COMPARATIVE STUDY OF INTRATHECAL BUPIVACAINE AND LEVOBUPIVACAINE WITH FENTANYL FOR CESAREAN SECTION

Dissertation submmited to

THE TAMILNADU DR .M. G. R . MEDICAL UNIVERSITY

In partial fulfilment for the award of the degree of

DOCTOR OF MEDICINE

IN

ANAESTHESIOLOGY

BRANCH X

DEPARTMENT OF ANAESTHESIOLOGY

THANJAVUR MEDICAL COLLEGE

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MARCH 2018

CERTIFICATE

This is to certify that the dissertation entitled "**COMPARATIVE STUDY OF INTRATHECAL BUPIVACAINE AND LEVOBUPIVACAINE WITH FENTANYL FOR CESAREAN SECTION"** submitted by **Dr.SIVASANKAR . K** in partial fulfilment for the award of the degree of **Doctor of Medicine in Anaesthesiology - Branch - X** by the Tamilnadu Dr. M.G.R Medical University, Chennai is a bonafide record of the work done by him in the Department of Anaesthesiology, Government Thanjavur Medical College, during the academic year 2015 – 2018.

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DECLARATION

I, **Dr.SIVASANKAR. K** solemnly declare that the dissertation titled **COMPARATIVE STUDY OF INTRATHECAL BUPIVACAINE AND LEVOBUPIVACAINE WITH FENTANYL FOR CESAREAN SECTION"** is a bonafide work done by me at Thanjavur Medical College Hospital , Thanjavur, during 2015 – 2018.

The dissertation is submitted to **"The Tamilnadu Dr.M.G.R Medical University, Chennai"** Tamilnadu as a partial fulfilment for the requirement of M.D Degree examinations – Branch –X(Anaesthesiology) to be held in May 2018.

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INSTITUTIONAL ETHICAL COMMITTEE

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submitted by Dr. K. SIVASANKAR **of**

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Thanjavur

Dated : 21.9.16

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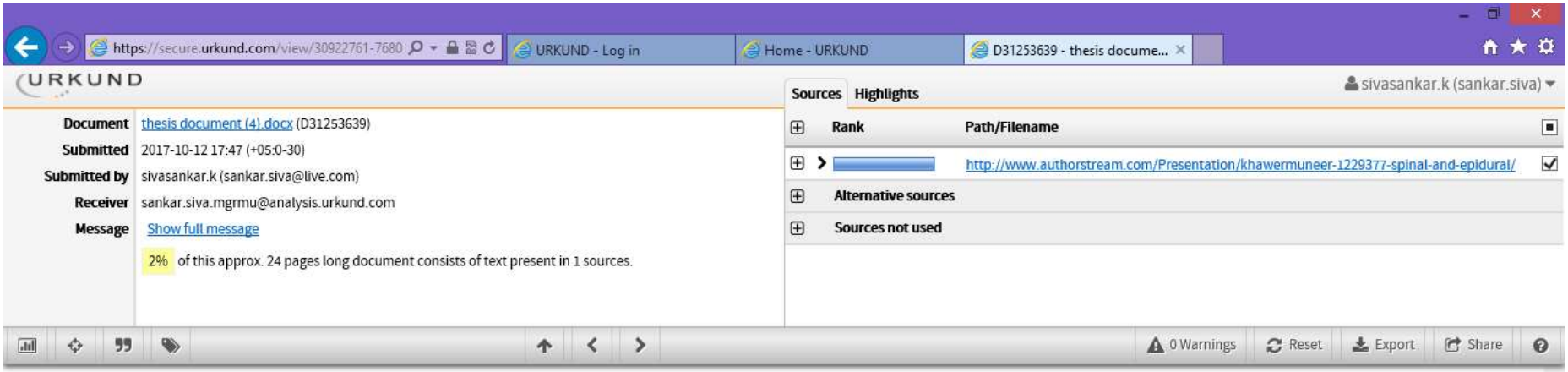

INTRODUCTION Spinal anesthesia was first administered by J.Leonard Corning's in Newyork in 1885.The first planned spinal anaesthesia for surgery in man was administered by August Bier on 16 August 1898, in Kiel, where he injected 3ml of 0.5% cocaine into intrathecal space. More than a century has passed and even now , it is one of the most popular technique for both elective and emergency surgical procedures such as caesarean sections, lower abdominal procedures, orthopedic and urological surgeries.

Spinal anaesthesia is widely used, providing a fast onset and effective sensory and motor blockade .Bupivacaine is available as a racemic mixture of its enantiomers, levobivacaine and dextrobupivacaine. In recent years, its pure S-enatiomers , levobupivacaine, ropivacaine, have been introduced into clinical practice because of their lower toxic effects for cardiovascular and central nervous system and hemodynamic effects .

In our study intrathecal levobupivacaine and bupivacaine with fentanyl as additive has been evaluated in elective cesarean section .

AIM OF THE STUDY

To compare the effects of intrathecal administration of 8.75 mg of 0.5% Hyperbaric Bupivacaine and 12.5 mcg of fentanyl with 8.75 mg of 0.5 % Isobaric Levobupivacaine and 12.5 mcg of fentanyl in cesarean section with respect to the following :

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CERTIFICATE – II

This is to certify that this dissertation work titled "**COMPARATIVE STUDY OF INTRATHECAL BUPIVACAINE AND LEVOBUPIVACAINE WITH FENTANYL FOR CESAREAN SECTION ”** of the candidate DR.SIVASANKAR . K with registration Number 201520206 for the award of the degree of DOCTOR OF MEDICINE in ANAESTHESIOLGY - Branch - X. I personally verified the urkund.com website for the purpose of plagiarism Check. I found that the uploaded thesis file contains from introduction to conclusion pages and result shows 2 (two) percentage of plagiarism in the dissertation.

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CONTENTS

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1. Efficacy of sensory blockade ,
2. Efficacy of motor blockade,
3. Duration of analgesia,
4. Hemodynamic parameters,
5. Neonatal outcome in both the groups.

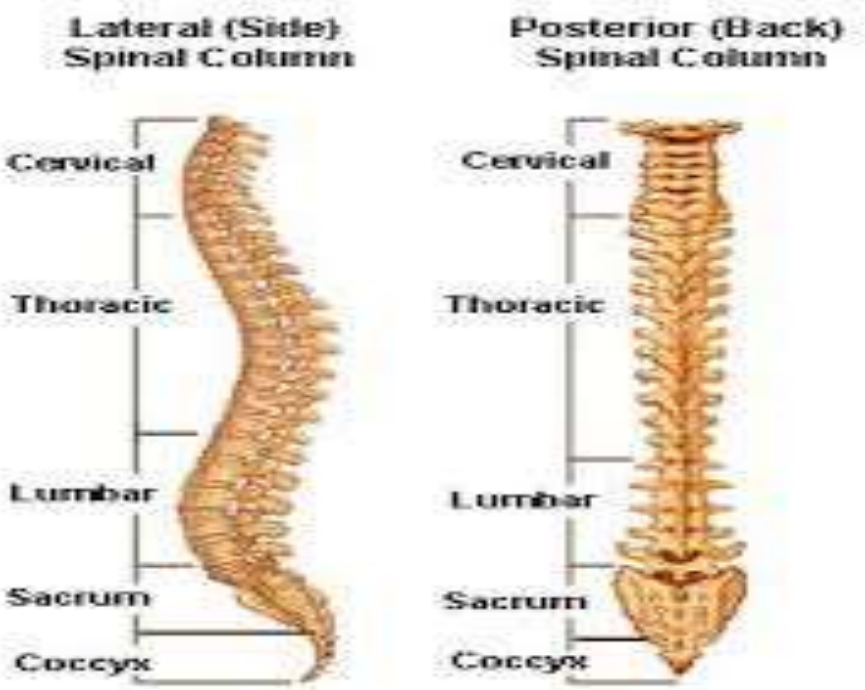
ANATOMY

Spinal anaesthesia results in sympathetic blockade, sensory analgesia or anaesthesia and motor blockade . It depends on the dose, concentration or volume of local anaesthetic into the subarachnoid space.

The vertebral canal extends from the foramen magnum to the sacral hiatus. There are seven cervical; twelve thoracic and five lumbar vertebrae. The sacrum comprises five and the coccyx four fused segments. The adult spine presents four curvatures. They are as follow, cervical and lumbar zones are convex forwards (lordosis), whereas those of the thoracic and sacral regions are concave forwards (kyphosis).

The former are postural , while the latter are produced by the actual configuration of the bones themselves. The vertebrae are held together by a series of overlapping ligaments namely,

- Anterior longitudinal ligament
- Posterior longitudinal ligament
- Ligamentum flavum
- Interspinous ligament
- Supraspinous ligament
- Intervertebral discs



There are certain common palpable landmarks that may correspond to particular level, including the most prominent spinous process which usually corresponds to the seventh cervical vertebra. The inferior angle of scapula usually corresponds to the seventh thoracic vertebra. Tuffier line, the line connecting the two iliac crests almost crosses the vertebral column at the level of L4-L5 intervertebral space.

The intervertebral canal consists of:

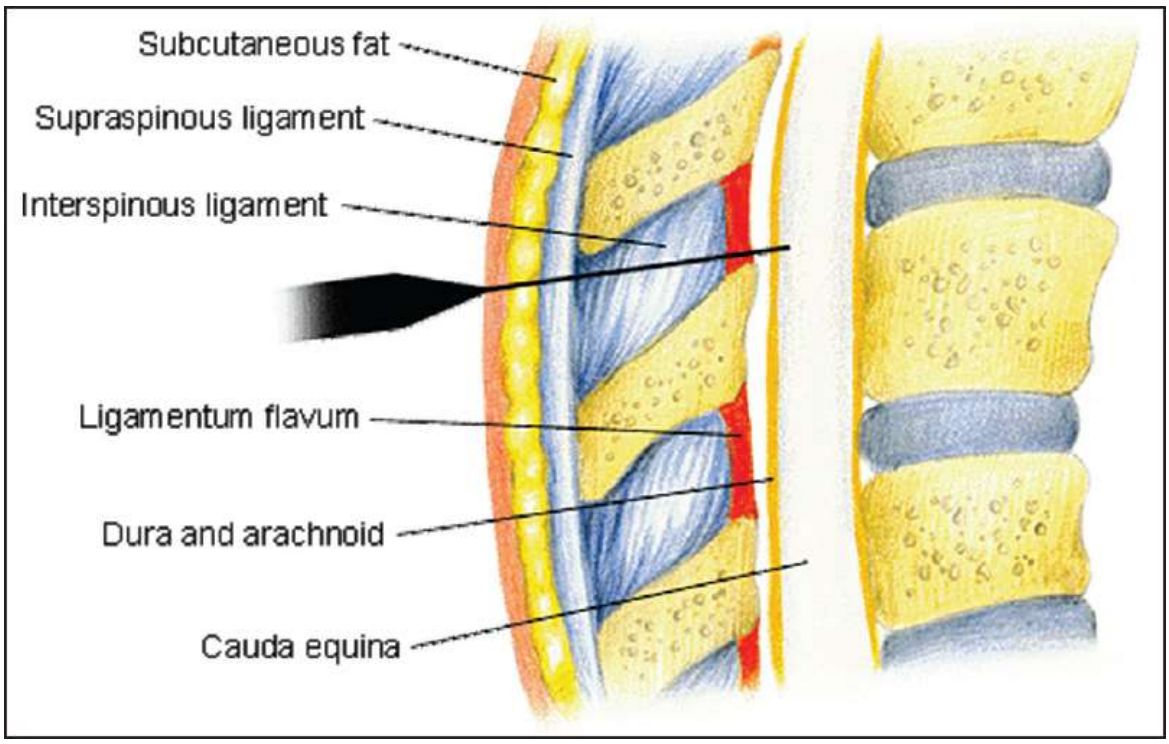
- Roots of spinal nerves,
- Spinal membrane with the spinal cord and cerebrospinal fluid,
- Vessels fat and areolar tissue.

The spinal cord is the continuation of medulla oblongata and it ends below in conus medullaris from which filum terminale descends vertically as cauda equina .The extent of the spinal cord is from the upper border of atlas to the lower border of first lumbar vertebra in adults .The spinal cord extends till the upper border of second lumbar vertebra and still lower in infants.

The coverings of spinal cord from outside to inside are :

- Duramater,
- Arachnoidmater,
- Piamater.

The duramater is attached to the margins of foramen magnum above and ends below at the lower border of the second sacral vertebra .The anterior and posterior nerve roots from the spinal cord pierce the investing layer of duramater.

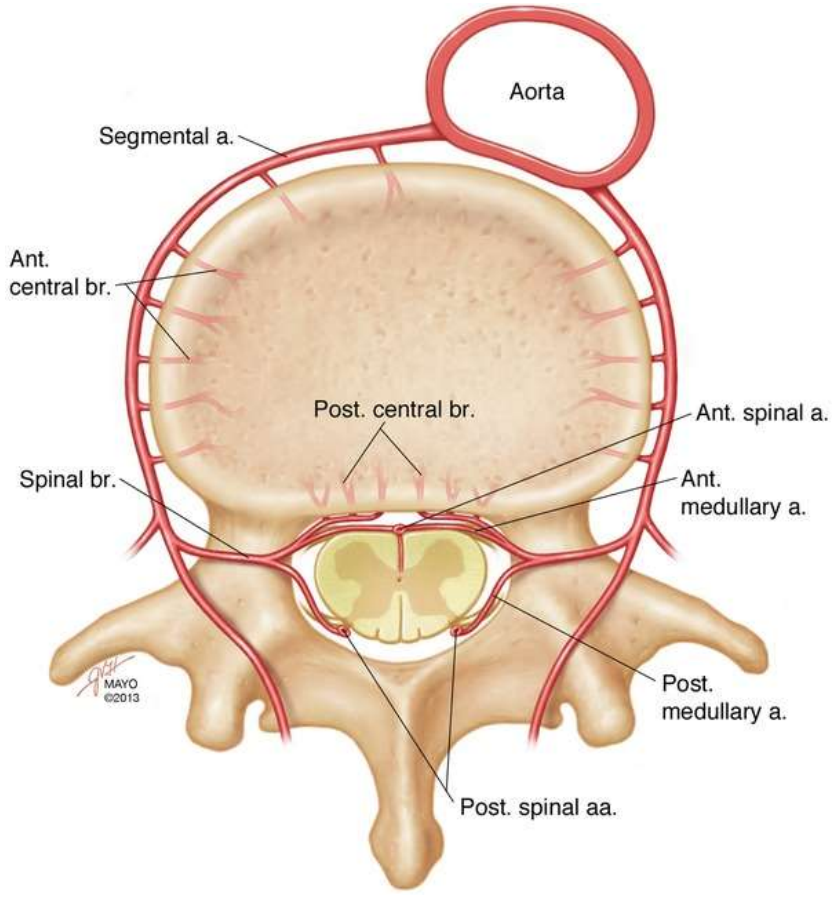


Blood supply of spinal cord

Blood supply of spinal cord is mainly from three longitudinal arterial channels namely ;

- One anterior spinal artery
- Twoposteriorspinalarteries

The main source of blood supply to the spinal arteries is from the vertebral arteries. However it reaches only up to the cervical segment of the cord . The spinal arteries also received blood through radicular arteries that reaches the cord along the roots of spinal nerves. These radicular arteries form the vertebral ,ascending cervical, deep cervical, intercostals, lumbar and sacral arteries.



Some of these radicular arteries are larger in size. They are radicularis magna ,or artery of Adamkiewicz, the largest of the radicular (dural cuff) which blends with the perineurium of the mixed spinal nerve.

The arachnoid mater is a thin transparent sheath closely applied to duramater. The subdural space is a potential space which contains it contains only a small amount of serous fluid to allow the dura and arachnoid membranes to move over each other.

The pia mater closely invests the cord and sends delicate septa into its substances. From each lateral surface of the piamater, a fibrous band ,the denticulate ligament projects into the subarachnoid space. Inferiorly the piamater ends as a prolongation termed as filum terminale which penetrates the distal end of dural sac and is attached to the periostium of coccyx.

The subarachnoid space is filled with the cerebrospinal fluid and it contains the spinal nerve roots and the denticulate ligament. Lumbar puncture is routinely done below the second lumbar vertebra to L5-S1 interspace to avoid damaging the spinal cord which ends at the lower border of first lumbar vertebra. Arteries and it may responsible for supplying blood to as the lower two – thirds of the spinal cord .Its position is variable, there is no anastamosis between the anterior spinal artery and the posterior spinal artery. So the occurrence of thrombosis in any of these arteries will cause spinal cord infarction.

Venous drainage of the spinal cord is mainly through six longitudinal venous channels. They are anteromedian and posteromedian venous channels which lies in the midline and two paired anterolateral and posterolateral channels. These channels join together and form a venous plexus, from here the venous blood drains through the radicular vein, intersegmental vein , the vertebral veins in the neck, the azygos veins in the thorax ,lumbar veins in the abdomen and lateral sacral veins in the pelvis.

CEREBROSPINAL FLUID

The cerebrospinal fluid is an ultrafiltrate of plasma secreted by choroid plexus of third fourth and lateral ventricles at a rate of 0.3 to 0.5m1/min. The average volume ranges from 120 to 150ml, of which 25ml is in the cerebral subarachnoid space 35ml in the ventricles and about 75 ml is in the spinal subarachnoid space. It is a colourless liquid with slight opalescence due to globulin.

Circulation of cerebrospinal fluid

From the lateral ventricles it enters the 3rd ventricles through the interventricular foramina. Then it flows through the cerebral aqueduct and it reaches the 4th ventricle. Through the foramen of magendie and luschka in the roof the 4th ventricle it enters the subarachnoid space and circulates over the cerebral hemispheres and around the spinal cord.

Physical characteristics of cerebrospinal fluid

pH	: 7.4
Specific gravity at body temperature	: 1.007
Specific gravity at 4 degree celsius	: 1.0003
Density	: 1.0003gm/ml
Baricity	: 1.000
Pressure in supine position	: 8-12 mm of Hg
Cells	: 3-5 / cu.mm
Proteins	: 20mg / d1
Glucose	: 45 -80 mg/d1

Absorption

The main site of cerebrospinal fluid absorption is into the venous system through the arachnoid villi and arachnoid granulations .These are most numerous in superior sagittal sinus and its lateral lacunae. Approximately 300-380 ml of cerebrospinal fluid enters venous circulation each day.

It plays an important role in spinal anesthesia as a media for dispersion of the local anesthetic drug to the spinal nerve. Specific gravity of the injected solution is an important factor in determining the spread of the local anesthetic drug in the subarachnoid space.

MECHANISM OF ACTION OF LOCAL ANAESTHETIC DRUGS

Local anesthetic solution injected into the subarachnoid space mixes with the cerebrospinal fluid and comes into contact with the spinal cord and the peripheral nerve roots . And it leaving the spinal canal are readily exposed to the local anesthetic solution as they are not covered with epithelium.

Local anesthetic drugs prevent the transmission of nerve impulses (conduction blockade) by inhibiting the passage of sodium ions through ion-selective sodium channels in nerve membranes. The failure of sodium

ion channel permeability to increase slows the rate of depolarization so that the threshold potential is not reached and thus an action potential is not propagated. Local anesthetics do not alter the resting transmembrane potential or threshold potential.

Zone of Differential Blockade

In subarachnoid block ,sympathetic fibres are blocked two to six segments higher than the sensory fibres. Sympathetic block will be greater when more concentrated solutions are used or when adrenaline is added . Motor block will be two segments below the sensory block.

Nerve fibres are blocked in the following order

1. Autonomic preganglionic B fibres
2. Temperature fibres – cold fibres first followed by warm fibres
3. Pinprick fibres
4. Fibres conveying pain greater than pin prick
5. Touch fibres
6. Deep pressure fibres
7. Somatic motor fibres
8. Fibres conveying vibratory sense and proprioceptive impulses.

During recovery ,sensations return in the reverse order, but it has been suggested that sympathetic activity returns before sensation.

SPREAD OF LOCAL ANAESTHETICS IN SUBARACHNOID SPACE

The local anaesthetic solution is diluted by CSF and therefore its original concentration is less than the actual mass of drug injected. Spread is also determined by the baricity of the injected solution. Baricity is a ratio comparing the density of a local anaesthetic solution at a specific temperature to the density of CSF at the same temperature.

A hypobaric solution has a baricity less than 1.0000 or specific gravity less than 1.0069 (the mean value of specific gravity). A hyperbaric solution has a baricity greater than 1.0000 or specific gravity more than 1.0069.Hypobaric and Hyperbaric solutions are prepared from isobaric solutions by the addition of various amounts of sterile distilled water and dextrose respectively.

Isobaric solutions do not move under the influence of gravity in the CSF. Hyperbaric solutions, being heavier than CSF, settle to the most dependent aspect of the subarachnoid space, which is determined by the position of the patient. In supine patient, hyperbaric solutions gravitate to the thoracic kyphosis. Hypobaric solution floats up against the gravity to the nerves innervating the surgical site.

FATE OF LOCAL ANAESTHETICS IN SUBARACHNOID SPACE

After injection of local anaesthetic solution into subarachnoid space, its concentration falls rapidly. The initial steep fall is due to mixing with CSF and subsequent absorption into nerve roots and spinal cord. The removal of local anaesthetic solution following subarachnoid injection is primarily by vascular absorption.

Depending on the type of the drug used it is metabolized in plasma by pseudo cholinesterase or in the liver the addition of a vasoconstrictor to the local anaesthetic solution will decrease the absorption of the drug and thus increase the duration of anaesthesia.

PHYSIOLOGICAL EFFECTS OF SUBARACHNIID BLOCK

Cardiovascular effects

Vasomotor tone is determined by sympathetic fibers arising from T5 to L1 and innervating arterial and venous smooth muscle. Hence sympathetic block will cause a decrease in blood pressure that may be accompanied by a decrease in heart rate. With high sympathetic block, sympathetic cardiac accelerator fibers arising at T1-T4 are blocked, leading to decreased cardiac contractility. Bezold Jarisch reflex has been implicated as a cause of bradycardia, hypotension and cardio vascular collapse after central neuraxial anaesthesia,in particular spinal anesthesia.

Respiratory effects

Even with high thoracic levels , the tidal volume remains unchanged. A small decrease in vital capacity is due to paralysis of abdominal muscles necessary for forced exhalation and not due to phrenic nerve involvement or impaired diaphragmatic function .Effective coughing and clearing of secretions may get affected with higher levels of block. Respiratory arrest associated with spinal anaesthesia is rare and is due to hypo perfusion of respiratory centers in brain stem.

Gastrointestinal function

Nausea and vomiting is seen upto 20% of patients. It is due to gastrointestinal hyperperistalsis caused by unopposed parasympathetic activity. Vagal tone dominance results in a small contracted gut with active peristalsis and can provide excellent operative conditions .Hepatic blood flow will decrease with reductions in mean arterial pressure.

Renal function

Renal function has a wide physiological reserve. Decrease in renal blood flow is of little physiological importance. Neuraxial blocks are a frequent cause of urinary retention which delays discharge of outpatients and necessitates bladder catheterization of inpatients**.**

INDICATIONS FOR SUBARRACHNOID BLOCK:

Spinal anaesthesia can be administered for following surgeries ,

- Cesarean section,
- Lower limb surgeries,
- Urological procedures,
- Lower abdominal surgeries,
- Gynecological surgeries

CONTRAINDICATIONS FOR SUBARACHNOID BLOCK

The absolute contraindication for subarachnoid block are

1.Patient refusal,

2.Local sepsis.

The relative contraindications include

1. Raised intracranial pressure
2. Coagulopathy
3. Neurological disease
4. Fixed cardiac output states,
5. Documented allergy to local anesthetics,
6. Major spine deformities or previous surgery on the spine,
7. Hemodynamic instability

FACTORS INFLUENCING HEIGHT OF ANALGESIA IN SUBARACHNOID BLOCK

1. Dose of the drug injected,
2. Volume of fluid injected ,
3. Specific gravity of the solution ,
4. Position of the patient after injection ,
5. Choice of interspace ,
6. Patient factors-Age ,Height and Pregnancy.

FACTORS NOT INFLUENCING HEIGHT OF ANALGESLA IN SUBARACHNOID BLOCK

- Patient factors – Weight, Sex
- Barbotage,
- Rate of injection,
- Composition and circulation of cerebrospinal fluid,
- Direction of bevel of the standard needle (although not of the Whitacare needle)

COMPLICATIONS OF SUBARACHAOID BLOCK

The immediate complications are,

- Hypotension
- Bradycardia
- Toxicity due to intravascular injection
- Allergic reaction to local anesthetic
- Hypoventilation (brain stem hypoxia)

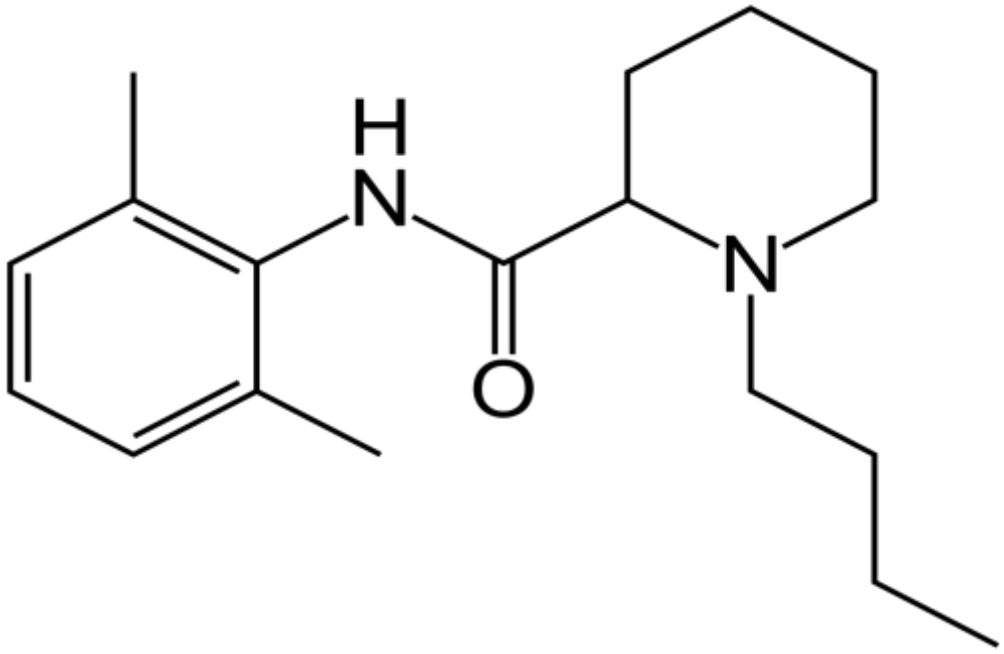
The late complications include

- Postdural puncture headache
- Retention of urine
- Backache
- Meningitis
- Transient neurological symptoms
- Cauda equina syndrome
- Anterior spinal artery syndrome
- Horner’s syndrome

BUPIVACAINE

Bupivacaine an anion amide local anaesthetic was first synthesized in Sweden by A.F Ekenstam and his colleagues in 1957 .First report of its use was in 1963 by L.J Teluvio. It is one of the long acting local anesthetic agents available which is extensively used for intrathecal extradural and peripheral nerve blocks it is a white crystalline powder soluble in water.

CHEMICAL STRUCITURE OF BUPIVACAINE



1-butyl-n-(2,6-dimethylphenyl) piperidine-2-carboxamide

Physiochemical properties

- Molecular formula C18 H28 N20 HCL,
- Molecular weight 288.43 g/mol,
- Solubility in water 25 mg/ml ,
- pH of saturated solution 5.2 ,
- P ka 8.1 ,
- Specific gravity 1.021 at 37 degree C ,
- Melting point 247-258 degree C

Mechanism of action

Mechanism of action of bupivacaine is similar to that of any other local anaesthetic. The primary action of local anaesthetics is on the cell membrane axon, on which it produces electrical stabilization. Bupivacaine prevents transmission of nerve impulses (conduction blockade) by inhibiting passage of sodium ions through ion selective sodium channels in nerve membranes .

The sodium channel is a specific receptor for local anesthetic molecules. Failure of sodium ion channel permeability to increase slows the rate of depolarization such that threshold potential is not reached and thus an action potential is not propagated local anesthetics do not

alter the testing transmembrane potential or threshold potential

The mechanism by which local anesthetics block sodium conductance is as follows:

1. Local anesthetics in the cationic from act on the receptors within the sodium channels on cell membrane and block it .The local anesthetics can reach the sodium channel either via the liphophilic pathway directly across the lipid membrane, or via the axoplasmic opening. This mechanism accounts for 90% of the nerve blocking effects of amide local anesthetics.
2. The second mechanism of action is by membrane expansion this is a nonspecific drug receptor interaction

Other site of action targets:

- Voltage dependent potassium ion channels
- Calcium ion currents (L-type most sensitive)
- G protein coupled receptors

Dosage depends on

- Area to be anaesthetized ,
- Number of nerve segments to be blocked ,
- Individual tolerance ,
- Technique of local anaesthesia ,
- Vascularity of area .

Bupivacaine is available in the following concentrations :

- 0.25%, 0.5% and 1% ,
- 0.25% and 0.5% solution in isotonic saline ,
- 0.5% solution in 8% dextrose.

Dosage is 2mg/kg limited to 150mg in four hours, the intrathecal minimum local analgesic dose of Bupivacaine is 2.37 mg.

Type of block	Concentration	Dosage in ml	Dosage in mg
Sub arachnoid block	0.5-0.75%	02-04	Upto 20
Epidural block	0.25-0.5%	15-30	50-200
Caudal block	0.25-0.5 %	15-30	75-150
Brachial plexus block	0.25-0.5%	15-30	75-225
Intercostal nerve block	0.25-0.5%	3-5/nerve	15-20/nerve
Local infiltration	0.25-0.5%	5-20	Upto 175 mg

These doses may be repeated in 3-4hrs but 400 mg is the maximum dose in 24 hrs .Addition of vasoconstrictor produces a very slight increase in the duration of action . However the peak blood level is significantly reduced thereby minimizing the systemic toxicity.

ANESTHATIC POTENCY

Hydrophobicity appears to be a primary determinant of intrinsic anesthetic potency and Bupivacaine is highly hydrophobic , hence is very potent .

ONSET OF ACTION

The onset of conduction blockade is dependent on the dose or concentration of the local anaesthetic. The onset of action of Bupivacaine is between 4-6 minutes and maximum anaesthesia is obtained between 15-20 minutes.

DURATION OF BLOCK

The duration of anaesthesia varies according to the type of block. The average duration of peridural block is about 3.5-5 hours for nerve blocks it is about 5-6 hours.

Pharmacokinetics

The concentration of Bupivacaine in blood is detetmined by the amount injected , the rate of absorption from the site of injection ,the rate of tissue distribution and the rate of biotransformation and excretion of Bupivacaine. Bupivacaine can be detected in the blood within 5 mins of infiltration or following epidural or intercostals nerve blocks. Plasma levels are related to the total dose administered, peak levels of 0.14 to 1.18 mcg/ml were found within 5 mins to 2 hrs and they gradually declined to 0.1 to 0.34 mcg/ml by 4 hrs.

PLASMA BINDING

In plasma, drug binds avidly with protein to the extent of 70-90%.

ABSORPTION

The site of injection , dose and addition of a vasoconstrictor determine the systemic absorption of Bupivacaine. The maximum blood level of Bupivacaine is related to the total dose of drug administered from any particular site. Absorption is faster in areas of high vascularity

TOXICITY

The toxic plasma concentration is 4-5 mcg/ml .Maximum plasma concentration rarely approach toxic levels.

DISTRIBUTION

The two compartment model can describe this. The rapid distribution phase is believed to be related to uptake by rapid equilibrating tissue i.e., tissues that have high vascular perfusion . The slow distribution phase is mainly a function of distribution to slowly equilibrating tissue, biotransformation and excretion of the compound .

More highly perfused organs show higher concentrations of the drug Bupivacaine is rapidly excreted by lung tissues.

Though skeletal muscle does not show any particular affinity for Bupivacaine it is the largest reservoir of the drug.

DISTRIBUTION CHARACTERISTICS

T1/2 : 2-7 minutes (uptake by rapid equilibrium tissue),

T1/2 : 28 minutes (distribution by slowly perfused tissues),

T1/2 :3-5 hours (metabolism and elimination),

VDSS :72 liters (volume of distribution at steady state).

Pharmacodynamics

Central Nervous System

Bupivacaine readily crosses the blood brain barrier causing CNS depression following higher doses. The initial symptoms involve feeling of light – headedness and dizziness followed by visual and auditory disturbances. Disorientation and drowsiness may occur, objective signs are usually excitatory in nature, which includes shivering , muscular twitches and tremors .Initially involving muscles of the face (perioral numbness) and part of extremities.

At still higher doses cardiovascular or respiratory arrest may occur acidosis increases the risk of CNS toxicity from Bupivacaine, since an elevation of paCO2 enhances blood flow, so that more anaesthetic is delivered rapidly to the brain.

Autonomic nervous system

Bupivacaine does not inhibit the noradrenaline uptake and hence has no sympathetic potentiating effect .Myelinated preganglionic B fibers have a faster conduction time and are more sensitive to action of Bupivacaine. When used for conduction blockade, all local anesthetics particularly Bupivacaine produces higher incidence of sensory than motor fibers.

Cardiovascular system

The primary cardiac electrophysiological effect of local anaesthetic is a decrease in the maximum rate of depolarization in purkinje fibres and ventricular muscle .This action by bupivacaine is far greater compared to Lignocaine. Also the rate of recovery of block is slower with Bupivacaine.

Therefore there is complete restoration of V max between action potential particularly at higher rates. Therefore Bupivacaine is highly arrythmogenic. Bupivacaine reduces the cardiac contractility by blocking, the calcium transport. Low concentration of Bupivacaine produces vasoconstriction whereas high doses cause vasodilatation.

Respiratory system

Respiratory depression may be caused if excessive plasma level is reached which in turn results in depression of medullary receptor center. Respiratory depression may be also caused by paralysis of respiratory muscles of diaphragm as may occur in high spinal or total spinal anaesthesia.

Biotransformation and excretion

Bupivacaine undergoes enzymatic degradation primarily in the liver. The excretion occurs primarily via the kidney. Renal perfusion and factors affecting urinary pH affect urinary excretion. Less than 5% of Bupivacaine is excreted via the kidney unchanged through urine. The major portion of injected agent appears in urine in the form of 2,6 pipecolyoxylidine (ppx) which is a n- dealkylated metabolite of bupivacaine. Renal clearance of the drug is related inversely to its protein binding capacity and pH of urine.

Adverse effects

Adverse effects are encountered in clinical practice mostly due to overdose inadvertent intravascular injection or slow metabolic degradation.

CNS

Characterized by ,excitation or depression. The first manifestation may be nervousness dizziness blurring of vision or termors followed by drowsiness, convulsions, unconsciousness and respiratory arrest.

CVS

Myocardial depression, hypotension, arrhythmia, ventricular type conduction defect, SA node depression and cardiac arrest.

ALLERGIC REACTIONS

Utricaria, bronchospasm, hypotension.

OTHER

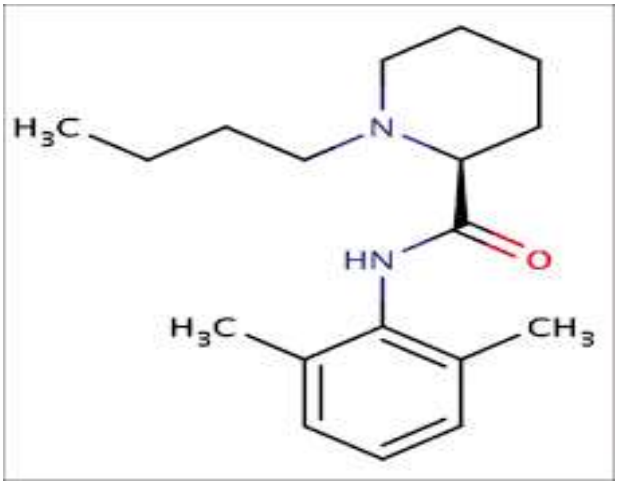
Nausea, vomiting ,chills, constriction of pupil and tinnitus.

PHARMACOLAGY OF LEVOBUPIVACAINE

Levobupivacaine is a long acting amide – type local anesthetic that is the S(-) /3 isomer of the racemate bupivacaine. In general in vitro in vivo and human volunteer studies of nerve block indicate that levobupivacaine is as potent as bupivacaine and produces similar sensory and motor block.

A trend towards a longer sensory block with levobupivacaine was seen in some in some studies, and may be related to the greater vasoconstictive activity of levobupivacaine than that of the R(+) – enantiomer (dexbupivacaine) at lower doses. The minimum local analgesic concentration was 0.083% for epidural levobupivacaine 20ml and 0.081% for bupivacaine 20ml in woman in the first stage of labour.

In vitro findings indicating a lower risk of cardiotoxicity with levobupivacaine compared with dextrobupivavaine or bupivacaine have lower potency in blocking cardiac sodium channels in the inactivated state. Blocking cardiac potassium channels reducing the maximal rate of depolarization prolonging atrioventricular conduction; and prolonging QRS interval duration.



Structure of Levobupivacaine

In human volunteers, intravenous levobuoivacaine (mean dose 56 mg) produced less of a negative ionotropic effect tan bupivacaine (48 mg).

In another study of intravenous administration the mean maximum increase in QTc interval was significantly less with levobupivacaine that with bupivacaine (3 vs 24msec) in volunteers receiving > 75mg.

In human volunteers 64% of intravenous bupivacaine recipients (mean dose 65.5mg) compared with 36% of levobupivacaine (67.7mg) recipients experienced central or peripheral nervous system disorders.

Intravenous levobupivacaine 40mg produced fewer changes indicative of CNS depression EEG than bupivacaine 40mg in volunteers. When compared with ropivacaine in animals , levobupivacaine had similar or more pronounced nerve blocking effects depending on the concentration and model.

Levobupivacaine and ropivacaine had generally similar cardiovascular effects in in vitro and animal studies although some studies reported greater QRS interval prolongation and /or arrhythmogenic risk with levobupivacaine at some concentrations, but no difference in mortality rates. However cardio toxicity has not been compared at established equipotent anesthetic dose.

Pharmacokinetics

Molecular weight	:	288
Pka	:	8.1
Liposolubility	:	30
Partition coefficient	:	346
Protein binding	:	95%
Vdss(L)	:	54
T1/2(min)	:	157
Clearance (L/min)	:	0.32

Therapeutic use

Surgical anaesthesia

Levobupivacaine is long acting with an onset of action < 15 minutes. The duration of action is dose – dependent and varies according to the anaesthetic technique . Adequate sensory and motor block for surgery was achieved in >90% of adult patients receiving adequate doses of levobupivacaine with satisfactory anaesthetic technique in most of the 10 available clinical trials .The anaesthetic and /or analgesic effects of

levobupivacaine were largely similar to those with bupivacaine at the same dose in all comparative studies including those of epidural peripheral nerve block (supraclavicular or axillary brachial plexus nerve block) local infiltration and peribulbar administration.

The duration of sensory block tended to be longer with levobupivacaine although the difference was not statistically significant compared with bupivacaine in most cases.

After epidural administration the duration of sensory block with levobupivacaine was 8 to 9 hours with 0.75% (112.5 to202.5mg) ,7.5hours with 0.5% (150mg) and 6 hours with 0.5% (75mg) and was 23 to 45 minutes longer than with bupivacaine at the same dose.

The duration of sensory block after intrathecal levobupivacaine 15mg was 6.5 hours. With peripheral nerve block, the duration of sensory block was 17 hours with levobupivacaine 0.5% (2mg/kg) versus 15 hours with bupivacaine 05% (2mg/kg) or levobupivacaine 0.25%(1mg/kg). With epidural administration, levobupivacaine produced less prolonged motor block than sensory block. This differential was not seen with peripheral nerve block.

Pain management

Analgesia attained with epidural levobupivacaine was generally similar to that with bupivacaine in woman in labour in the 2 available studies .The median time to onset of pain relief was 12 minutes and the duration of pain relief was approximately 50 minutes with levobupivacaine or bupivacaine 0.25%(25mg). With another regimen (mean dose of levobupivacaine 28 mg/h bupivacaine 27 mg/h) 43% of the first stage of labour was pain free in both groups.

Effective postoperative pain relief was attained by combining epidural levodupivacaine 0.125% (7.5 mg/h) with clonidine levobupivacaine 0.25% (10mg/h) with morphine or levobupivacaine 0.125% (5mg/h) with fentayl or using higher doses of levobupivacaine 0.25%(15 mg/h) the time to first request for rescue analgesia was 10 to 17 hours the combined regimens were more effective than any of the comparator agents alone and the higher dose was more effective than lower doses of levobupivacine.

Ilioinguinal /iliohypogastric nerve block with levobupivacaine 0.5% (1.25 mg /kg per operated side) at the conclusion of surgery provided better pain relief than placebo in children. Most patients did not have significant motor block.

Dosage and administration

The indications for levobupivacaine it include epidural, intrathecal, peripheral nerve block ,peribulbar administration and local infiltration for surgical anaesthesia in adults. Levobupivavaine is also indicated for epidural use for the management of pain, including labour and postoperative pain in adults. In children levobupivacaine is indicated for ilioinguinal/iliohypogastric nerve block.

The recommended maximum single dose for surgical anaesssthesia in adults (other than for intrathecal administration) is generally 150mg. Additional doses may be required for a prolonged procedure. The recommended maximum single dose for intrathecal administration is 15mg. The recommended maximum epidural dose for labour analgesia is a 0.125% infusion of 12.5 mg/h or epidural injection of 0.25% up to 25mg at >15-minute intervals.

For postoperative pain management in adults the dose should not exceed 18.75 mg/h the maximum dose for children undergoing ilioinguinal / iliohypogastric block is 1.25 mg/kg/ side levobupivacaine is indicated for epidural peripkeral nerve block peribulbar administration and local infiltration for surgical anesthesia in adults.

Levobupivacaine is also indicated for epidural use for the management of pain, including labour and postoperstive pain in adults. The drug is contraindicated for paracervical block in obstetrics and intravenous regional anesthesia (Bier's block)as well in patients with severe hypotension or known hypersensitivity to local anesthethesia of the amide type.

US product labelling carries warnings against the use of levobupivacaine in obstetric patients at the 0.75% concentration, obstetrical paracervical block, and intravenous regional anesthesia. Use of levobupivacaine in patients with known hypersensitivity to amide –type local anaesthetics is contraindicated.

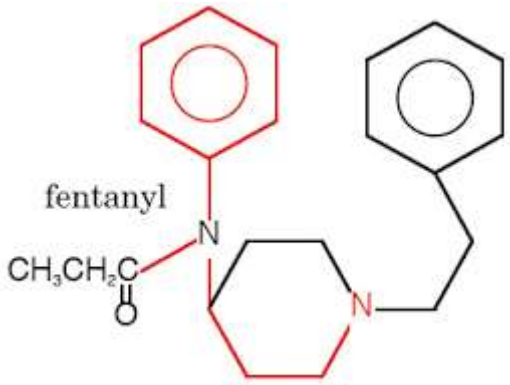
Levobupivacaine should be used with caution in patients with impaired cardiovascular function or liver disease or reduced liver blood flow. As with all local anaesthetics, epidural levobupivacaine can cause hypotension, bradycardia and possibly cardiac arrest.

Appropriate treatments, equipment and personnel should be readily available in the event that a serious adverse event occurs. The toxic effects of other local anesthetics, antiarrhythmic agents with local anesthetic activity or class lll antiarrhythmic agents may be additive to those of levobupivacaine.

PHARMACOLOGY OF FENTANYL

Fentanyl was first synthesized in 1960 by Dr. Paul Jannsen, a chemist working for a Belgian pharmaceutical company. It was released into clinical practice in 1963. Fentanyl is a synthetic opioid, a tertiary amine and a phenylpiperidine derivative.

Structure:



Presentation

1. As a clear, colourless solution for injection containing 50 mcg /ml of Fentanyl citrate.
2. Transdermal patches which deliver 25/50/75/100 mcg / hour over a 72 hour period.
3. Lollipop (Fentanyl citrate on stick) – dissolves slowly in mouth, available in 6 dosages, 200 to 1600 micrograms in 200 microgram increments (excluding 1000 and 1400 microgram).

Potency

Fentanyl is 1000 times more potent than Meperidine, 50 –100 times morepotent than Morphine,100 microgram of Fentanyl is equal to 10 mg of Morphine and 75 mg of Meperidine.

Mode of action

Fentanyl is a highly selective mu receptor agonist, which is mainly responsible for its analgesic properties. It acts by increasing intra-cellular calcium concentration which inturn increases K+ conductance and hyperpolarization of cell membranes. This decreased membrane conductance decreases both pre and postsynaptic responses. Analgesia is produced principally through interaction with mu receptors at supra spinal sites. Fentanyl also binds to mu receptors causing spinal analgesia, sedation and anaesthesia.

Pharmacokinetics and Pharmacodynamics

A single dose of Fentanyl administered IV has a rapid onset and shorter duration of action than Morphine. The effect site equilibration time between blood and the brain is 6.4 minutes. The greater potency and more rapid onset of action reflect the greater lipid solubility, which facilitates its passage across blood-brain barrier. Its rapid redistribution to

inactive tissue sites accounts for its shorter duration of action. 75% of the initial dose undergoes first pass pulmonary uptake.Effective analgesic concentrations are between 1 and 3ng/ml, while concentrations of 1.5 to 3ng/ml result in a 50% decrease in ventilatory response to carbon dioxide.

Metabolism

Fentanyl avidly binds to alpha-1-acid glycoprotein and is also bound to albumin. It is metabolized in the liver to polar inactive metabolites by N-dealkylation, producing norfentanyl with subsequent hydroxylation to hydroxypropionyl derivatives. Cytochrome P–503A4 plays the predominant role in Fentanyl metabolism.

Absorption and distribution

It is absorbed orally and has a bioavailability by this route of 33%. It is 81 to 94% protein bound in the plasma. The VD is 0.88 – 4.4 L/Kg.

Excretion

10% of it is excreted in urine. Clearance is 0.4 - 1.5 L / min and elimination half-life is 1.5 - 6 hrs. Halothane decreases the clearance of Fentanyl by 48%, a similar effect occurs with Enflurane. Clearance is decreased in patients with hepatic involvement.

Analgesic potency

Minimal analgesic dose is 0.011 mg/kg. It is 29 times more potent than Morphine. Therapeutic index – 323 and pKa – 8.4.The onset of action and duration depends on the route of administration. IM onset of action is 7-15 min, peaks at 15 mins and duration of action is1-2 hrs. IV- onset of action is 2-5 minutes and duration of action is 30-60 minutes. Epidural route – onset of action is 4-6 min, peaks at 5-10 min and duration of action is 2-3 hours.

Effects: CVS

- In the dose of 1mcg/kg there is no significant effect on papillary muscle mechanics
- Doses of 7mcg/kg at induction decreases heart rate but there is no change in mean arterial pressure.
- At 10mcg/kg myocardial contractility is reduced by 50%.
- 20 to 25mcg/kg decreases heart rate, MAP, systemic and pulmonary vascular resistance and PCWP by15% in patients with coronary artery disease.

- At 75mcg/kg there is haemodynamic stability. There are clinical reports attesting to hemodynamic stability of high dose Fentanyl for both cardiac and noncardiac surgeries.
- It rarely causes histamine release.
- Fentanyl produces bradycardia of vagal origin.

Respiratory System

- Fentanyl at 1 to 2 mcg/kg decreases respiratory rate and increases tidal volume.
- At doses greater than 3mcg/kg it decreases both the respiratory rate and tidal volume and also the ventilatory response to hypoxia and hypercarbia.
- It has an antitussive property.
- Chest wall rigidity ("Wooden – chest" phenomenon) due to its effect on mu receptors located on GAB Anergic interneurons can be controlled by the early use of muscle relaxant. The side effect of great concern after epidural or spinal opioid administration is respiratory depression. Use of more lipid soluble opioids like Fentanyl decreases the potential occurrence of the problem.

Central Nervous System

It is a CNS depressant. At low doses (1-2 microgram/kg) it is devoid of hypnotic and sedative activity. Miosis is seen as a result of stimulation of Edinger Westphal nucleus. The central effects are markedly less after epidural injection than after IV administration.

Gastro Intestinal Tract system

It increases the common bile duct pressure by causing spasm of the sphincter of oddi. It causes nausea, vomiting and decreases GI motility**.**

Genito urinary system

It increases the tone of the ureters, bladder detrussor muscle and vesicle sphincter causing retention of urine.

Metabolic / others

At doses of 50-100mcg/kg it prevents increases in plasma epinephrine, cortisol, glucose, free fatty acids

Relationship between Fentanyl Plasma Concentration and Effect:

Plasma Fentanyl concentration (ng/ml)	Pharmacological effect
>1	Slight analgesia, minimal ventilatory depression
1-3	Analgesia; 50% decrease in the ventilatory response to carbon dioxide
4-10	Analgesia for surgery if combined with nitrous oxide
>20	Unconsciousness, satisfactory anesthesia if used as sole agent

Uses

To provide analgesic component of balanced anesthetic technique for short surgical procedures in the dose of 2mcg/kg.

- High dose (50 to 100 mcg/kg) Fentanyl anesthesia with nitrous oxide/oxygen or oxygen alone has been employed for cardiac surgery and long surgical procedures. Postoperative ventilation should be routinely employed when high doses are administered.

- It is used for postoperative pain relief in the loading dose of 50 to 150mcg and a maintainance infusion of 0.5 to 1.5mcg/kg/hour.

Used for sedation and analgesia in the dose of 1-4mcg/kg IV.

As a component of neuroleptanalgesia with Droperidol (Innovar).

Side effects

Respiratory depression can occur post-operatively, related to the appearance of secondary peak in the plasma Fentanyl concentration due to elution from muscle.

Other side effects include nausea, vomiting, pruritus, urinary retention

MATERIALS AND METHODS

After obtaining approval from Institutional Ethical Committee, the study was conducted in 60 ASA I and ASA II parturients, who underwent elective caesarean section. This study was prospective, randomised, double blinded study. The study was conducted in Government Raja Mirasudar Hospital, Thanjavur Medical college, Thanjavur. All the patients were explained about the procedure and written informed consent were obtained.

It was observed in various studies that 0.5% Isobaric Levobupivacaine with fentanyl given intraethecally in elective caesarean section had less intense motor blockade and better hemodynamic stability with less hypotension ,bradycardia , nausea and vomiting than with the 0.5 % hyperbaric Bupivacaine with fentanyl.

60 parturients were randomly allotted with the help of sealed envelope technique into 2 groups, Group B and Group L, with 30 parturients in each group.

Group B received 0.5% hyperbaric Bupivacaine 8.75 mg with fentanyl 12.5 mcg making a total volume of 2mL.

Group L received 0.5 % isobaric Levobupivacaine 8.75 mg with fentanyl 12.5 mcg making a total volume of 2 ml.

The inclusion criteria were

1.parturient of age >20years,

2.height between 150 to 170 cm,

3.weight between 50-80 kgs

4.gestational age >37 weeks.

The exclusion criteria were

1. Parturient who had contraindication to spinal anaesthesia ,
2. allergic to local anaesthetics ,
3. emergency LSCS,
4. objection to spinal anaesthesia,
5. patient with moderate anaemia (Hb < 10gm %),
6. patient with spine deformities.

Pre operative evaluation was done in all these patients with detailed case history , general examination, systemic examination, assessment of

airway and evaluation of the investigations . Day before surgery the parturients were asked to fast for 8 hours. Every patient included in the study were pre-medicated with Inj Ranitidine 50 mg im and Inj .Metaclopramide 10 mg im 1 hour before surgery.In the operating room peripheral IV line was established with 18 G venflon and preloaded with infusion of 10ml /kg of Ringer lactate 10 minutes before the procedure

Standard intra operative monitoring consisted of ECG, NIBP, Pulseoximetry (SPO2) .At the end of preloading ,basal parameters were recorded and patient was turned to right lateral position . Skin over the back was prepared with antiseptic solution and draped with sterile towel. Subarachnoid block was performed by using 25G Quinckes needle in the L3-L4 interspace. Correct needle placement was identified by free flow of cerebrospinal fluid and 2 mL of study drug was injected over 10 seconds.

Then the patient was turned supine immediately and a right sided 15 degree tilt was given .Oxygen was administered at a rate of 6L /min by a face mask to all the patient . After delivery of the baby inj.oxytocin 10 U in 500ml normal saline was administered.

The level of sensory blockade achieved was evaluated by bilateral

loss of pinprick sensation (20-gauge hypodermic needle). The test was performed every 2 min for first 10 minutes to access maximum sensory blockade and every 10 minutes there after till it regressed to L1.

We checked bilaterally L1,T12,T10,T8,T6,T4,T2 dermatomes by needle protrusion of 2mm through a guard.

Motor blockade was evaluated using Bromage score:

0 = no motor blockade

1 = hip blockade(inability to raise extended leg; able to flex knees and feet)

2 = hip and knee blockade(inability to raise extended leg and flex knee; able to move feet)

3 = hip, knee and ankle blockade

The onset of sensory blockade was defined as time interval between intrathecal administration of drug and maximum pinprick score.

The onset of motor blockade was defined as time interval between intrathecal administration of drug and a Bromage score of 3

Two segment regression time was defined as time interval between maximum sensory blockade and two segment regression of

sensory blockade.

EVALUATION OF DURATION OF MOTOR BLOCKAD

After the intrathecal drug injection the Bromage score was recorded for every minute till achieving a score of BROMAGE 3.There after for every 15 minutes until it recovered to BROMAGE 0.

The duration of sensory block was defined as the time interval between intrathecal administration of drug to regression to L 1 sensory blockade level .

The duration of motor block was defined as the time interval between intrathecal administration of drug to the point in which the Bromage score was back to zero

Time to achieve the maximum sensory blockade, duration of analgesia (request for rescue analgesia), time to attain bromage 0 and APGAR score at 1 minute and 5 minutes were recorded.

Intra operative hemodynamic parameters were recorded every 5 minutes for first 30 minutes and then every 10 minutes thereafter till the end of surgery .

Rescue measures

Whenever hypotesion occurred (Any fall in MAP >20 % from base line value) Inj Ephidrine 6mg IV bolus was given as rescue dose and repeated if necessary. And in case of bradycardia (fall in heart rate of < 50/min) was treated with inj Atropine 0.6 mg iv bolus. Shivering ,was treated with inj tramadol 0.5 mg/kg. Nausea and vomiting was treated with Inj Ondensetron 0.1 mg/kg .

In case of atonic uterus, Inj.Methyl-ergometrine 0.2 mg intravenously or Inj Carboprost 250 mcg intramuscularly was given but the study was abandoned.

Statistical analysis was done using SPSS version 20 software. Socio demographic details ,patient profiles and variables used in this study were calculated by descriptive analysis.

Categorical data of each group was compared by using Chi-square test. Categorical data was compared after constructing contingency tables and applying the chi – square test .

Mean value of 2 groups were compared using student t test

Data was expressed as mean +/-SD ,median (range) or number of parturients (n).

A p value of < 0.05 was considered statistically significant.

REVIEW OF LITERATURE

Ayesha goyal et al, 2015 (27) conducted study in 30 parturients with isobaric bupivaine with fentanyl and hyperbaric bupivacaine with fentanyl in elective LSCS. Group BF received hyperbaric bupivacaine 10 mg (2ml) and fentanyl 25 mcg (0.5 ml) and the group LF received isobaric levobupivacaine 10 mg an fentanyl 25 mcg (0.5ml), total volume of 2.5ml intrathecally. They found that in group BF MAP(mean arteterial pressre was found to be lower and noted maximum motor blockade , whereas in group LF maximum sensory block level and less motor block level was noted. Hence they concluded LF was better alternative to BF in LSCS.

Turkmen et al 2012 (13) conducted randomised prospective study to compare two groups . Group B received 7.5 mg of 0.5 % bupivacaine with 15 mcg fentanyl intrathecally and group L received 7.5 mg 0.5 % isobaric levobupivacaine with fentanyl 15 mcg intrathecally . They found that the time to achieve T 4 sensory block was shorter in group B (group B 4.8 min ; group L 6.0 min & $p < 0.05$) and also found that time to achieve maximum motor blockade was lesser in group B (group B 3.4 ,min; group L 4.7 min; $p < 0.05$) . The duration of analgesia was longer in group L compared to group B (group B 102 min ; group L 118

min, p< 0.05) and concluded that levobupivacaine is a good alternative to bupivacaine.

Erknan yavuz akcaboy et al 2011 conducted prospective randomized and double blind study in forty nine patients undergoing transurethral resection of prostate surgery to evaluate the clinical effectiveness and block quality of low dose levobupivacaine and fentanyl with low dose bupivacaine and fentanyl . Patients in levobupivacaine group received 5 mg Levobupivacaine with 25 mcg Fentanyl and bupivacaine group received 5mg bupivacaine with 25 mcg fentanyl

Hemodynamic parameters were comparable and stable during the procedure in both groups. Sensory block was comparable and clinically effective in both groups .While 3 patients in bupivacaine group had Bromage score of 3 at the beginning of the surgery, no patient in levobupivacaine had this score and this difference was significant (p=0.042). Bromage score at the end of the surgery was comparable in both groups.

In conclusion ,for transurethral resection of prostatic surgery 5mg of levobupivacaine with fentanyl 25mcg can provide stable hemodynamic status and effective sensory blockade with less motor blockade in spinal

anaesthesia .So it could be used at low doses as a good alternative to bupivacaine.

Glaser et al 2002 performed a prospective randomized double blinded study to evaluate the anaesthetic potencies and hemodynamics of intrathecal levobupivacaine compared with raceimic bupivacaine. Eighty patients underwent elective hip replacement received either 3.5 ml of 0.5 % isobaric levobupivacaine or 3.5 ml of 0.5% bupivacaine sensory blockade was verified using pinprick test ,motor blockade was recorded by using a modified Bromage score.

Intergroup difference of bupivacaine and Levobupivacaine were insignificant in both groups with regard to the onset time and the duration of surgery and motor blockade (11+/- 6 versus 13+/- min: 10+/-7 versus 9+/- 7 mim; 228+/- 77 versus237+/-88 mi; 280+/- 80 min). Both groups showed slight reductions in heart rate and mean arterial pressure, but there was no intergroup differences in hemodynamics. Hence they concluded that intrathecal levobupivacaine was equal in efficacy but less toxic than the racemic bupivacaine.

Opas vanna et al 2006 conducted a study to investigate the clinical efficacy and safety of isobaric solution of levobupivacaine compared with hyperbaric solution of racemic bupivacaine in spinal anaesthesia .70 patients underwent elective transurethral endoscopic surgery who received either 0.5% isobaric levobupivacaine (n=35) or 0.5% hyperbaric bupivacaine (n=35) intrathecally, in randomised study. Study concluded that 2.5 ml of 0.5% isobaric levobupivacaine and 0.5% hyperbaric of racemic bupivacaine showed equally effective potency for spinal anaesthesia in regard to both onset of time and duration of sensory blockade.

Guler G et al 2012 (12) conducted randomised double blinded study in 60 pregnant women in ASA I-II group scheduled for elective cesarean section to investigate the clinical efficacy of Levobupivacaine comparaed with hyperbaric bupivacaine for spinal anaesthesia for caesarean section. Patients were randomly divided into two groups. The combination of 10mg Levobupivacaine (0.5%) and fentanyl (15 mcg) for group LF (n=30) patients and 10 mg 0.5 % hyperbaric bupivacaine and fentanyl(15 mcg) for BF (n=30) parturients were intrathecaly administered to a total volume of 2.3 ml.

Sensory and motor block characteristic of the groups were assessed with pinprick and bromage scale, observed hemodynamic changes and side effects were recorded. The time to reach maximum dermatome for the sensory block and the time to regression by two dermatomes and time to regress to T12 dermatome was found to be significantly longer in group BF . It was observed that in group BF, the evolution of motor block was faster and last longer , where as hypotension , bradycardia and nausea were less in group LF. The need for ephedrine was higher in BF($p<0.05$).They concluded that motor blockade time was shorter and side effects like hypotension ,bradycardia and nausea were less and the combination of levobupivacaine and fentanyl can be a good alternative in cesarean section.

Sathikaranmanee et al 2011 conducted study to find the onset of motor block and other anaesthetic efficacy of intrathecally administered racemic bupivacaine compared with levobupivacaine .70 patients of age between 18 to 65 years of ASA I & II posted for elective lower abdominal and lower limb surgery under spinal anaesthesia was included in this study . patients were grouped such that they received either 0.5% isobaric levobupivacaine 3ml or 0.5% isobaric racemic bupivacaine 3 ml given intrathecally.

They monitored PR ,NIBP, SPO2 ,ECG, peak block height, motor and sensory blockade and side effects. There was no significant difference between the two groups in the motor and sensory blockade.

Mantouvalou et al 2008 performed study to compare the anesthetic efficacy and safety of three local anaesthetic agent of racemic bupivacaine in patient who underwent lower abdominal surgery. ASA I and II class of 120 patients were randomized into three groups group A, B, and C, received 3ml of isobaric bupivacaine, levobupivacaine and ropivacaine (n respectively in all three groups (n= 40). The onset of motor block was significantly faster in bupivacaine group compared to ropivavaine and levobupivacaine group($p<0.05$). Bupivacaine required more ephedrine when compared to other drugs.($p<0.05$)

Sundharathiti P et al 2014 conducted prospective ,randomized, double blinded study in 90 parturients of ASA I & II in elective LSCS. Group H received 10 mcg of 0.5 % hyperbaric bupivacaine and fentanyl 10 mcg, group L received 11 mg of 0.5 % levobupivacaine and fentanyl 10 mcg . and group B received 11 mg 0.5 % Bupivacaine and fentanyl 10 mcg. The incidence of hypotension compared in groups were in H=67%B =50%,and group L=50%. They concluded that levobupivacaine as a better alternative to bupivacaine.

Karsli N D et al 2015 (28) conducted randomized double blinded study to determine ED(50) and ED(95) of intrathecal isobaric levobupivacaine in various doses of 6 , 8 ,10 ,12 ,14 mg in equal volume with25 mcg of fentanyl. sensory block was determined by pin prick and motor blockade by Bromage scale. Done in ASA I-III of 100 patient who underwent transurethral resection of prostate.

The mean onset time of sensory block in 6mg group was significantly longer than that of sensorial block in 10 ,12,14 mg group ($p < 0.01$); onset time of 8mg was longer than 12,14 mg($p< 0.01$) mean onset timeof T10 sensory level in 6mg group was significantly longer than the10, 12,14 mg groups ($p<0.01$); mean onset of T10 sensory block level in 8mg group was significant when compared with 12 and 14 mg groups($p<0.01$);ED(50) and ED(95) of levobupivacaine coadministered with 25mcg fentanyl were 7.32 mg and 10.88 mg respectively.

Prabha.P et al 2014 (26) conducted randomised double blinded study into two grops. Group B received 8.75 mg of 0.5% hyperbaric bupivacaine with 12.5 mcg of fentanyl. Group L received 8.75mg of 0.5% isobaric levobupivacaine with 12.5 mcg of fentanyl. Levobupivacaine with fentanyl produced adequate level of sensory

blockade with less motor blockade and better haemodynamic stability and lesser incidence of adverse effects like bradycardia, hypotension than bupivacaine with fentanyl group. They concluded that levobupivacaine was a good alternative to bupivacaine in LSCS.

OBSERVATION AND RESULTS

Graph :1 Demographic parameters

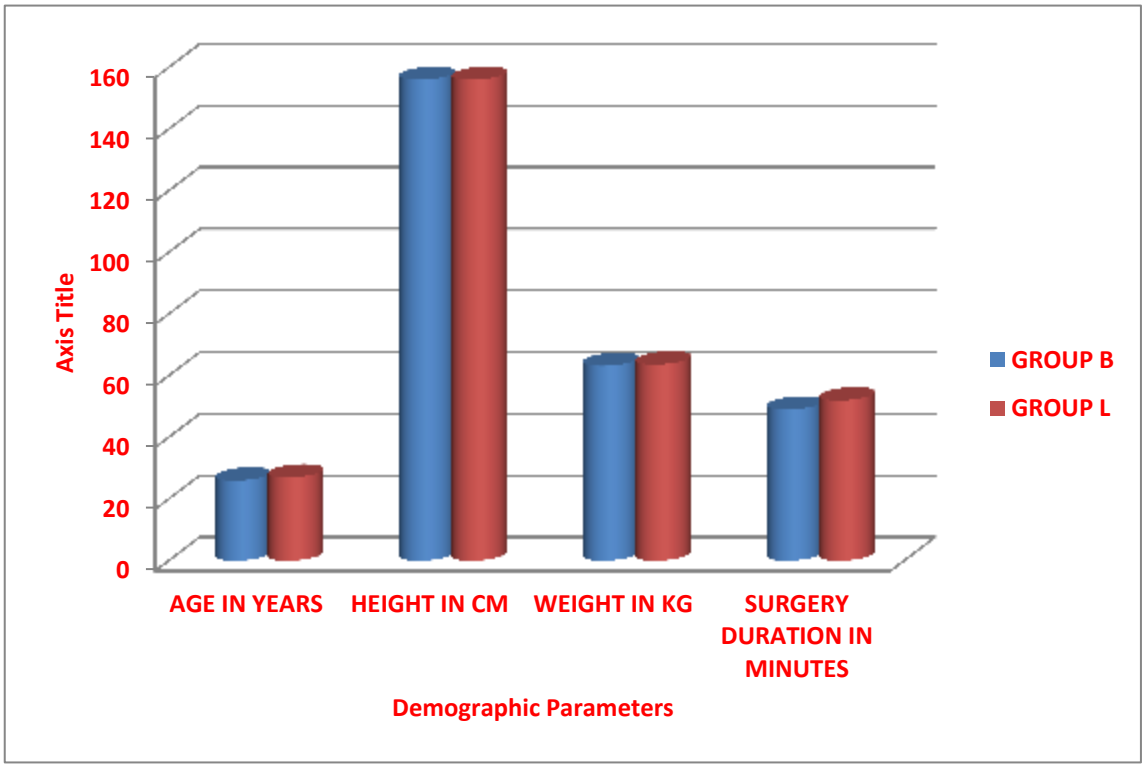


Table : 1.Demographic parameters.

	n	Mean	Standard deviation	p value
AGE				
B Group	30	26.50	4.167	0.567 Not Significant
L Group	30	27.03	2.748	
HEIGHT				
B Group	30	156.73	4.631	0.957 Not significant
L Group	30	156.80	4.930	
WEIGHT				
B Group	30	63.20	7.112	0.781 Not significant
L Group	30	63.67	5.791	
DURATION OF SURGERY				
B Group	30	49.90	5.989	0.065 Not significant
L GROUP	30	52.30	6.717	

From table 1: the following parameters such as age, height, weight and duration of surgery was insignificant.

Graph : 2.Pulse rate

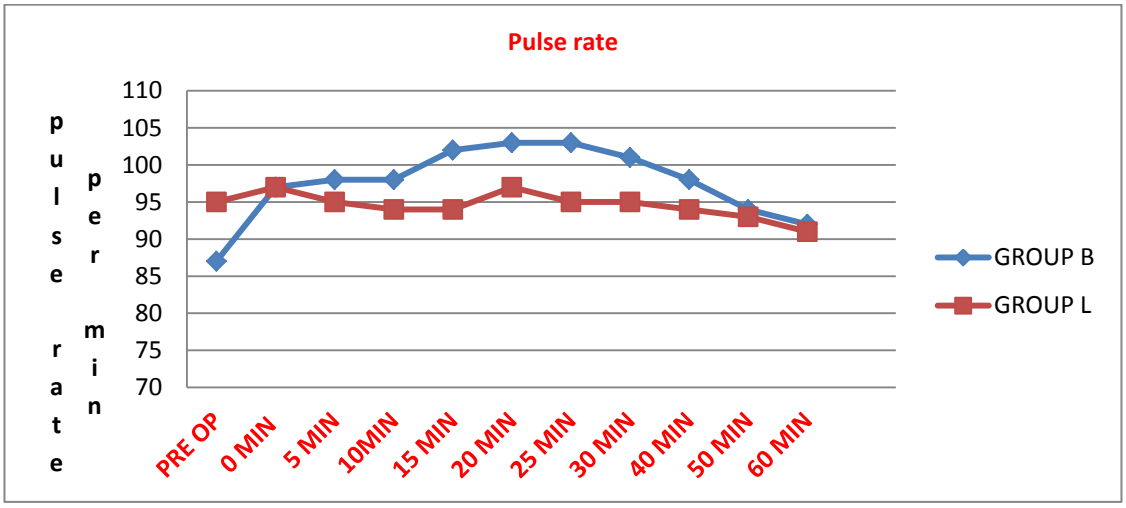


Table: 2. Pulse rate

Pulse Rate	Pre op	0 min	5 min	10 min	15 min	20 min	25 min	30 min	40 min	50 min	60 min
Group B	87	97	98	98	103	103	101	98	98	94	92
Group L	95	97	95	94	94	97	95	95	94	93	92
p value	0.000	0.768	0.147	0.109	0.000	0.002	0.000	0.004	0.076	0.276	0.759

Table: 2 showed, significant change in the pulse rate in group B from 15 minutes to 40 minutes when compared to group L . p value is significant.

Graph:3-SystolicBP

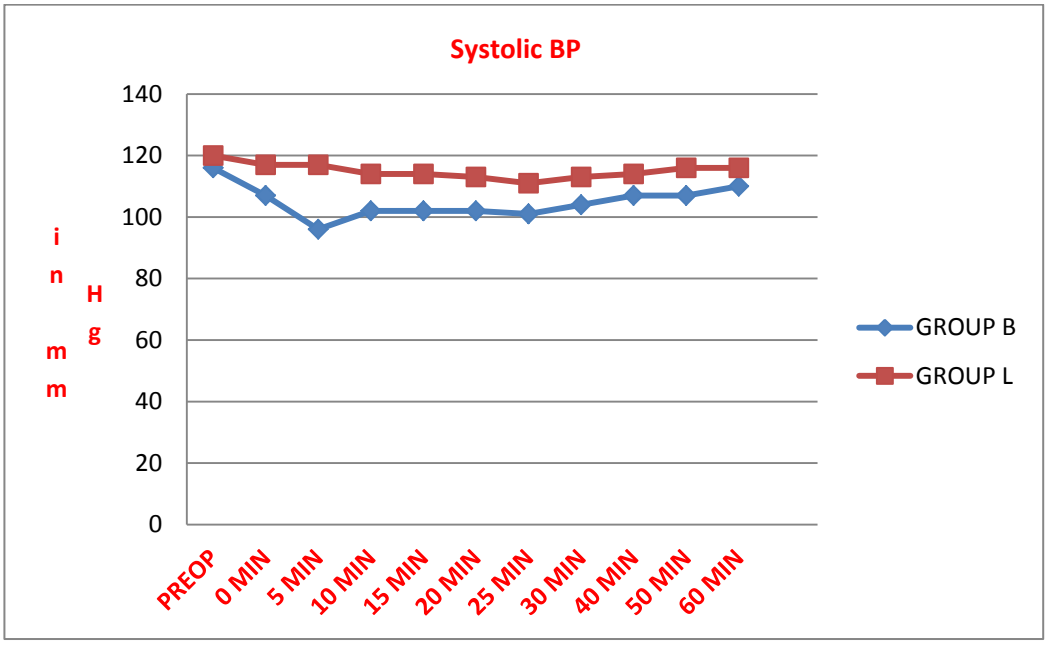


Table :3 Systolic BP

Systolic BP	Preop	0 min	5 min	10 min	15 min	20 min	25 min	30 min	40 min	50 min	60 min
Group B	116	107	96	102	102	102	101	104	107	107	110
Group L	120	117	117	114	114	113	111	113	114	116	116
p value	0.037	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

Table 3 showed that the systolic BP was significant from 0 minutes to 60 minutes

Graph :4. Diastolic BP

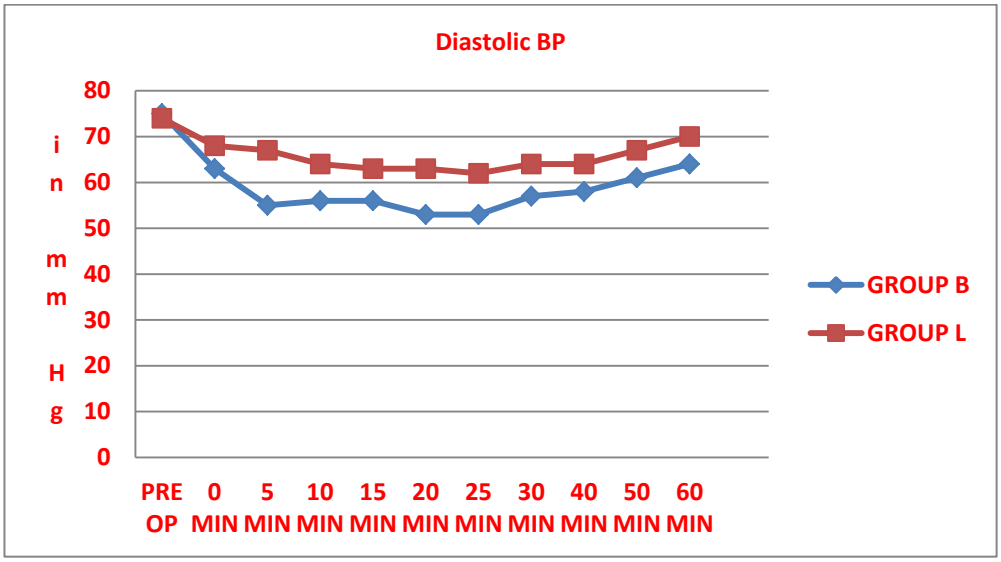


Table : 4.Diastolic BP

Diastolic BP	Pre op	0 min	5 min	10 min	15 min	20 min	25 min	30 min	40 min	50 min	60 Min
Group B	75	63	55	56	56	53	53	57	58	61	64
Group L	74	68	67	64	63	63	62	64	64	67	70
p value	.591	.056	.000	.001	.002	.000	.001	.001	.002	.001	.000

From the table 4: the p value of diastolic BP showed significant difference in between group B and group L from 5 minutes to 60 minutes

Graph : 5. Mean arterial pressure

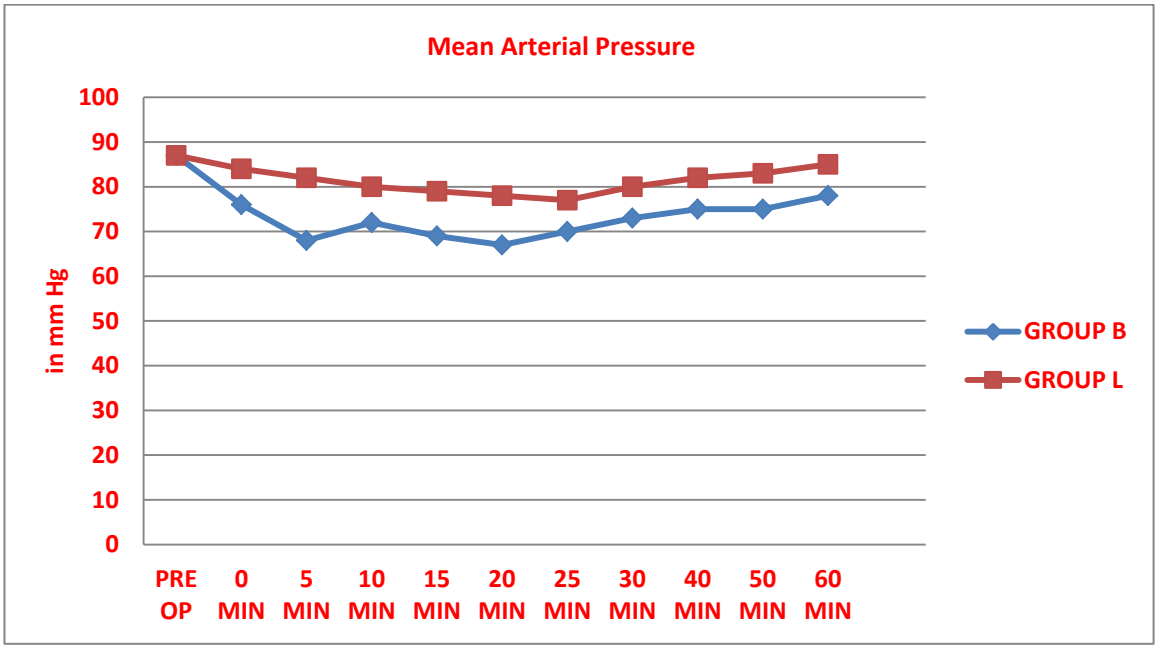


Table :5. Mean arterial pressure

MAP	Pre op	0 min	5 min	10 min	15 min	20 min	25 min	30 min	40 min	50 min	60 min
Group B	87	76	68	72	69	67	70	73	75	75	78
Group L	87	84	82	80	79	78	77	80	82	83	85
p value	.915	.003	.000	.000	.000	.000	.000	.000	.000	.000	.000

From above table the p value of MAP was significant from 0 minutes to 60 minutes.

Graph : 6.Time interval between induction to skin incision

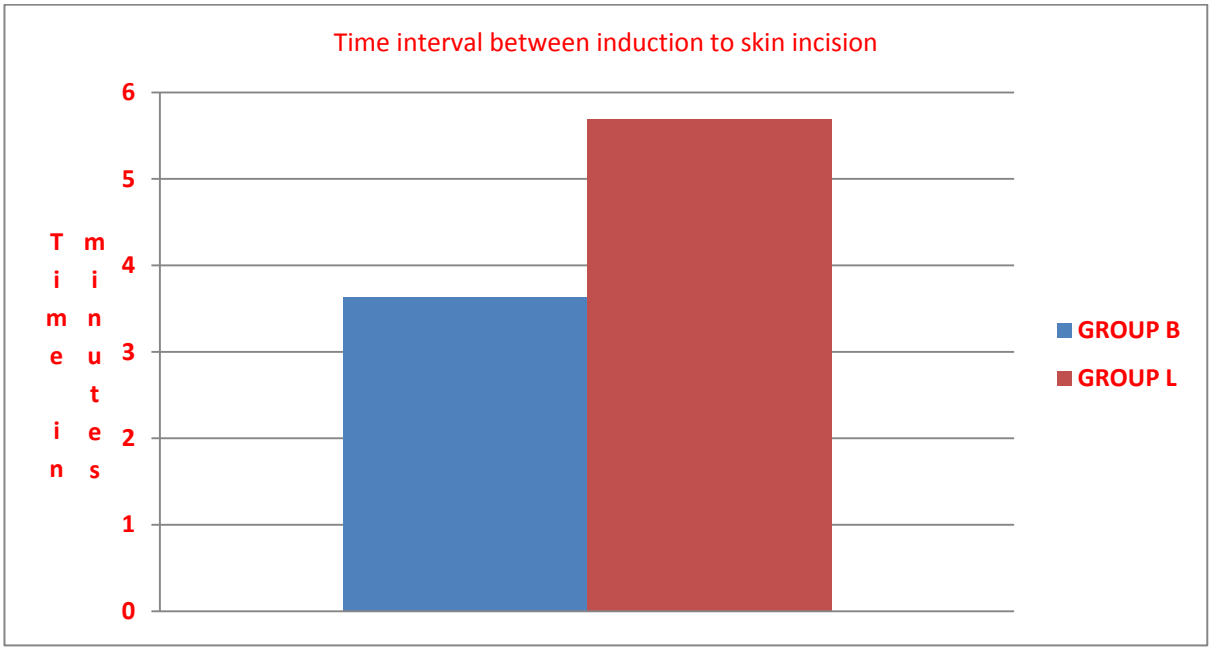


Table : 6 .Time interval between induction to skin incision

	n	mean	Standard deviation	p value
Group B	30	3.66	0.349	0.000
Group L	30	5.69	0.328	Significant

Table 6 showed significant difference between group B and group L and p value of 0.000 .

Graph :7. Onset of sensory blockade

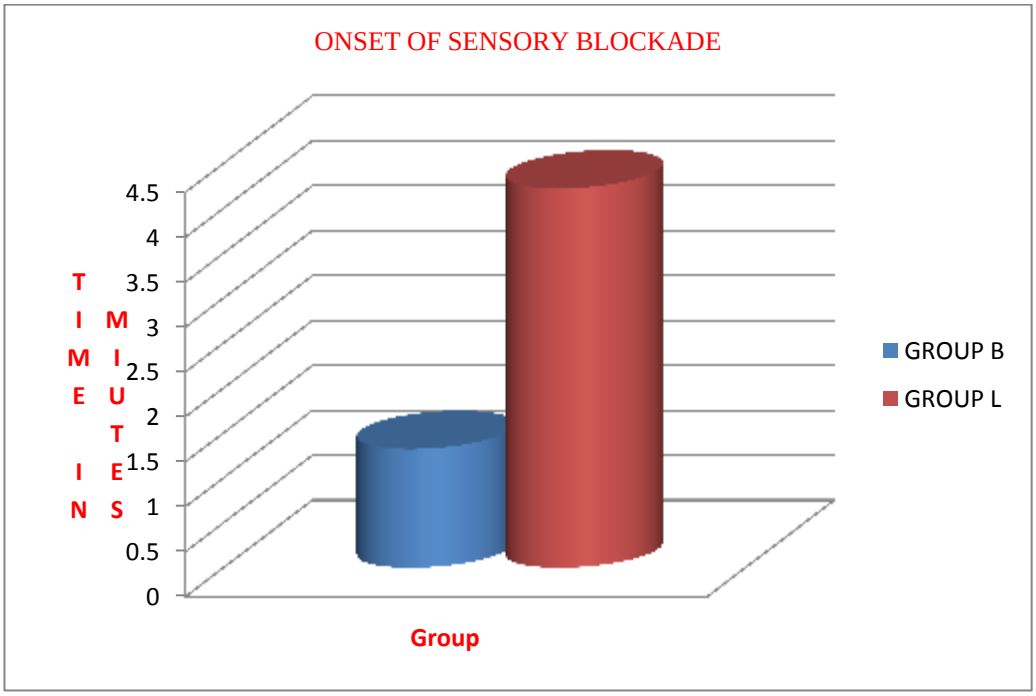


Table :7. Onset of sensory blockade

Group	n	mean	Standard deviation	p value
Group B	30	1.32	0.107	0.000 Significant
Group L	30	4.22	0.168	

Table 7 showed that onset of sensory blockade was 1.32 minutes (± 0.107) in group B and 4.22 minutes (± 0.168) in group L . p value is significant

Graph : 8. Onset of Motor blockade

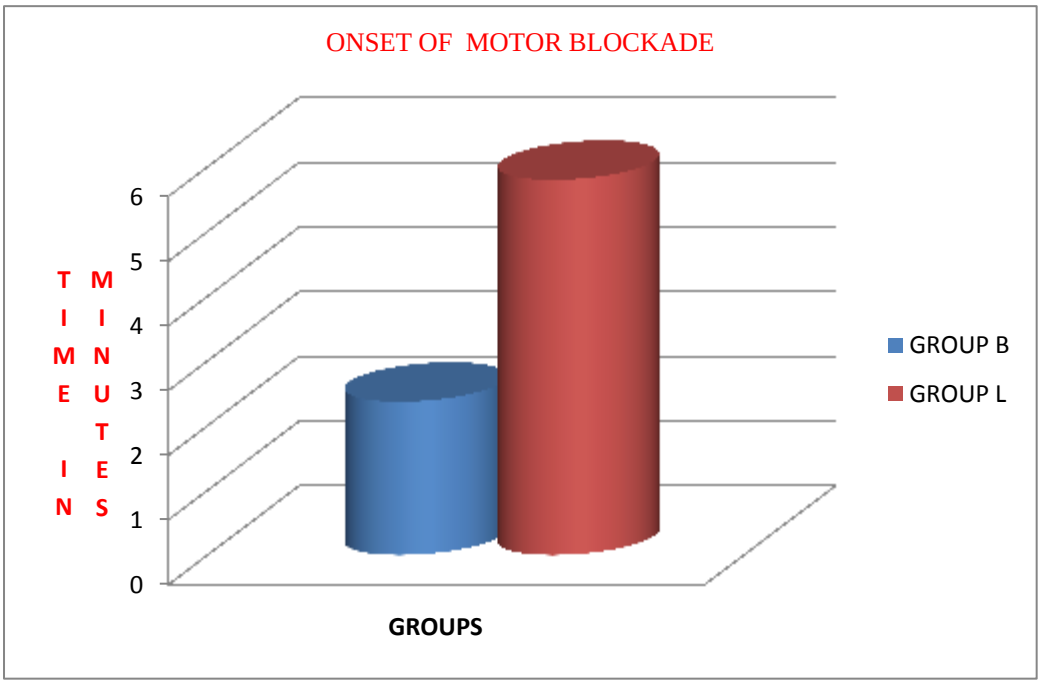


Table :8 . Onset of Motor blockade

GROUPS	n	mean	Standard deviation	p value
GROUP B	30	2.37	0.284	0.000
GROUP L	30	5.85	0.364	Significant

Table showed that the p value was significant .

Graph : 9 .Maximum sensory blockade level

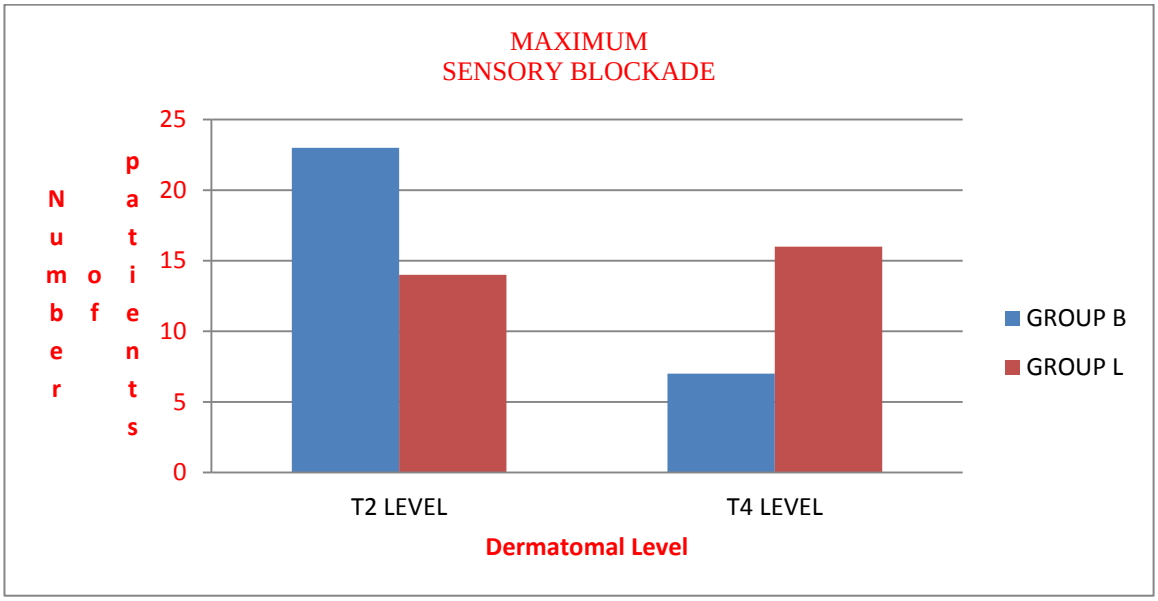


Table : 9 .Maximum sensory blockade level

Maximum Sensory blockade	Group B		Group L		Total		p value
	f	%	f	%	f	%	
T 2	23	76.7	14	46.7	37	61.7	0.017
T 4	7	23.3	16	53.3	23	38.3	Significant

Since the p value is <0.05 .it is significant

Graph : 10. Adverse effects.

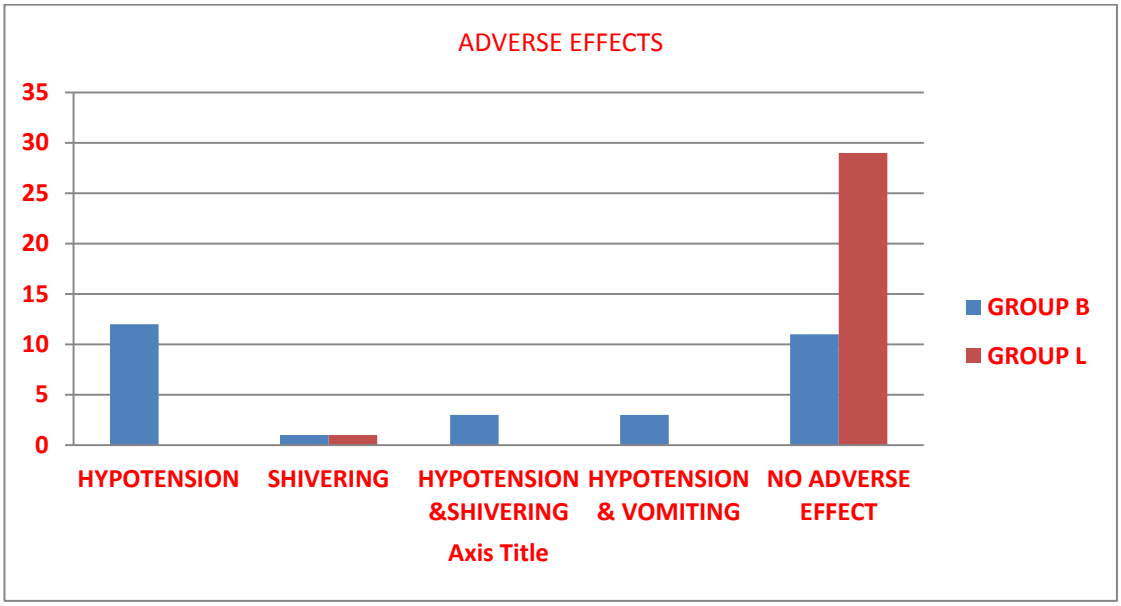


Table : 10 - Adverse effects

Adverse effects	Group B		Group L		Total		p value
	f	%	f	%	f	%	
No adverse effect	11	36.7	29	96.7	40	66.7	0.000 Significant
Hypotension	12	40.0	0	0.0	12	20.0	
Hypotension & Vomiting	3	10.0	0	0.0	3	5.0	
Hypotension & shivering	3	10.0	0	0.0	3	5.0	
Shivering	1	3.3	1	3.3	2	3.3	

Table 10 illustrated that in Group B 36.7 % of parturients had no adverse effect .Whereas in group L it was 96.7 % . Adverse effects such as hypotension ,vomiting and shivering were more in group B and lesser in group L. p value of 0.000 is significant.

Graph:11 Two segment regression time

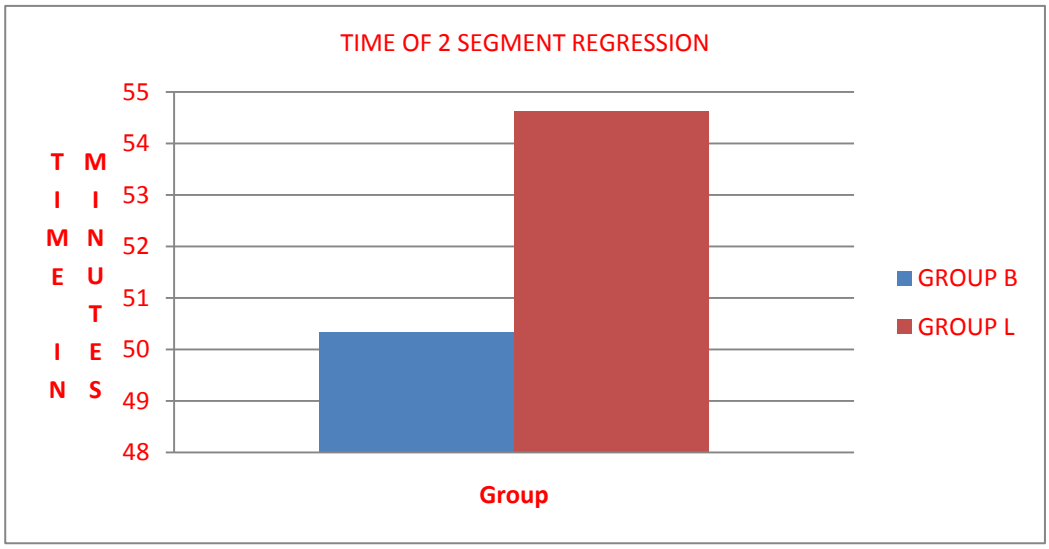


Table :11. Two segment regression time

Group	n	mean	Standard deviation	p value
Group B	30	50.33	4.634	0.002
Group L	30	54.63	5.353	significant

Table 11 showed that two segment regression time was 50.33 minutes (± 4.634) in group **B** and 54.63 minutes (± 5.353) in group L . p value is significant

Graph :12 Time for regression to L1 sensory level.

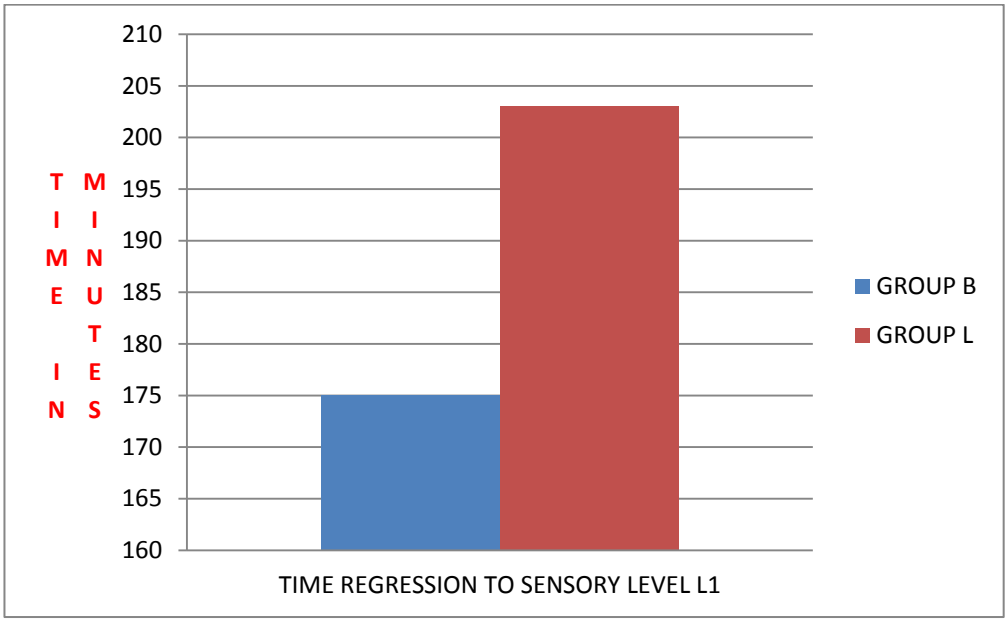


Table : 12 - Time for regression to L1 sensory level

Group	n	mean	Standard deviation	p value
Group B	30	175.60	4.64	0.000
Group L	30	203.57	4.53	Significant

The above table showed that p value is significant

Graph : 13. Regression to BROMAGE 0

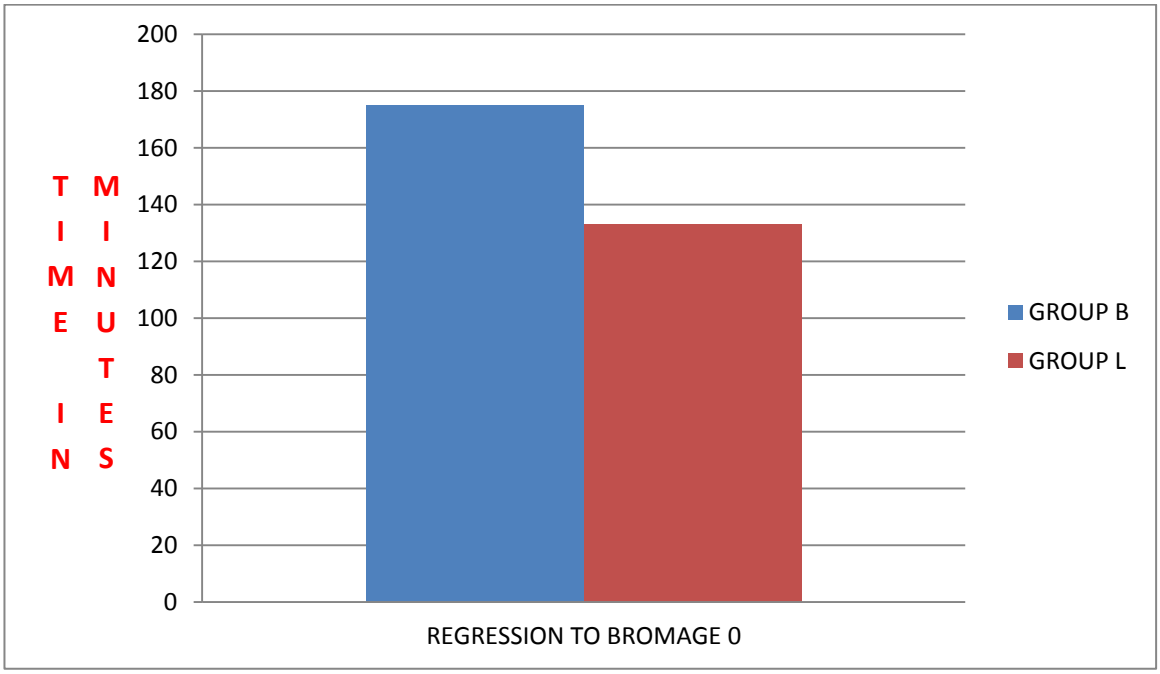


Table : 13. Regression to BROMAGE 0

Group	n	mean	Standard deviation	p value
Group B	30	175.13	5.61	0.000 Significant
Group L	30	133.10	5.86	

Table 13 showed that time for regression to Bromage score 0 was 175.13 minutes (± 5.61) in Group B and 133.10 minutes (±5.86) in Group L. P value 0.000 significant.

Graph : 14. First request for rescue analgesia

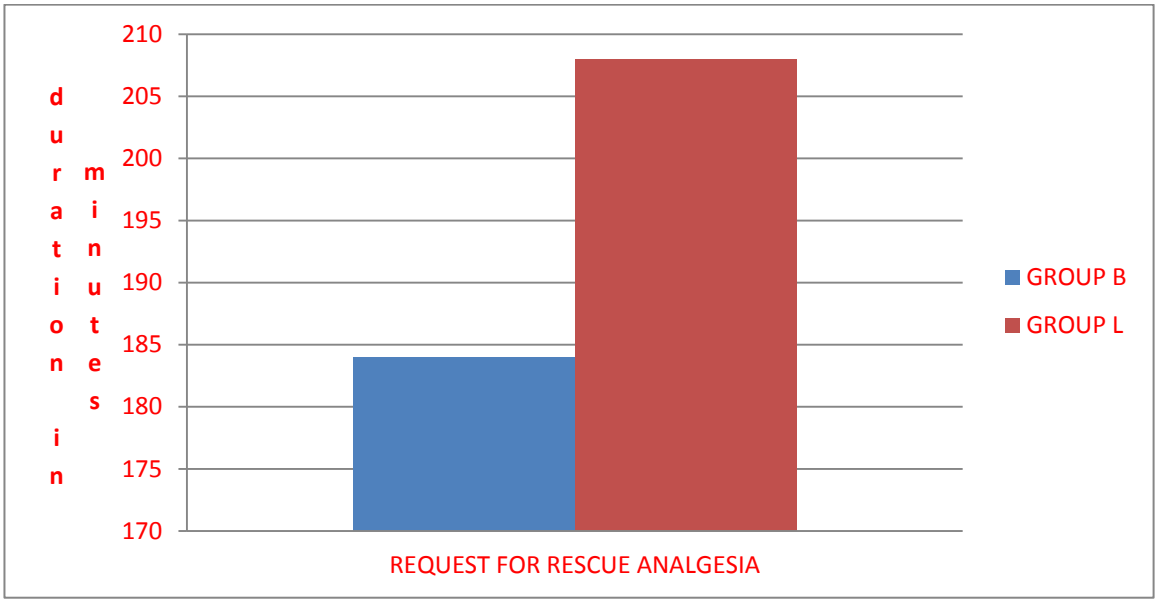


Table: 14. First request for rescue analgesia

Group	n	mean	Standard deviation	p value
Group B	30	184.87	7.380	0.000
Group L	30	208.60	6.173	Significant

Table 14 showed that request for first rescue analgesia was 184.87 minutes (± 7.380) in group B where as 208.6 minutes (± 6.173) in group L. p value of 0.000 is significant.

DISCUSSION

Spinal anaesthesia is the most preferred technique in LSCS, because of easy and rapid induction, effective sensory and motor blockade and has no significant effect on the foetus. Addition of opioids fasten the onset of sensory blockade and thereby it prolonged the duration of anaesthesia without any adverse out come in foetus

For cesarean section, adequate sensory and motor blockade and better hemodynamic stability with minimum adverse effect is necessary. Hypotesion and bradycardia are the most common and unavoidable complications of sub arachanoid block and are even more serious in caesarean section because of aorta-caval compression by the gravid uterus.

We have conducted a prospective, randomized controlled study, to observe the efficacy of sensory blockade, efficacy of motor blockade, duration of analgesia, hemodynamic parameters, neonatal outcome in both the B and L group.

In our study, we evaluated the hemodynamic stability of intrathecal administration of 0.5 % isobaric Levobupivacaine 8.75 mg and 12.5 mcg of fentanyl in **Group L**, which was based on Prabha P et al., we observed

the effective sensory blockade and less motor blockade and stable hemodynamics in caesarean section.

Further, In our study we evaluated the hemodynamic stability of intrathecal administration of 8.75 mg of 0.5 % hyperbaric Bupivacaine and fentanyl 12.5 mcg in Group B.

We observed the following parameters

1. Time of onset and duration of sensory block,
2. Onset of motor blockade,
3. Duration of motor blockade
4. Hemodynamic changes,
5. Adverse effects.

All these were observed from the time of injection of the study drugs into the subarachnoid space.

Prabha P **et** al observed that the fall in Mean Arterial Pressure noted in group B was statistically significant, and also noted about 30 % fall in systolic BP in 10 patients.

In our study intraoperatively we noted that in group B , there was a fall in MAP of > 20 % of the basal value. Where as in group L there was no such fall in MAP noted.

In our study we noted that in group B the intra operative heart rate was increased 20 % more from basal heart rate, whereas in group L, stable heart rate was documented intra-operatively.

This Shows that intrathecal 0.5 % isobaric levobupivacaine with fentanyl had better hemodynamic stability than 0.5% hyperbaric Bupivacaine with fentanyl in LSCS.

Erdil et al. noted in spinal anaesthesia, that low dose Levobupivacaine plus fentanyl had better hemodynamic stability when compared with low dose Bupivacaine with fentanyl.

Gulen Guler et al**.** concluded that time since motor block is shorter, and adverse effects like hypotension , bradycardia and nausea were less in Levobupivacaine (10 mg) with fentanyl (15 mcg) group than that of the Bupivacaine(10 mg) with fentanyl (15 mcg) group in LSCS.

Prabha P et al., observed that, the mean time taken for induction to skin incision was prolonged in group L, and it showed slower onset of action. Maximum sensory blockade level was variable in group B and in group L, it was T4 in all cases. Motor blockade was significantly shorter in group L ,as noted by time taken to regress to Bromage 0. The time

duration needed for rescue analgesia was more in group L when compared to group B.

All neonates had a APGAR score of more than 7 at 5 minutes. It concluded that both the local anaesthetic and opioids had no adverse effect on neonate.

In our study we found that the time taken from intrathecal injection to skin incision in group B were 3 min 34 seconds and in group L it was 5 min 32 seconds and p value is <0.05 .This shows that group L had late onset of sensory blockade when compared to group B .

The duration of sensory blockade was 175 min in group B and 203 min in group L ,and p value was < 0.05. This shows that group L had longer duration of anaesthesia.

And in our study we noted that the time to request for rescue analgesia was 184 min in group B and 208 min in group L . The p value was < 0.05 , which is significant.

Turkmen A et al. Observed that time to achieve maximum sensory and motor blockade was shorter in Intrathecal administration of Bupivacaine (7.5 mg) with fentanyl (15mcg) group and longer

duration of anaesthesia and shorter duration of motor blockade was achieved in levobupivacaine (7.5 mg) with fentanyl (15 mcg) group.

Idowu et al. found that the addition of 25 mcg of fentanyl to 2.5 ml of 0.5 % hyperbaric Bupivacaine increased the duration of analgesia.

Goel et al**.,** in a study observed that intrathecal fentanyl added to low dose local anaesthetic, produced a synergic effect without increasing sympathetic blockade or delaying discharge from hospital.

In our study we noted that the mean APGAR score in 5 minutes were about 9 in both group B and L and it showed that study drug had no adverse effect in neonate.

Lirk et al**.,** found in his study that intrathecal bupivacaine , ropivacaine, and levobupivacaine used for LSCS had no adverse effect as evaluated by APGAR and the pH of arteries in umbilical cord.

Bremerich DH et al . studied variable doses of Levobupivacaine (7.5 mg/ 10 mg / 12.5 mg) without any additives . They recommended 10 mg of Levobupivacaine for parturients who underwent elective caesarean section with spinal anaesthesia.. They also observed that Levobupivacaine showed significantly shorter and less dense motor

blockade when compared to Bupivacaine in subaracnoid block in elective caesarean section.

In our study we noted that, both the drugs 0.5 % Hyperbaric Bupivacaine and 0.5 % Isobaric Levobupivacaine with fentanyl 12.5 mcg achieved satisfactory sensory and motor blockade. The time to attain maximum sensory blockade and to the regression of sensory level to below L1 was longer in group L than group B. We also noted that the duration and density of motor blockade was shorter in group L making early ambulation possible.

The incidence of adverse effects such as hypotension, nausea, vomiting were lesser in group L compared to group B.

SUMMARY

We conducted a double blinded randomized control study in 60 parturients belonging to ASA I and II posted for elective caesarean section at Government Raja Mirasudhar Hospital, Thanjavur Medical College, Thanjavur.

They were randomly allotted into two groups namely , group L and group B. Parturients in **Group B** received 0.5 % Hyperbaric Bupivacaine 8.75 mg and fentanyl 12.5 mcg , making a total volume of 2 mL and it was given intrathecally.

Parturients in **Group L** received 0.5% Isobaric Levobupivacaine 8.75 mg and Fentanyl 12.5 mcg, making a total volume of 2 mL and it was given intrathecally.

In our study we observed the efficacy of sensory blockade, efficacy of motor blockade, hemodynamic parameters, APGAR score for neonatal out come and time to request for rescue analgesia.

The collected data was analysed using chi square test and p value of < 0.05 was considered significant.

Group L showed a better hemodynamic stability in terms of pulse rate ,mean arterial pressure (MAP), decreased incidence of adverse effect such as hypotension , nausea and vomiting, prolonged sensory blockade , lesser duration of motor blockade.

Group B showed a significant fall in MAP, and had significant adverse effects, longer duration of motor blockade.

CONCLUSION

From this study we conclude that 8.75 mg of 0.5 % Isobaric Levobupiacaine with 12.5 mcg fentanyl when given intrathecally in elective caesarean section had prolonged sensory blockade ,with earlier regression of motor blockade, stable heamodyamic parameters and decreased incidence of adverse effects such as hypotension , nausea and vomiting than 8.75 mg of 0.5 % Hyperbaric Bupivacaine with 12.5 mcg fentanyl. APGAR score at 5 minutes was more than 7 in both the groups and it showed that study drugs had no adverse effect in neonates.

So we conclude that 0.5 % Isobaric Levobupivacaine with fentanyl is a better alternative to 0.5 % Hyperbaric Bupivacaine with fenanyl in elective caesarean section.

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PROFORMA

NAME: AGE: SEX: FEMALE

IP NO: HT: WT:

DIAGNOSIS:

Date of SURGERY:

SURGERY DURATION:

ASA Physical Status:

Co-Morbidity:

Pre loaded with iv infusion of 10 ml/kg Ringer Lactate.

Standard intaoperative monitors: ECG, NIBP , Pulseoximetry.

REGIONAL ANAESTHESIA/ SUB ARACHANOID BLOCK

Level:

Parameters

Pre- OP:

PR: SBP: DBP: MAP:

SPO2:

Time for subarachnoid injection to skin incision (min):

MOTOR BLOCKADE (MODIFIED BROMAGE SCORE)

MOTOR LEVEL	0	1	2	3
TIME				

Time of onset:

Time for maximum motor blockade:

SENSORY BLOCKADE (pin prick score)

Time of onset:

Time for maximum sensory blockade:

Two segment regression time :

HAEMODYNAMICS:

TIME	PR	SBP	DBP	MAP	SP02
0MIN					
5MIN					
10MIN					
15MIN					
20MIN					
25MIN					
30MIN					
40MIN					
50MIN					
60MIN					
70MIN					
80MIN					
90MIN					

INTRA-OP;

Inj.Ephedrine Inj.Atropine

Any other Drugs

COMPLICATIONS:

COMPLICATIONS	GROUP B	GROUP L
Hypotension		
Bradycardia		
Nausea		
Vomiting		
Postop shivering		
Others		

TIME FOR FIRST REQUEST FOR RESCUE ANALGESIA:

MASTER CHART Group - B

S.NO	NAME OF THE PATIENT	AGE	SEX	IP.NO	HEIGHT CM	WEIGHT IN KG	DIAGNOSIS	ASA I / II	DURATION OF SURGERY (MIN)
B 1	KANAGA	23	F	447592	159	64	G2 PI L1 PREV LSCS	I	54
B 2	AMBIKA	25	F	447202	165	78	G2P1L1PREV LSCS	1	57
B 3	FATHIMA BANU	24	F	465848	154	70	G2P1L1PREV LSCS	II	48
B 4	SARANYA	23	F	447583	156	54	G2P1L1PREV LSCS	II	55
B 5	GOMATHI	32	F	447400	161	55	G2P1L1PREV LSCS	1	51
B 6	ANUSIYA	32	F	447477	155	64	G2P1L1PREV LSCS	II	60
B 7	SARANYA	23	F	448751	150	53	G2P1L1PREV LSCS	I	53
B 8	LOGANAYAGI	26	F	449035	156	56	G2PILI PREV LSCS	I	54
B 9	CHITRA	25	F	447739	150	55	G2P1L1PREV LSCS	1	46
B 10	MAHESWARI	21	F	452688	159	67	G2P1L1PREV LSCS	1	51
B 11	GAYATHRI	23	F	449981	168	60	G3P1L1A11PREV LSCS	II	57
B12	YASMIN ROJA	24	F	456869	153	62	G2P1L1PREV LSCS	II	46
B 13	BEHEGAM	38	F	456 875	155	65	G3P2L2 PREV LSCS	II	48
B 14	MANJULA	30	F	466183	156	70	G2P1L1PREV LSCS	II	54
B 15	MAHADEVI	30	F	452602	153	74	G3P2L2 PREV LSCS	II	55
B 16	SENTHAMARAISELVI	24	F	442586	159	74	G3P1L1A1PREV LSCS	II	48
B17	DEVI	23	F	442388	162	68	PRIMI	II	45
B 18	NITHYA	28	F	448457	160	65	G3P2L2 PREV LSCS	II	47
B19	PARKAVI	25	F	478842	152	55	PRIMI	II	48
B20	TAMIL SELVI	32	F	487572	150	70	G2P1L0 PREV LSCS	I	46
B21	NATHIYA	26	F	486594	160	67	G2P1L1PREV LSCS	II	52
B22	ANGAIYARKANNI	23	F	487541	156	50	G2P1L1PREV LSCS	I	43
B 23	THANGAM	21	F	487613	155	55	G2P1L1PREV LSCS	II	48
B 24	RADHA	30	F	484174	160	60	G2P1L1PREV LSCS	II	43
B25	PUSHPALATHA	32	F	487520	155	65	PRIMI	II	40
B26	SARITHA	31	F	486330	163	67	G2P1L1PREV LSCS	I	45
B27	DURGA	27	F	486095	161	70	G3P2L2 PREV 2 LSCS	II	58
B28	MANOMANI	27	F	487600	157	57	G2P1L1 PREV LSCS	II	55
B 29	SANGEETHA	26	F	487488	152	61	G3P2L1A1 PREV LSCS	II	50
B30	NIRMALA	21	F	458866	150	65	PRIMI	I	40

PULSE RATE											MEAN ARTERIAL PRESSURE (MAP)										
PRE OP	0 MIN	5 MIN	10 MIN	15 MIN	20 MIN	25 MIN	30 MIN	40 MIN	50 MIN	60 MIN	PRE OP	0 MIN	5 MIN	10 MIN	15 MIN	20 MIN	25 MIN	30 MIN	40 MIN	50 MIN	60 MIN
82	84	78	61	85	87	86	82	91	86	89	78	78	43	94	62	66.66	66	63	65	65	66
89	90	98	106	108	111	104	100	107	98	96	73	63	67	71	63	65	72	65	70	72	75
76	81	96	93	103	102	95	93	89	90	83	89	67	56	63	74	55	70	75	77	77	82
94	98	109	111	118	121	110	105	98	100	98	90	78.6	50	68	76	73	63	76	78	84	85
88	84	80	98	91	95	101	103	100	95	93	80	67	69	84	66	65	82	80	84	84	87.3
76	83	99	96	105	104	99	100	98	92	91	89	87	90	78	75	75	76	76	73	79	83.3
90	109	89	87	109	114	112	124	114	113	107	86	68	52	68	64	54	57	59	64	70	70
95	92	109	94	99	102	107	111	104	98	95	97	89	79	84	79	77	70	68	81	85	90
76	86	91	99	98	92	87	87	82	80	69	97	84	83	82	72	74	72	78	81	84	86
92	98	100	110	112	111	114	108	101	98	96	89	82	73	65	64	73	72	75	76	75	80
89	90	97	109	118	107	110	101	99	91	93	90	85	75	63	66	63	71	72	75	77	80
91	107	94	91	106	111	115	109	104	104	96	76	58	65	68	55	57	65	67	70	71	73
86	93	107	97	113	108	111	107	98	96	93	93	83	70	76	69	58	75	67	77	80	82
92	88	96	95	104	98	98	97	99	100	95	85	72	64	70	66	67	73	78	72	73	74
96	111	109	103	104	108	106	108	105	95	97	96	73	61	84	75	74	78	62	69	73	79
84	119	98	91	92	104	107	102	96	90	88	83	82	61	70	63	65	61	67	68	71	78
81	95	100	106	104	108	110	98	105	95	104	91	82	65	74	64	69	72	70	78	81	82
94	96	101	108	111	109	112	106	100	97	92	90	84	76	66	68	65	68	69	73	76	78
94	112	110	112	111	108	104	98	97	95	94	100	100	76	72	72	69	70	71	81	78	77
92	110	100	94	105	100	103	104	93	89	87	101	98	80	64	71	73	78	78	74	79	80
88	84	80	99	90	96	103	105	99	96	96	90	84	69	72	85	69	71	83	82	82	83
88	105	105	103	107	115	103	92	90	92	88	91	84	83	76	75	77	73	82	84	83	86
97	102	102	109	98	106	106	102	98	94	97	84	78	78	72	81	73	71	70	71	71	80
91	88	96	104	107	98	96	94	99	103	93	78	60	65	72	62	67	72	71	72	71	76
84	99	92	98	97	104	94	93	94	86	83	93	69	70	70	61	66	61	61	65	67	74
85	108	102	98	107	100	105	106	97	94	96	93	83	66	63	74	73	70	77	74	79	80
90	107	94	91	106	110	116	105	107	100	95	79	49	63	63	62	62	66	65	70	70	72
81	103	108	84	89	90	104	99	98	91	87	85	47	65	78	78	73	66	61	66	71	73
82	90	110	106	102	103	100	99	102	98	93	85	89	83	80	70	68	67	65	65	68	73
92	122	117	104	90	94	100	95	84	89	84	86	66	64	62	68	67	73	78	73	75	79

TIME FOR INDUCTION TO SKIN INCISION	TIME FOR ONSET OF SENSORY BLOCKADE	HEIGHT OF MAXIMUM SENSORY BLOCKADE SENSORY BLOCKADE	TIME OF 2 SEGMENT REGRESSION	TIME OF REGRESSION TO SENSORY LEVEL <LI IN MIN	ONSET OF MOTOR BLOCKADE
					BROMAGE 3
3 MIN 50 SEC	1 MIN 25SEC	T2	50 MIN	180 MIN	2 MIN 05
3 MIN 45 SEC	1 MIN 33 SEC	T4	53 MIN	175 MIN	2 MIN15 SEC
4 MIN	1MIN 41 SEC	T2	55 MIN	175 MIN	2 MIN
3 MIN 45SEC	1 MIN 30 SEC	T2	45 MIN	172 MIN	2.MIN 0 SEC
3 min 10 sec	1MIN 32 SEC	T2	48 MIN	176 MN	2.MIN 15 SEC
4 MIN 05 SEC	1 MIN 37 SEC	T4	50 MIN	172 MIN	2 MIN 30 SEC
3 MIN 58 SEC	1 MIN 23 SEC	T4	58 MIN	168 MIN	2 MIN 38 SEC
3MIN 35 SEC	1 MI0 35 SEC	T2	50 MIN	173 MIN	2 MIN 32 SEC
3 MIN 23 SEC	1 MIN 22 SEC	T2	48 MIN	169 MIN	2 MIN 43 SEC
3 MIN 56 SEC	1 MIN 30 SEC	T2	55 MIN	179 MIN	2 MIN 36 SEC
4MIN 08 SEC	1 MIN 19 SEC	T4	48 MIN	182 MIN	2MIN 08 SEC
3 MIN 32 SEC	1 MIN 24 SEC	T2	45 MIN	177 MIN	2MIN 58 SEC
3 MIN 20 SEC	1 MIN 22 SEC	T2	48 MIN	180 MIN	2 MIN 50 SEC
4 MIN 15 SEC	1 MIN 35 SEC	T4	55 MIN	175 MIN	2MIN
4 MIN10 SEC	1 MIN 12 SEC	T2	46 MIN	171 MIN	2 MIN 16 SEC
4 MIN 03 SEC	1MIN 10 SEC	T2	53 MIN	179 MIN	2 MN 35 SEC
3 min30 sec	1min 15 sec1	T4	46 MIN	174 MIN	2 MIN
3 MIN 30 SEC	1 MIN 40 SEC	T2	57 MIN	170 MIN	2 MIN 15 SEC
4 MIN	1MIN 30 SEC	T2	55 MIN	175 MIN	2 MIN 30 SEC
4MIN 10 SEC	1MIN 30 SEC	T2	40 MIN	176 MIN	2 MIN 45 SEC
3 MIN 40 SEC	1 MIN 40 SEC	T2	52 MIN	170 MIN	2MIN 40 SEC
4 MIN	1 MIN45 SEC	T4	45 MIN	175 MIN	2 MIN 50 SEC
4 MIN	1 MIN 40 SEC	T2	47 MI	180 MIN	2 MIN 55 SEC
3MIN 35 SEC	1 MIN 35 SEC	T2	43 MIN	170 MIN	3 MIN
4 MIN	1 MIN 40 SEC	T2	50 MIN	175 MIN	2 MIN 50 SEC
3 MIN 40 SEC	1 MIN 45 SEC	T2	57 MIN	170 MIN	2MIN 55 SEC
4 MIN	1MIN 40 SEC	T2	50 MIN	180 MIN	3 MIN
3 MIN 40 SEC	1 MIN45 SEC	T2	50 MIN	185 MIN	2 MIN50 SC
4 MIN	1 MIN 50 SEC	T2	56 MIN	185 MIN	2 MIN 55 SEC
3 MIN 50 SEC	1 MIN 50 SEC	T2	55 MIN	180 MIN	3 MIN

RESOUTION TO BROMAGE 0 (MIN)	REQUEST FOR ANALGESIA	APGARSCORE 0 / 5 MIN	ADVERSE EFFECT
170 MIN	185 MIN	8 & 9	HYPOTENSION /VOMITING
174 MIN	184 MIN	8 &9	
165 MIN	195 MIN	8& 9	HYPOTENSION
164 MIN	199 MIN	8 & 9	HYPOTENSION
171 MIN	191 MIN	8 & 9	
168 MIN	188 MIN	8 & 8	SHIVERING
183 MIN	193 MIN	8&9	HYPOTENSION
174 MIN	194 MIN	8 & 9	
169 MIN	167 MIN	9&9	HYPOTENSION/SHIVERING
175 MIN	188 MIN	8 & 9	HYPOTENSION
177 MIN	182 MIN	8 & 9	HYPOTENSION
171 MIN	192 MIN	8 & 9	HYPOTENSION & VOMITING
181 MIN	180 MIN	8 & 9	HYPOTENSION
170 MIN	176 MIN	8 & 9	HYPOTENSION
175 MIN	185 MIN	8 & 9	HYPOTENSION & SHIVERING
180MIN	189 MIN	8 & 9	HYPOTENSION
178 MIN	185 MIN	8 &9	HYPOTENSION
180 MIN	176 MIN	8 & 9	HYPOTENSION
175 MIN	180 MIN	8 & 9	
180 MIN	185 MIN	8 & 9	HYPOTENSION
169 MIN	180 MIN	8 & 9	
175 MIN	175 MIN	8& 9	
185 MIN	190 MIN	8 & 9	
180 MIN	175 MIN	8 & 9	
170 MIN	192 MIN	8 & 9	HYPOTENSION/SHIVERING
175 MIN	185 MIN	8& 9	
180 MIN	175 MIN	8 & 9	
180 MIN	190 MN		HYPOTENSION
175 MIN	180 MIN	8 & 9	HYPOTENSION / VOMITING
185 MIN	190 MIN	8 & 9	

MASTER CHART Group - L

S NO	NAME OF THE PATIENT	AGE/YRS	SEX	IP NUMBER	HEIGHT IN CM	WEIGHT IN KG	DIAGNOSIS	ASA I/ II	DURATION OF SURGERY (MIN)
L 01	KAVITHA	29	F	**458866**	155	66	G3 A2	II	48 MIN
L 02	KALAISELVI	28	F	449362	154	53	G4P3L2 PREV LSCS	II	55 MIN
L 03	MARUTHAMBAL	25	F	478705	152	63	PRIMI	II	48 MIN
L 04	SRIVIDHYA	30	F	478766	158	72	G2P1L1 PREV LSCS	II	52 min
L 05	SHANTHI	33	F	478845	155	57	G2P1L1 PREV LSCS	II	55 MIN
L 06	SABITHA	26	F	455180	151	50	G4P2L2A1 PREV LSCS	II	58 MIN
L 07	OVIYA	22	F	455272	152	55	G3P1L1A1 PREV LSCS	II	50 MIN
L 08	SASI	28	F	463046	159	65	G3P1L1A1 PREV LSCS	II	55 MIN
L 09	VIMALA RANI	27	F	487494	160	60	G2P1L1 PREV LSCS	II	54 MIN
L 10	BERLIN	28	F	464046	153	55	G2P1L1 PREV LSCS	II	48 MIN
L 11	CHITRA	27	F	485445	162	68	G4P1L1A2 PREVLSCS	II	60 MIN
L12	RANA	24	F	464112	157	65	G3P1L1A1 PREV LSCS	II	55 MIN
L 13	RADHIKA	30	F	486336	158	60	G2P1L1 PREV LSCS	II	57 MIN
L 14	SUJATHA	26	F	465439	153	67	G3P2L2 PREV LSCS	II	53 MIN
L 15	PARAMESHWARI	32	F	486119	159	68	G2P1L1 PREV LSCS	II	50 MIN
L 16	RANA	27	F	466973	154	64	G2P1L1 PREV LSCS	II	56 MIN
L 17	MOHANA	32	F	486957	164	70	G3P2L1 PREV 2 LSCS	II	58 MIN
L 18	GEETHA	30	F	466170	150	58	G3P1L1A1 PREV LSCS	II	54 MIN
L 19	NARMATHA	27	F	478798	160	69	PRIMI	I	45 MIN
L 20	KAYARHARNI	25	F	4823120	158	65	PRIMI	II	50 MIN
L 21	SIVARANJINI	24	F	487413	168	68	G2P1L1 PREV LSCS	II	53 MIN
L22	SATHIYA	26	F	449260	165	65	G2P1L1 PREV LSCS	II	55 MIN
L 23	SUGANYA	24	F	486531	166	70	G2P1L1 PREV LSCS	II	54 MIN
L 24	SANTHI	25	F	450086	150	56	G2 P1L1 PREV LSCS	I	50 MIN
L 25	MALARVIZHI	28	F	486234	157	69	G2P1L1 PREV LSCS	II	49 MIN
L 26	SUGUNAYA	24	F	459305	155	65	G3P2L2 PREV LCS	II	58 MIN
L 27	DIVYA	24	F	486274	152	63	PRIMI	I	42 MIN
L 28	SANGEETHA	27	F	459347	156	70	G2P1L1 PREV LSCS	II	45 MIN
L 29	PAVITHRA	24	F	486337	161	69	PRIMI	II	46 MIN
L 30	JAYANTHI	29	F	459308	150	65	G2P1L1 PREV LSCS	II	56 MIN

PULSE RATE											MEAN ARTERIAL PRESSURE (MAP)										
PRE OP	0 MIN	5 MIN	10 MIN	15 MIN	20 MIN	25 MIN	30 MIN	40 MIN	50 MIN	60 MIN	PRE OP	0 MIN	5 MIN	10 MIN	15 MIN	20 MIN	25 MIN	30 MIN	40 MIN	50 MIN	60 MIN
108	101	103	109	106	107	106	100	97	95	96	79	88	85	78	82	84	88	87	95	95	92
98	106	96	103	98	101	105	98	99	94	99	96	80	84	85	83	73	75	79	82	78	84
95	85	79	88	83	85	88	90	88	90	84	94	94	77	85	85	83	84	81	74	74	82
88	95	89	88	98	94	99	98	100	83	89	96	92	95	97	97	95	94	94	94	92	94
96	98	94	95	96	99	95	98	95	96	92	92	77	76	77	75	75	73	80	80	83	86
98	108	102	94	95	88	84	87	96	98	92	83	82	73	73	71	70	69	71	72	76	73
93	103	97	95	92	107	100	94	90	91	98	86	76	80	74	69	72	72	79	75	79	78
92	88	87	90	93	98	96	93	82	86	84	85	85	87	79	78	76	69	72	79	81	85
96	98	94	87	88	92	95	96	99	93	89	86	89	90	82	79	78	76	77	81	84	85
104	106	106	105	101	107	98	102	100	99	98	87	85	85	95	82	85	76	75	80	77	86
97	87	79	86	85	83	90	88	85	92	89	93	90	88	91	87	85	86	86	84	87	90
100	100	103	108	97	108	107	105	101	96	92	93	74	82	73	72	75	75	79	80	77	85
96	106	98	96	92	99	104	95	91	90	92	91	78	78	77	73	77	72	75	78	82	85
76	90	89	70	71	75	75	85	103	100	89	85	86	78	77	78	76	74	69	74	84	81
98	94	90	86	94	95	90	88	84	86	80	87	85	84	84	83	75	77	82	79	81	99
102	108	104	106	108	109	101	108	103	98	96	87	93	93	91	85	82	82	76	79	84	86
101	101	103	99	96	104	100	99	97	94	96	83	86	83	74	79	81	80	82	87	83	86
99	100	105	101	107	107	108	96	95	94	90	85	89	94	84	79	74	77	78	75	80	84
92	96	96	93	98	91	98	98	99	94	99	89	76	73	74	74	75	71	77	77	81	85
102	94	95	108	99	100	97	98	93	90	81	92	90	94	90	91	89	85	82	87	86	85
96	98	99	94	101	93	98	102	95	102	97	82	86	80	74	77	80	79	83	87	82	87
95	105	99	97	94	109	102	96	92	93	98	88	79	83	75	71	75	77	81	82	81	82
92	92	96	94	96	98	86	89	93	97	93	80	79	73	70	71	71	70	69	73	73	74
98	97	104	103	98	94	96	98	95	98	97	89	93	94	90	93	92	83	89	87	92	93
78	88	84	76	79	84	88	84	89	90	91	80	82	79	73	74	75	75	74	71	77	79
94	90	91	88	94	96	93	90	86	89	83	110	86	84	82	84	81	76	78	81	84	87
88	84	87	90	92	91	93	97	94	91	90	82	73	79	72	74	75	73	76	80	80	81
102	111	109	101	102	101	95	103	100	94	97	91	80	67	70	71	73	73	75	70	85	87
92	94	99	98	97	101	97	98	99	95	87	92	91	91	88	90	84	87	85	87	88	87
93	89	92	86	92	96	91	95	87	91	95	89	84	80	81	83	79	79	81	88	89	87

TIME FOR INDUCTION TO SKIN INCISION	TIME OF ONSET OF SENSORY BLOKADE	HEIGHT OF MAXIMUM SENSORY BLOCKADE	TIME OF 2 SEGMENT REGRESSION	TIME OF REGRESSION TO SENSORY LEVEL <LI IN MIN	ONSET OF MOTOR BLOCKADE
					BROMAGE 3
5 MIN 40 SEC	4 MIN 10 SEC	T4	62 MIN	205 MIN	5 MIN
6 MIN	4 MIN	T4	53 MIN	203 MIN	5 MIN
5 MIN 50 SEC	4 MIN 35SEC	T2	67 MIN	200 MIN	6MIN
5 MIN 45 SEC	4 MIN 10 SEC	T2	58 MIN	198 MIN	5 MIN45 SEC
5 MIN35SEC	4 MIN 10 SEC	T2	57 MIN	210 MIN	6 MIN
6 MIN	4 MIN 15 SEC	T4	65 MIN	200 MIN	6 MIN
6 MIN	4 MIN	T4	58 MIN	205 MIN	5 MIN 30 SEC
5 MIN 30 SEC	4 MIN 20 SEC	T2	54 MIN	210 MIN	5 MIN 50 SEC
5 MIN 55 SEC	4 MIN 55 SEC	T2	58 MIN	205 MIN	6 MIN10 SEC
6 MIN	4 MIN 10 SEC	T4	54 MIN	200 MIN	6 MIN
6 MIN	4 MIN 48 SEC	T4	58 MIN	208 MIN	6 MIN
6 MIN 10 SEC	4 MIN 30	T4	59MIN	205 MIN	6 MIN 15 SEC
5 MIN 55 SEC	4 MIN 40 SEC	T2	55 MIN	210 MIN	6 MIN
5 min 45 sec	4 min 20 sec	T4	56 MIN	210 MIN	6 MIN 10 SEC
5 min 45 sec	4 MIN	T2	54 MIN	200 MIN	6 MIN 05 SEC
6 MIN 05 SEC	4 MIN25 SEC	T4	50 MIN	205 MIN	6 MIN
5 MIN 40 SEC	4 MIN 35SEC	T2	56 MIN	212 MIN	6 MIN
5 MIN 45 SEC	4 MIN 10 SEC	T2	52 MIN	200 MIN	6 MIN 15 SEC
6 MIN 30 SEC	4 MIN 50 SEC	T2	54 MIN	205 MIN	6 MIN 23 SEC
6 MIN	4 MIN20 SEC	T4	58 MIN	210 MIN	6 MIN
5 MIN 35 SEC	4 MIN 12 SEC	T2	45 MIN	200 MIN	5 MIN50 SEC
5 MIN 50 SEC	4 MIN 20 SEC	T2	48 MIN	200 MIN	5 MIN 55 SEC
5 MIN30 SEC	4 MIN	T4	50 MIN	205 MIN	5 MIN 30 SEC
6 MIN 20 SEC	4 min35 sec	T4	58 MIN	195 MIN	6 MIN 35 SEC
5 MIN 30 SE	4 MIN 50 SEC	T4	45 MIN	198 MIN	6 MIN
5 MIN 55 SEC	4 MIN 30 SEC	T2	50 MIN	205 MIN	6 MIN 05 SEC
5 min 40 sec	4 min	T4	55 MIN	200 MIN	5 MIN 50 SEC
6 MIN	4 MIN 30 SEC	T4	55 MIN	200 MIN	6 MIN 10 SEC
6 min 05 sec	4 min 15 sec	T4	45 MIN	198 MIN	6 MIN
6 min	4 MIN 45SEC	T2	50 MIN	205 MIN	6 MIN 15 SEC

RESOUTION TO BROMAGE 0 (MIN)	REQUEST FOR ANALGESIA	APGARSCORE 0 / 5 MIN	ADVERSE EFFECT
130 MIN	210 MIN	8 & 9	
120 MIN	220 MIN	8 &9	
130 MIN	218 MIN	8 & 9	
134 MIN	210 MIN	8& 9	
130 MIN	215 MIN	8 & 9	
135 MIN	210 MIN	8 & 9	
130 MIN	205 MIN	8 & 9	
125 MIN	210 MIN	8 & 9	
130 MIN	200 MIN	8 & 9	
140 MIN	205 MIN	8 & 9	
132 MIN	210 MIN	8 & 9	
130 MIN	210 MIN	8 & 9	
140 MIN	200 MIN	8 & 9	
135 MIN	215 MN	8 & 9	
128 MIN	200 MIN	8& 9	
130 MIN	210 MIN	8 & 9	
137 MIN	200 MIN	8 & 9	
135 MIN	220 MIN	8 & 9	
141 MIN	210 MIN	8 & 9	
120 MIN	205 MIN	8 & 9	
136 MIN	200 MIN	8 & 9	
137 MIN	205 MIN	8 & 9	
135 MIN	210 MIN	8 & 9	
125 MIN	210 MIN	8 & 9	
139 MIN	205 MIN	8 & 9	
132 MIN	220 MIN	8 & 9	SHIVERING
141 MIN	210 MIN	8 & 9	
135 MIN	200 MIN	8 &9	
139 MIN	205 MIN	8 & 9	
142 MIN	210 MIN	8 & 9	