COMPARATIVE EVALUVATION OF SPINAL ANAESTHESIA WITH LEVOBUPIVACAINE AND HYPERBARIC BUPIVACAINE FOR CAESAREAN SECTION

A STUDY OF 60 CASES

DISSERTATION SUBMITTED FOR

DOCTOR OF MEDICINE

BRANCH X (ANAESTHESIOLOGY)

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

CHENNAI, TAMILNADU

APRIL 2016

CERTIFICATE BY THE HEAD OF THE INSTITUTION

This is to certify that the dissertation entitled **"COMPARATIVE EVALUVATION OF SPINAL ANAESTHESIA WITH LEVO BUPIVACAINE AND HYPERBARIC BUPIVACAINE FOR CAESAREAN SECTION"** submitted by **Dr.C.IMAYAVARAMBAN**, in partial fulfillment for the award of the degree of Doctor of Medicine in Anaesthesiology by theTamilnadu Dr.M.G.R. Medical University, Chennai , this is a bonafide original research work done by him in the department of Anaesthesiology and Critical Care,Tirunelveli Medical College, under the guidance and supervision of **Prof.Dr.A.BALAKRISHNAN M.D.,** during the academic year 2013-2016.

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DECLARATION BY THE CANDIDATE

I, **Dr.C.IMAYAVARAMBAN**, declare that the dissertation entitled **"COMPARATIVE EVALUVATION OF SPINAL ANAESTHESIA WITH LEVO BUPIVACAINE AND HYPERBARIC BUPIVACAINE FOR CAESAREAN SECTION"** has been prepared by me. This is submitted to The Tamil Nadu Dr. M.G.R. Medical University, Chennai, in partial fulfilment of the requirement for the award of M.D. Degree,Branch X (ANAESTHESIOLOGY) degree Examination to be held in April 2016.

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PROTOCOL TITLE: COMPARATIVE EVALUATION OF SPINAL ANAESTHESIA WITH LEVOBUPIVACAINE AND HYPERBARIC BUPIVACAINE FOR CAESAREAN SECTION.

PRINCIPAL INVESTIGATOR: Dr. C. IMAYAVARAMAN, MBBS.,

DESIGNATION OF PRINCIPAL INVESTIGATOR: POST GRADUATE IN ANAESTHESIOLOGY
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Dear ,Dr. C. Imayavaraman, MBBS., The Tirunelveli Medical College Institutional Ethics Committee (TIREC) reviewed and discussed your application during the IEC meeting held on 10.06.2015.

THE FOLLOWING DOCUMENTS WERE REVIEWED AND APPROVED

1.	TIREC Application Form	☐
2.	Study Protocol	☐
3.	Department Research Committee Approval	☐
4.	Patient Information Document and Consent Form in English and Vernacular Language	☐
5.	Investigator's Brochure	☐
6.	Proposed Methods for Patient Accrual Proposed	☐
7.	Curriculum Vitae of the Principal Investigator	☐
8.	Insurance /Compensation Policy	☐
9.	Investigator's Agreement with Sponsor	☐
10.	Investigator's Undertaking	☐
11.	DCGI/DGFT approval	☐
12.	Clinical Trial Agreement (CTA)	☐
13.	Memorandum of Understanding (MOU)/Material Transfer Agreement (MTA)	☐
14.	Clinical Trials Registry-India (CTRI) Registration	☐

THE PROTOCOL IS APPROVED IN ITS PRESENTED FORM ON THE FOLLOWING CONDITIONS

1. The approval is valid for a period of 2 year/s or duration of project whichever is later
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3. A written request should be submitted 3weeks before for renewal / extension of the validity
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   c. If the amendments require a change in the consent form, the copy of revised Consent Form should be submitted to Ethics Committee for approval. If the amendment demands a re-look at the toxicity or side effects to patients, the same should be documented.
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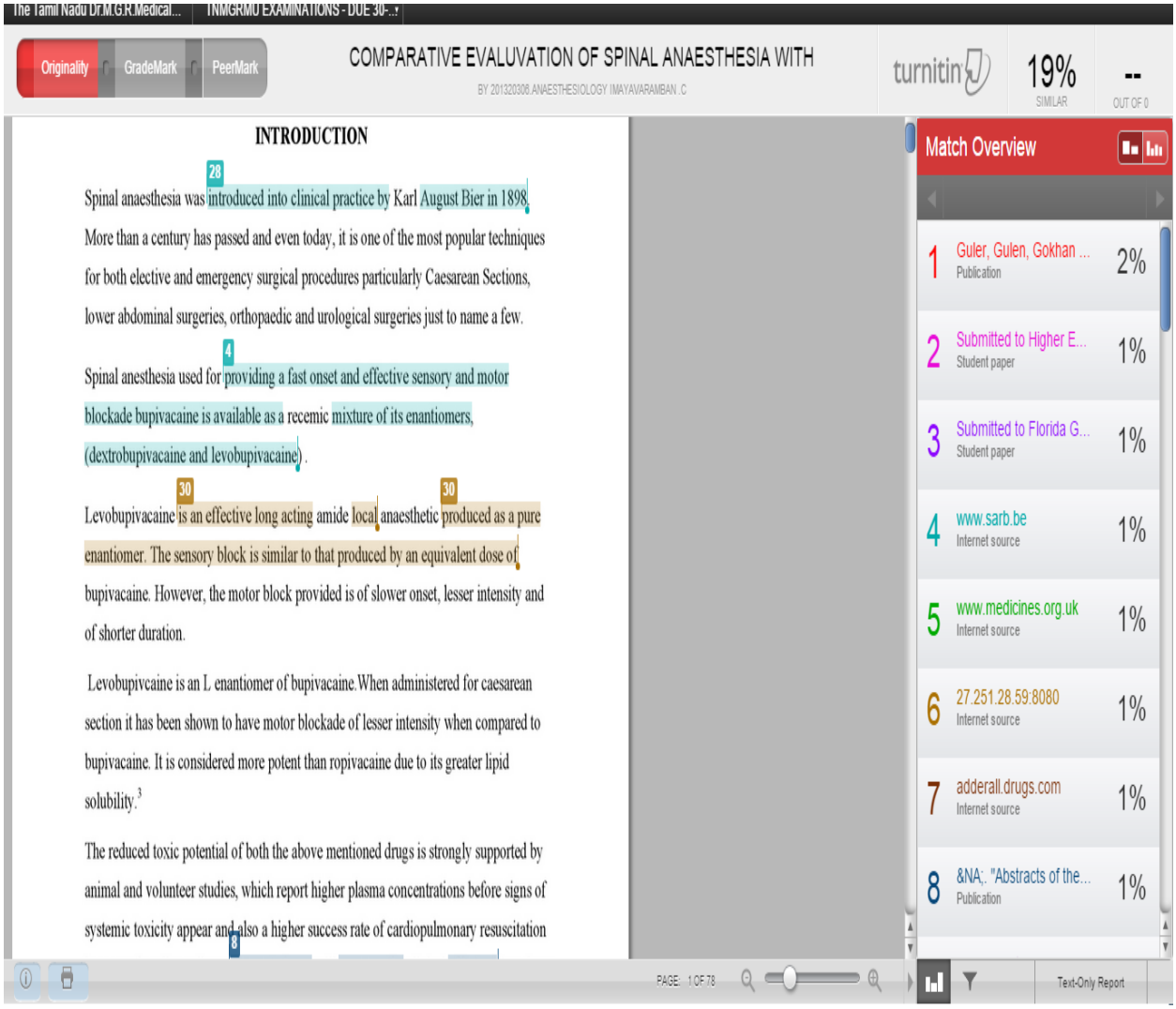
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INTRODUCTION
Spinal anaesthesia was introduced into clinical practice by Karl August Bier in 1898.
More than a century has passed and even today, it is one of the most popular techniques for both elective and emergency surgical procedures particularly Caesarean Sections, lower abdominal surgeries, orthopaedic and urological surgeries just to name a few.
Spinal anesthesia used for providing a fast onset and effective sensory and motor blockade bupivacaine is available as a recemic mixture of its enantiomers, (dextrobupivacaine and levobupivacaine).
Levobupivacaine is an effective long acting amide local anaesthetic produced as a pure enantiomer. The sensory block is similar to that produced by an equivalent dose of bupivacaine. However, the motor block provided is of slower onset, lesser intensity and of shorter duration.
Levobupivcaine is an L enantiomer of bupivacaine.When administered for caesarean section it has been shown to have motor blockade of lesser intensity when compared to bupivacaine. It is considered more potent than ropivacaine due to its greater lipid solubility.[3]
The reduced toxic potential of both the above mentioned drugs is strongly supported by animal and volunteer studies, which report higher plasma concentrations before signs of systemic toxicity appear and also a higher success rate of cardiopulmonary resuscitation
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COMPARATIVE EVALUVATION OF SPINAL ANAESTHESIA WITH LEVOBUPIVACAINE AND HYPERBARIC BUPIVACAINE FOR CAESAREAN SECTION

ABSTRACT

AIM&OBJECTIVES:

This study was performed to compare the anesthetic efficacy and safety of two local anesthetic agents : hyperbaric bupivacaine and isobaric levobupivacaine, in patients undergoing elective caesarean section.

METHODS AND MATERIALS:

Sixty patients, ASA I-II, were randomized to receive an intrathecal injection of hyperbaric bupivacaine or isobaric levobupivacaine. Group B (n = 30) received 2 ml of Hyperbaric bupivacaine 5 mg/ml (10 mg). Group L (n = 30) received 2 ml of isobaric levobupivacaine 5 mg/ml (10 mg).

The onset and duration of sensory and motor blockade, recovery parameters, hemodynamic changes and side effects for the two agents were compared.

RESULTS:

The time of onset of sensory block was faster in Group B(1.46 ± 0.50) when compared with Group L(2.0 ± 0.37). In Group B the time to two segment regression was prolonged (76.16 ± 13.86) when compared with Group L (68.43 ±12.96) and it is statistically significant. Duration of motor blockade was prolonged in Group B(132 ± 7.67) when compared with Group L (99 ± 9.13). Hemodynamic variables were more stable in Group L than Group B. Twelve patients in Group B had adverse effects when compared with seven patients in Group L.

CONCLUSION:

0.5% Isobaric Levobupivacaine 10mg for intrathecal injection of caesarean section produces adequate sensory and motor blockade and stable hemodynamic parameters with minimum adverse effects than 0.5% hyperbaric bupivacaine 10mg. We concluded that isobaric Levobupivacaine is a better alternative for caesarean section.

INTRODUCTION

Spinal anaesthesia was introduced into clinical practice by Karl August Bier in 1898. More than a century has passed and even today, it is one of the most popular techniques for both elective and emergency surgical procedures particularly Caesarean Sections, lower abdominal surgeries, orthopaedic and urological surgeries just to name a few.

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The reduced toxic potential of both the above mentioned drugs is strongly supported by animal and volunteer studies, which report higher plasma concentrations before signs of systemic toxicity appear and also a higher success rate of cardiopulmonary resuscitation in cases of cardiac collapse.In our study we will compare the clinical effects of two drugs levobupivacaine and bupivacaine in spinal anaesthesia for elective caesarean section.

AIM OF THE STUDY

To compare the following factors in two groups (0.5%hyperbaric Bupivacaine 10mg) and (0.5% isobaric Levobupivacaine 10mg) for elective caesarean sections under spinal anaesthesia, with respect to:

1. Sensory blockade - Onset, Time to peak sensory blockade, highest level of sensory block.

2. Motor blockade - Onset, Time to maximum motor blockade, duration of motor block.

3. Recovery parameters - Time to two segment regression, time to complete sensory and motor recovery.

4. Hemodynamic changes

5. Adverse effects

HISTORY

1884 - Koller, demonstrated local analgesic properties of cocaine

1885 - JlL Corning, produced analgesia by accidental subarachnoid injection of cocaine

1892 - Heinrich Braun introduced the term ‘conduction anaesthesia

1898 - August Bier, introduced first clinical spinal analgesia

1901 - Extradural caudal injection, introduced by Sicard and Cathelin, independently.

1902 - Heinrich Braun, added adrenaline to cocaine, to prolong its effects and retard its absorption.

1906 - Haubold and Meltzer – Intrathecal administration of magnesium Sulphate

1917 - Edmund Boyle described his portable N_2O and O_2 apparatus.

1921 - Extradural lumbal analgesia described by Pages.

1947 - Lignocaine was introduced by Torsten Gordh.

1957 - Ekenstam synthesized Bupivacaine

1963 - Bupivacaine was used clinically by LJ telivuo

1966 - Ketamine used clinically by Corssen and Domino.

ANATOMICAL CONSIDERATION

Spinal anaesthesia was initially produced inadvertently by J.L.Cornings in 1885, and first used deliberately by August Bier in 1898. Lumber subarachnoid block is a safe and simple clinical procedure and is to be preferred to general anaesthesia for certain operations and in certain groups of patients.

Vertebrae

They are 33 in number, seven cervical, twelve thoracic, five lumbar, five sacral and four coccygeal, each being composed of body, separated by intervertebral discs. 'Vertebral arch' formed by pedicles and laminae, transverse and spinous processes with attached ligaments and muscles and articular processes.

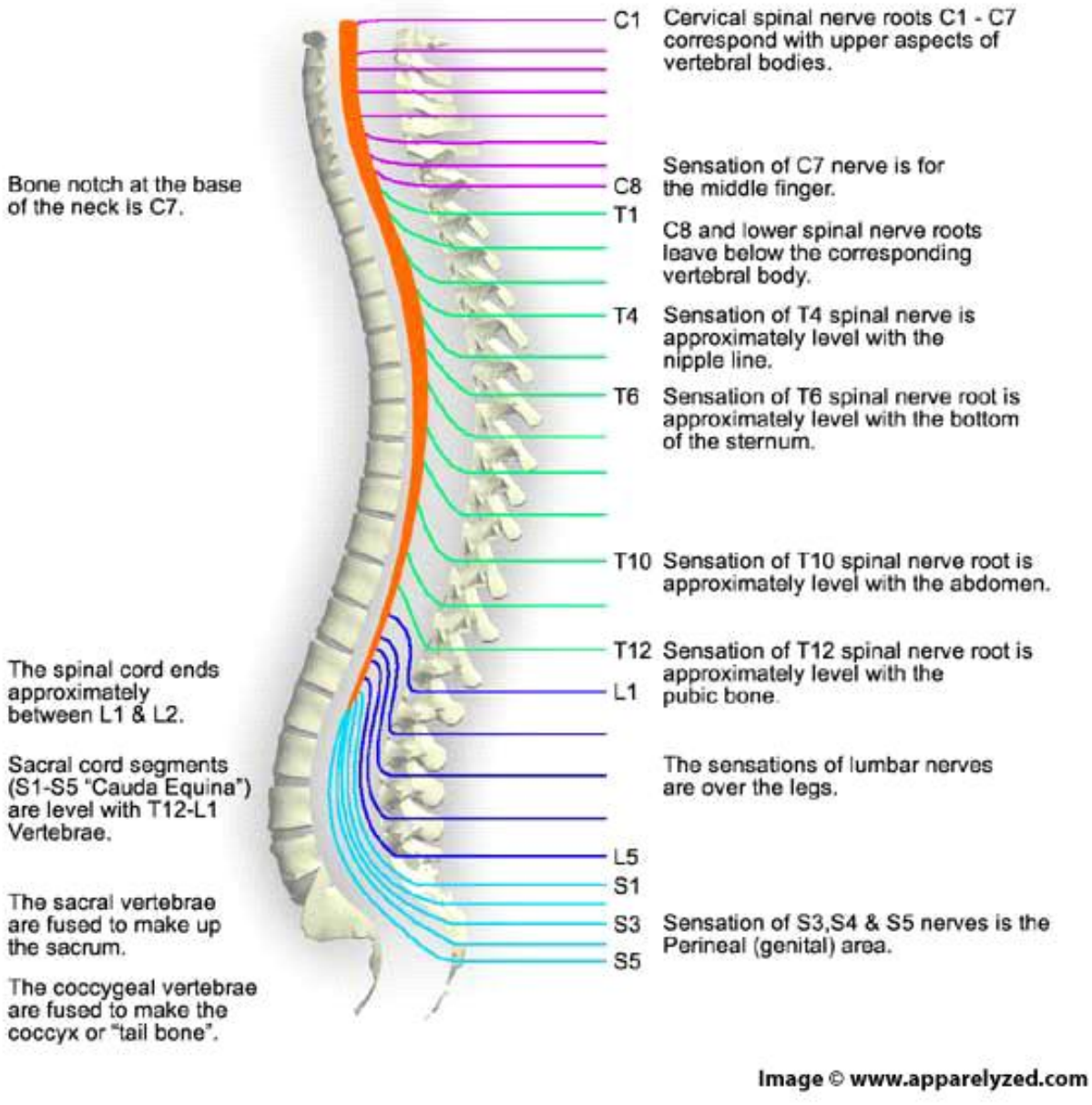
Vertebral canal

Formed by these structures, vertebral canal has deficiencies laterally between intervertebral foramen and posteriorly between interlaminar foramen which enlarges in flexion and accessible for spinal needle. The direction of spinous processes determines the direction of spinal needle.

From skin onwards spinal needle pierces through subcutaneous tissue, supra and inter spinous ligaments, ligamentum flavum and dura before reaching subarachnoid space. Piamater is closely applied to spinal cord.

Ligamentum Flavum

Ligamentum flavum is important to anaesthesiologists. It is composed of yellow elastic fibres running between lower border of lamina above and upper border of lamina below.



Spinal cord

Spinal cord is a direct continuation of medulla oblongata extending from upper border of atlas to first lumber vertebra, below which there is a leash of nerve roots termed ‘Cauda Equina’.

Spinal Nerves and Spinal segments

Spinal nerves are 31 pairs, eight cervical, twelve thoracic, five lumbar, five sacral and one coccygeal, each composed of anterior and posterior rami uniting at the intevertebral foramen to form nerve trunk.

Coverings of the spinal cord from outside are;

Duramater is composed of outer periosteal layer, in continuation with periosteum of skull, and inner investing layer attached to foramen magnum preventing spread of drug at the epidural space above first cervical vertebra.

Arachnoid mater is continuous above into cranium.

Dura and arachnoid end as tube at S2 level, hence CSF is not found below this level.

Piamater is closely applied to the spinal cord and is highly vascular.

Blood supply of Spinal Cord

Blood supply of spinal cord is through a single anterior spinal artery arising by union of a small branch from each vertebral artery and it supplies the lateral and the anterior columns. Two posterior spinal arteries on each side which are branches of posterior inferior cerebellar arteries with no anastamosis between

them, supply the posterior columns of the cord.Spinal Veins comprise of anterior and posterior plexuses draining into vertebral, azygos and lumbar veins.

Cerebro Spinal Fluid (CSF)

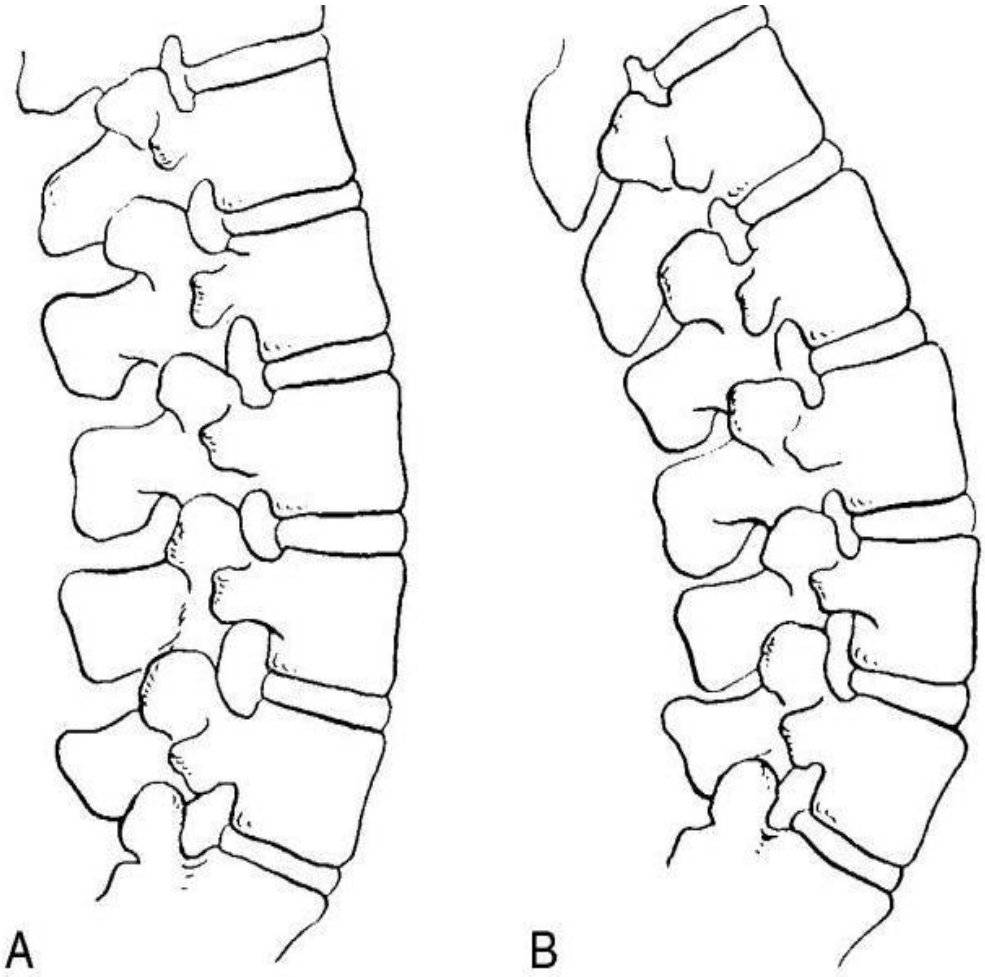
CSF is a clear liquid with P^H of 7.4. It is produced as a selective filtrate by the choroid plexuses of lateral ventricles, passes through the interventricular foramina (of monro) into the third ventricle then through the cerebral aqueduct (of sylvius) into the fourth ventricle. CSF reaches the spinal subarachnoid space through foramen of Magendie and foramen of Luschka. Amount in spinal canal is 75 ml with a pressure of 70-180 mm of H_2O in lateral position and 375-500mm of H_2O in vertical position. Normal contents are protein 20-40 mg%; sugar 45-80 mg% and cells 0-5 lymphocytes. An important factor that determines the spread of drug in CSF is the specific gravity of the drug in relation to that of CSF, which is 1.003 – 1.009 (average 1.004). Hyperbaric solution is one which is denser than CSF at C. The Specific gravity of 10% Dextrose, such as is commonly included in the so called heavy or hyperbaric solutions is 1.034.

APPLIED ANATOMY OF PREGNANCY

VERTEBRAL ANATOMY:

In women of child bearing age, the spinal cord terminates as conus medullaris at the level of the lower border of the first lumbar vertebral body. The conus medullaris is attached to the coccyx by means of neuro-fibrous band called the filum terminale, which is surrounded by the nerves of the lower lumbar and sacral roots known as cauda equine.

The subarachnoid space located between the pia mater and arachnoid mater, contains (1) Cerebrospinal fluid (CSF) (2) spinal nerves (3) Trabecular network between the two membranes (4) Blood vessel that supply the spinal cord and (5) The lateral extension of pia mater – the denticulate ligament. The Normal anatomic changes of pregnancy affect the use of neuraxial technique. Uterine enlargement and venacaval compression result in engorgement of epidural veins. The enlarged epidural veins also may displace cerebrospinal fluid (CSF) from the thoracolumbar region of the subarachnoid as does the greater intra-abdominal pressure of pregnancy. This displacement of CSF and lower specific gravity of CSF, partly explains lower dose required for spinal anesthesia in pregnant patients.

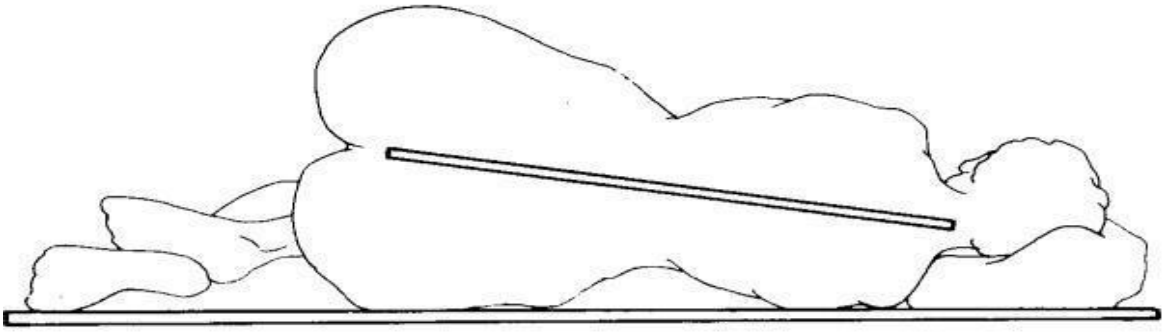


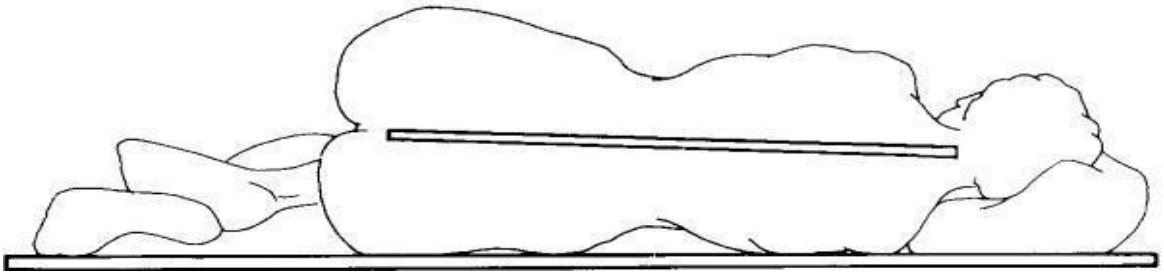
Effect of pregnancy on lumbar spine: Fig A, Non pregnant. B, pregnant there is a marked increase in lumbar lordosis and a narrowing of the interspinous space during pregnancy.

The hormonal changes of pregnancy affect the perivertebral ligamentous structures, including ligamentum flavum. The ligamentum flavum feels less dense and softer in pregnant women than in non pregnant.

Achieving flexion of the lumbar spine is difficult for pregnant women. Progressive accentuation of lumbar lordosis alter the relationship of surface anatomy to the vertebral coloum. The changes that my occur in pregnancy are

- A pregnant women pelvis rotates on the long axis of the spinal column, thus the line joining the iliac crest assume a more cephalad relationship to the vertebral column.
- There is less space between adjacent lumbar spinous processes during pregnancy. It may be more difficult to use the midline approach to indentify the epidural or subarachnoid space in pregnant women.
- MRI imaging has shown that the apex of the lumbar lordosis is shifted caudal during pregnancy, and the typical thoracic kyphosis in women is reduced during pregnancy. These changes may influence the spread of intrathecal anesthetic solution in supine patient.
    - Pelvic widening and resultant head-down tilt in the lateral position during pregnancy.





Anatomical changes in respiratory system:

During pregnancy the thoracic cage increases in both the anteroposterior and transverse diameters by which circumference also increases by 5 to 7 cm .At the end of the first trimester flaring of the ribs results in an increase in the sub costal angle from 68.5 to 103.5 degrees at term. Because of elevated position of the diaphragm vertical measurement of the chest decreases by as much as 4 cm.

Capillary engorgement of the nasal and oropharyngeal mucosae and larynx begins early in the first trimester and increases progressively throughout pregnancy. Nasal breathing commonly becomes difficult, and epistaxis may occur because of nasal mucosal engorgement.

Airway conductance increases, indicating a dilation of the larger airways below the larynx. Factors contributing to airway dilation include the direct effects of progesterone, cortisone, and relaxin.

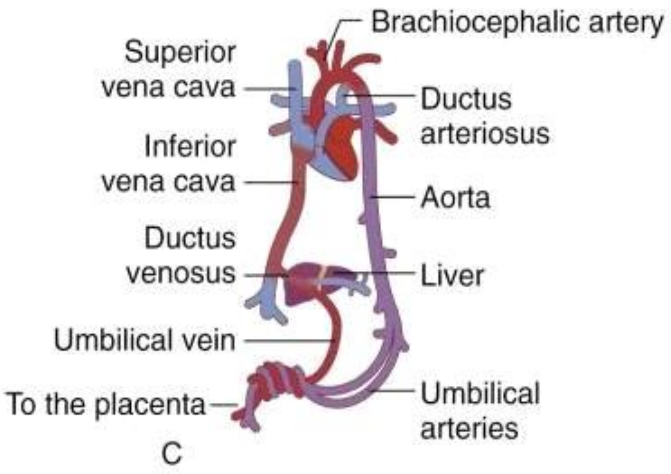
Anatomical changes in Gastrointestinal system:

The stomach is displaced upward toward the left side of the diaphragm during pregnancy, and its axis is rotated approximately 45 degrees to the right from its normal vertical position. The altered position of the stomach displaces the intra-abdominal segment of the esophagus into the thorax. This causes a reduction in tone of the lower esophageal high-pressure zone (LEHPZ), which normally prevents the reflux of gastric contents. This displacement of the esophagus also prevents the rise in lower esophageal tone that normally accompanies an increase in intragastric pressure (IGP). Progestins also may contribute to a relaxation of

the LEHPZ IGP is elevated during the last trimester in all pregnant women. These anatomical changes predispose to increased risk of aspiration.

Feto-placental unit:

The placenta is composed of both maternal and fetal tissues that consist of a basal and a chorionic plate, It is semi permeable membrane that provides an interface for the maternal and fetal circulation. The intervillous space separates the plates and is subdivided by decidual tissue. Chorionic villi and spiral arteries protrude into this intervillous space.Maternal blood flows into the intervillous space from the spiral artery while placental transfer from the mother to the fetus occurs.Approximately 80% of the uterine blood flow passes through the intervillous space.



C

Oxygenated blood leaves the placenta through fetal umbilical vein, enters the liver where flow divides between portal sinus and ductus venosus then empties into IVC. Inside the fetal heart, blood enters the right atrium through foramen

ovale, where most of the blood is directed into left atrium and left ventricle, and then enters aorta. Blood is then sent to the brain and myocardium. Deoxygenated blood returning from lower extremities and SVC is preferentially directed into right ventricle and pulmonary trunk, majority of blood passes through ductus arteriosus into descending aorta. Blood returns to the placenta through umbilical arteries for gas and nutrient exchange. Fetal blood flow is approximately 75 ml/kg/min, a rate far less than maternal flow.

APPLIED PHYSIOLOGY OF PREGNANCY

Physiological changes in Pregnancy

There are considerable physiological changes in parturient which can affect the anaesthesia technique.

Cardiovascular System

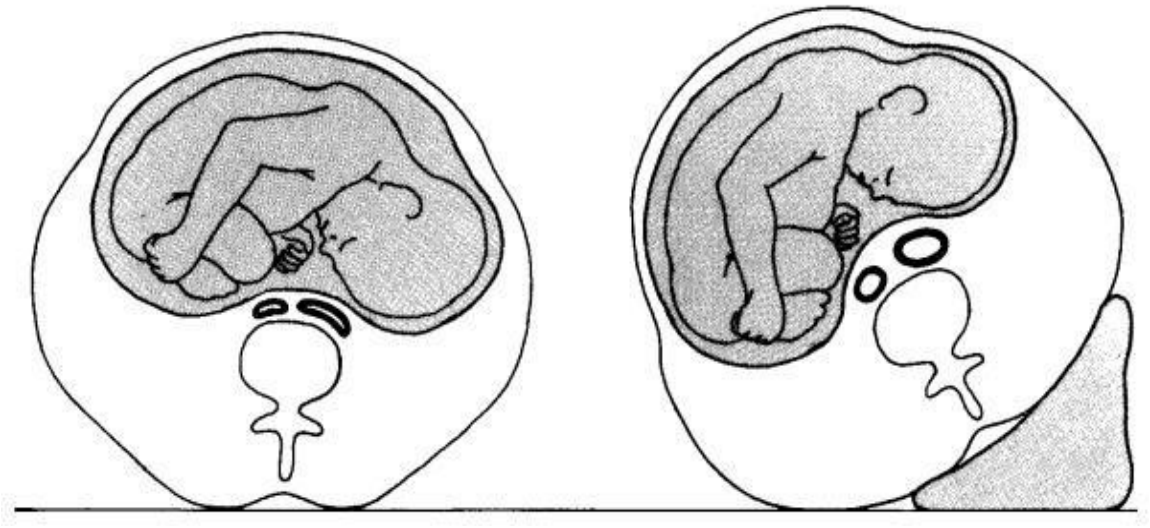
- Intravascular fluid volume - by 35%
- Cardiac output - by 40%
- Systemic vascular resistance - by 15%
- Heart rate - by 15%
- Systolic blood pressure - No change

Increase; : Decrease

The implication is that these patients due to hyperdynamic circulation can develop congestive heart failure.

Aortocaval Compression:

In supine position, gravid uterus compress the aorta and inferior vena cava leading to decreased venous return. Venous return occurs primarily by diversion of blood through the intraosseous vertebral veins, paravertebral veins, and epidural venous plexus. This drop in venous return for which the cardiovascular system cannot compensate could result in supine hypotensive syndrome.



Respiratory System:

Tidal volume - by 40%

Respiratory rate - by 10%

Minute ventilation - by 50%

Functional residual capacity - by 20%

Functional residual capacity

Expiratory reserve volume- (due to gravid uterus causing diaphragmatic

Residual volume elevation)

Vital capacity lung volume - No changes

Airway resistance - by 35%

Oxygen consumption - by 20%

Blood gases

paO_2 by 10mmHg - Due to

pCO_2 by 10mmHg - hyperventilation

Ph - No change due to compensatory mechanism

Anaesthetic Implications of Respiratory Changes

- Due to increased minute ventilation the induction with inhalational agents is faster and dose requirement is less making pregnant patients more susceptible to anaesthetic over dosage.
- Due to decreased FRC, ERV and increased oxygen requirement these patients are more vulnerable for hypoxia so preoxygenation is very important.
- Due to capillary engorgement in upper airways chances of trauma and bleeding during intubation are high.
- Laryngeal edema may be a prominent feature in PH patients, making intubation difficult.

Nervous System

- Progesterone has got sedative effect decreasing the anaesthetic requirement by 25 to 40%.
- Since epidural veins are in direct communication with inferior vena cava therefore compression of inferior vena cava by gravid uterus leads to engorgement of epidural veins which decreases subarachnoid space leading the drugs to spread higher. Because of this pregnant patients are vulnerable for high spinal. Therefore, to prevent high spinal the dose of local anaesthetic for spinal has to be reduced by 30 to 40%.

GIT

Parturient are very vulnerable for aspiration due to the following reasons:

- Gastric emptying is delayed due to progesterone.
- Gravid uterus alters the normal gastro esophageal angle making lower esophageal sphincter (LES) incompetent.
- Progesterone relaxes the LES.
- Gastric contents are more acidic.

Anaesthetic Implications

A pregnant patient should be considered full stomach even if she is fasting and must be managed like a high risk case for aspiration.

Hepatic System

Plasma cholinesterase level is decreased by 25% prolonging the effect of SCH.

Kidneys

Because of increase in cardiac output there is increase in renal blood and GFR.

Uterus

If a pregnant patient lies in supine position gravid uterus can compress the inferior vena cava and aorta decreasing the cardiac output and blood pressure causing supine hypotension syndrome (SHS) and this can cause severe hypotension or even cardiac arrest after spinal anaesthesia.

To prevent this the pregnant patient should lie in left lateral position. This can be accomplished by:

- Putting a wedge under right buttock.
- Tilting the delivery table by to left.
- Manually displacing the uterus to left.

Uteroplacental circulation and anaesthetic drugs

Uterine blood flow is 500 to 700 ml/min (10% of cardiac output) and placental flow is directly dependent on maternal blood flow.

- Hypotension and drugs causing vasoconstriction can severely compromise fetal wellbeing.
- Positive pressure ventilation (IPPV) can decrease cardiac output by decreasing venous return and thus can compromise Placental blood flow.
- Inhalational agents in higher concentration can compromise uterine flow by their effect of producing hypotension and decreased cardiac output.
- Intravenous agents: Thiopentone and propofol decrease uterine blood flow in proportion to decrease in blood pressure. Ketamine by producing uterine hypertonicity can decrease the uterine blood flow.

  Spinal / epidural anaesthesia can compromise uterine blood flow by producing hypotension.

Transfer of Anaesthetic drugs to fetal circulation

All anaesthetic drugs except muscle relaxants (only gallamine has significant transfer) and glycopyrrolate can be transferred to fetus from

maternal circulation. So all drugs should be used in minimum concentration and dosage.

- A large fraction of drug which is coming from placenta to fetus is metabolized by fetal liver (75% of umbilical vein blood flows through liver), so less drug reaches to vital structures like brain and heart. This is a protective mechanism but drugs like local anaesthetics and opioids which are bases, cross the placenta in unionized form, become ionized in fetal circulation (which has low pH) and cannot come back to maternal circulation leading to accumulation in fetus.

PHARMACOLOGICAL CHANGES IN PREGNANCY

PHARMACODYNAMICS OF LA

Pregnant women require small doses of local anesthetics due to epidural venous engorgement, enhance neural sensitivity to local anesthetics higher PH lower bicarbonate and total Carbon dioxide content in CSF in women undergoing caesarian section.

PHARMACOKINETICS OF LA:

Bupivacaine is the most commonly used local anesthetic in obstetric anaesthesia because it preserve motor function and is compatible with intrathecal opioids. It bound extensively by two proteins, both of which decline during pregnancy: (1) alpha-1-acid glycoprotein (AAG), a high-affinity, low-capacity site, and (2) albumin, a low-affinity, high-capacity site.

PREECLAMPSIA AND LA DRUGS

In preeclampsia reduced hepatic blood flow, abnormal liver function and decreased intravascular volume affect, maternal blood concentration of local anesthetics. Long acting amides have a relatively low hepatic extraction ratio, changes in liver blood flow in preeclampsia may have less effect on the metabolic clearance.

Effect on Uterus:

Pregnancy may enhance uterine vascular reactivity to local anesthetic agents.

Effect on umbilical blood flow:

Bupivacaine does not constrict umbilical artery at clinically relevant concentration of 0.3-1 mcg/ml. At higher concentration the effect of bupivacaine appear to be biphasic. 5-10 mcg.ml produce uterine artery constriction more than 125 mcg/ml produce relaxation of artery.

S/D ratio (systolic peak to diastolic trough of the umbilical artery) in the umbilical artery decreases during normal pregnancy and high ratio usually are associated with fetal compromise.

Placental drug transfer:

Factor affecting placental transfer of drugs include

- Physiochemical characteristic of local anesthetic agent
- Concentration of free drug in mater
- Permeability of the placenta
- Hemodynamic events occurring within the fetal maternal unit

During pregnancy, anatomic adaptations result in substantial (near maximal) vasodilation of the uterine spiral arteries, this result in a low-resistance pathway for the delivery of blood to the placenta. Therefore, adequate uteroplacental blood flow depends on the maintenance of a normal maternal perfusion pressure. Physical factors (e.g., molecular weight, lipid solubility, degree of ionization) affect the placental transfer of drugs and other substances.

In addition, other factors affect maternal – fetal exchange, including changes in maternal and fetal blood flow, placental binding, placental metabolism, diffusion capacity, and degree of maternal and fetal plasma protein binding.

Lipophilicity, which enhances the central nervous system uptake of general anesthetic agents, also heightens the transfer of these drugs across the placenta. Fetal acidemia can result in the so-called "ion trapping" of both local anesthetics and opiods.

Molecular size:

Compound with a molecular size less than 1000 Daltons crosses the placenta easily.

Ionization and lipid solubility:

The degree of ionization affect the rate of placental diffusion because the unionized molecule is more lipid soluble than ionized molecule.

Protein binding:

Bupivacaine in the maternal plasma is 2 mg/L. bupivacaine are approximately 90% bound to maternal plasma proteins, the free concentration of drug available for placental transfer is 0.2 mg/L. At equilibrium, the concentration of free drug is equal on both sides of the placenta. However, in the fetus, bupivacaine 50% bound to fetal plasma proteins, Total bupivacaine, and the concentration in fetal plasma is 0.4 mg/L and an F/M ratio of 0.2.

Transfer across the placenta may be reported as drug clearance or as a ratio that is also referred to as the *transfer index* used to improve interplacental comparisons.

Teratogenicity:

Local anesthetics used during the first trimester of pregnancy caused reversible reduction of cell division in tissue culture. Large multicenter study demonstrated that the risk of congenital anomalies in humans was not increased by the administration of benzocaine, procaine, tetracaine, or lidocaine during early pregnancy. However, a twofold increase in the incidence of congenital anomalies was noted in infants whose mothers had received mepivacaine.

FETUS AND NEWBORN:

Pharmacokinetics:

Local anesthetics, once transferred across the placenta, are distributed in the fetus. Factors that influence tissue uptake of the drug include (1) fetal plasma protein binding, (2) lipid solubility, (3) the degree of ionization of the drug, and (4) hemodynamic changes that affect the distribution of fetal cardiac output.

The term newborn has the hepatic enzymes necessary for the biotransformation of amide local anesthetics. The elimination half-life of these drugs is longer in the neonate compared with the adult. The use of mepivacaine in obstetric epidural analgesia elimination half-life of the drug in the newborn was approximately 9 hours.

SYSTEMIC TOXICITY:

Changes in fetal heart rate (FHR) after administration of local anesthetics most often are related to indirect effects such as maternal hypotension and uterine hyperstimulation. FHR patterns are not affected by the larger doses of local

anesthetics required during administration of epidural anesthesia for cesarean delivery.

PRETERM FETUS AND NEWBORN:

Enhanced drug sensitivity in the preterm newborn: (1) less protein is available for drug binding; (2) higher levels of bilirubin are present and may compete with the drug for protein binding; (3) greater drug access to the CNS occurs because of a poorly developed blood-brain barrier; (4) the preterm infant has greater total body water and less fat content; and (5) the preterm infant has a decreased ability to metabolize and excrete drugs.

The placenta efficiently eliminates fetal bilirubin. Thus the hyperbilirubinermia of prematurity normally occurs in the postpartum period. Bupivacaine has been implicated as a possible cause of neonatal jaundice. High affinity of the drug for fetal erythrocyte membranes may lead to a decrease in filterability and deformability, which may render red blood cells more prone to hemolysis.

Asphyxia: In asphyxiated preterm fetus, exposure to bupivacaine reduced blood flow to vital organs however, fetal heart rate, blood pressure, and acid-base measurements did not change Johnson et al. suggested that bupivacaine might be preferable to lidocaine in the presence of fetal acidosis because the greater maternal protein binding of bupivacaine may limit its placental transfer.

Pharmacokinetic Principles:

Transfer of a drug that is highly protein bound is affected by the concentration of both maternal and fetal plasma proteins. The pKa of a drug

determines the fraction of drug that is nonionized at physiologic pH. Thus, fetal acidemia will greatly enhance the maternal-to-fetal transfer (i.e., "ion trapping") of many *basic* drugs, such as local anesthetics and opioids.

Factor affecting placental transfer of drug (maternal to fetal)

	Increased transfer	**Decreased transfer**
Size – Mol. Weight (Dalton)	<1000	>1000
Charge of molecule	Uncharged	Charged
Lipid solubility	Lipophilic	Hydrophilic
PH vs drug Pka	Higher proportion of un-ionised drug in maternal plasma	Higher proportion of ionized drug in maternal plasma
Placental efflux transporter proteins(e.g. P glycoprotein)	Absent	Present
Binding protein type	Albumin (lower binding affinity)	Alpha-1-acid glycoprotein (AAG) higher binding affinity
Free (unbound) drug fraction	High	Low

ANESTHETIC DOSE REQUIREMENT:

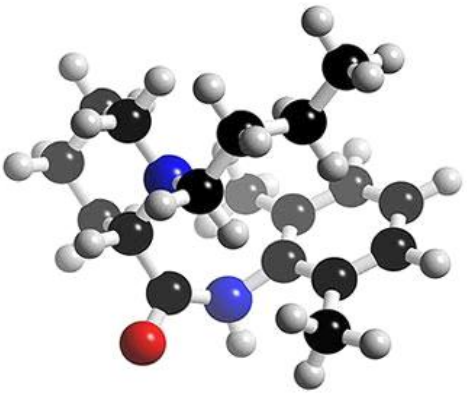
The effects of pregnancy on local anesthetic potency may reflect a combined effect of mechanical factors associated with pregnancy (i.e., dilated epidural veins decrease the volume of the epidural and subarachnoid spaces) and direct effects of hormones, especially progesterone, on the susceptibility of nerves to conduction blockade by local anesthetics per se. Hormonal alterations are probably the more important of these two factors because greater spread of epidural anesthesia occurs during the first trimester of pregnancy, before any grows change in vascular dimensions within the epidural or subarachnoid spaces. The dosage of local anesthetics should probably be reduced in patients in all stages of pregnancy.

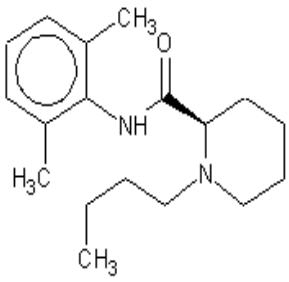
Pregnancy enhances the spread of hyperbaric local anesthetic solution in the subarachnoid space, resulting in a 25% reduction in the segmental dose requirement (i.e., milligrams of drug necessary to block one spinal segment) in term pregnant women.

PHARMACOLOGY OF BUPIVACAINE

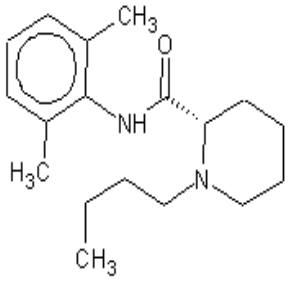
Bupivacaine, an amide local anaesthetic was synthesized in Sweden by Ekenstam and his colleagues in 1957. It was introduced into clinical practice by L.J.Telivuo in 1963.

Structure:





r-bupivacaine



s-bupivacaine(levobupivacaine)

Molecular formula:

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

Physico chemical Properties:

Molecular Weight	: 288 (base)
	: 324 (HCL Salt)
pKa at C	: 8.1
Hydrophobicity at C	: 3420

PH of 0.5% solution : 3.5

Percentage of protein binding : 96%

Plasma protein binding : 2 microgm/ml

Lipid solubility : 28

Partition coefficient : 27.5 (n-Haptane pH 7.4 buffer)

Approximate anaesthetic duration : 175min

Site of metabolism : liver

Safe dosage : 2mg / kg

Conduction blocking potency : 4 times more than that of lignocaine

Maximum infuslon rate : 0.4 mg/kg/hr

Maximum single dose for infiltration : 175 mg.

t½α	t½β	t½γ	V	clearance
2.7 min	28 min	3.5 hrs	72L	0.47L/min

Mechanism of action:

Bupivacaine action is similar to other local anesthetics, it produces electrical stabilization by acting on axonal cell membrane and produces conduction blockade by inhibition of sodium channels.

Metabolism:

Possible pathways of metabolism include aromatic hydroxylation, N-dealkylation, amide hydrolysis and conjugation in liver. Only the N-desbutyl bupivacaine has been measured in blood or urine. Alpha-1-acid glycoprotein is the most important plasma protein binding site of bupivacaine.

Main Anaesthetic Utility:

It is used in infiltration peripheral nerve blockade, spinal and epidural anaesthesia.

Pharmacodynamics:

Cardiovascular system:

The primary electrophysiological effect is a decrease in the maximum rate of depolarization and due to an interaction with the fast sodium channels in cardiac membrane. Action potential duration and effective refractory period are also decreased. But the ration of effective refractory period to action potential duration is increased both in purkinje fibres and in ventricular muscle. It exerts a dose dependent negative inotropic action. Bupivacaine decrease ventricular contractility.

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.

Autonomic nervous system:

Bupivacaine does not inhibit the Noradrenalin 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.

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 anesthesia.

Peripheral vascular system:

Biphasic action on smooth muscle was demonstrated with bupivacaine. At low dose, it decreases peripheral arterial blood flow without changing blood pressure, whereas in high dose increases blood flow.

Toxicity:

It is relatively free of side effects, if it is administered in an appropriate dosage and in the correct anatomic location.

The toxic plasma concentration of bupivacaine is 4-5 mic/ml

Systemic toxicity reactions primarily involve CNS and CVS. The blood level required to produce CNS toxicity is less than that required of circulatory collapse.

CNS toxicity:

Initial symptoms include feeling of light headedness and dizziness, followed by visual and auditory disturbances. Objective signs are excitatory and include shivering, muscle twitching and tremors. Ultimately, generalized tonic clonic seizures can occur. The typical plasma concentration of bupivacaine associated with seizures is 4.5 to 5.5 microgm / ml.

CVS toxicity:

The rate of depolarization in fast conduction tissues of purkinje fibres and ventricular muscle is decreased. The rate of recovery of bupivacaine induced block is slower than that of lignocaine. Extremely high concentration cause sinus bradycardia and cardiac arrest. R-enantiomer is more toxic than S-enantiomer.

CC/CNS ratio is 3.7 ± 0.5

Neurotoxicity: Placement of bupivacaine into epidural space can cause neurotoxicity. Whose spectrum may range from patchy groin numbness and persistent isolated myotomal weakness to cauda equine syndrome.

Allergy:

Although uncommon, allergic reactions can occur due to methyl paraben, the preservative.

Fate of bupivacaine in the subarachnoid space

After injection of bupivacaine (Hyperbaric) 0.5% into the subarachnoid space it gets mixed with CSF. The 'DISTRIBUTION' of bupivacaine within the CSF determines the 'amount of the neural blockade'. Distribution of hyperbaric solutions is governed by position of the patient during injection and for the next

20-30 mins. The total dose is more important than volume (or) concentration of bupivacaine in determining spread in CSF.

'UPTAKE" occurs into the spinal nerve rootlets and slow diffusion via subarachnoid extensions accompanying blood vessels into cord (Virchow-Robin spaces). The level of anaesthesia is said to be fixed, when changes in position of the patient no longer influence the distribution of the drug in CSF.

Elimination

It is eliminated from CSF by vascular absorption via subarachnoid and epidural blood vessels.

Metabolism

No significant metabolism of bupivacaine occurs in CSF. After absorption, they bind with plasma proteins and then slowly taken up by tissues. It is metabolized in the liver by N-dealkylisation and hydroxylation and small percentage is excreted in urine.

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 150 mg 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	10-20
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
Intercostals nerve block	0.25 – 0.5%	3 – 5 /ml	15 – 20
Local infiltration	0.25 – 0.5%	5 – 20	Upto 175 mg

Adverse effects:

CNS:

Nervousness, dizziness, blurring of vision or tremors, followed by drowsiness, convulsion, unconsciousness and respiratory arrest.

CVS:

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

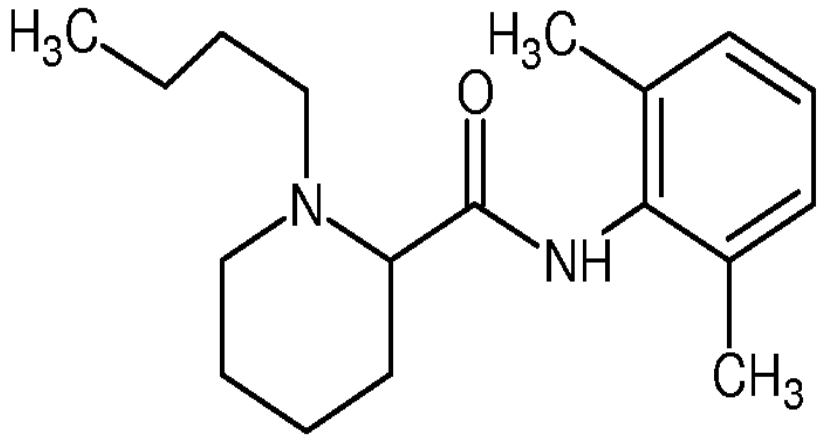
Allergic Reactions : Utricaria, bronchospasm, hypotension

OTHER : Nausea, vomiting, chills, constriction of pupil and tinitus.

PHARMOCOLOGY OF LEVOBUPIVACAINE

Levobupivacaine, (2s-1-butyl-N-(2,6-dimethyipheny) piperidine-2-carboxamide ,an amide local anaesthetic belongs to alkyl substitute pipecoloxylidide family, it is an S enantiomer of racemic bupivacaine,since it dose not contain R isomer cardiotoxicity and neurotoxicity is lesser than bupivacaine. It produces similar sensory and motor blockade like bupivacaine.

Structure:



CHEMICAL FORMULA C18 H28 N2 O .

Physico chemical Properties:

Molecular Weight	: 288 (base)
pKa at C	: 8.1
pH of 0.5% solution	: 4.5-6
solubility in water	: 25mg/ml

Percentage of protein binding	: 97%
Lipid solubility	: 30
Partition coefficient	: 346
Site of metabolism	: liver
Safe dosage	: 2mg / kg
Maximum single dose for infiltration	: 175 mg.
volume of distribution	: 66.91 ±18.23 L
Half life	: 157 min
Clearance	: 0.32

Metabolism:

Levobupivacaine extensively in liver with no or unchanged form appear in urine and faeces. The cytochromes CYP3A4 and CYP1A2 converts levobupivacaine metabolism to desbutyl levobupivacaine and 3-hydroxy levobupivacaine, appears to undergo further transformation to glucuronide and sulphate conjugates. Alpha-1-acid glycoprotein is the most important plasma protein binding site of levobupivacaine.

Main Anaesthetic Utility:

Surgical anaesthesia

- Major, e.g. epidural (including for caesarean section), intrathecal, peripheral nerve block.

- Minor, e.g. local infiltration, peribulbar block in ophthalmic surgery.

Pain management

- Continuous epidural infusion, single or multiple bolus epidural administration for the management of pain especially post-operative pain or labour analgesia.

Paediatric population

Analgesia (ilioinguinal/iliohypogastric blocks).

No data are available in paediatric population < 6 months of age.

Pharmacodynamics:

Cardiovascular system:

Levobupivacaine is a long acting local anaesthetic and analgesic, It blocks nerve conduction in sensory and motor nerves largely by interacting with voltage sensitive sodium channels on the cell membrane, but also potassium and calcium channels are blocked. The primary electrophysiological effect is a decrease in the maximum rate of depolarization and due to an interaction with the fast sodium channels in cardiac membrane. Action potential duration and effective refractory period are also decreased. But the ration of effective refractory period to action potential duration is increased both in purkinje fibres and in ventricular muscle. It exerts a dose dependent negative inotropic action. levobupivacine decrease ventricular contractility but it is less when compared with bupivacine. The safety margin is estimated at 1.3 which means that toxic effects are not seen until the concentration rises by 30% .

Peripheral vascular system:

Biphasic action on smooth muscle was demonstrated with levobupivacaine. at low dose, it decreases peripheral arterial blood flow without changing blood pressure, whereas in high dose increases blood flow.

Nervous System:

As any other local anaesthetic drug, it blocks conduction of nerve impulses.

Toxicity:

It is relatively free of side effects, if it is administered in an appropriate dosage and in the correct anatomic location.

Systemic toxicity reactions primarily involve CNS and CVS. The blood level required to produce CNS toxicity is less than that required of circulatory collapse.

CNS toxicity:

Initial symptoms include feeling of light headedness and dizziness, followed by visual and auditory disturbances. Objective signs are excitatory and include shivering, muscle twitching and tremors. Ultimately, generalized tonic clonic seizures can occur. The typical plasma concentration of levobupivacaine associated with seizures is lesser than that of bupivacaine. (levobupivacaine 103mg vs 85 mg bupivacine).

CVS toxicity:

There is lesser affinity and strength of inhibitory effect of levobupivacaine on cardiac sodium channel than bupivacine.it causes lesser depressant

effect on AV conduction, QRS duration and lesser impairment of contarctile function on heart based on animal studies, sodium and pottasium channels blocked in lesser potent than bupivacaine.

Neurotoxicity:

Placement of levobupivacaine into epidural space can cause neurotoxicity. Whose spectrum may range from patchy groin numbness and persistent isolated myotomal weakness to cauda equine syndrome.

Availability

Chirocaine is a sterile, non-pyrogenic, colorless solution (pH 4.0-6.5) containing levobupivacaine hydrochloride equivalent to 2.5 mg/mL, 5.0 mg/mL, and 7.5 mg/mL of levobupivacaine, sodium chloride for isotonicity, and Water for Injection. Sodium hydroxide and/or hydrochloric acid may have been added to adjust pH. Chirocaine is preservative free and is available in 10 mL and 30 mL single dose vials.

Dosage

Maximal dose is 2mg/kg body weight for epidural and nerve/ plexus blockade. For subarachnoid block maximum dose is 20mg (4cc 0.5%).

Route, onset time and duration.

Route	Onset (Mins.)	Duration (Mins.)	Concentration (%)
Intrathecal	5	90 – 200	0.5 (or) 0.75
Epidural	15-20	180-350	0.25 (or) 0.75

CLINICAL APPLICATIONS :

Subarchanoid block :

Levobupivacine produces similar sensory, motor and recovery parameters like bupivacaine, intrathecal administration of 11.5mg produces adequate sensory

and motor block for 6.5 hrs ,(5-10 mg) in a smaller dose used in day care surgeries .The minimum effective dose is 11.7 mg.

EPIDURAL ANESTHESIA:

Levobupivacaine and bupivacaine in equal dose (15ml) of 0.5% produces similar onset of sensory (8-30 min), maximum cephalic spread (T7-T8) and duration of analgesia for 4-6 hrs. Concentrations like 0.75 % vs 0.5% provides longer sensory and motor duration without any increase in incidence of adverse effects.

Continuous infusion of 15 mg/h of levobupivacaine provides effective pain relief in post-op period and in cesarean section under epidural anesthesia incidence of hypotension is similar for both levobupivacaine and bupivacaine.

WOUND INFILTRATION:

Levobupivacaine 0.125% in wound and post incisional infiltration of produces more effective and longer duration of analgesia and early mobilisation. it has positive effect on wound healing and but negative effect on wound tension by decreasing it.

PERIPHERAL NERVE BLOCK:

Epinephrine with levobupivacaine reduces the systemic toxicity, but it does not prolong duration of sensory and motor block.

levobupivacaine with clonidine and fentanyl produces good analgesia and local anesthetic sparing effect and also decreases post op morphine requirement.

EPIDURAL LABOR ANALGESIA :

Levobupivacaine produces less motor block and less toxicity provide adequate and safe labor analgesia with no effect duration of labor, mode of delivery and neonatal outcome.

Epidural dose for labor analgesia 0.125% infusion of 125 mg/hr or 0.25% up to 25mg/r at 15 min intervals.

OPTHALMIC SURGERY:

Levobupivacaine in 0.75% used in various ocular blocks including peribulbar block for cataract surgery and retro bulbar block for vitreo-retinal surgery because of its lower cardiovascular and neurological toxicity .

PEDIATRIC ANESTHESIA:

Subarachanoid block dose is 1.2 g/kg of isobaric 0.5% levobupivacaine.

Caudal block dose is 2.5mg/kg.

GERIATRIC ANESTHESIA:

levobupivacaine is considered to be a better local anesthetic than bupivacaine in the geriatric patient with co-morbid systemic diseases because of its better pharmacologic profile .

ADVERSE REACTIONS:

Nausea, Vomiting, Headache, Hypotension, Dizziness, Procedural pain

CONTRAINDICATION:

Intravenous regional anesthesia, Allergy for LA

REVIEW OF LITERATURE

"**Gulen guler et al**[1] 2012, conducted a study to investigate the clinical efficacy of levobupivacaine and bupivacaine for spinal anesthesia in cesarean section, Group L recieved 10 mg levobupivacaine with fentanyl 15 mcg and Group B received 10mg bupivacaine with fentanyl 15 mcg. They observed in group B motor block was faster and longer, bradycardia, hypotension and nausea less in group L".

"**Bremerich DH et al**[2] carried out a dose finding investigation of levobupivacaine for parturient undergoing elective caesarean delivery in 2007.Parturients received either 7.5, 10 or 12.5 mg intrathecal hyperbaric 0.5% levobupivacaine,they recommended 10 mg levobupivacaine for parturients undergoing elective caesarean section with spinal anaesthesia".

A study carried out by **Camorcia et al**[3] in 2007, compared the relative potencies of intrathecal ropivacaine, levobupivacaine and bupivacaine for motor block.They concluded that potency for motor block when administered via intrathecal route was low for ropivacaine, intermediate for levobupivacaine and high for bupivacaine.

Aygen Turkmenin et al[4]**,** conducted a prospective study, 50 gravidas, who were scheduled for cesarean section .They were randomized into group A 7.5 mg 0.5% bupivacaine with 15 µg fentanyl intrathecally; Group L levobupivacaine 7.5 mg of 0.5% levobupivacaine with 15 µg fentanyl intrathecally, the level of sensory and motor blocks were tested by pin-prick test and bromage scale, respectively.

Results: the time to sensory block at the t4 dermatome was shorter in group b (group b, 4.8 min; group l, 6.0 min; p <0.05). The time to maximum motor block was also shorter in group b (group b, 3.4 min; group l, 4.7 min;). The duration of analgesia in group L was longer compared to group B (group b, 102 min; group l, 118 min; p <0.05).

"In bupivacaine + fentanyl group, time to sensory and maximum motor block was shorter and duration of analgesia was longer in the levobupivacaine + fentanyl group. Although levobupivacaine is a novel drug, it is a good alternative for bupivacaine".

"**Filiz Karaca et al[5],** conducted a study in 30 pregnant women for cesarean section, Group C received intrathecal isobaric 7.5 mg 0.5% levobupivacaine (1.5 ml) and 20 µg fentanyl (0.4 mL), while the ones in Group B had intrathecal isobaric 7.5 mg 0.5% bupivacaine (1.5 mL) and 20 µg fentanyl (0.4 mL). Following spinal anesthesia, hemodynamic parameters, onset and recovery time of sensorial and motor block, side effects, Apgar scores of the newborns, blood gas levels of the umblical artery, pain scores (VAS) of the patients, surgeon, patient and anesthesiologist satisfaction were recorded. They found that the addition of 20 µg of fentanyl in low doses of intrathecal 7.5 mg of 0.5% isobaric levobupivacaine and 7.5 mg of 0.5% isobaric bupivacaine in elective caesarean section operations provided sufficient analgesia for surgery, and this had no negative effect on the mother or the baby. levobupivacaine + fentanyl can be an alternative to bupivacaine + fentanyl in caesarean section operations because the

first analgesia is required at a later stage, motor blockade disappears earlier and early mobilization is ensured".

Dilek Subaşı et al[6], conducted a study on eighty patients for elective cesarean section. In Group BF received 7.5 mg hyperbaric bupivacaine with 25 mcg fentanyl in Group LF received 7.5 mg hyperbaric levobupivacaine with 25 mcg fentanyl.

Results: Group BF hemodynamic parameters such as 45th min MAP was lower and motor block level was found to be higher. In Group LF, max sensorial block level and postoperative VAS scores were higher. Onset of motor block time, time to max motor block, time to T4 sensorial block, reversal of two dermatome, first analgesic need were similar in both groups. They concluded that levobupivcaine produces less effective motor blockade and maintains stable hemodynamics.

"In a study by **Bremerich et al[2].** involving 60 patients for caesarean section and were administered 0.5% levobupivacaine (10 mg) and 0.5% bupivacaine (10 mg) in combination with opioid (10 and 20 μg of fentanyl and 5 μg of sufentanil), the duration of motor block was found to be shorter in levobupivacaine than bupivacaine".

" **Bremerich et al[2]**opined that if additives are not added, Levobupivacaine 10 mg is recommended for caesarean section with spinal anaesthesia (7.5 mg/ 10 mg/ 12.5 mg). He also noted that Levobupivacaine showed significantly shorter and less pronounced motor blockade when compared to Bupivacaine".

Goyal et al[7] conducted a study on 30 parturient for elective cesarean section .They were divided in to Group BF receiving 10 mg bupivacaine and 25 mcg fentanyl, or Group LF receiving 10 mg isobaric levobupivacaine and 25 mcg fentanyl. Hemodynamics like MAP was lower in group BF and in Group LF max sensorial block level and postoperative visual analog scale scores were higher.

"Onset of motor block time, time to max motor block, time to T10 sensorial block, reversal of two dermatome, the first analgesic need were similar in both groups"

They concluded that isobaric levobupivacaine is good alternative for cesarean section as it provides less motor block and maintains hemodynamic stability.

"Camorcia et al[3]**.** reported that intrathecal 0.5 % levobupivacaine had weaker motor block potency than 0.5 % bupivacaine in elective cesarean cases with CSE anesthesia technique ".

Erkan yavuz akcaboy et al[8] 2011 conducted a study Forty nine patients scheduled for transurethral prostate surgery.

"To evaluate the block quality and clinical effectiveness of low dose levobupivacaine, and compare it with low dose bupivacaine when they are combined with fentanyl. Patients in levobupivacaine Group received 5 mg levobupivacaine with 25 mcg fentanyl and bupivacaine Group received 5 mg bupivacaine with 25 µg fentanyl. Hemodynamic parameters and sensory block characteristics were comparable, stable and effective in both groups.

They conclude that 5 mg levobupivacaine with 25 mcg fentanyl for TURP provides stable hemodynamic profile, patient and surgeon satisfaction and effective sensorial blockade with less motor blockade in spinal anaesthesia and it is an alternative to bupivacaine".

"**Lee YY et al[9], 2005** conducted a study to compare the hemodynamic effects, clinical efficacy, motor block of using 2.6 mL of 0.5% levobupivacaine and 2.3 mL of 0.5% levobupivacaine with fentanyl 15 mcg in 0.3 mL in urological surgery".

"The hemodynamic changes, and quality of sensory and motor block was not significant, they conclude that 2.3 mL of 0.5% levobupivacaine with fentanyl 15 microg is as effective as 2.6 mL of 0.5% levobupivacaine alone in spinal anaesthesia for urological surgery".

"**Glaser et al[10]** 2002 performed this prospective randomized double blinded study to evaluate the anesthetic potencies and hemodynamics of intrathecal levobupivacaine compared with racemic bupivacaine". (Eighty patients undergoing elective hip replacement received either 3.5 mL levobupivacaine 0.5% isobaric or 3.5 mL bupivacaine 0.5% isobaric).

"The onset time and the duration of sensory and motor blockade between groups was not significant (11 +/- 6 versus 13 +/- 8 min; 10 +/- 7 versus 9 +/- 7 min; 228 +/- 77 versus 237 +/- 88 min; 280 +/- 84 versus 284

+/- 80 min). They conclude that levobupivacaine is equal in efficacy but less toxic than bupivacaine".

"**NK Girgin et al**[11] 2012 conducted a study to investigate whether the addition of 25 µg intrathecal fentanyl to levobupivacaine spinal anaesthesia for outpatient inguinal herniorrhaphy allows a subanaesthetic levobupivacaine dose to be used". Forty patients were assigned to receive 5 mg levobupivacaine 0.5% mixed with 25 µg fentanyl (group LF) or 7.5 mg levobupivacaine 0.5% (group L).

"The highest sensory block levels achieved were T7 (range T5 – T9) and T6 (range T4 – T9) in groups LF and L, respectively".

"The times to two-segment regression, S2 regression, ambulation, urination and discharge were all significantly shorter in group LF than group L. These results indicate that, for outpatient inguinal herniorrhaphy, intrathecal fentanyl combined with low-dose levobupivacaine provides good quality spinal anaesthesia and minimizes the need for intra-operative analgesia. This protocol is well suited for the outpatient setting because it features rapid recovery of full motor power, sensory function and bladder function".

"**Opas vanna et al**[12] 2006 conducted a study on patients undergoing elective transurethral endoscopic surgery to investigate the clinical efficacy and safety of isobaric solution of levobupivacaine compared with hyperbaric

solution of racemic bupivacaine in spinal anesthesia received either 0.5% isobaric levobupivacaine or 0.5% hyperbaric bupivacaine" . "They concluded that both levobupivacaine and bupivacaine showed equal effective potencies for spinal anesthesia, regard to both the onset time and duration of sensory blockade".

Mantouvalou et al[13] 2008 performed study to compare the anesthetic efficacy and safety of three local anesthetic agents: racemic bupivacaine and its two isomers: ropivacaine and levobupivacaine, in patients undergoing lower abdominal surgery. One hundred-twenty patients, ASA I-III, were randomized to receive an intrathecal injection of one of three local anesthetic solutions. Group A (n = 40) received 3 ml of isobaric bupivacaine 5 mg/ml (15 mg). Group B (n = 40) received 3 ml of isobaric ropivacaine 5 mg/ml (15 mg). Group C (n = 40) received 3 ml of isobaric levobupivacaine 5 mg/ml (15 mg).

"The onset and duration of sensory block at dermatome level T8, maximum upper spread of sensory block, time for 2-segment regression of sensory block as well as the onset, intensity and duration of motor block were recorded, as were any adverse effects, such as bradycardia, hypotension, hypoxia, tremor, nausea and/or vomiting".

“The onset of motor block was significantly faster in the bupivacaine group compared with that in the ropivacaine group and almost the same of that in the levobupivacaine group".

"Ropivacaine presented a shorter duration of both motor and sensory block than bupivacaine and levobupivacaine,Bupivacaine required more often the use of a vasoactive drug (ephedrine) compared to both ropivacaine and levobupivacaine and of a sympathomimetic drug (atropine) compared to the ropivacaine group".

Titti et al[14] reported that in cesarean section incidence of hypotension is 62 percent when they administered 2.5 ml of bupivacaine.

Fattorni et al[15] conducted study on eighty patient who has been posted for major orthopedic surgery .there is no significant characteristic difference in sensory and motor block between the levobupivacaine and bupivacaine .In levobupivacaine group no incidence of severe hypotension and cardiovascular stability was maintained.

Parpaglioni et[16] all reported that incidence of hypotension is less in levobupivacaine compared to bupivacaine and Glasser et al compared that in levobupivacaine group causes less incidence of bradycardia and it reduces arterial pressure less compared to bupivacaine.

MATERIALS AND METHODS:

SOURCE OF DATA

After obtaining ethical committee approval from Tirunelveli Medical College, 60 Pregnant women of physical status American society of anaesthesiologists (ASA) I and II between the age group of 18-35 posted for elective lower segment cesarean section at TIRUNELVELI MEDICAL COLLEGE HOSPITAL have been selected for the study. The patients were randomly allocated into two groups comprising of 30 patients in each group.

METHOD OF COLLECTION OF DATA

Inclusion Criteria

- ASA physical status I and II,
- Age between 18-35 years
- At Term, Elective cesarean Section
- Valid informed consent
- Pregnant women with the height ranging between 150 – 170 cms
- Pregnant women with the weight ranging between 50 – 90 kg.

Exclusion Criteria

- Pregnant patients having coexisting systemic disorders like neuromuscular diseases, neuronal degenerative disorder, seizure disorder, bleeding and hematological disorders, Cardiac disorders, Diabetes mellitus or gestational diabetes.
- Pregnant women with hepatic and renal disorders, severe Anaemia

- Eclampsia, placenta previa,abruptio placenta
- Parturient in active labour, Twin/ complicated pregnancy
- Spinal deformities, poliomyelitis short stature <145cm
- Weight less than 50 kgs and more than 90 kgs
- Patient refusal, Contra – indications to spinal anaesthesic, Allergy to local Anesthetic drugs.
- Fetal distress.
- Mentally retarded.

METHODS:

Each patients was reassured, explained the procedure and informed consent taken. All patients were confirmed to be physically fit. Minimal fasting period is 8 hrs,following application of routine monitors(NIBP,ECG,PULSE OXIMETRY), IV line secured with 18G venflon are given aspiration prophylaxis comprising of injection metaclopramide (10mg) and ranitidine (50mg) IV 10 min before surgery & preloaded with RL 10 – 12 ml/ kg . Baseline mean arterial BP and pulse rate, Spo2 were noted. Subarachnoid block (SAB) is instituted at L3 – L4 or L4-L5 intervertebral space in right Lateral position using 25-G quincke's needle.

Using a sealed envelope technique,patients were equally and randomly divided into two groups.

Group L (n = 30); 10 mg 0.5% (2 ml) levobupivacaine

Group B (n = 30); 10 mg 0.5% (2 ml) bupivacaine

Patients were turned to a 15˚ - 20˚ left lateral supine position. Oxygen 6 L/min was administered via a facial mask. Patients were treated with titrated doses of

- Inj : Ephedrine 6mg I.V. if systolic BP <90mm/Hg or <20% baseline.
- InJ : Atropine 0.6mg I.V. if Heart Rate <50/min

After delivery of baby Inj. Oxytocin 10 IU in drip & 10 IU Im given.

The sensory level of spinal anesthesia was assessed by pinprick in axillary line using a 26 G needle, and was recorded at baseline prior to spinal injection, then every 2 minute for the first 15 min after injection, and every five minutes for the next 30 min, and at 45 min.

Blood pressure, heart rate, and the extent of motor block were recorded every 2 min for first 15 min ,and 5 min for next 30 min and at 45 min.

Once a T4-T6 level has been reached permission to perform operation given.

Parameters to be evaluated

Sensory:

- Time for onset of sensory block by pinprick
- The time taken to reach peak sensory block level
- The time to regression of two dermatomes of the sensory block

Sensory score:

Score	Response
0	normal sensation
1	analgesia (loss of pin prick sensation)
2	anesthesia (loss of touch sensation)

Motor

- Time of onset of motor block
- Time to maximum motor block level
- Degree of motor block (as per Bromage scale)
- Total duration of motor block

Motor block was assessed with **modified Bromage scale**

Grade	Response	Degree of block
0	no motor block	Nil (0%)
1	unable to straight leg raise	Partial (33%)
2	unable to flex knee against resistance	Almost complete (66%)
3	unable to flex ankle	complete

The time to onset of motor block, the time to reach Bromage 3 and the time of complete disappear ance were recorded.

SENSORY BLOCK ONSET TIME

Time interval between end of anesthetic injection and appearance of cutaneous analgesia in dermatomes assessed by the pin prick test T-12, T-10, T-8, T-6.

DURATION OF MOTOR BLOCK

Administration of anesthetic and attainment of grade 0 in Bromage motor scale.

TIME FOR TWO SEGMENT REGRESSION:

The duration of two segment regression was defined as the time taken for the sensory block to regress from the maximum level of blockade to two segment down.

DURATION OF ANALGESIA

Administration of anesthetic agent and disappearance of cutaneous level of sensation at each dermatomal level.

POST-OP ANALGESIA DURATION

Administration of anesthetic drug and time of analgesic requirement in PACU.

The occurrence of Adverse events including Bradycardia, Hypotension, decrease in oxygen saturation SP02 < 93 %, shivering, Nausea and vomiting were also recorded.

OBSERVATION AND RESULTS

All 60 patients in two groups completed the study without any exclusion. We did an inter group analysis and the results were as followed. Of the 60 patients 30 belonged to Group B (Hyperbaric Bupivacaine) and other 30 categorized as Group L (Isobaric Levobupivacaine). Data were presented as range, mean, standard deviation. The probability value 'P' of less than 0.05 considered statistically significant.

Age, weight , height of the patient between both the groups were comparable and were not statistically significant (P>0.05)

Table – 1 Comparison of Age (yrs),Wt(kg), Height(cm) Distribution between the two groups

PARAMETR	GROUP	FREQUENCY	MEAN	STANDARD DEVIATION	p VALUE 't' TEST
AGE	B	30	25.90	9.87	0.419
	L	30	24.36	2.99	
WEIGHT	B	30	71.00	6.41	0.779
	L	30	71.43	5.45	
HEIGHT	B	30	159.10	6.445	0.161
	L	30	160.10	6.922	

CHART – 1 Comparison of Age (yrs) Distribution between the two groups

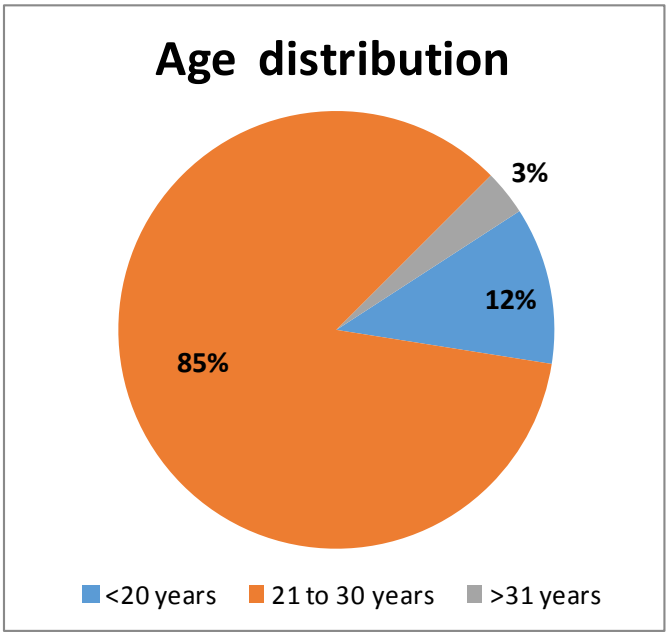


CHART – 2 Comparison of Weight (kg) distribution between the two groups

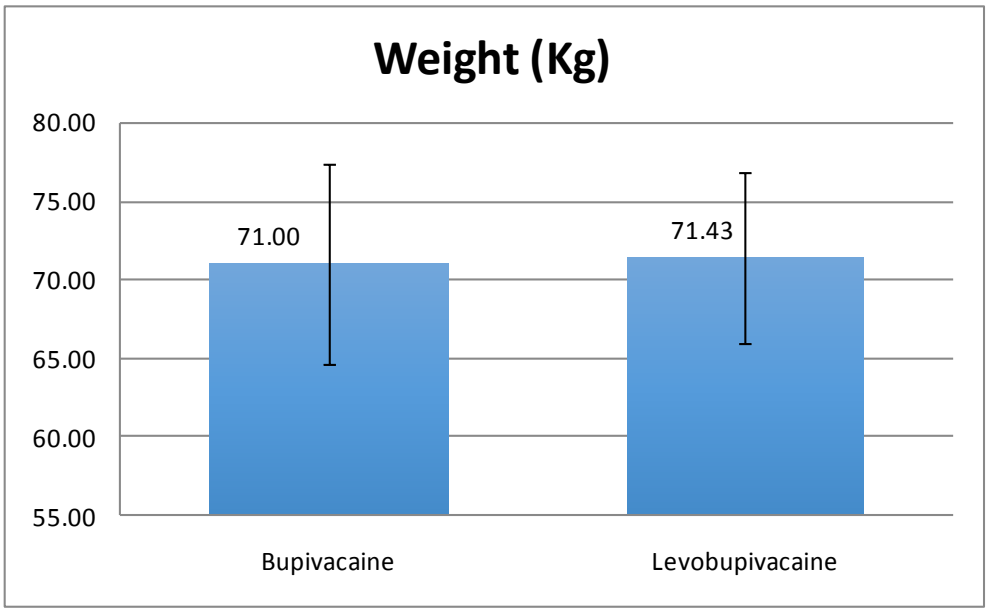


CHART – 3 Comparison of height (cm) distribution between the two groups

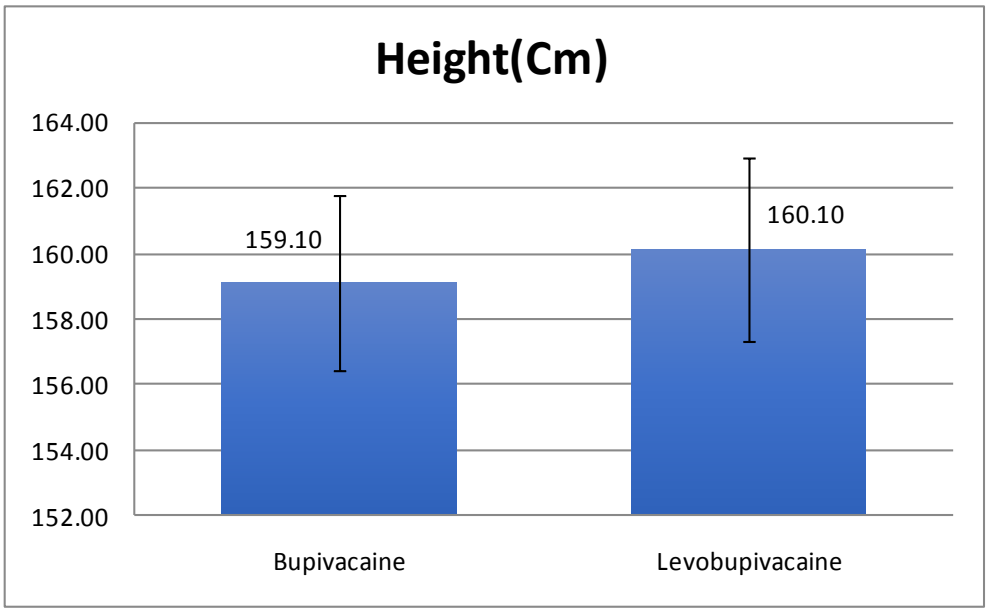


Table 2: Comparison of duration of surgery (min) between the two groups

Parameter	**Duration of Surgery (in minutes)**	
	Group B	**Group L**
Range	45-60	50-60
Mean	52.10	52.73
SD	4.11	4.32
'p'	0.563 Not significant	

The average duration of surgery in both groups was comparable the "P " value of 0.563 which was not significant.

CHART – 4 Comparison of duration of surgery (min) between the two groups

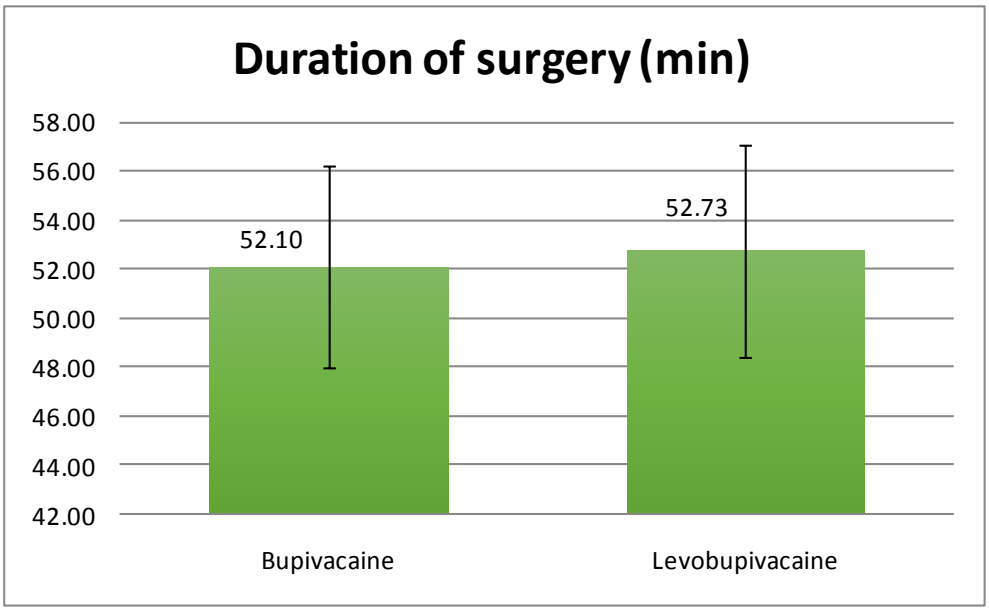


Table - 3 Comparison of PR between two groups at various intervals.

PULSE RATE	GROUP	FREQUENCY	MEAN	STANDARD DEVIATION	p VALUE 't' TEST
BASELINE	**B**	30	93.33	8.59	.512
	L	30	83.76	7.7	
2 MIN	**B**	30	86.4	9.82	.475
	L	30	84.73	8.04	
5 MIN	**B**	30	77.7	11.46	.067
	L	30	83.66	8.74	
10 MIN	**B**	30	84.33	9.81	.542
	L	30	80.1	5.89	
15 MIN	**B**	30	89.16	7.68	.088
	L	30	84.66	6.69	
30 MIN	**B**	30	88.43	8.81	.265
	L	30	83.03	6.68	
45 MIN	**B**	30	94.93	9.06	.124
	L	3 0	83.76	7.7	

Table 3 shows distribution of pulse rate at various intervals between two groups and p value is statistically insignificant.

CHART – 5 Comparison of Pulse Rate (min) between the two groups

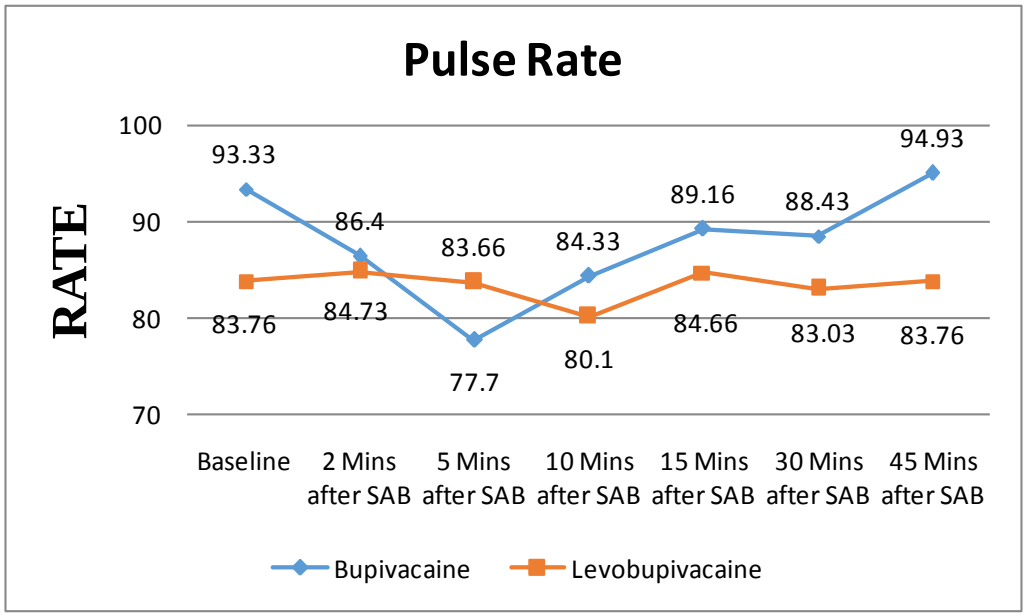


Table - 4 Comparison of MAP between two groups at various intervals.

MAP	GROUP	FREQUENCY	MEAN	STANDARD DEVIATION	p VALUE 't' TEST
BASELINE	**B**	30	85.78	5.34	.356
	L	30	87.1	7.24	
2 MIN	**B**	30	90.06	6.09	.0258
	L	30	88.26	6.11	
5 MIN	**B**	30	70.56	9	.0001
	L	30	87.53	10.23	
10 MIN	**B**	30	68.4	6.47	.0001
	L	30	84.1	7.35	
15 MIN	**B**	30	69.4	5.72	.0001
	L	30	84.53	6.72	
30 MIN	**B**	30	71.7	6.22	.0001
	L	30	83.46	4.5	
45 MIN	**B**	30	74.76	4.68	.0001
	L	30	86.66	3.53	

Table 4 shows the distribution of hemodynamic variables at various interval between the two groups and p value is statistically significant

CHART – 6 Comparison of Mean Arterial Pressure (mmhg) between the two groups

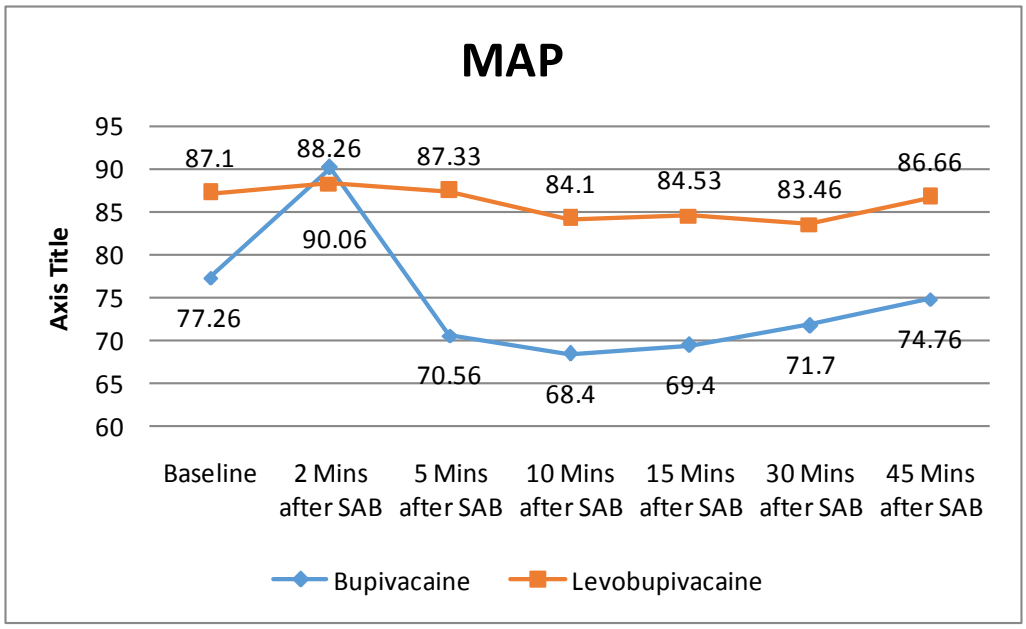


Table - 5 Comparison of Spo2 between two groups at various intervals.

PULSE RATE	GROUP	FREQUENCY	MEAN	STANDARD DEVIATION	p VALUE 't' TEST
BASELINE	**B**	30	99.03	1.84	.428
	L	30	99.36	1.35	
2 MIN	**B**	30	100	0	N/A
	L	30	100	0	
5 MIN	**B**	30	100	0	N/A
	L	30	100	0	
10 MIN	**B**	30	99.16	0.94	.425
	L	30	99.4	1.27	
15 MIN	**B**	30	99.8	0.48	.577
	L	30	99.86	0.43	
30 MIN	**B**	30	99.73	0.44	.177
	L	30	99.5	0.82	
45 MIN	**B**	30	99.83	0.46	.074
	L	3 0	99.53	0.77	

The Table 5 shows distribution of spo2 at various interval between two groups which is statistically insignificant.

CHART – 7 Comparison of SPO2 between the two groups at various intervals

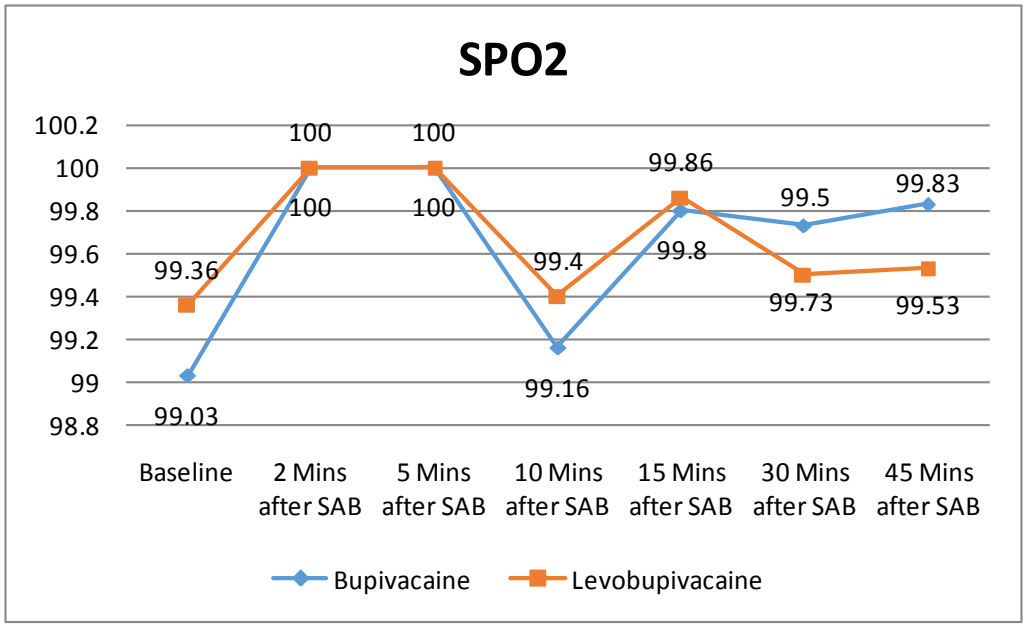


Table 6: Comparison of time of onset of sensory block (min) between the two groups

	Time of onset of sensory block	
Parameter	**(in minutes)**	
	Group B	**Group L**
Range	1-3	1-2
Mean SD	1.83 0.37	2.03 1.73669
'p' value	<0. 082 not Significant	

The table 6 shows time of onset of sensory block which was not statistically significant between two groups.

CHART – 8 : Comparison of time of onset of sensory block (min) between the two groups

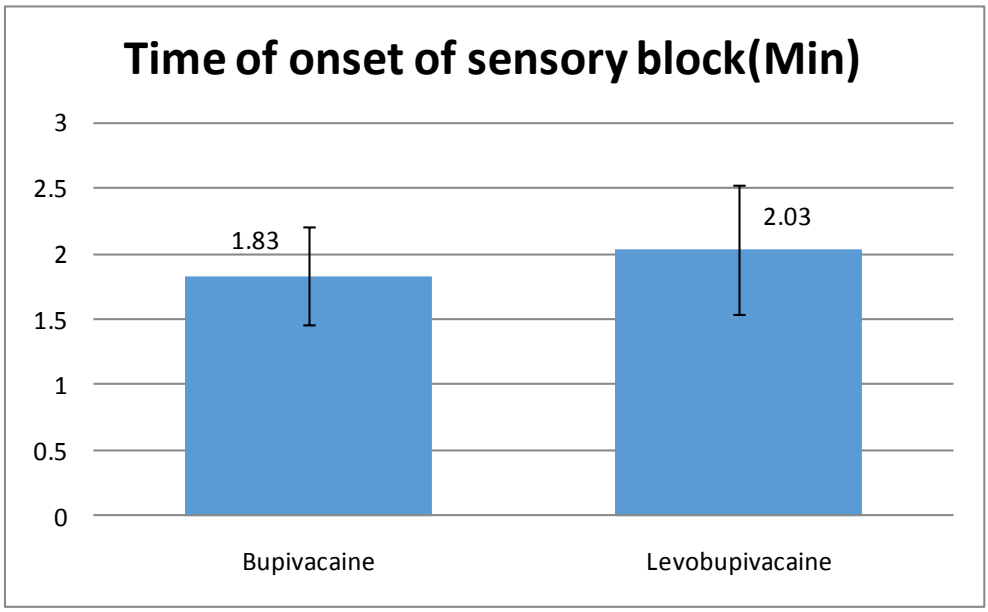


Table 7: Comparison of time to reach maximum sensory level (min) between the two groups

	Time to reach maximum sensory level	
Parameter	**(in minutes)**	
	Group B	**Group L**
Range	9-20	8-15
Mean	13.46	11.43
SD	1.47	1.75
'p' value	<0. 0001 Significant	

In table 7 time to reach maximum sensory block in the two groups were depicted. P value is statistically significant. The time to reach maximum sensory block was faster in Group L (11.96 ± 1.97) when compared with Group B (13.16 ± 2.57).

CHART – 9 Comparison of time to reach maximum sensory level (min) between the two groups

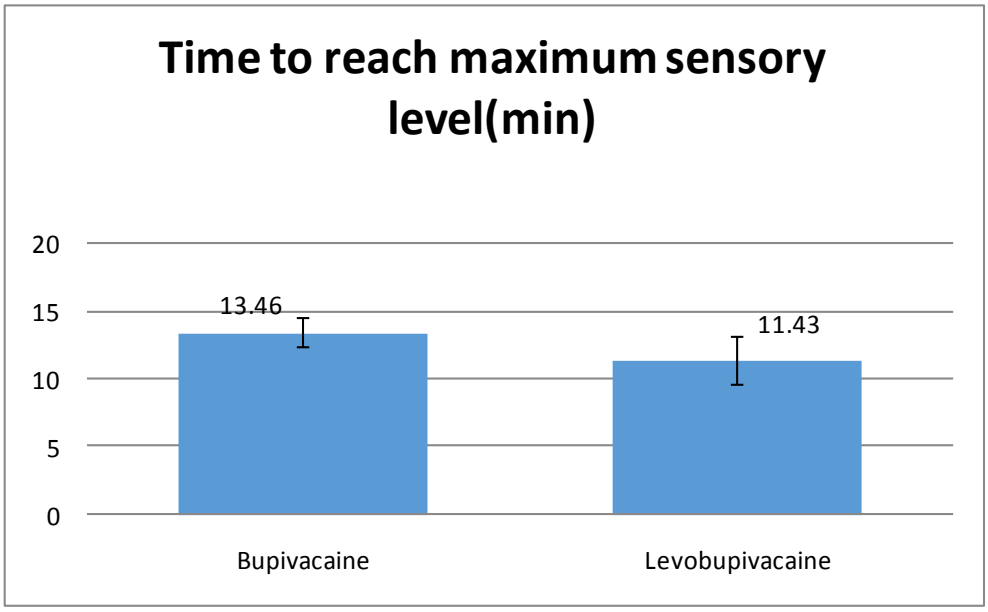


Table 8 : Comparison of peak level of sensory block (min) between the two groups

Peak level of Sensory Block	Number of cases in			
	Group B		Group L	
	No.	%	No.	%
T2	6	20%	2	7%
T4	12	40%	8	27%
T6	12	40%	20	66%
Total	30	100%	30	100 %

In this table the distribution of level of sensory block in both groups were given. T6, the ideal peak sensory level is attained.

CHART – 10 Comparison of maximum sensory level between the two groups .

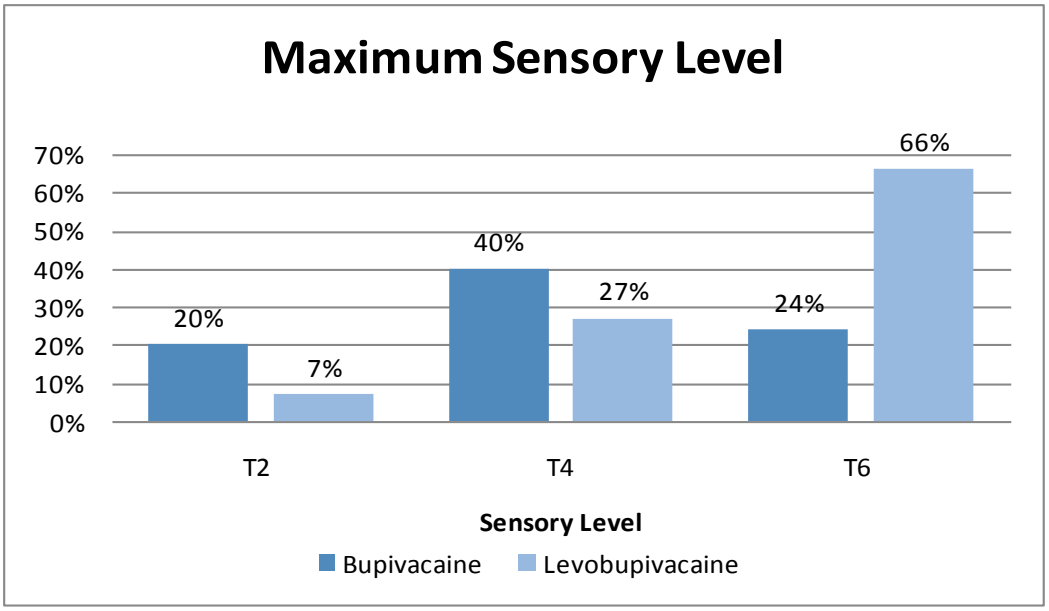


Table 9 : Comparison of time to two sement regression (min) between the two groups

	Time to two segment regression	
Parameter	**(in minutes)**	
	Group B	**Group L**
Range	70-80	60-70
Mean	74.53	65.17
SD	3.501	3.291
‘p’ value	<0. 0001 Significant	

Table shows the distribution of time to two segment regression between the two groups. In Group B the time to two segment regression was prolonged (75.13 ±3.501) when compared with Group L (65.17± 3.29) and it is statistically significant.

CHART – 11 Comparison of time to two sement regression (min) between the two groups

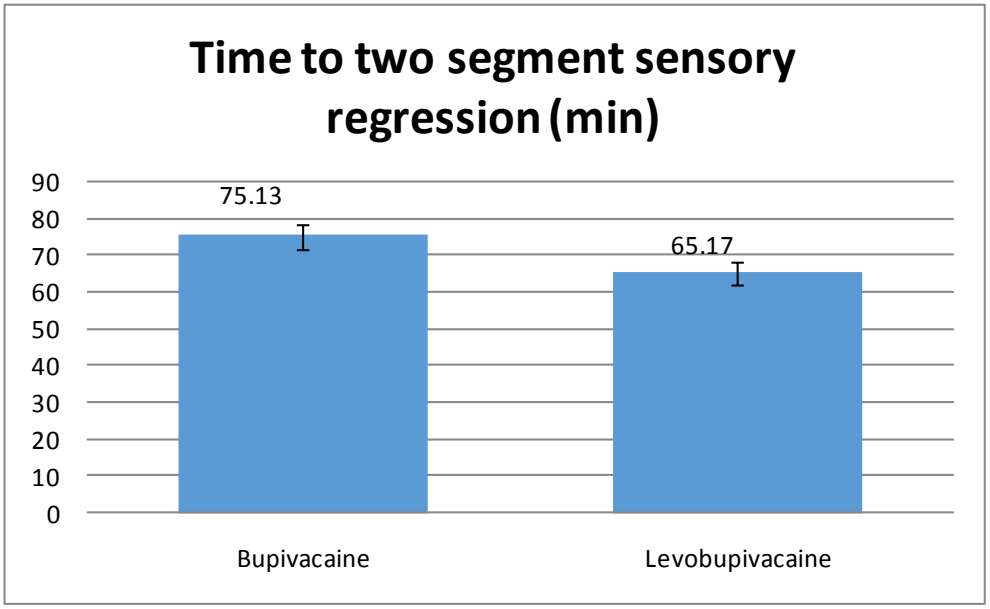


Table 10 : Comparison of time of onset of motor block (min) between the two groups

	Time of onset of motor level	
Parameter	**(in minutes)**	
	Group B	**Group L**
Range	2-4	2-6
Mean SD	2.93 0.52	4.51 0.87
'p' value	<0. 0001 Significant	

Table 10 shows the time of onset of motor block between groups ,onset of motor block is faster in Group B(2.36±0.61)when compared with Group L(4.1±0.88) P value is statistically significant.

CHART – 12 Comparison of time of onset of motor block (min) between the two groups

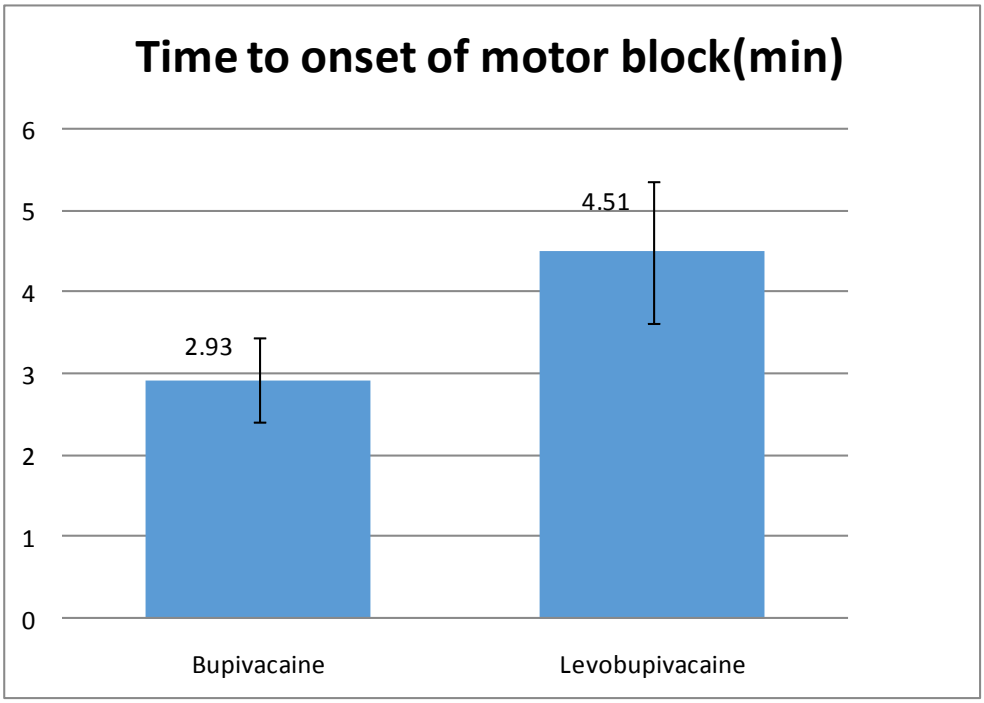


Table 11 : Comparison of time to maximum motor block level between two groups

	Time to maximum motor block level	
Parameter		
	Group B	**Group L**
Range	4-10	5-15
Mean	6.43	11.66
SD	1.13	2.12
'p' value	<0. 0001	
	Significant	

In table time to reach maximum motor block in the two groups were depicted. P value is statistically significant .The time to reach maximum motor block was faster in Group B (6.13 ± 0.67) when compared with Group L (11.6 ± 2.35).

CHART – 13 Comparison of time to maximum motor block level between two groups

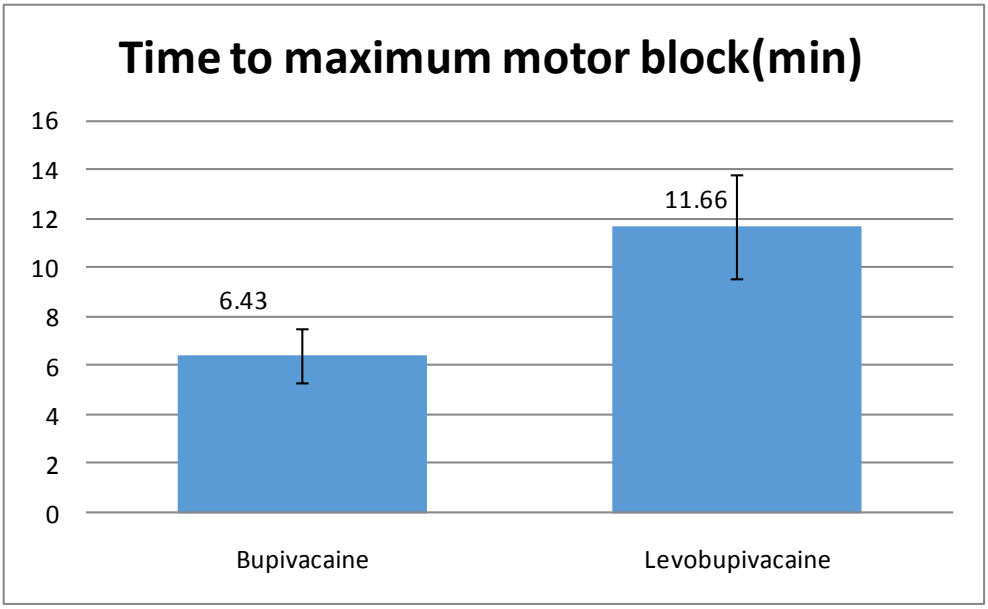


Table 12 : Comparison of duration of motor block level between two groups

	duration of motor block level	
Parameter		
	Group B	**Group L**
Range	125-155	90-115
Mean	135.03	101.06
SD	4.81	9.42
'p' value	<0. 0001 Significant	

In table duration of motor block in the two groups were depicted. P value is statistically significant .The duration of motor block was prolonged in Group B (132.66 ± 7.15) when compared with Group L (99 ± 9.13).

CHART – 14 Comparison of duration of motor block level between two groups

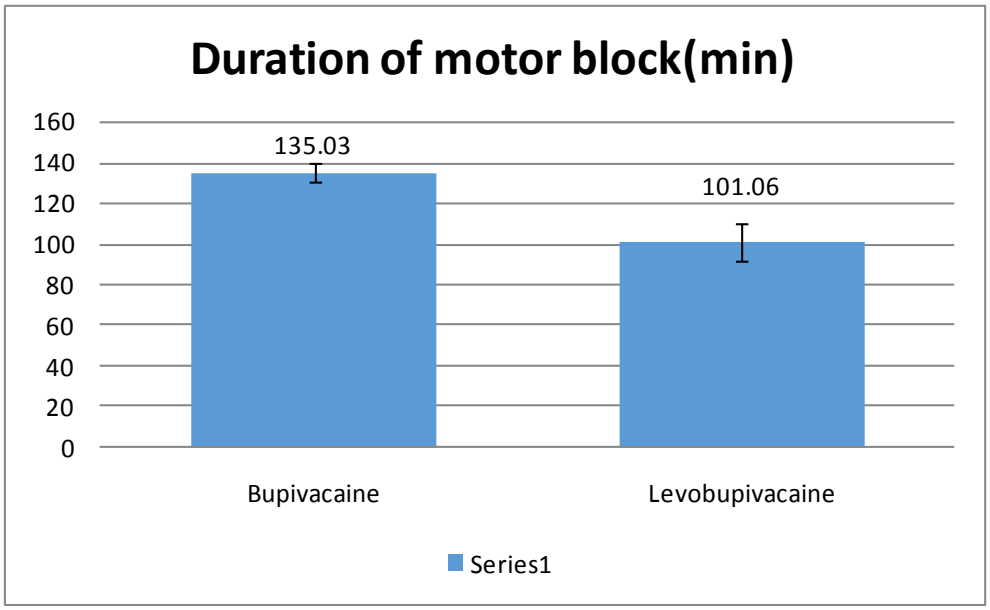
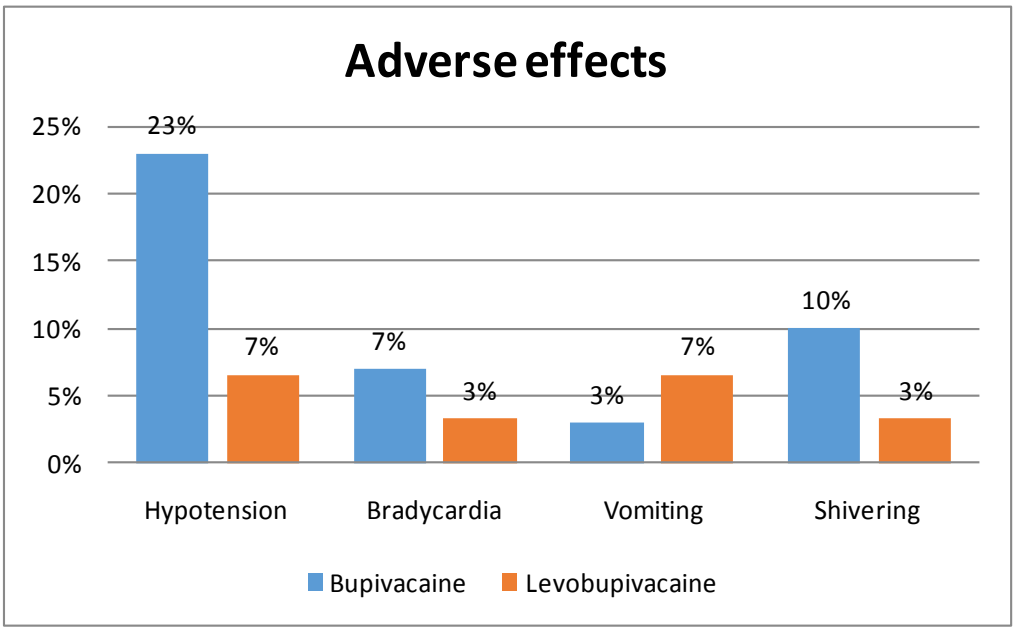


Table 13 : Comparison of Adverse effects between two groups

Adverse effects	**Group B**		**Group L**	
	No	**%**	**No**	**%**
Hypotension	7	23	2	7
Bradycardia	2	7	1	3
Shivering	2	7	2	7
Vomiting	1	3	2	7
Total cases with adverse				
effects	12*	40	7*	23
Total cases without adverse				
effects	18*	60	23*	77
Total	30*	100	30*	100

* More than one adverse effect was present in one case in each Group Adverse effects between the two groups were comparable.

CHART – 15 Comparison of Adverse effects between two groups



DISCUSSION

Spinal anesthesia, providing an effective surgical anesthesia and postoperative analgesia by ensuring minimal maternal and neonatal side effects, has been reported to be more advantageous than general anesthesia for caesarean operations.

Bupivacaine is a preferred agent in obstetric anesthesia due to its long lasting action and lower levels of placental transition; most serious side effect is cardiotoxicity, which makes pregnant women, more sensitive to this effect.

Levobupivacaine is a more favorable local anesthetic agent in terms of safety profile with similar pharmacokinetic properties to racemic bupivacaine. However, trials have reported that the cardiovascular and central nervous system-related side effects of levobupivacaine are less than those of bupivacaine, though the onset and duration of action, hemodynamic changes after spinal anesthesia are the same for levobupivacaine and bupivacaine.

We conducted a randomized, double-blind, case-control study to evaluate the hemodynamic stability of intrathecal Isobaric Levobupivacaine 10mg for cesaerean which was based on of ***Gulen guler et al***[1] 2012, conducted a study to investigate the clinical efficacy of levobupivacaine and bupivacaine for spinal anesthesia in cesarean section. Group L recieved 10 mg levobupivacaine with fentanyl 15 mcg and Group B received 10mg bupivacaine with fentanyl 15 mcg.

They observed in group B motor block was faster and longer, bradycardia, hypotension and nausea less in group L **Bremerich DH[2] et al** carried out a dose finding investigation of levobupivacaine for parturients undergoing elective caesarean delivery in 2007.Parturients received either 7.5, 10 or 12.5 mg intrathecal hyperbaric 0.5% levobupivacaine. They recommended 10 mg levobupivacaine for parturients undergoing elective caesarean section with spinal anaesthesia.

"In our study, sensory block levels required for cesarean section were achieved in both groups, and it was observed that the hemodynamic stability with levobupivacaine was better maintained".

Goyal et al[7] conducted a study on 30 parturient for elective cesarean section .They were divided in to Group BF receiving 10 mg bupivacaine and 25 mcg fentanyl, or Group LF receiving 10 mg isobaric levobupivacaine and 25 mcg fentanyl. Hemodynamics like MAP was lower in gruop BF and in Group LF max sensorial block level and postoperative visual analog scale scores were higher.

“Onset of motor block time, time to max motor block, time to T10 sensorial block, reversal of two dermatome, the first analgesic need were similar in both groups" They concluded that isobaric levobupivacaine is good alternative for cesarean section as it provides less motor block and maintains hemodynamics stability.

In our study we observed that maximum sensory block level in bupivacaine group was higher and development of motor block was faster and lasted longer.

"The results of our study are similar to **Gautier et al[17]** reported during spinal anesthesia for cesarean delivery, they compared the same doses of levobupivacaine and bupivacaine, and reported that while adequate anesthesia was maintained in the 97% of the patients in the bupivacaine group, this rate was 80% in the levobupivacaine group, and duration of motor block and analgesia was shorter in the levobupivacaine".

In a study by bremerich et al[2].10 involving 60 patients who were scheduled for caesarean section and were administered 0.5% levobupivacaine (10 mg) and 0.5% bupivacaine (10 mg) in combination with opioid (10 and 20 μg of fentanyl and 5 μg of sufentanil), the duration of motor block was found to be shorter with levobupivacaine compared to bupivacaine.

In a study by **Copperjans et al[18].** comparing 6.6 mg of bupivacaine supplemented with 3.3 μg of sufentanil, 6.6 mg of levobupivacaine and 10 mg of ropivacaine, they found a better value of systolic blood pressure in the levobupivacaine group.

In our study, we used 10mg of 0.5 % Hyperbaric bupivacaine for intrathecal injection. We measured the time of onset and duration of sensory block, hemodynamic changes, modified bromage scale, duration of motor block and adverse effects all these were measured from the time of injection of subarachnoid block.

In our study, we found that both Isobaric Levobupivacaine and Hyperbaric bupivacaine produces equal efficacy of motor and sensory blockade. Isobaric levobupivacaine produces effects with minimal adverse effect which is similar to randomized double blind study conducted by **Glaser et al[10].**

Mantouvalou et al[13] performed a study to compare three local anesthetic agents: racemic bupivacaine and its two isomers: ropivacaine and levobupivacaine, for anesthetic efficacy and safety in patients undergoing lower abdominal surgery. They found that levobupivacaine required less vasoactive drugs with equal efficacy of motor and sensory blockage. In our study hypotension is more prevalent in Hyperbaric bupivacaine than isobaric levobupivacaine.In our study we found that the time to two segment regression is earlier in Isobaric levobupivacaine than hyperbaric bupivacaine which is supported by *NK Girgin et al[11]* 2012.

In our study we found that the potency of two drugs, duration of motor block is higher in Hyperbaric bupivacaine (Range 125-155min,) than Isobaric bupivacaine (Range 90-115min).

A study carried out by **Camorcia et al[3]** in 2007 compared the relative potencies of intrathecal ropivacaine, levobupivacaine and bupivacaine for motor block.They concluded that potency for motor block when administered via intrathecal route was low for ropivacaine, intermediate for

levobupivacaine and high for bupivacaine,which is in keeping with our findings.

Fattorni et al[15] conducted study on eighty patient who has been posted for major orthopedic surgery .there is no significant characteristic difference in sensory and motor block between the levobupivacaine and bupvacaine .In levobupivacaine group no incidence of severe hypotension and cardiovascular stability was maintained.

Glasser et al[10] compared that in levobupivacaine group causes less incidence of bradycardia and it reduces arterial pressure less compared to bupivacaine.

In my study, we found that occurence of bradycardia is mor prevalent in Group B bupivacaine 0.5 % than Group L isobaric levobupivacaine 0.5% . This findings has been supported by ***Mantouvalou et al***[13] performed study which compared to both ropivacaine and levobupivacaine , Bupivacaine required more often the use of ephedrine and atropine.

SUMMARY

Sixty term pregnant women of A S A I and II physical status who presented for elective caesarean section were included in this double blinded study.

They were randomly and equally allotted into two groups namely, Group B and Group L

Patients in Group B received 0.5% hyperbaric bupivacaine 10mg intrathecally.

Patients in Group L received 0.5% Isobaric Levobupivacaine 10mg intrathecally.

They were observed for

- Onset time for sensory block**.**
- The time taken to reach peak sensory block level.
- Regression time to two dermatomes for sensory block.
- Onset of motor block.
- Time for maximum motor block level.
- Duration of motor block.
- Hemodynamic changes.
- Adverse effects.

- The collected data was analysed using Student's' test and a 'p' value <0.05 was considered significant.

Group L showed a better hemodynamic stability in terms of mean arterial pressure and there was no significant difference in terms of pulse rate between the two groups.

Patients in bupivacaine group had a faster onset of sensory block, Group B patients showed significantly longer duration of sensory analgesia and motor block.

CONCLUSION

0.5% Isobaric Levobupivacaine 10mg for intrathecal injection of caesarean section produces adequate sensory and motor blockade and stable hemodynamic parameters with minimum adverse effects than 0.5% hyperbaric bupivacaine 10mg. We concluded that isobaric levobupivacaine is a better alternative for caesarean section.

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PROFORMA

Case No:				
Name:		Age:	I.P.No.	Date:
Address:		Unit:	Weight:	Height:
Indication:				
Surgeon:				
Pre – Operative status				
Anaemia: Yes / No		A.S.A. Grade:		
Pulase Rate:	BP:	CVS:	Rs.	

AIR WAY

Investigation : HB%

Urine – Albumin Sugar Deposits

Blood Sugar Urea Creatinine

HIV VDRL Hbs Ag, ECG, Blood Group

Pre Medication

Inj. Ranitidine 50mg

Inj. Metoclopramide 10mg

Anaesthetic Technique

Preloading : Yes / No Amount infused

Position for S.A.B. Level of Injection : L3 – L4

No. of attempts: Needle:

Time of Injection:

Drug given:

Dose:

Group B :

Group L :

Group		B( )/L( )
Position and site of injection		
Time of intrathecal injection of drug		
Time of onset of sensory block Peak level of sensory block		
Duration of procedure		
Time of two segement regression		
Modified bromage scale		
Duration of Motor blockade		

Intraoperative hemodynamic changes:

	0 min	2 min	5 min	10 min	15 min	30 min	45 min	1 hr After the procedure
HR								
BP								
SpO_2								

Side effects and complications:

Insufficient Block :

Any discomfort : Nausea, Vomiting, pruritus, pain

Hypotension :

Bradycardia :

Shivering :

Post Op. headache and back pain:

ஆராய்ச்சி ஒப்புதல் படிவம்

சிசேரியன் முறையில் செய்யப்படும் முதுகுத் தண்டுவட நீரில் ஊசியின் மூலம் உபயோகப்படுத்தக்கூடிய இரண்டு மயக்க மருந்துகளின் விளைவுகள் பற்றி ஆய்வு

பெயர் :

வயது :

இனம் :

உள்நோயாளி எண் :

வார்டு :

நோய் :

அறுவை சிகிச்சை :

விளக்கம் :

சிசேரியன் முறையில் செய்யப்படும் அறுவை சிகிச்சைக்காக மயக்க மருந்தினை முதுகுத் தண்டுவட நீரில் ஊசி மூலம் செலுத்தி தற்காலிகமாக உணர்விழக்க செய்யும் முறையில் புபிவேகெய்ன் எனும் மருந்து பரவலாக உபயோகிக்கப்படுகின்றது. இந்த முறையில் லீவோபுபிவேகெய்ன் எனும் ஆராய்ச்சிக்கான முதுகுத்தண்டுவட நீரில் ஊசி மூலம் செலுத்தி அறுவை சிகிச்சை செய்வதனால் ஏற்படும் பயன்கள், விளைவுகள், பக்க விளைவுகள் பற்றி எனக்கு நன்கு புரிகின்ற தமிழ் மொழியில் தெளிவாக விளக்கி கூறப்பட்டது.

என்னுடைய அடையாளம் எந்த வகையிலும் இந்த ஆராய்ச்சி மூலம் வெளியே தெரியாது என்பதை அறிவேன். இந்த ஆராய்ச்சியில் இருந்து எந்த நேரமும் விலகலாம் என்பதையும் அதனால் எந்த பாதிப்பு ஏற்படாது என்பதையும் அறிவேன்.

நான் யாருடைய நிர்பந்தமுமின்றி என் சொந்த விருப்பத்தின் பேரில் சுய நினைவுடன் இந்த ஆராய்ச்சியில் பங்கு கொள்ள சம்மதிக்கிறேன்.

இடம் : திருநெல்வேலி கையொப்பம்

நாள் :

Sl.No.	Name	Age (in yrs)	Weight(in kgs)	Height (in cms)	Duration Surgery (MIN)	Group	Pulse Rate						
							Baseline	2 Mins after SAB	5 Mins after SAB	10 Mins after SAB	15 Mins after SAB	30 Mins after SAB	45 Mins after SAB
1	ARUMUGAKANI	21	65	156	50	B	88	92	56	98	100	102	98
2	SELVI	27	66	158	55	B	92	96	68	92	88	83	92
3	VIMALA	24	68	158	53	B	102	88	82	88	88	76	102
4	DIVYA	26	80	156	52	B	108	82	88	86	86	88	108
5	UPPIDATHAI	22	72	157	48	B	98	88	78	82	86	96	98
6	VIMALA	23	77	159	59	B	100	98	88	84	87	92	100
7	RENU	26	68	160	52	B	88	92	56	98	102	106	100
8	FATHIMA	19	64	161	50	B	68	100	68	82	90	88	68
9	JAYASHREE	20	83	163	48	B	98	89	88	76	84	94	98
10	GOMATHY	35	75	155	55	B	78	86	88	78	86	96	78
11	MURUGESHWARI	24	66	158	51	B	98	82	54	100	98	100	102
12	SHANTHI	75	82	157	47	B	112	76	86	88	88	86	112
13	RENU	23	79	164	52	B	96	78	72	74	78	88	96
14	REVATHI	20	66	157	49	B	92	74	58	110	106	110	92
15	SHANMUGAKANI	27	79	157	60	B	86	88	78	74	84	82	86
16	MALATHY	25	70	159	56	B	99	82	78	80	86	80	99
17	SRIDEVI	24	66	156	58	B	98	92	88	82	88	78	98
18	MAGESHWARI	23	68	162	54	B	88	96	55	98	106	80	110
19	DHARSHINI	22	82	158	50	B	100	55	86	96	102	100	100
20	SHOBANA	21	74	161	56	B	88	82	82	84	86	84	88
21	VADIVUKARASI	25	67	157	57	B	102	76	86	86	82	80	102
22	ABIRAMI	27	65	161	48	B	89	78	88	88	84	86	89
23	PONMUTHU	20	68	156	59	B	86	92	82	78	88	84	86
24	KALEESHWARI	21	65	161	49	B	92	100	86	78	92	90	92
25	ASHWINI	26	82	163	48	B	96	102	82	68	96	92	96
26	BHARATHI	26	67	157	47	B	88	94	76	76	78	80	88
27	KIRTHIGA DEVI	30	66	159	48	B	92	88	78	70	86	86	92
28	NANDHINI	28	67	160	49	B	98	86	88	80	82	78	98
29	RAJESHWARI	25	65	164	56	B	92	82	82	76	82	80	92
30	SUDHA	22	68	163	47	B	88	78	86	80	86	88	88
31	KRISHNAVENI	27	70	163	56	L	78	76	88	76	88	82	78
32	NIRMALA	27	73	164	48	L	96	68	82	78	86	80	96
33	PARVATHY	21	67	160	47	L	90	76	86	80	82	80	90
34	NIVEDITHA	28	74	157	48	L	80	78	54	88	98	102	80
35	VANDHANA	23	74	159	57	L	82	82	98	90	90	88	82
36	TAMIL SELVI	26	68	163	50	L	72	88	88	92	90	86	72
37	SHANMUGA PRIYA	25	70	162	49	L	76	92	82	88	82	80	76
38	RUBINI	22	73	157	60	L	88	100	86	78	80	78	88
39	FATHIMA FARZANA	29	71	163	49	L	92	86	78	72	76	88	92
40	MARY	22	77	164	56	L	86	82	76	74	78	80	86
41	TAMILARASI	19	65	156	50	L	88	86	78	70	78	80	88
42	MUTHUKUMARI	21	66	157	53	L	82	98	72	76	80	78	82
43	ESAKKIAMMAL	23	68	156	52	L	96	92	78	70	80	74	96
44	LAKSHMI	20	76	159	48	L	88	96	82	78	82	76	88
45	MARIAMMAL	30	65	160	59	L	70	92	86	80	84	70	70
46	KAYATHRI	21	80	163	48	L	68	78	84	83	86	80	68
47	MEERA	23	71	159	55	L	75	76	78	76	88	84	75
48	BACKIYALAKSHMI	20	80	158	59	L	86	72	98	88	88	82	86
49	ESTHER	24	65	157	60	L	72	82	92	86	92	78	72
50	INDHIRA	26	69	164	56	L	86	88	90	76	94	90	86
51	POORNIMA	28	78	162	54	L	82	98	88	82	90	88	82
52	AMUTHAMOZHI	22	65	156	47	L	88	92	78	82	88	84	88
53	ARUNA	26	79	163	48	L	78	76	88	76	72	76	78
54	NATHIYA	28	64	164	49	L	82	78	82	78	74	80	82
55	MALLIKA	22	74	160	53	L	86	86	80	76	78	88	86
56	SATHYA PRIYA	24	82	163	54	L	88	84	90	78	76	86	88
57	POORNAKALA	25	63	159	55	L	82	82	100	88	86	89	82
58	RASI	27	67	158	57	L	98	84	78	86	88	90	98
59	AMBIKA	25	72	159	57	L	90	88	84	78	88	78	90
60	SASIKALA	27	77	158	48	L	88	86	86	80	98	96	88

Sl.No.	Group	MAP							SPO2						
		Baseline	2 Mins after SAB	5 Mins after SAB	10 Mins after SAB	15 Mins after SAB	30 Mins after SAB	45 Mins after SAB	Baseline	2 Mins after SAB	5 Mins after SAB	10 Mins after SAB	15 Mins after SAB	30 Mins after SAB	45 Mins after SAB
1	B	72	96	56	58	60	65	70	100	100	100	100	100	100	100
2	B	76	90	65	66	68	70	76	100	100	100	100	100	100	100
3	B	68	98	70	68	70	72	76	100	100	100	100	100	100	100
4	B	82	100	74	70	72	76	76	100	100	100	100	100	100	100
5	B	74	86	75	70	74	78	76	98	100	100	98	100	99	100
6	B	72	88	72	70	70	78	76	99	100	100	99	100	100	100
7	B	76	80	70	75	78	80	82	98	100	100	98	100	100	100
8	B	78	90	80	76	74	84	80	100	100	100	100	100	100	100
9	B	90	95	82	78	80	86	78	90	100	100	98	100	99	100
10	B	72	90	80	76	78	80	80	99	100	100	98	100	100	100
11	B	77	96	58	60	64	66	70	99	100	100	99	100	100	100
12	B	81	98	80	72	70	68	76	99	100	100	99	100	100	100
13	B	82	90	78	74	72	70	74	100	100	100	100	99	99	100
14	B	70	88	52	56	60	64	70	99	100	100	99	99	100	100
15	B	81	84	50	55	60	66	70	98	100	100	98	99	100	100
16	B	70	86	78	80	76	74	78	100	100	100	100	100	99	100
17	B	78	88	76	70	72	70	78	100	100	100	100	100	100	100
18	B	86	90	58	56	60	70	74	99	100	100	97	100	100	100
19	B	72	78	56	70	75	78	80	98	100	100	98	99	99	100
20	B	78	76	76	66	68	70	74	99	100	100	99	100	100	99
21	B	80	88	74	68	70	72	72	100	100	100	100	100	100	100
22	B	78	90	75	70	70	70	75	100	100	100	100	100	99	99
23	B	80	98	76	70	72	70	76	99	100	100	99	100	100	100
24	B	75	96	78	68	66	64	70	100	100	100	100	100	100	
25	B	78	98	68	66	64	66	68	100	100	100	100	100	99	100
26	B	74	94	66	65	62	60	64	99	100	100	98	98	100	100
27	B	82	92	70	65	64	66	68	100	100	100	100	100	99	99
28	B	72	86	78	76	75	76	86	99	100	100	98	100	100	100
29	B	76	85	74	70	68	72	76	99	100	100	100	100	100	100
30	B	88	88	72	68	70	70	74	100	100	100	100	100	100	98
31	L	76	80	90	88	80	84	86	100	100	100	100	100	98	100
32	L	80	88	88	86	86	80	88	100	100	100	100	100	100	100
33	L	75	90	78	76	78	74	80	95	100	100	98	99	100	100
34	L	99	94	88	65	68	78	90	100	100	100	100	100	100	100
35	L	76	98	90	88	90	86	88	100	100	100	100	100	100	100
36	L	96	96	80	82	80	86	84	98	100	100	98	100	98	100
37	L	86	88	98	96	98	96	94	100	100	100	100	100	100	98
38	L	84	84	99	90	92	86	88	100	100	100	100	100	100	100
39	L	88	85	100	95	92	88	90	100	100	100	100	100	100	99
40	L	86	88	88	90	92	86	88	100	100	100	100	100	100	100
41	L	83	86	90	86	88	84	86	99	100	100	99	100	100	98
42	L	93	85	92	84	82	80	80	100	100	100	100	100	98	100
43	L	99	90	96	90	92	88	90	100	100	100	100	100	100	99
44	L	93	98	98	86	88	84	86	99	100	100	99	100	100	100
45	L	84	95	94	84	86	84	90	100	100	100	100	100	100	98
46	L	79	100	88	82	80	82	90	100	100	100	100	100	98	100
47	L	78	98	60	76	80	82	80	99	100	100	94	98	100	99
48	L	98	96	90	82	78	80	88	100	100	100	100	100	100	100
49	L	86	88	85	84	80	82	86	98	100	100	98	100	98	100
50	L	98	90	86	80	82	80	88	100	100	100	100	100	100	99
51	L	91	85	84	86	88	86	90	100	100	100	100	100	100	100
52	L	81	86	78	80	82	80	84	100	100	100	100	100	98	100
53	L	86	80	80	78	80	82	86	100	100	100	100	100	100	100
54	L	86	86	82	80	82	80	86	95	100	100	98	99	100	100
55	L	93	84	86	84	86	83	84	100	100	100	100	100	100	98
56	L	92	82	88	86	88	86	86	100	100	100	100	100	99	100
57	L	81	85	90	88	86	84	84	98	100	100	98	100	100	100
58	L	95	78	98	90	88	86	90	100	100	100	100	100	99	100
59	L	85	80	56	65	70	75	80	100	100	100	100	100	100	100
60	L	86	85	100	96	94	92	90	100	100	100	100	100	99	98

Sl.No.	Group	Time of Once of sensory black (min)	Maximum Sensor level	Time to reach maximum sensory block((min)	Time to two segment regression sensory(min)	Time to onset of motor block (min)	Time for maximum mottor (min)	Duration of motor block (min)	Side effects
1	B	2	2	13	75	3	6	135	Hypotension,Bradycardia
2	B	2	6	12	68	3	6	132	
3	B	2	4	14	77	3	7	138	Shivering
4	B	1	6	14	68	4	5	125	
5	B	1	6	15	78	3	6	136	
6	B	2	4	13	69	3	7	129	
7	B	2	2	13	79	3	6	136	Bradycardia
8	B	2	6	14	80	3	6	131	
9	B	2	6	16	70	4	6	135	
10	B	2	6	14	74	2	7	129	
11	B	1	2	12	72	2	5	133	Hypotension
12	B	1	6	14	73	3	8	136	
13	B	2	4	13	79	3	10	134	
14	B	2	2	11	70	3	9	137	Hypotension,Nausea,Vomiting
15	B	1	2	12	75	4	8	133	Hypotension
16	B	2	6	14	74	3	7	136	
17	B	2	4	13	77	3	7	137	
18	B	2	4	13	78	3	6	136	Hypotension
19	B	2	2	13	78	3	6	138	Hypotension.Bradycardia
20	B	2	6	13	76	3	6	139	
21	B	2	6	14	76	2	7	137	Shivering
22	B	2	4	14	75	3	6	136	
23	B	2	4	15	74	3	5	138	
24	B	2	6	12	77	3	6	135	
25	B	2	4	15	73	2	6	128	
26	B	2	4	13	72	3	6	133	
27	B	2	4	14	76	3	5	134	
28	B	2	4	14	76	2	6	130	Nausea,vomiting
29	B	2	4	14	74	3	6	145	
30	B	2	6	13	73	3	6	150	Shivering
31	L	2	6	11	65	4	14	108	Shivering
32	L	2	6	12	68	5	14	110	
33	L	2	6	12	67	4	13	115	
34	L	1	2	11	69	4	12	106	Hypotension,Bradycardia
35	L	2	6	12	69	4	15	98	
36	L	2	6	11	71	5	14	96	
37	L	2	4	12	68	6	12	93	
38	L	1	6	11	70	4	14	94	
39	L	2	6	11	68	4	12	90	
40	L	2	4	13	73	4	12	110	
41	L	2	6	11	65	4	12	115	
42	L	1	6	12	64	5	6	115	
43	L	2	6	11	70	4	7	108	
44	L	3	4	3	72	5	12	100	
45	L	2	6	12	65	4	8	108	
46	L	2	6	11	70	6	12	86	
47	L	3	4	12	73	4	9	87	Nausea,vomiting
48	L	2	6	13	70	6	12	96	
49	L	2	6	12	65		9	98	
50	L	2	6	13	75	5	10	96	
51	L	2	4	12	73	6	13	103	
52	L	2	6	12	67	5	12	92	
53	L	3	6	11	70	4	11	88	
54	L	2	6	13	65	6	11	84	
55	L	2	4	11	75	5	11	98	
56	L	2	4	11	64	4	12	99	Nausea,vomiting
57	L	2	4	12	72	3	12	108	
58	L	2	6	13	71	4	13	106	
59	L	3	2	11	67	3	12	110	Hypotension
60	L	2	6	11	72	4	14	115	