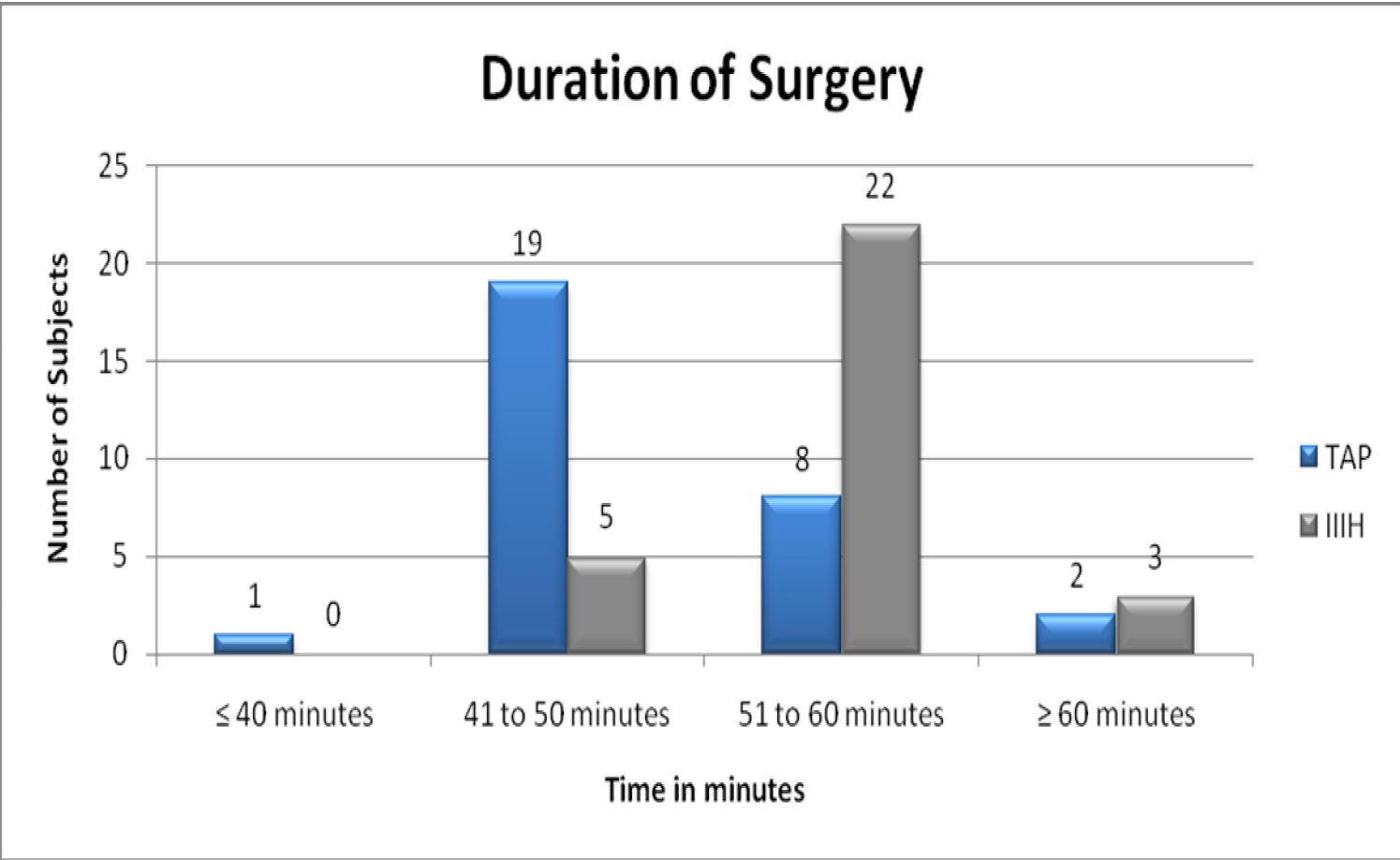
By conventional criteria the association between the treatment groups, the effect on heart rate is considered to be not statistically significant since  $p > 0.05$ .

## DURATION OF SURGERY

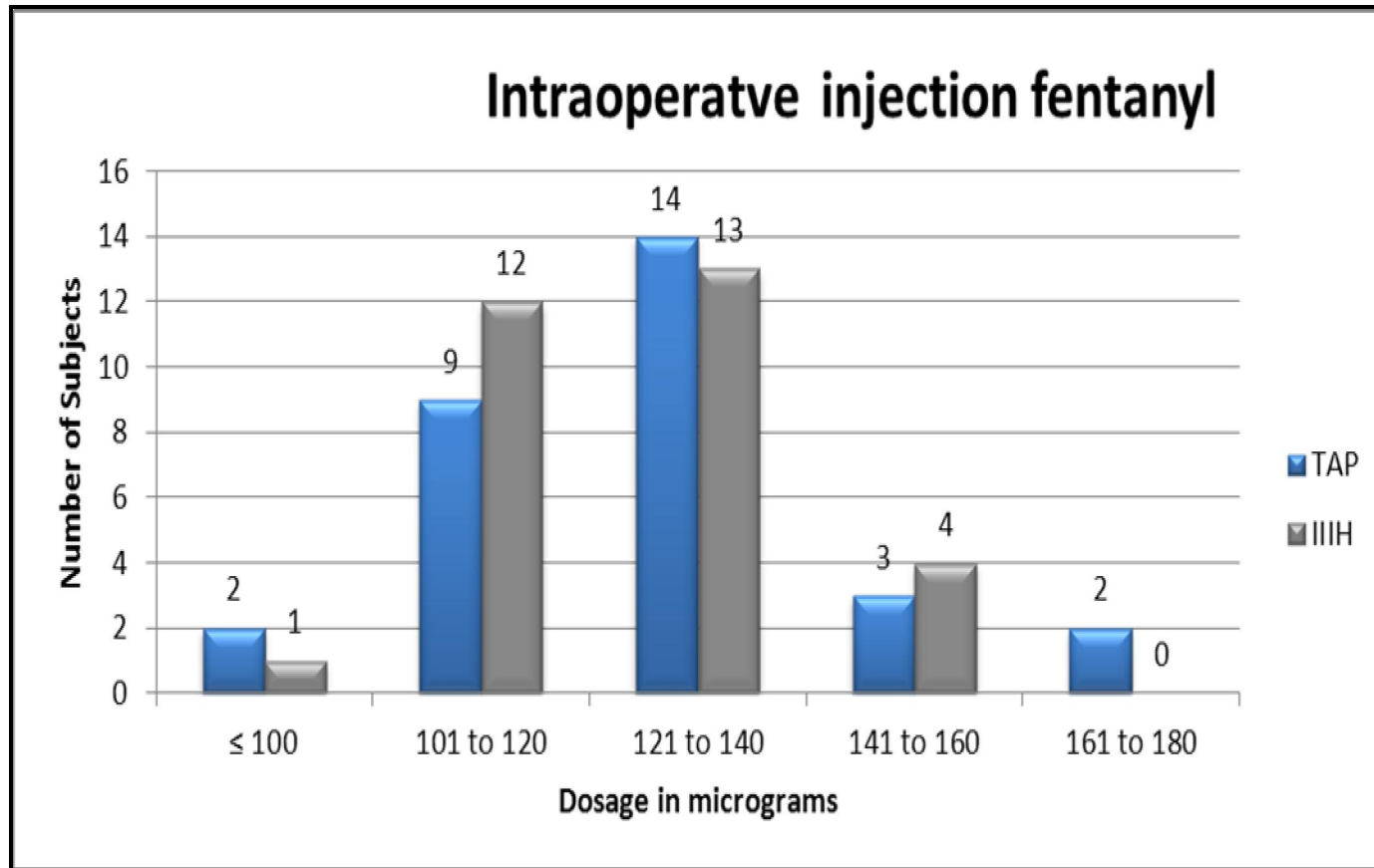
Duration of Surgery	TAP	%	IIH	%
≤ 40 minutes	1	3.33	0	0.00
41 to 50 minutes	19	63.33	5	16.67
51 to 60 minutes	8	26.67	22	73.33
≥ 60 minutes	2	6.67	3	10.00
Total	30	100	30	100

Duration of Surgery	TAH	IIH
N	30	30
Mean	53.66667	59.66667
SD	6.686751	6.149479
t test	0.627618	

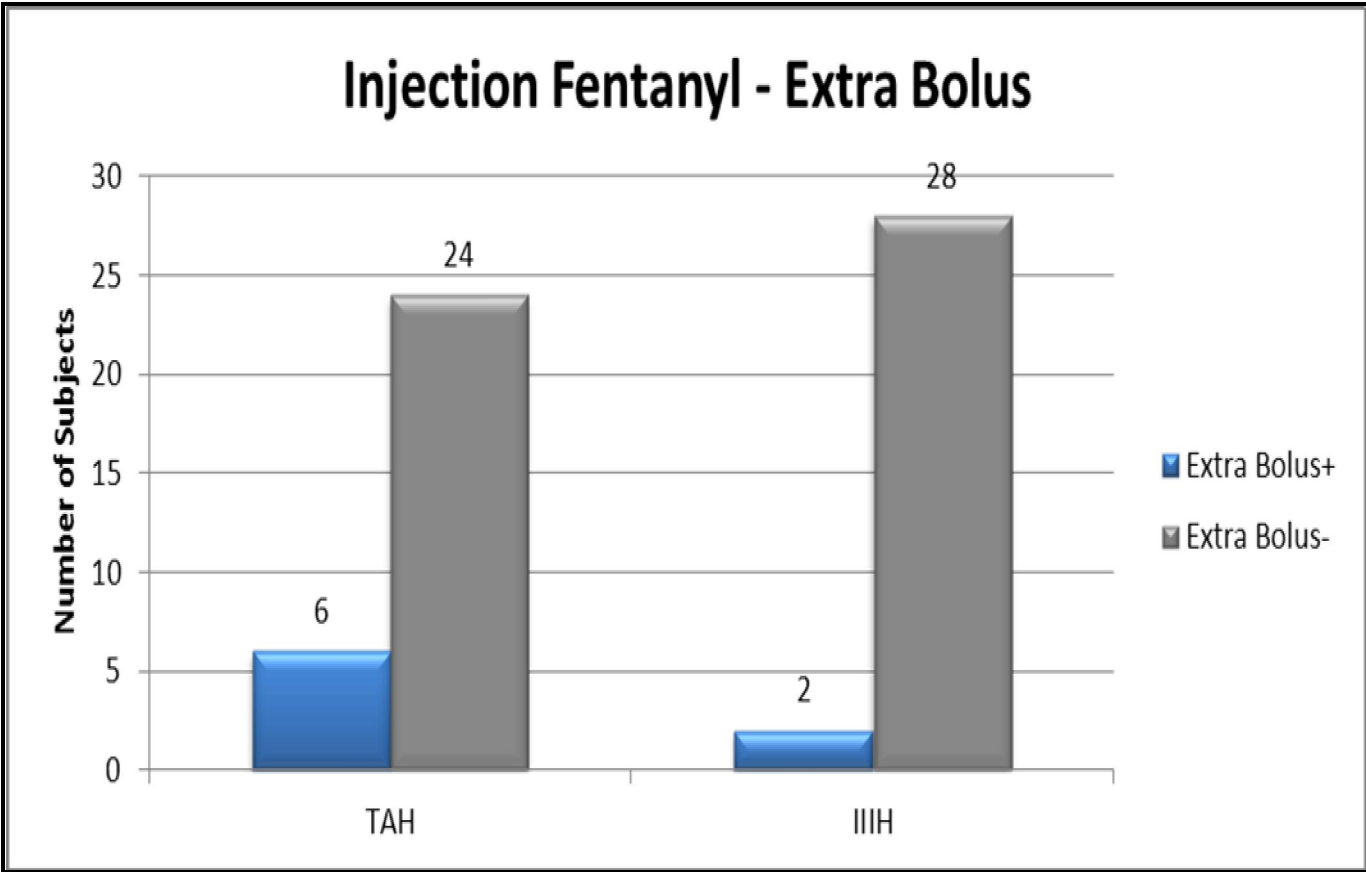
By conventional criteria the association between the treatment groups, the duration of surgery is considered to be not statistically significant since  $p > 0.05$ .



## FENTANYL







<b>Intraop inj fentanyl</b>	<b>TAP</b>	<b>%</b>	<b>IIIH</b>	<b>%</b>
≤ 100	2	6.67	1	3.33
101 to 120	9	30.00	12	40.00
121 to 140	14	46.67	13	43.33
141 to 160	3	10.00	4	13.33
161 to 180	2	6.67	0	0.00
Total	30	100	30	100

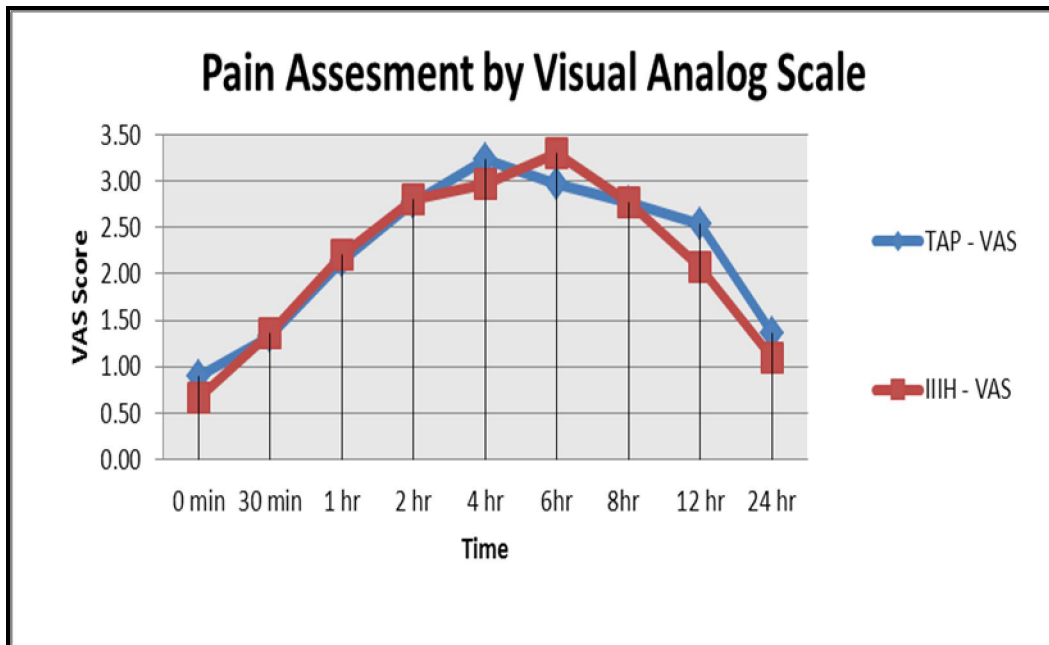
<b>Intraop inj fentanyl</b>	<b>TAH</b>	<b>IIIH</b>
N	30	30
Mean	132	130.3333
SD	17.49877	14.49931
P value Unpaired t test	0.689432753	

<b>Extra Bolus of 20 mcg Fentanyl</b>	<b>TAH</b>	<b>%</b>	<b>IIH</b>	<b>%</b>
Extra Bolus+	6	20.00	2	6.67
Extra Bolus-	24	80.00	28	93.33
Total	30	100	30	100
P value Fishers Exact Test	0.2542			

By conventional criteria the association between the treatment groups, the intra operative injection of fentanyl is considered to be not statistically significant since  $p > 0.05$ .

By conventional criteria the association between the treatment groups, the intra operative extra bolus injection of fentanyl is considered to be not statistically significant since  $p > 0.05$ .

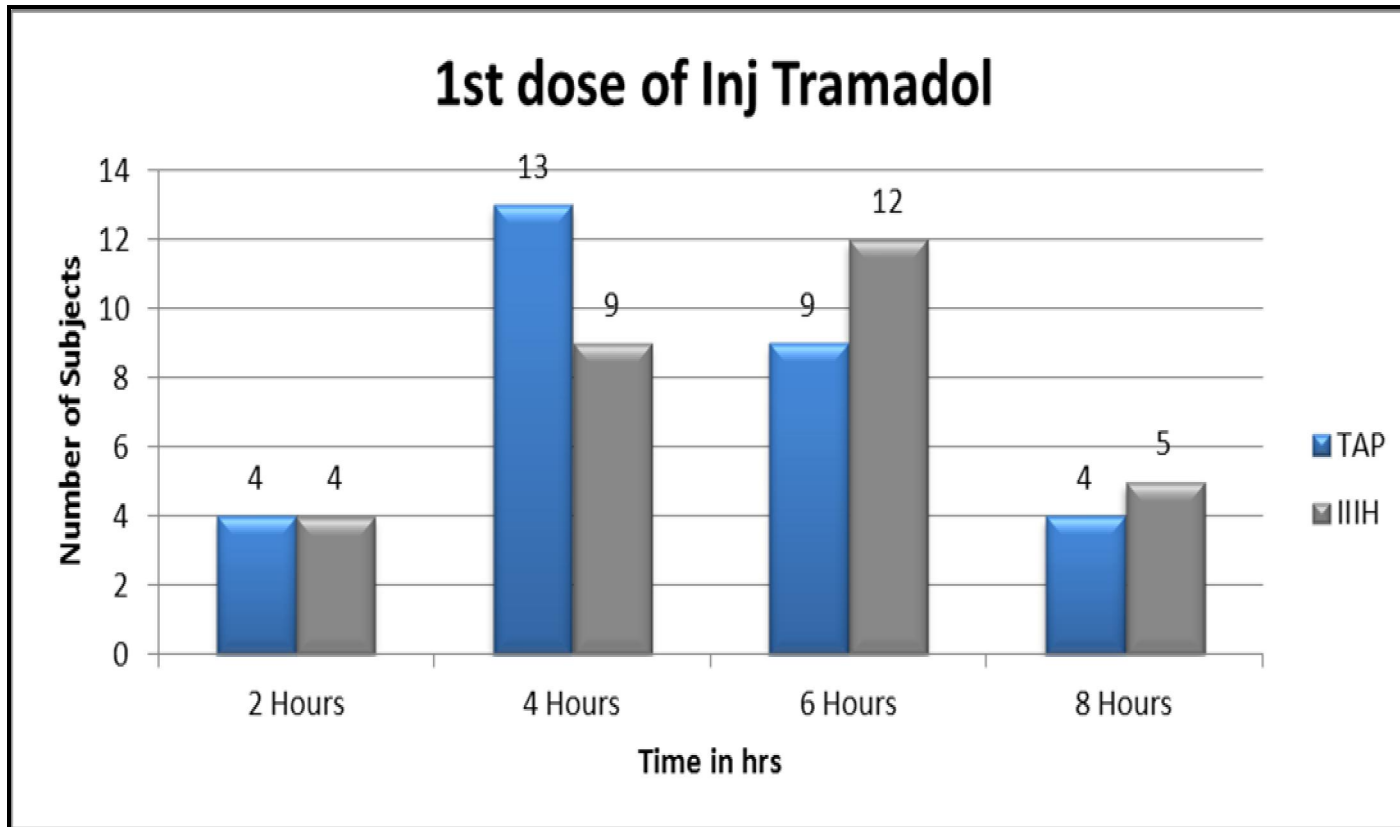
## VAS



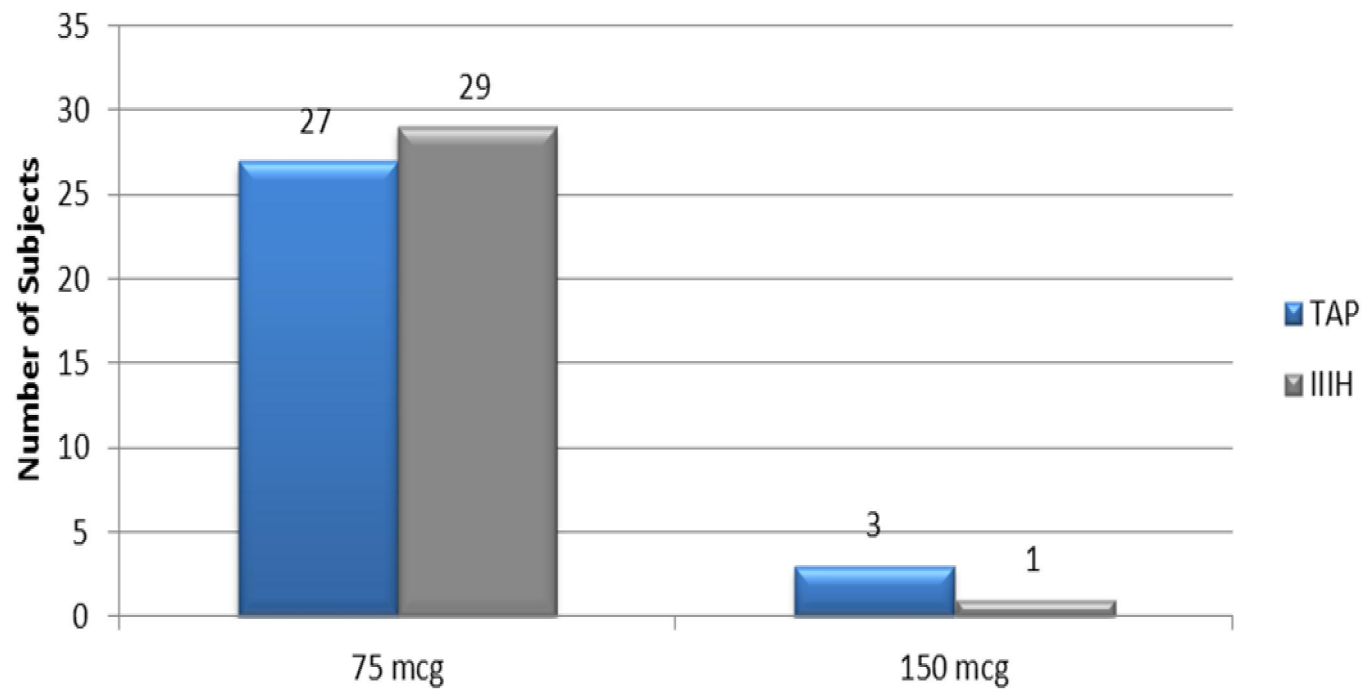
VAS		0 min	30 min	1 hr	2 hr	4 hr	6 hr	8 hr	12 hr	24 hr
TAP	N	30	30	30	30	30	30	30	30	30
	Mean	0.90	1.33	2.13	2.77	3.23	2.97	2.77	2.53	1.37
	SD	0.80	0.71	0.68	0.90	0.97	1.10	0.82	0.68	0.56
IIIH	N	30	30	30	30	30	30	30	30	30
	Mean	0.67	1.37	2.20	2.80	2.97	3.30	2.77	2.07	1.10
	SD	0.66	0.81	0.76	0.76	0.93	1.06	0.77	0.58	0.76
P value Unpaired t test		0.22427	0.865977	0.722086	0.877269	0.281423	0.235497	1.000	0.6094	0.126465

By conventional criteria the association between the treatment groups, The mean post-operative vas score at 4,6,12,24 hrs (TAP vs IIIH) are 3.23vs2.97; 2.97vs3.30; 2.53vs2.07; 1.37vs0.76, respectively. The post operative analgesia is considered to be statistically not significant since  $p > 0.05$ .

## TRAMADOL



## Total Tramadol Consumption in 24 hrs



<b>1st dose of Inj Tramadol</b>	<b>TAP</b>	<b>%</b>	<b>IIIH</b>	<b>%</b>
2 Hours	4	13.33	4	13.33
4 Hours	13	43.33	9	30.00
6 Hours	9	30.00	12	40.00
8 Hours	4	13.33	5	16.67
Total	30	100	30	100

<b>Dosage of Inj Tramadol</b>	<b>TAP</b>	<b>%</b>	<b>IIIH</b>	<b>%</b>
75 mcg	27	90.00	29	96.67
150 mcg	3	10.00	1	3.33
Total	30	100	30	100

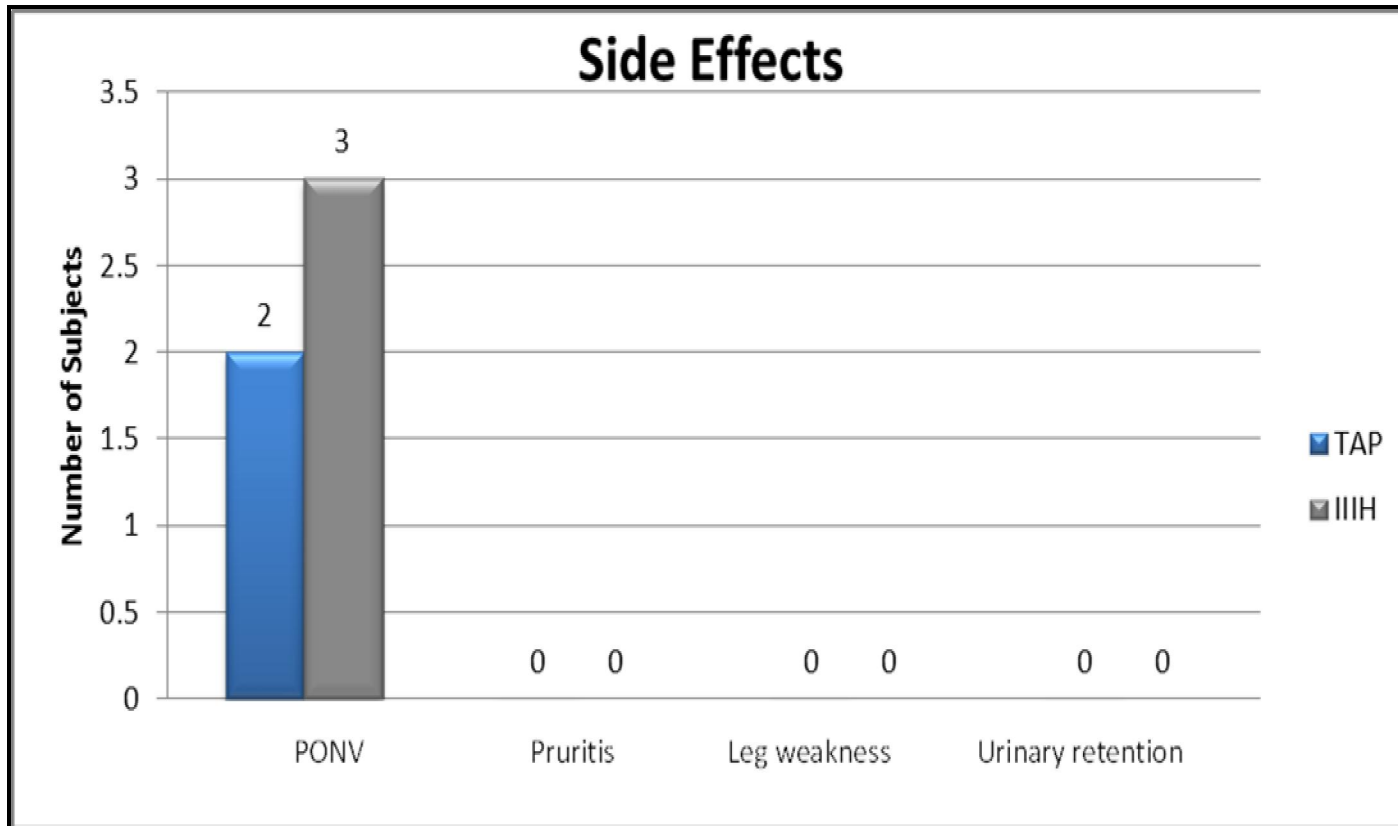
<b>1st dose of Inj Tramadol</b>	<b>TAH</b>	<b>IIH</b>
N	30	30
Mean	4.866667	5.2
SD	1.795268	1.864366
P value Unpaired t test	0.483385072	

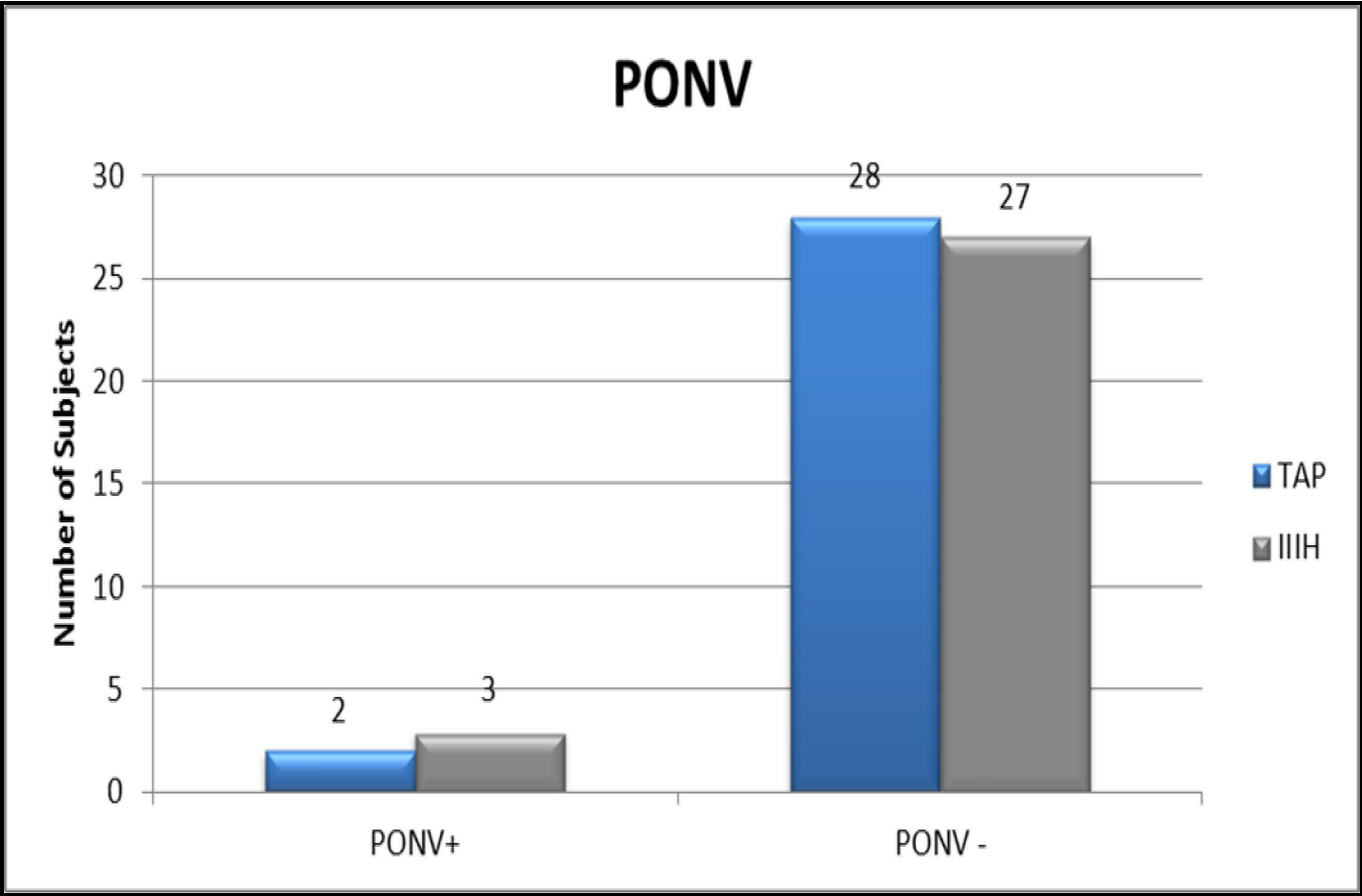
<b>Total Tramadol consumption in 24 hrs</b>	<b>TAH</b>	<b>IIH</b>
N	30	30
Mean	82.5	77.46667
SD	22.88464	13.70057
t test	0.306562368	

By conventional criteria the association between the treatment groups, the rescue analgesia using Tramadol is considered to be statistically not significant since  $p > 0.05$ .



## SIDE EFFECTS





Side Effects	TAP	%	IIIH	%
PONV	2	6.67	3	10.00
Pruritus	0	0.00	0	0.00
Leg weakness	0	0.00	0	0.00
Urinary retention	0	0.00	0	0.00
Nil	28	93.33	27	90.00
Total	30	100	30	100

Side Effects	TAP	%	IIIH	%
PONV+	2	6.67	3	10.00
PONV -	28	93.33	27	90.00
Total	30	100	30	100
Chi squared statistic	0.218			
Degrees of freedom	1			
P value Chi squared test without Yates correction	0.6404			

By conventional criteria the association between the treatment groups, the side effects is considered to be not statistically significant since  $p > 0.05$ .

## ***DISCUSSION***

## DISCUSSION

The analgesic efficacy of TAP block in the intraoperative and immediate post-operative period in lower abdominal or pelvic surgeries has been documented by many studies<sup>4,6,8,10,11,15,22</sup>. But these studies compared TAP block with a control group receiving systemic analgesia.

Hernia repair induces parietal pain depending on Ilioinguinal Iliohypogastric nerve distribution. The Ilioinguinal iliohypogastric nerve blocks, usually performed blindly, have been documented to provide effective post-operative analgesia<sup>23,24</sup>. There are very few studies compared TAP block with other regional blocks such as Ilioinguinal,Iliohypogastric nerve blocks<sup>5</sup> available.

**C.Aveline et al<sup>5</sup>, (2011)** compared ultrasound guided transversus abdominis plane block with conventional Ilioinguinal Iliohypogastric nerve blocks in open inguinal hernia repair.

The Ilioinguinal and Iliohypogastric nerves show frequent variation in their course and division at iliac crest. So the failure rate is as high as 10-30%<sup>21</sup>. The blind technique also carry a risk of possible transient femoral nerve palsy<sup>19,20</sup>, which could be

explained by faulty deposition of local anaesthetic deep to transversus abdominis muscle, i.e. between transversus abdominis and fascia transversalis. These disadvantages of blind technique can be overcome by using guided approach.

### **PRESENT STUDY:**

With these in mind we compared ultrasound guided transversus abdominis plane block with ultrasound guided Ilioinguinal, Iliohypogastric nerve blocks in patients undergoing open inguinal hernia repair.

- ❖ All patients were assessed in our pre anaesthetic assessment clinic. Patients satisfying inclusion criteria were included in the study with their informed consent.
- ❖ Sixty patients were randomly assigned into two groups of 30 each. Randomisation done by alternating patients to either Transversus abdominis plane block group (Group 1) or Ilioinguinal, Iliohypogastric nerve blocks group (Group 2)
- ❖ **Group 1:- pre operative ultrasound guided transversus abdominis plane block with 0.5 % bupivacaine.**

- ❖ **Group 2:- pre-operative ultrasound guided ilioinguinal, iliohypogastric nerve blocks with 0.5% bupivacaine.**
- ❖ In the operating room, all basic monitors were connected to the patient (ECG, SPO<sub>2</sub>, non invasive BP). Baseline vitals were recorded.
- ❖ Patients were given according to their group, either ultrasound guided transversus abdominis plane block with 0.5 % bupivacaine<sup>6</sup> (20ml) or ultrasound guided ilioinguinal, iliohypogastric nerve blocks with 0.5 % bupivacaine<sup>6</sup> (20ml).
- ❖ All patients were given inj cefotaxim 1gm IV, inj.Glycopyrrolate 0.2 mg IV, inj.Fentanyl 2 microgram / kg IV and induced with inj.Propofol 1.5 – 2mg/kg IV. Airway maintained with appropriate size laryngeal mask airway. Anaesthesia maintained with sevoflurane 1-2% and 50% N<sub>2</sub>O with O<sub>2</sub>.
- ❖ Intra-operative hemodynamics and fentanyl requirements were recorded.when mean arterial pressure exceeds 20% more than baseline inj.fentanyl 20 microgram is given.

- ❖ At the end of procedure patients were extubated, and post operatively received standard analgesic regime.(oral paracetamol 1 gm 6<sup>th</sup> hourly, oral diclofenac 50mg)<sup>6</sup>
- ❖ Patients were monitored post-operatively for Visual analogue pain scale (VAS) and incidence of side effects such as PONV, Pruritis, Leg weakness, Urinary retention. Inj tramadol 75 mg IV was used as rescue analgesic when VAS scores more than four.
- ❖ In our study the demographic profiles are comparable between two groups with respect to age, height, weight, BMI, and ASA PS.

#### **INTRAOPERATIVE HEMODYNAMICS:**

Intraoperative systolic blood pressure, diastolic blood pressures, mean arterial blood pressures, and heart rate between both groups were considered to be not statistically significant since p value is more than 0.05.

#### **INTRAOPERATIVE FENTANYL:**

The mean intraoperative fentanyl requirement in TAP group is  $132 \pm 17.49$  microgram and in IIIH block group is  $130.33 \pm$



14.49 microgram. The p value is 0.689, infers there is no significant difference in intraoperative fentanyl requirement between both groups.

#### **VISUAL ANALOGUE PAIN SCORE:**

No significant difference is noted in 24 hour VAS score between both groups.

*Abdurrahman Demirci et al<sup>23</sup>, 2013* conducted a study comparing ultrasound guided ilioinguinal, iliohypogastric nerve blocks with landmark method in 40 patients undergoing inguinal hernia repair. They concluded that VAS pain score at rest was significantly less in ultrasound guided ilioinguinal, iliohypogastric nerve blocks than anatomical landmark method.

*G .Niraj et al<sup>6</sup>, (2009)* concluded that Postoperative visual analogue scale pain scores were reduced in the TAP block group, compared to control group at 24 h [5.2 (4–6.2) vs 8 (7–8.5), P, 0.001] respectively.

*Abualhassan A Abdellatif et al<sup>25</sup>, 2013* compared ultrasound guided ilioinguinal, iliohypogastric nerve blocks with caudal block in fifty children undergoing unilateral groin repair. He concluded that post-operative analgesic efficacy of ultrasound guided

ilioinguinal; iliohypogastric nerve blocks are as effective as caudal block in unilateral groin surgeries.

**Sooyoung et al<sup>15</sup>, 2013** concluded that ultrasound guided TAP block with 0.5 %levobupivacaine provide effective post-operative analgesia for 12 hours following open appendicectomy.

### **TRAMADOL:**

The mean time of **First dose of inj tramadol** in TAP block group is  $4.86 \pm 1.79$  and in IIIH block group is slightly longer,  $5.2 \pm 1.86$  hours with p value of 0.48. Hence there is no significant difference.

No significant difference in **total tramadol consumption** in first 24 hours between both groups ( TAP  $82.5 \pm 22.88$  Vs IIIH  $77.46 \pm 13.7$  mg)

**G .Niraj et al<sup>6</sup>, (2009)** concluded that Ultrasound-guided TAP block significantly reduced postoperative morphine consumption in the first 24 h [mean (SD) 28 (18) vs 50 (19) mg, P, 0.002].

**Abualhassan A Abdellatif et al<sup>25</sup>, 2013** compared ultrasound guided ilioinguinal, iliohypogastric nerve blocks with caudal block in fifty children undergoing unilateral groin repair. And showed the

average time to first rescue analgesia was longer in ilioinguinal iliohypogastric block group  $253\pm 102.6$  min as compared to  $219.6\pm 48.4$  min in caudal block group.

### **SIDE EFFECTS:**

Since both blocks are ultrasound guided, no procedure related complications recorded. PONV occur in very few patients ( TAP 2 Vs IIIH 3) which is statistically not significant.

Our aim was mainly to compare the two block techniques, we did not include a control group without block because each of them had documented analgesic efficacy vs control.

***SUMMARY***

## SUMMARY

On comparing ultrasound guided transversus abdominis plane block with ultrasound guided ilioinguinal,iliohypogastric nerve blocks in patients undergoing unilateral open inguinal hernia repair,we found that,

The intra operative hemodynamics are well maintained in both groups

The intraoperative fentanyl requirement is nearly equal and comparable between two groups. (TAP block  $132 \pm 17.49$  microgram and IIIH block  $130.33 \pm 14.49$  microgram)

The post operative analgesia (24hr) in terms of visual analogue pain score is comparable between two groups.

The first dose of rescue analgesia is given  $4.86 \pm 1.79$  hours in TAP block group and  $5.2 \pm 1.86$  hours in IIIH block group,which is nearly equal in two groups.

The total 24 hours opioid consumption after surgery is nearly equal (TAP  $82.5 \pm 22.8$  mg Vs IIIH  $77.46 \pm 13.7$  mg) in two groups.

There are no recorded complications due to two techniques.

Thus in our study, the analgesic efficacy of ultrasound guided ilioinguinal,iliohypogastric nerve blocks in patients undergoing unilateral open inguinal hernia repair is comparable with ultrasound guided transversus abdominis plane block.

***CONCLUSION***

## **CONCLUSION**

In our study we concluded that the analgesic efficacy of ultrasound guided ilioinguinal, iliohypogastric nerve block is as effective as ultrasound guided transversus abdominis plane block in patients undergoing unilateral open inguinal hernia repair.



## **ABSTRACT**

### ***A PROSPECTIVE, RANDOMIZED STUDY COMPARING ULTRASOUND GUIDED TRANSVERSUS ABDOMINIS PLANE BLOCK AND ULTRASOUND GUIDED ILIOINGUINAL, ILIOHYPOGASTRIC NERVE BLOCKS IN PATIENTS UNDERGOING OPEN INGUINAL HERNIA REPAIR***

**Background:** Transversus Abdominis Plane Block and Ilioinguinal Iliohypogastric nerve blocks have been documented to provide effective analgesia after lower abdominal surgeries. But there are limited studies comparing both techniques.

**Methods:** Sixty patients undergoing unilateral open inguinal hernia repair were randomly assigned into two groups, either to receive ultrasound guided Transversus Abdominis Plane Block or ultrasound guided Ilioinguinal Iliohypogastric nerve blocks with 20 ml of 0.5% bupivacaine. All patients received general anaesthesia. The patients were monitored for intraoperative hemodynamics, intraoperative opioid requirement, and post operative visual analogue pain scale for 24 hours.

**Results:** Intraoperative hemodynamics between two groups was considered to be not statistically significant ( $p > 0.05$ ). The mean intraoperative fentanyl requirement in TAP group is  $132 \pm 17.49$  microgram and in IIIH block group is  $130.33 \pm 14.49$  microgram. The p value is 0.689. The mean post-operative vas score at 4, 6, 12, 24 hrs (TAP vs IIIH) are 3.23 vs 2.97; 2.97 vs 3.30; 2.53 vs 2.07; 1.37 vs 0.76, respectively. Thus the post-operative analgesia is considered to be statistically not significant between two groups, since  $p > 0.05$ .

**Conclusion:** we concluded that the analgesic efficacy of ultrasound guided ilioinguinal, iliohypogastric nerve block is as effective as ultrasound guided transversus abdominis plane block in patients undergoing unilateral open inguinal hernia repair.

**Key words:** Transversus Abdominis Plane Block, Ilioinguinal Iliohypogastric nerve blocks, analgesia, bupivacaine, general anaesthesia, opioid, visual analogue pain scale.

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***ANNEXURE***

**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. R.Venkatesh Kumar,  
Postgraduate MD (Anaesthesia),  
Madras Medical College,  
Chennai - 600 003.

Dear Dr. R.Venkatesh Kumar

The Institutional Ethics Committee has considered your request and approved your study titled **"A Prospective, randomized study comparing ultrasound guided transversus abdominis plane block and ultrasound guided ilioinguinal, iliohypogastric nerve blocks in patients undergoing open inguinal hernia repair" No. 34082014.**

The following members of Ethics Committee were present in the meeting held on **05.08.2014** 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. Prof.B.Kalaiselvi, M.D., Vice-Principal, MMC, Ch-3            | : Member Secretary   |
| 4. Prof.R.Nandhini, M.D., Inst.of Pharmacology, MMC              | : Member             |
| 5. Dr.G.Muralidharan, Director Incharge, Inst.of Surgery         | : Member             |
| 6. Prof.K.Ramadevi, Director i/c, Inst.of Biochemistry, MMC      | : Member             |
| 7. Prof.Saraswathy, M.D., Director, Pathology, MMC, Ch-3         | : Member             |
| 8. Prof.Tito, M.D., Director i/c, Inst.of Internal Medicine, MMC | : Member             |
| 9. Thiru S.Rameshkumar, Administrative Officer                   | : Lay Person         |
| 10. Thiru S.Govindasamy, B.A., B.L.,                             | : Lawyer             |
| 11. 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, Ethics Committee

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



## INTRODUCTION

*For all the happiness mankind can gain  
Lies not in pleasure but in relief from pain*

(Dryden - The Roman Emperor)

<sup>41</sup> Pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage. Postoperative pain is the main adverse outcome that distresses the patient, prolongs the hospital stay and increases the incidence of admission after surgery.

### Match Overview

1	&NA; . "Abstracts of th... Publication	1%
2	Aveline, C., H. Le Hetet... Publication	1%
3	Oliver, Jodi-Ann, and L... Publication	1%
4	www.science.gov Internet source	1%
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## **PATIENT CONSENT FORM**

### **STUDY TITLE:**

**“A Prospective, randomized study comparing ultrasound guided transversus abdominis plane block and ultrasound guided ilioinguinal, iliohypogastric nerve blocks in patients undergoing open inguinal hernia repair”**

### **STUDY CENTER:**

Institute of Anaesthesiology and Critical Care,  
Madras Medical College,  
Chennai- 600003.

### **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 any time 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 :**

**Place :**

**Signature / thumb impression of patient**

**Patient name**

**Signature of the investigator:**

**Name of the investigator:**

## **INFORMATION TO PARTICIPANTS**

**INVESTIGATOR :**

**NAME OF THE PARTICIPANT:**

**TITLE:**

**“A Prospective, randomized study comparing ultrasound guided transversus abdominis plane block and ultrasound guided ilioinguinal, iliohypogastric nerve blocks in patients undergoing open inguinal hernia repair”**

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 post-operative analgesia between ultrasound guided transversus abdominis plane block and ultrasound guided ilioinguinal, iliohypogastric nerve block using 0.5% bupivacaine.

### **THE PURPOSE OF THE RESEARCH:**

To compare ultrasound guided Transversus abdominis plane block and ultrasound guided ilioinguinal, iliohypogastric nerve blocks in patients undergoing open inguinal hernia repair with respect to,

- ✓ Intra operative hemodynamics,
- ✓ Intra operative opioid requirement,
- ✓ Post-operative visual analogue scale pain score.

## **STUDY DESIGN:**

- ✓ Prospective, randomized, single blinded, case control study
- ✓ 60 patients presenting for elective open inguinal hernia repair were randomly assigned to two groups.
  - Group 1- pre operative ultrasound guided transversus abdominis plane block with 0.5% bupivacaine
  - Group 2- pre operative ultrasound guided ilioinguinal, iliohypogastric nerve block with 0.5% bupivacaine.
- ✓ All patients were given general anaesthesia and airway maintained with laryngeal mask airway.

## **BENEFITS:**

The benefits of the study are:

- ✓ Ultrasound guided Transversus abdominis plane block or Ilioinguinal, Iliohypogastric nerve blocks given pre operatively, reduces fluctuations in intra operative hemodynamics, reduces opioid requirement, and causes post-operative pain relief.
- ✓ Complications associated with blind techniques are avoided by using ultrasound guidance
- ✓ Problems associated with central neuraxial blockade are avoided

**DISCOMFORTS AND RISKS.**

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

**Time :**

**Date :**

**Place :**

**Signature / Thumb Impression of Patient**

**Patient Name:**

**Signature of the Investigator :** \_\_\_\_\_

**Name of the Investigator :** \_\_\_\_\_

# PROFORMA

ROLL NO:

DATE:

NAME: IP NO:

AGE:

SEX:

HEIGHT:

WEIGHT:

DIAGNOSIS:

SURGICAL PROCEDURE:

ANAESTHETIC PLAN:

ASA PS:

MMC:

	<b>BP</b>	<b>HR</b>	<b>MAP</b>	<b>SPO2</b>	<b>Fentanyl bolus</b>
Baseline					
TAP/IIH					
Induction					
5 mins					
10 mins					
20 mins					
30 mins					
40 mins					
50 mins					
60 mins					
70 mins					

TOTAL INTRA OPERATIVE FENTANYL:

COMPLICATIONS IN INTRA OPERATIVE PERIOD:

COMPLICATIONS POST EXTUBATION:

POST OPERATIVE PAIN SCORE:

<b>Hours</b>	<b>0 min</b>	<b>30 mins</b>	<b>1</b>	<b>2</b>	<b>4</b>	<b>6</b>	<b>8</b>	<b>12</b>	<b>24</b>
VAS									
Inj tramadol									

SIDE EFFECTS

PONV:

Pruritis:

Leg weakness:

Urinary retention:











## GROUP-2 ULTRASOUND GUIDED ILIOINGUINAL, ILIOHYPOGASTRIC NERVE BLOCKS

S.No	IP No	Name	Age/Sex	Ht-cm/Wt-kg	BMI	Group	ASA PS	Baseline				Intraoperative SBP							
								SBP	DBP	MAP	HR	5 min	10 min	20 min	30 min	40 min	50 min	60 min	70 min
1	30014	Durai	50/M	160/59	23.05	2	1	131	83	99	71	125	130	123	125	133	134	136	
2	28081	Rajaram	50/M	167/70	25.1	2	2	116	78	90.7	58	112	118	120	118	123	130	133	
3	32933	Francis	40/M	163/68	25.59	2	1	128	84	98.7	80	116	118	121	128	125	133	133	
4	32903	Paranthaman	52/M	155/62	25.81	2	1	136	78	97.3	78	130	133	138	144	148	138		
5	37037	Gubendran	44/M	169/70	24.51	2	1	116	74	88	76	110	98	100	104	130	123	128	
6	35878	Kalaivanan	55/M	162/63	24.01	2	1	121	79	93	75	110	116	124	130	155	136	123	
7	32470	Gajendran	55/M	158/64	25.64	2	1	124	80	94.7	81	110	116	114	136	131	130	121	120
8	34911	Muthusamy	58/M	160/55	21.48	2	1	128	81	96.7	71	120	128	121	130	133	138	138	
9	35488	Prabhakaran	54/M	159/54	21.36	2	1	138	88	104.7	78	109	112	130	128	144	138	140	
10	38560	Antony	45/M	168/75	26.57	2	1	130	85	100	74	130	136	138	140	142	140	143	
11	36981	Pachaiyappan	60/M	160/57	22.27	2	2	136	85	102	72	138	133	130	133	148	146		
12	55217	Jayaram	59/M	163/62	23.34	2	1	128	81	96.7	69	126	134	130	136	139	133	130	
13	55442	Karthik	20/M	168/74	26.22	2	1	118	79	92	82	122	128	125	122	125	133	133	
14	53064	Madhanamohan	19/M	163/68	25.59	2	1	114	76	88.7	80	112	123	118	126	123	122	127	
15	54204	Umar	60/M	152/54	23.37	2	2	134	84	101	64	133	130	128	130	139	130	133	
16	56000	Janarthanan	39/M	162/65	24.77	2	1	127	84	98.3	76	123	128	123	123	123	128	133	
17	54381	Muniyappan	49/M	160/57	22.27	2	2	129	82	95	72	126	119	124	128	128	130	133	138
18	55401	Krishnamoorthy	52/M	163/69	25.97	2	1	117	74	88.3	74	110	103	112	115	120	119	123	
19	55940	Seenu	33/M	170/78	26.99	2	1	114	76	88.7	78	115	114	125	126	122	133		
20	56821	Mariyappan	54/M	163/61	22.96	2	1	135	89	101	70	125	125	133	131	130	133	134	
21	59567	Palpandiyan	60/M	158/49	19.63	2	2	134	91	103	71	133	126	124	128	130	139	133	
22	60487	Rajendran	56/M	160/69	26.95	2	1	130	83	99	74	136	130	128	126	128	133		
23	62795	Thirupathy	42/M	164/71	26.4	2	1	118	77	90.7	79	118	112	119	123	130	133		
24	63894	Tharunkumar	34/M	168/69	24.45	2	1	121	79	93	80	118	123	120	121	123	121	133	
25	62743	Arumugam	51/M	157/59	23.94	2	1	124	78	93.3	76	128	123	133	136	135	130	138	
26	62924	Gopalan	46/M	170/74	25.61	2	1	128	78	94.7	80	133	138	129	128	120	128	130	
27	63324	Kannan	49/M	166/71	25.77	2	1	127	84	98.3	79	123	120	123	128	133	138		
28	64737	Lakhmanaperumal	50/M	163/61	22.96	2	1	139	85	100	75	139	136	133	130	135	138	138	
29	63834	Duraisamy	39/M	168/70	24.8	2	1	124	81	95.3	84	128	126	119	124	136	138	133	
30	65710	Selvam	48/M	161/57	21.99	2	1	130	83	97	81	133	130	138	143	148	155	138	

## GROUP-2 ULTRASOUND GUIDED ILIOINGUINAL, ILIOHYPOGASTRIC NERVE BLOCKS

S.No	IP No	Name	Intraoperative DBP								Intraoperative MAP							
			5 min	10 min	20 min	30 min	40 min	50 min	60 min	70 min	5 min	10 min	20 min	30 min	40 min	50 min	60 min	70 min
1	30014	Durai	82	80	78	81	81	86	89		96.3	96.6	93	95.6	98.3	102	104	
2	28081	Rajaram	78	76	80	80	81	80	78		89.3	90	93.3	92.6	95	96.6	96.3	
3	32933	Francis	80	80	82	84	81	89	90		92	92.6	95	98.6	95.6	103.6	104.6	
4	32903	Paranthaman	78	76	78	90	91	81			95.3	95	98	108	110	100		
5	37037	Gubendran	79	72	74	74	91	86	81		89.3	80.6	82.6	84	104	98.3	96.6	
6	35878	Kalaivanan	71	78	81	86	94	84	86		84	90.6	95.3	100.6	114.3	101.3	98.3	
7	32470	Gajendran	78	79	78	84	81	80	76	74	88.6	91.3	90	101.3	97.6	96.6	91	89.3
8	34911	Muthusamy	74	71	72	79	78	81	83		89.3	90	88.3	96	96.3	100	101.3	
9	35488	Prabhakaran	69	71	84	74	90	81	91		82.3	84.6	99.3	92	108	100	107.3	
10	38560	Antony	80	84	83	90	90	89	94		96.6	101.3	101.3	106.6	107.3	106	110.3	
11	36981	Pachaiyappan	88	85	80	86	90	90			104.6	101	96.6	101.7	110	108.6		
12	55217	Jayaram	80	86	80	89	85	81	83		95.3	102	96.6	104	100	98.3	96	
13	55442	Karthik	64	82	82	78	80	86	85		81	94	92	90	92	101.7	101	
14	53064	Madhanamohan	81	81	76	80	78	79	84		90.6	95	90	93.3	93	89	94	
15	54204	Umar	81	83	86	84	85	90	91		98.3	98.6	100	99.3	103	103.3	105	
16	56000	Janarthanan	74	75	78	82	80	75	78		90.3	92.6	93	95.6	94.3	92.6	96.3	
17	54381	Muniyappan	80	67	74	82	78	80	86	90	95.6	85	90.7	97.3	94.6	96.6	101.7	106
18	55401	Krishnamoorthy	78	70	80	78	80	77	80		88.6	81	90.6	90.3	93.3	91.6	94.3	
19	55940	Seenu	68	65	88	84	83	63			83.7	81.3	100.3	98	98	86.3		
20	56821	Mariyappan	80	82	81	84	80	78	86		95	96.3	98.3	99.6	96.6	96.3	102	
21	59567	Palpandiyan	81	80	74	86	84	85	91		98.3	95.6	90.7	100	99.3	103	105	
22	60487	Rajendran	89	80	78	80	82	86			105.3	96.6	94.6	95.3	97.3	101.7		
23	62795	Thirupathy	76	81	78	81	72	78			90	90.6	91.6	95	91.3	98		
24	63894	Tharunkumar	80	81	80	80	78	81	81		92.6	95	93.3	93.6	93	94.3	98.3	
25	62743	Arumugam	75	74	78	79	75	72	78		92.6	90.3	96.3	98	98	91.3	98	
26	62924	Gopalan	81	86	80	76	70	77	80		98.3	103.3	96.3	93.3	86.6	90.6	96.6	
27	63324	Kannan	81	80	78	78	81	86			95	93.3	93	94.6	98.3	103.3		
28	64737	Lakhmanaperumal	86	89	81	80	82	86	90		103.6	105.3	98.3	96.6	99.6	103.3	106	
29	63834	Duraisamy	82	80	67	74	89	90	86		97.3	95.3	85	90.7	105.3	106	101.7	
30	65710	Selvam	86	82	88	90	96	99	90		103.3	98	104.6	107.6	113.3	117.6	106	

## GROUP-2 ULTRASOUND GUIDED ILIOINGUINAL, ILIOHYPOGASTRIC NERVE BLOCKS

S.No	IP No	Name	Intraoperative HR								Duration of sx(min)	Intraop inj fentanyl (microgram)	Postoperative VAS									
			5 min	10 min	20 min	30 min	40 min	50 min	60 min	70 min			0 min	30 min	1 hr	2 hr	4 hr	6hr	8hr	12 hr	24 hr	
1	30014	Durai	68	70	74	80	78	81	83		60	120	0	0	1	3	2	3	4	2	1	
2	28081	Rajaram	54	59	61	60	61	66	62		60	140	0	1	1	3	3	4	2	3	2	
3	32933	Francis	76	74	70	79	80	81	84		60	140	0	1	2	3	2	4	2	2	0	
4	32903	Paranthaman	71	78	81	82	83	80			80	120	1	0	1	2	3	3	4	2	1	
5	37037	Gubendran	69	64	61	64	68	65	64		60	140	1	1	2	3	2	4	3	2	2	
6	35878	Kalaivanan	70	72	79	78	86	74	72		60	130+20	1	1	2	4	2	3	3	2	1	
7	32470	Gajendran	71	69	68	76	74	72	76	78	70	130	0	1	1	2	2	3	4	2	0	
8	34911	Muthusamy	70	71	68	72	76	72	76		60	110	1	1	2	2	4	2	2	1	1	
9	35488	Prabhakaran	74	69	71	78	81	82	80		60	110	0	0	2	3	3	5	3	2	1	
10	38560	Antony	72	69	74	76	77	74	78		60	150+20	0	1	1	2	2	4	2	1	0	
11	36981	Pachaiyappan	68	70	74	78	79	72			50	120	1	2	3	2	2	4	2	2	0	
12	55217	Jayaram	74	69	73	76	79	78	76		60	120	0	1	2	3	3	3	4	2	1	
13	55442	Karthik	68	68	71	74	72	76	72		60	150	1	2	3	3	4	1	3	2	2	
14	53064	Madhanamohan	80	81	84	81	84	82	88		60	140	1	1	3	2	3	5	3	3	1	
15	54204	Umar	68	70	73	69	75	74	75		60	110	0	2	3	3	4	2	3	2	2	
16	56000	Janarthanan	73	75	74	78	82	77	78		60	130	0	1	1	2	3	4	2	3	2	
17	54381	Muniyappan	78	72	76	74	76	78	74	80	70	120	1	2	3	2	3	4	2	3	1	
18	55401	Krishnamoorthy	74	69	70	71	69	78	81		60	140	1	1	2	2	5	2	3	2	1	
19	55940	Seenu	81	76	84	80	84	86			50	160	2	2	2	3	4	2	3	2	2	
20	56821	Mariyappan	70	68	72	79	84	78	82		60	120	0	1	2	3	3	5	2	2	0	
21	59567	Palpandiyan	68	64	68	70	69	75	76		60	100	1	1	3	4	2	3	3	2	1	
22	60487	Rajendran	78	76	72	78	76	74			50	140	1	2	2	3	4	2	2	2	0	
23	62795	Thirupathy	72	74	74	73	76	75			50	140	1	2	3	3	2	4	2	3	2	
24	63894	Tharunkumar	78	81	82	86	81	83	88		60	140	0	1	2	3	3	5	3	2	1	
25	62743	Arumugam	78	71	76	80	84	81	86		60	120	2	3	3	3	4	2	2	3	2	
26	62924	Gopalan	78	82	80	77	81	86	80		60	150	0	1	3	2	3	4	2	2	1	
27	63324	Kannan	80	76	73	81	78	86			50	140	1	2	3	2	3	3	4	2	0	
28	64737	Lakhmanaperumal	72	78	75	80	78	83	86		60	120	2	3	3	3	5	3	2	1	1	
29	63834	Duraisamy	80	78	81	83	86	90	88		60	140	0	1	2	4	2	3	3	2	2	
30	65710	Selvam	78	80	79	86	88	99	91		60	120+20	1	3	3	5	2	3	4	1	2	

## GROUP-2 ULTRASOUND GUIDED ILIOINGUINAL, ILIOHYPOGASTRIC NERVE BLOCKS

S.No	IP No	Name	1st dose of Inj.Tramadol(Hr)	Total tramadol in 24 hrs(mg)	Side effects			
					PONV	Pruritis	Leg weakness	Urinary retention
1	30014	Durai	8	75	0	0	0	0
2	28081	Rajaram	6	74	0	0	0	0
3	32933	Francis	6	75	0	0	0	0
4	32903	Paranthaman	8	75	0	0	0	0
5	37037	Gubendran	6	75	0	0	0	0
6	35878	Kalaivanan	2	75	0	0	0	0
7	32470	Gajendran	8	75	0	0	0	0
8	34911	Muthusamy	4	75	0	0	0	0
9	35488	Prabhakaran	6	75	0	0	0	0
10	38560	Antony	6	75	0	0	0	0
11	36981	Pachaiyappan	4	75	0	0	0	0
12	55217	Jayaram	8	75	0	0	0	0
13	55442	Karthik	4	75	0	0	0	0
14	53064	Madhanamohan	6	75	0	0	0	0
15	54204	Umar	4	75	0	0	0	0
16	56000	Janarthanan	6	75	0	0	0	0
17	54381	Muniyappan	6	75	0	0	0	0
18	55401	Krishnamoorthy	4	75	0	0	0	0
19	55940	Seenu	4	75	1	0	0	0
20	56821	Mariyappan	6	75	0	0	0	0
21	59567	Palpandiyan	2	75	0	0	0	0
22	60487	Rajendran	4	75	0	0	0	0
23	62795	Thirupathy	6	75	0	0	0	0
24	63894	Tharunkumar	6	75	1	0	0	0
25	62743	Arumugam	4	75	0	0	0	0
26	62924	Gopalan	6	75	1	0	0	0
27	63324	Kannan	8	75	0	0	0	0
28	64737	Lakhmanaperumal	4	75	0	0	0	0
29	63834	Duraisamy	2	75	0	0	0	0