A Dissertation on

"A COMPARATIVE STUDY OF BILATERAL ILIOINGUINAL AND HYPOGASTRIC NERVE BLOCK WITH WOUND INFILTRATION FOR POST OPERATIVE ANALGESIA IN CAESAREAN SECTION DONE UNDER SPINAL ANAESTHESIA"

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CERTIFICATE

This is to certify that the dissertation titled "**A COMPARATIVE STUDY OF BILATERAL ILIOINGUINAL AND HYPOGASTRIC NERVE BLOCK WITH WOUND INFILTRATION FOR POST OPERATIVE ANALGESIA IN CAESAREAN SECTION DONE UNDER SPINAL ANAESTHESIA**" presented here in by **Dr. KIRUBAKARA RAJ. S**. is an original work done in the Department of Anaesthesiology, Government Stanley Medical College & Hospital, Chennai for the award of the degree of M.D. (Branch X) Anaesthesiology under my guidance and supervision during the academic period of 2003-2006 .

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DECLARATION

I, **Dr. S. KIRUBAKARA RAJ** solemnly declare that the dissertation titled **"A STUDY ON A COMPARATIVE STUDY OF BILATERAL ILIOINGUINAL AND HYPOGASTRIC NERVE BLOCKADE AND WOUND INFILTRATION FOR POST OPERATIVE PAIN RELIEF IN CAESAREAN SECTION DONE UNDER SPINAL ANAESTHESIA"** is a bonafide work done by me in the Department of Anaesthesiology, Government Stanley Medical College and Hospital, Chennai under the able guidance of **Prof. J. Ranganathan MD.,DA.,** Professor & HOD, Department of Anaesthesiology, Government Stanley Medical College and Hospital, Chennai – 600001.

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CONTENTS

INTRODUCTION

"For all happiness mankind can gain is not a pleasure but in rest from pain

- JOHN DRYDEN

Pain is perhaps the most feared symptom of disease and trauma. PAIN IS AGONY WHILE ITS RELIEF IS ECTACY.

International association for study of pain (1979) defines pain as an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage.

Post operative pain is caused by

1. Direct trauma to operated tissues.
2. Reflex muscle spasm and visceral distension.
3. Patient's anxiety and previous painful experience.

However post-operative pain is transitory[1] and self limiting, being most severe during the first postoperative day and diminishing over the next 24 hours and therefore more amenable to therapy than chronic pain[1].

Objective for relieving post-operative pain:

1. To alleviate discomfort and distress of the patient.
2. To reduce neuro-endocrine stress response.
3. To reduce oxygen demand[2]
4. Humanitarian aspect.

Post-operative pain has 3 components:

1. Emotional.
2. Rational.
3. Physical.

Emotional component may vary according to patient's psychological aspect; the rational component varies with the patient's previous experience, insight and motivation while the physical component depends on the extent of direct tissue injury.

The use of specific nerve blocks and wound infiltration alone or in combination with general/spinal anaesthesia provides analgesia into the early and late recovery periods. This is the ideal pain relief modality: a fairly simple technique to eliminate the need for opioids or additional drug treatments there by minimizing the potential for undesirable interactions and adverse effects. Even though appropriate needle sizes and anaesthetic drugs needs to be tailored to the patient, regional anaesthesia provides advantage over general anaesthesia in reducing nausea and vomiting and providing prolonged post operative analgesia[3].

The obstetric department standard protocol for postoperative analgesia in our hospital is inj. diclofenac sodium on first complain of pain and there after

every 12 hours. Therefore we wanted to see if other techniques such as wound infiltration and/or ilioinguinal and hypogastric nerve block could be introduced as a method of post-operative analgesia.

Since spinal anaesthesia is safer than general anaesthesia especially in caesarean we preferred the spinal anaesthesia.

The Pfannenstiel incision and subsequent manipulations associated with Cesarean section (CS) delivery are known to produce a significant degree of post-procedural pain. This pain can be effectively relieved with neuraxial and systemic opioid administration[4] However, as with any post-operative opioid use, a high incidence of pruritis, nausea, vomiting, sedation and occasionally respiratory depression may occur. Debilitating in themselves, these opioid-related adverse effects can produce additional problems for mothers such as delayed initiation of breast feeding and impairment of mother\infant bonding.

The postoperative pain that follows a CS with the pfannenstiel incision has both a somatic component and a visceral component. The somatic pain generated at the incision site is conducted by the iliohypogastric and ilioinguinal nerves (IHII), which innervate the L1-2 dermatome distribution[5]. Generalised wound infiltration with local anaesthetics can produce some reduction in post-CS delivery pain but this route can be an ineffectual means of drug administration. We believed that, because of the IHII nerve involvement, there was the potential for

anaesthetic injection along this nerve track to produce a significant degree of post-CS pain relief.

In contrast to the somatic component of post-operative pain, the visceral pain component is diffuse with no peripheral nerve association[6]. We hypothesized that an enhanced IHII nerve block technique would decrease postoperative patient controlled analgesia (opioids\nsaids) use by addressing the somatic and visceral pain pathways.

AIM OF THE STUDY

Comparison of the effectiveness of the bilateral ilioinguinal and hypogastric nerve block with wound infiltration for post-operative analgesia in caesarean section done under spinal anaesthesia.

PHYSIOLOGY OF PAIN

The transmission of pain has four distinct physiological processes.

1. TRANSUDATION

Conversion of noxious stimuli into electrical signals by peripheral afferents.

2. TRANSMISSION

Propagation of electrical signals along the nociceptive pathways.

3. MODULATION

Alteration of the nociceptive signal within the dorsal horn.

4. PERCEPTION

Nociceptive input is integrated with cognitive and emotional factors to create subjective pain.

The pain pathway consists of:

1. Peripheral nociceptor system
2. Peripheral sensitization
3. Dorsal horn mechanisms
4. Ascending pain pathways
5. Central sensitization
6. Descending modulation

1. PERIPHERAL NOCICEPTOR SYSTEM

Somatic structures

Tissue damage activates pain receptors, nociceptors which are at the termination of free nerve endings of A-delta and C afferents. The nociceptors are activated by endogenous chemicals called allegoric, algestic or pain producing substances released by the damaged tissue into the extracellular fluid.

Skin is supplied by

a. A-delta high threshold mechanoreceptors (HTMs) are activated by mechanical noxious stimuli.

b. A-delta myelinated mechanodermal nociceptors (MMTNs) are activated by noxious heat and noxious mechanical stimuli.

c. C-polymodal nociceptors (CPNs) are activated by mechanical, thermal and chemical noxious stimuli.

Muscles, joints, fasciae and other deep somatic structures are supplied by C and probably A-delta fibres.

Visceral structures

Supplied by the C afferent fibres and some by A– delta fibres and are activated by disease, inflammation, ischemia and rapid distention.

2. PERIPHERAL SENSITIZATION

When nociceptors are stimulated, the release of allegoric substances results in:

i. Changed excitability of sensory and sympathetic nerve fibres
ii. Increased capillary permeability
iii. Either vasoconstriction or vasodilatation
iv. Extravasation of plasma proteins
v. Act on inflammatory cells to release chemical mediators

Accumulation of inflammatory mediators like potassium, serotonin, bradykinin, substance P, histamine, cytokines, nitric oxide causes sensitization of high threshold nociceptors converting them to low threshold nociceptors. This phenomenon is termed as peripheral sensitisation.

3. DORSAL HORN MECHANISM

The dorsal horn is the termination site of primary afferent and is a complex site of interaction between 3 main structures:

i. Primary afferent fibres
ii. Local intrinsic spinal neurons
iii. Descending fibers from the brain

Dorsal horn contains a complex circuitry with numerous varieties of neurons and synaptic arrangements and a rich biochemistry that permits reception, transmission and also sensory processing.

The primary afferents end in Lamina I, II, & V from where second order neurons arise.

Lamina I: MMTNs and CPNs end here having small receptive field and are slowly conducting.

Lamina V: Primary afferents from skin subcutaneous tissue, muscle and viscera ends here.

Lamina II_o: Substantia Gelatinosa neurons respond to inputs from high threshold and thermoreceptive primary afferents

Lamina II_1: Substantia Gelatinosa neurons respond to inputs from low threshold mechanoreceptive primary afferents.

Two classes of second order neurons are:

1. Nociceptive specific or high threshold, responding selectively to noxious stimuli.
2. Wide dynamic range (WDR) or convergent, responding to both noxious and non-noxious input.

4. **ASCENDING PAIN PATHWAYS**

The ascending pain pathways in the venterolateral quadrant for the transmission of nociceptive information from body to brain are:

Spinothalamic tract (STT)

Spinoreticular tract (SRT)

Spinomesencephalic tract (SMT)

The STT has 2 parts

Laterally projecting part, neospinothalamic tract (n STT)

Medially projecting part, paleospinothalamic tract (p STT)

nSTT is composed of neurons with cell bodies in Laminae I & V which terminate in ventroposterolateral thalamic nuclei (VPL) from which third order neurons arise projecting to the somatosensory cortex.

SRT, SMT and pSTT have all cell bodies in the deeper layer of spinal grey matter and they project to the reticular formation, periaqueductal grey, hypothalamus and medial and intralaminar thalamic nuclei which in turn project to the limbic forebrain.

In the thalamus, these relays divide into 2 main groups:

i. Those involved in the sensory discriminative component of pain (ventrocaudal or ventroposterior nuclei of the thalamus).
ii. Those involved in affective-motivational aspects of pain.

5. CENTRAL SENSITIZATION

A painful stimulus which is sufficient to activate C fibres not only activates dorsal horn neurons but also progressively increases the neuronal activity. It leads to the activation of NMDA receptors

With central sensitization 3 effects occur:

i. Increased receptive field size.

ii. Increased duration and magnitude of response to noxious stimuli.

iii. Reduction in pain threshold such that non-noxious stimuli elicit pain.

6 DESCENDING MODULATION

Presence of descending inhibitory influences that modulate sensory input was put forth by Melzack and Wall with the proposal of “gate theory of pain” which was further developed by Melzack and Casey. These descending influences arise from hypothalamus, periaqueductal grey matter, locus coeruleus and nucleus raphe magnus. This is mediated by endogenous opioid peptides, serotonin, noradrenaline, and gamma amino butyric acid.

NEUROTRANSMITTERS

The excitatory amino acids, glutamate and aspartate play a major role in nociceptive transmission in the dorsal horn acting at N-methyl-D-aspartate (NMDA) and non N-methyl-D-aspartate(NMDA) receptors.

The neurotransmitters released by primary afferents are:

Substance-P

NeurokininA- act on neurokinin receptors

Calcitonin gene related peptide.

The receptors involved in nociception are:

Opioid (mu, kappa and delta)

Alpha adrenergic receptors

GABA receptors

Serotonin receptors

Adenosine receptors.

NEURO ENDOCRINE RESPONSE TO POSTOPERATIVE PAIN

1. ENDOCRINE

Increased catabolism

Increased ACTH, Cortisol, Growth hormone, Vasopressin, IL-1, Catecholamines.

Decreased anabolism- decreased Insulin.

2. METABOLIC

Carbohydrate

Hyperglycemia

Glucose intolerance

Insulin resistance

Increased glycogenolysis and gluconeogenesis.

Protein

Enhanced catabolism

Enhanced synthesis of acute phase reactants.

Fat

Enhanced oxidation

Enhanced lipolysis.

METHODS OF PAIN MEASUREMENT

Pain is a subjective feeling or experience that is influenced by factors like cultural learning, the situation, attention and other psychological variables. Most accepted version of pain is the three dimensional view of sensory –discriminative, motivational-affective, cognitive-evaluative components.

Methods of pain assessment[7-10]

1. Verbal numeric rating scale
2. Visual analogue scale (VAS)
3. McGill pain questionnaire
4. Descriptor-differential scale

Of the various methods for measuring pain the VAS seems to be most sensitive. Pain cannot be said to have been relieved unless pain or pain relief has been directly measured[10].

For pain it is the intensity that is usually measured. Research on pain is hampered by the absence of any gold standard for pain intensity and only indirect approaches have been feasible[11].

Currently the most commonly used method by which the patient informs the observer of the pain is by the use of VAS. The patient marks the perception of his pain on a 10 cm line, vertical or horizontal, one end of which is marked as no pain

and the other end as the worst pain that one can imagine. This technique was first introduced by Bond in 1966 and since that has been extensively tested[12, 13, 14].

Visual analogue scale

Advantages:

- Widely used
- Simple, efficient, minimally intrusive measure of pain intensity.
- Exhibits ratio scale property
- Its conceptual simplicity provided that adequate clear instructions are given to the patients.

Disadvantages

- Pain is a uni-dimensional experience when measured by it.
- Bias of expectancy for change and reliance on memory.

METHODS OF POST-OPERATIVE PAIN RELIEF

1. PHARMOCOLOGICAL METHODS

1. Pre-emptive analgesia

   The concept of pre-emptive analgesia was developed by Wall as a strategy to reduce central neuronal hyper excitability in response to surgery by the treatment by opioids.

2. Non-steroidal anti-inflammatory drugs (NSAIDS)

   a. Acetaminophen

   b. Codeine sulphate

   c. Ibuprofen

   d. Diclofenac sodium

   e. Ketorolac

Routes: Oral, Rectal, Intramuscular, Intravenous and Patient controlled analgesia (PCA).

, 3. Opioids

   i. Morphine

   ii. Fentanyl

   iii. Pethidine

Routes: Oral, Intra muscular, Intra venous and Patient controlled analgesia (PCA), Intrathecal and Epidural.

3. Regional Techniques
    a. Continuous epidural and spinal techniques
    b. Epidural and intrathecal additives (opioids, alpha2 agonist and benzodiazepines)
    c. Peripheral Nerve Blocks.

NON-PHARMOCOLOGICAL METHODS

1. General measures- Psychotherapy
2. Hypnosis
3. Transcutaneous Electrical Stimulation (TENS).
4. Acupuncture.

ILIOINGUINAL-HYPOGASTRIC NERVE ANATOMY(Fig 1)

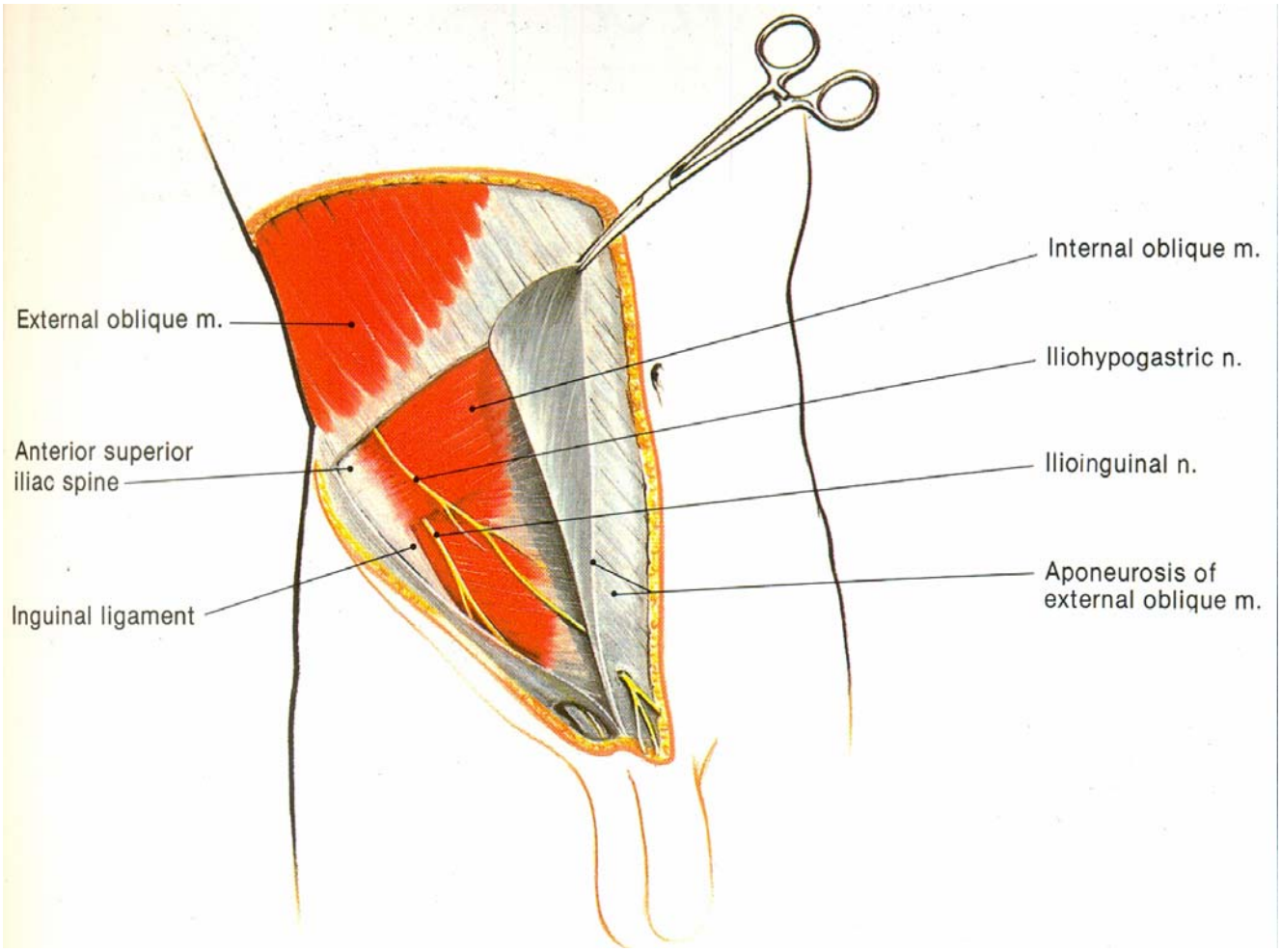


FIG-1

The anterior abdominal wall is innervated by anterior primary rami of T7-L1. The first lumbar divides in front of quadratous lumborum into the iliohypogastric and ilioinguinal nerve which penetrates the transverse abdominis to lie between transverse abdominis and internal oblique muscle. The ilioinguinal nerve pierces the internal oblique muscle and traverses the inguinal canal in front of the spermatic cord. It emerges either through the external ring itself or through the adjacent external oblique aponeurosis to supply the skin of the scrotum/labium majus together with the adjacent upper thigh. The iliohypogastric nerve pierces the internal oblique muscle immediately above and in front of anterior superior iliac spine, runs deep to external oblique, just superior to inguinal canal and ends by supplying the supra pubic skin. The ilioinguinal nerve is readily blocked as it passes close to the prominent anterior superior iliac spine. Although there is variability of the nerve course in the distance between above and medial to anterior superior iliac spine, it regularly lies in the alveolar layer of fascia just deep to the thick fascia of external oblique muscle[15].

TECHNIQUES OF ILIOINGUINAL-ILIOHYPOGASTRIC NERVE BLOCK ILIOINGUINAL NERVE BLOCK AS DESCRIBED BY *COUSINS*

An injection about 2cm or 3cm medial and superior to anterior superior iliac spine (ASIS) after palpable penetration of the definable external oblique fascia will block the nerve, particularly if the area injected is expanded in this

layer medially towards the umbilicus. The medial spread will also block the iliohypogastric nerve, which lends sensitivity to the pubic skin as described by cousins[16].

ILIOINGUINAL-HYPOGASTRIC NERVE BLOCK USING SHORT BEVEL NEEDLE AS DESCRIBED BY *C.J.SPARKS(**Fig 2)***

A mark is made at a point 2 cm along the line from the anterior superior iliac spine to the umbilicus with a skin wheal of lignocaine raised. A hole is made in the skin with a 19 gauge sharp needle. The 22 gauge short beveled needle is inserted through the skin at an angle of 90 degrees. It is important to ensure that

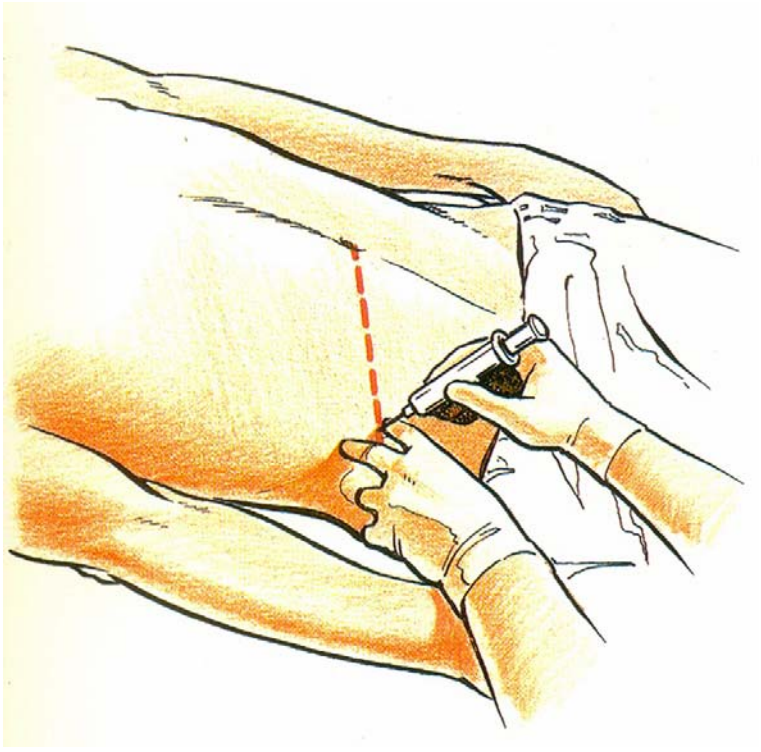


FIG-2

there is no resistance from the skin, which could impair recognition of tissue planes. The needle is advanced slowly and after approximately 1 cm, a distinct pop is felt. This is the point of penetration of external oblique aponeurosis. After negative aspiration, 7ml of local anaesthetic (lignocaine) is injected. The needle is advanced with pressure on the syringe. At this point the needle is located within the internal oblique muscle where there is difficulty in injecting solution through a short bevel needle into the muscle. The needle is further advanced approximately 0.5 cm and a less distinct pop felt with a loss of resistance to injection. A further 8 ml of local anaesthetic solution is injected after negative aspiration[17].

COMPLICATIONS OF ILIOINGUINAL–HYPOGASTRIC NERVE BLOCK:

The complication of Ilioinguinal-hypogastric nerve block is the motor weakness of the lower limb on the side where the block is given. There have been two case reports of lower limb weakness following Ilioinguinal-hypogastric nerve blockade as mentioned below.

Derrick et al[18] reported leg weakness in a nine year old boy following successful ilioinguinal-hypogastric nerve block for right inguinal herniotomy. Postoperatively patient had good analgesia but was unable to move his right leg. Three hours later the patient recovered fully and was discharged.

Another case of transient femoral nerve palsy complicating pre-operative Ilioinguinal nerve block in an adult for inguinal herniorraphy was reported by Rosaria et al[19].

Johnson's[20] comment on the above two case report was that these were infact a sufficient common problem to warrant informing parents, anaesthetic trainees and ward nursing staff of possible leg weakness postoperatively. The unexpected spread of local anaesthetic drug has simple anatomical basis which also allows the complication to be avoided. This is caused by injecting too deeply causing solution to spread under the fascia covering the iliacus muscle, as this fascia covers the femoral, lateral cutaneous and obturartor nerves. Prevention of this complication depends on clearly identifying external oblique aponeurosis and is usually easy using a short bevel needle.

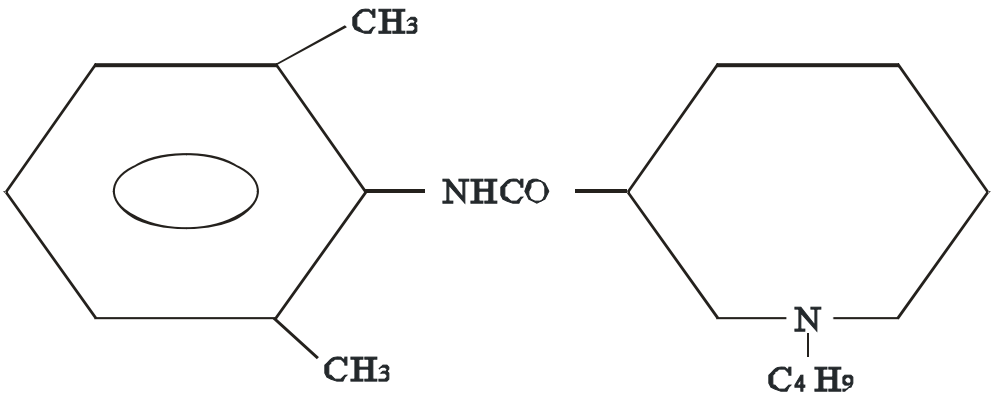
COMPLICATION OF WOUND INFILTRATION:

Karsten Hannibal[21], in his study to evaluate the early and late analgesic effect of pre-operative wound infiltration with Bupivacaine compared to placebo in patients undergoing elective abdominal hysterectomy reported wound complications consisting of rupture of the wound in the Bupivacaine group and wound infection in the placebo group.

BUPIVACAINE

To provide maximum benefit, agents with long duration of action are obviously required for single injection technique. Bupivacaine is the current agent of choice. Its long duration of action means that the risk of cumulative toxicity is low during continuous techniques. It is also recognized as having more immediate effect on pain transmission than other local anaesthetic drugs; it is non irritant, a feature not shared by all potentially long acting local anaesthetic agents[22].

STRUCTURE



It is first synthesized in Sweden by Ekenstam and colleagues in 1957. It is an amino amide local anaesthetic having aromatic moiety (benzene ring) which offers lipophilicity at one end of molecules linked by an amide to a tertiary amine which is hydrophilic on the other end of molecule. It is in clinical use since 1963[23].

MOLECULAR FORMULA

It displays stereoisomerism, marketed as a racemic mixture containing optically active enantiomers R and S. S enantiomer has been noted to have a slightly longer duration of action yet lower systemic toxicity when compared to its R type.

PHYSICOCHEMICAL PROPERTIES

Molecular weight	288
Potency ratio	15
Toxicity ratio	10
pka	8.16
Percentage ionized at ph 7.4	17
Protein binding	96%

PHARMACODYNAMIC PROPERTIES

Bupivacaine is a high potency and long acting agent with blocking property relative to procaine of 8 at C-fibres, lipophilicity of 3420 by octanol/water co-efficient[23].

Differential blockade is most usefully produced by Bupivacaine in clinical practice that is adequate anti-nociception with out profound inhibition of motor activity[23].

Bupivacaine has the ability to block C-fibers more rapidly than A-fibres, when the drug is applied on an isolated nerve preparation. It also produces very marked frequency depend block of C-fibres when the preparation is stimulated at a frequencies close to those seen in vivo[23].

Other advantages of long action, absence of tachyphylaxis, etc contributes to its popularity[23].

There are methods of prolonging the duration of local anaesthetics for wound infiltration for instance by addition of dextran or adrenaline. This has yielded conflicting results and vasoconstriction by adrenaline adds the risk of impaired wound healing[23].

MECHANISM OF ACTION

Bupivacaine acts by preventing the opening of voltage gated sodium channels in the nerve axons. Both the resting (tonic) and use dependent (phasic) action on the sodium channels account for its action[23].

PHARMACOKINETICS

Absorption, Distribution, Metabolism and Elimination.

ABSORPTION

Absorption depends on vascularity of the site, dosage and addition of vasoconstrictors. The half lives of the rapid distribution phase and slower distribution phase are 2.7 and 28.0 minutes respectively.

Enzymatic degradation occurs in the liver. Excretion is via the kidneys as metabolites with less than 5% excreted in the unchanged form. The terminal half life is less 3.5 hours, with clearance rate estimated to be 0.47l/ min[23].

Tolerability/Over dosage

CNS Toxicity:

This occurs with over dosage or intravascular injection. It exerts biphasic effect with initial excitation followed by depression of the central nervous system. Irritability, restlessness, confusion and convulsions followed by stupor, coma and death[23].

CVS Toxicity:

Rapid and prolonged cardiovascular depression is seen with bupivacaine and etidocaine compared to other local anaesthetics[24, 25, 26].

1. CVS/CNS toxicity ratio is lower for Bupivacaine compared to lignocaine and etidocaine.
2. Rapid intra venous administration can result in ventricular arrhythmias[27].
3. Pregnant patients are more sensitive to cardio vascular effects.
4. Cardiac resuscitation is more difficult after its toxicity than lignocaine.

5. Acidosis and hypoxia markedly potentiates its toxicity.

Management of toxicity:

The initial priority is to ventilate the lungs with oxygen. Often many convulsions will stop before an anticonvulsant can be given but if one is needed, it is important to limit its dosage to minimise further cardio pulmonary depression .If cardiac arrest does occur, external cardiac compression may need to continue for a very long time and repeated attempts made at defibrillation. The essential electrophysiological problem is a prolonged refractory period, which will be shortened by adrenaline. To the same end, metabolic acidosis must be corrected, because the prolonged refractory period allows “re-entry” type arrhythmias known as “Torsades – de pointes”. Treatment of choice if other measure fails is bretylium in doses of 5 to 10 mg/kg[28, 29].

REVIEW OF LITERATURE

The use of parentral opioids are associated with undesirable side effects like respiratory depression, excessive sedation, drowsiness, dizziness, nausea, vomiting, urinary retention and reduced gastric intestinal motility. NSAIDS can provide effective analgesia without the above mentioned side effects[3], however renal toxicity with worsening renal function has been known to occur with NSAIDS[30].Adverse effects involving gastro intestinal tract and aspirin induced asthma in susceptible patients are also common[1]. Platelet dysfunction causing haemorrhage is also a problem. During maxillary osteotomy for trismus, uncontrolled blood loss of almost 3 liters in a 60 minute period was related to an intra muscular injection of Ketorolac[31].

Nerve Blocks and Infiltration:

The use of specific nerve blocks and wound infiltration alone or in combination with general anesthesia /regional anaesthesia provides smooth intra-operative conditions with continued analgesia into the early and late recovery periods. This simple technique eliminates the needs for opioids, NSAIDS there by minimizing the potential for undesirable side effects[3].

Nerve blocks and wound infiltration are administrated more frequently either by the surgeon or by the anaesthesiologist commonly with 0.25% or 0.5% bupivacaine[3]. Ilioinguinal and hypogastric nerve blocks with 2-3 ml/ kg of 0.5%

bupivacaine with adrenaline 1:200,000 was found to reduce the need for intramuscular codeine and/or acetaminophen in the post-anaesthetic care unit, in children undergoing hernia repair[32].

Bunting and Mcconachie[33] studied the effect of post-operative bilateral ilioinguinal nerve blockade after caesarean section. It was a randomized study with an ilioinguinal and hypogastric nerve block group and Control group of 13 patients each. They showed that pain scores were less in the block patients at all times during the first day after operation. They showed an increased time from the patient recovery from anaesthesia to the first injection of opioids in the block group. The operation of caesarean section involves dissection of deep tissues in the pelvis. It would be expected, therefore that, while providing analgesia of the skin and deeper layers of the anterior abdominal wall, ilioinguinal nerve blockade would not provide visceral analgesia. This appears to be the case, as all patients in the present study experienced some pain at all times during this study, including three patients who reported some pain but did not require additional analgesics.

Ilioinguinal nerve blockade is a simple regional technique which takes little time to perform. This method is provided the permitted maximum dose of local anaesthetic agent is not exceeded and care is taken to ensure asepsis and avoidance of intravascular injection. There were no complications attributed to nerve blockade in their study. They have shown that the technique reduces pain during

the first day after operation and decreases by a significant amount of the requirement for additional post-operative analgesia.

Yifeng Ding and *Paul F. White*[34] in their double blind placebo controlled study in thirty adult patients undergoing unilateral hernia repair during monitored anaesthesia care found that preincisional ilioinguinal and hypogastric nerve block decreased post-operative pain and reduced the requirement of oral analgesics after discharge.

Harrison et al[35] have compared in forty adult patients, the effect on pain in the first 24 hours after herniorraphy of preincisional ilioinguinal and hypogastric nerve block and wound infiltration with 0.5% Bupivacaine or Saline. This was a double blinded randomized trial. The patients were allocated randomly to receive either bupivacaine or saline for ilioinguinal and hypogastric nerve block and wound infiltration. All patients had general anaesthesia with spontaneous respiration via Laryngeal Mask Airway.

After surgery patients received morphine intravenously via patient controlled analgesia machine and the VAS scores at rest and movements were measured. The bupivacaine group consumed less morphine in the first six hours after surgery. The time to first analgesia was delayed in the bupivacaine group and was not followed by a rebound increase in requirement in analgesia. There was no difference in morphine consumption in the next 18 hours between the two groups. There were

no significant decrease in VAS scores at rest but there was significant higher pain score with movement in the saline group. Neural block with bupivacaine may last from 4-12 hours and they have failed to show any effect of bupivacaine lasting longer than this.

Langer et al[32] studied the effect of intra-operative Bupivacaine on post-operative pain in children undergoing outpatient hernia repair in 99 children aged 1-7 years in a randomized double blind trial. They showed that 0.5% bupivacaine with adrenaline block the ilioinguinal and hypogastric nerves and decreases the need for post-operative analgesia. These patients also showed rapid return to normal activity.

Trotter et al[36] studied the analgesic efficacy of subcutaneous wound infiltration of local anaesthetic after elective caesarean Section. 28 patients scheduled for elective caesarean section under general anaesthesia were investigated in a double blind, randomized trial. Each patient was visited pre-operatively and familiarized with the use of patient controlled analgesia system.

Patients were randomly allocated between the groups to receive either 20ml of 0.5% bupivacaine or a control group receiving 20ml of normal saline. Morphine consumption was compared over each 4 hourly interval over the first 12 hours and over the 24 hours study period. There were no significant differences between the groups over these intervals. The VAS scores did not show any significant

difference between the two groups. This study demonstrated that subcutaneous wound infiltration with 0.5% bupivacaine did not reduce requirements on the first post-operative day. The mean 24 hour morphine consumption of the placebo group and the bupivacaine group were similar.

Analysis of the cumulative hourly morphine consumption failed to show any statistical significant differences between the groups.

Hannibal et al[21] studied the effect of pre-operative wound infiltration with Bupivacaine on early and late post-operative opioid requirements, in 41 patients (20 in Bupivacaine group, 21 in Control group) after hysterectomy. This was a double blind, randomized, placebo controlled study. They found that preoperative infiltration of the surgical area with bupivacaine improves immediate as well as late postoperative pain management after hysterectomy compared to placebo.

Patients in bupivacaine group consumed significantly fewer analgesics in a small proportion of patients compared with those in the placebo group with identical pain measures in the two groups.

Turner et al[37] studied 90 patients undergoing Appendicectomy who were randomly allocated to receive lignocaine infiltration of the incision in the pre and postoperative period, for their analgesic requirement. They found no difference in pain scores on post-operative opioid requirement between the two groups.

Dierking et al[38] studied the effect of pre-operative verses post-operative inguinal field block on postoperative pain after Herniorraphy in 32 healthy adult patients. This was a double blind, randomized study. They found no significant difference between the two groups in VAS scores or verbal pain scores and there was no significant difference in time to first request for morphine or total morphine consumption. These results do not show pre-emptive analgesia with a conventional inguinal field block to be of clinical importance when compared with a similar block administered after observation.

Sinclair et al[39] studied the effect of topical anaesthesia with lignocaine aerosol in the control of post-operative pain in 30 patients scheduled for elective Hernia repair in a double blind, randomized trial. Ten patients received lignocaine aerosol (200mg) in the surgical wound before skin closure, ten patients received placebo aerosol devoid of lignocaine and ten patients untreated. The lignocaine treated group had significant lower pain scores and lesser pethidine requirements during the first postoperative day.

In another study Sinclair et al[40] investigated the postoperative pain relief by topical lignocaine in the surgical wound of hysterectomized patients. Thirty patients undergoing elective hysterectomy were studied in a double blind, randomized trial. Patients were randomized to receive single wound treatment either with lignocaine aerosol 500mg or placebo aerosol. Postoperatively was evaluated by the VAS. Requirements of opiate analgesics after surgery were monitored. Lignocaine aerosol induced a significantly better analgesia at rest and

significant reduction in the post-operative requirements of opioids during the first 24 hours compared to placebo aerosol. The plasma lignocaine administration was well below the toxic level. No drug related side effects were reported. They concluded that a single dose of Lignocaine aerosol topically administered in the surgical wound improved analgesia during the first post-operative day.

Ganta et al[41] compared the effectiveness of bilateral ilioinguinal nerve block and wound infiltration for post-operative analgesia after caesarean section. They studied 62 patients having elective caesarean section under general anaesthesia. They allocated the patients randomly to 3 groups to receive bilateral ilioinguinal nerve block, wound infiltration, no supplementation with local anaesthesia. They used 0.5% bupivacaine 10ml on each side for ilioinguinal nerve block and 20ml of 0.5% bupivacaine for wound infiltration. Pain scores were assessed by using VAS at 4 hourly intervals for 24 hours. After surgery patients were given intramuscular papavertum 10mg/square meter body surface area when requested for the first 24 hours. They concluded that infiltration of the edges of surgical wound before skin closure produces equally good analgesia as that provided by ilioinguinal nerve block.

Huffangle et al[42] compared the effectiveness of bilateral ilioinguinal nerve block with control group in patients undergoing caesarean section. They use patient controlled analgesia Morphine use as an end point but they found that the amount of morphine self administered by the no block control group was similar to the amount administered by those who received ilioinguinal and hypogastric

nerve block, either before or after caesarean section. They concluded that ilioinguinal and hypogastric nerve block were of no benefit to the patient.

Elizabeth et al[43] investigated the effectiveness of ilioinguinal and hypogastric nerve block to reduce the need for post-caesarean section Morphine analgesia and incidence of opioid related side effects in patients undergoing caesarean section done under spinal or epidural anaesthesia. It was a twin part study.

Part one was a retrospective assessment of caesarean section patients with and with out Ilioinguinal and Hypogastric nerve blocks to determine if the technique reduced PCA morphine use. They concluded that the reduction in morphine consumption was associated with ilioinguinal and hypogastric nerve block technique and was not dependent upon the method of regional anaesthesia (spinal, epidural) used during the caesarean section.

Part two was a double blind, randomized, placebo controlled trial conducted in 90 patients undergoing caesarean section under spinal or epidural anaesthesia. 45 patients received bilateral ilioinguinal and hypogastric nerve block with 0.5% bupivacaine 24ml + adrenaline 1 in 200,000 and 45 had been injected with normal saline. They concluded that effective ilioinguinal and hypogastric nerve blocks decrease the need for opioid analgesia but failed to reduce the appearance of opioid related adverse effects.

MATERIALS AND METHODS

This prospective, randomized, clinical study was conducted at the Govt. RSRM Hospital, attached to Govt. Stanley Medical College & Hospital, Chennai.1, in 40 patients undergoing emergency and elective caesarean section. The Hospital Committee approved this study and informed consent was obtained from each patient.

STUDY DESIGN

An open, randomized, comparative parallel group design was employed.

INCLUSION CRITERIA:

1. ASA I & II
2. Age : 18-35 years
3. Pfannenstiel incision.

EXCLUSION CRITERIA:

1. ASA III & IV
2. Age >18<35 years
3. All contraindications to central neuraxial blockade.
4. Progressive neurological disease.
5. Local anesthetic & NSAID sensitivity
6. Para median incision
7. Obese patients

8. Peptic ulcer disease
9. Renal disease
10. Infection at the site of ilioinguinal & hypogastric nerve block
11. Patient refusal.

ANAESTHETIC TECHNIQUE FOR CAESAREAN SECTION

Spinal anaesthesia

METHODOLOGY

40 parturients undergoing Caesarean section with Pfannenstiel incision under Spinal anaesthesia were recruited.

Once written consent was obtained, patients were randomized into two groups. Before skin closure,

Group I: Received Wound infiltration with 20ml of 0.5% bupivacaine + adrenaline 1 in 200,000 solution.

Group II: Received Ilioinguinal and Hypogastric nerve block with 20ml of 0.5% bupivacaine + adrenaline 1 in 200,000 solution.

PRE-OPERATIVE PREPARATION

The patients were explained about the procedure and informed consent was obtained. Bupivacaine sensitivity was tested.

All the patients were shown a VAS. They were instructed to indicate their degree of pain by a mark on 10cm line, one end of which was measured “0” indicating “no pain” and the other end marked “10” indicating “the worst pain imaginable”.

Inj. Metaclopramide 10mg + Inj. Ranitidine 50mg was given intravenously half an hour prior to surgery.

ANAESTHETIC PROCEDURE:

When the patient arrived into the operation theatre an intravenous line was started with 18 gauge cannula. Following this an ECG, Pulse oximetry and Non invasive Blood pressure monitor were connected to the patient.

Anaesthesia for caesarean section was achieved using standardized sub-arachnoid block at L2-L3/L3-L4 level with 1.4-2.0ml of 0.5% bupivacaine depending on patient’s height. Intra-operatively patient was supplemented with oxygen via face mask.

At the end of surgery prior to skin closure in Group I patients 20ml of 0.5% bupivacaine and 1in 200,000 adrenaline solution was given in a 20ml

syringe to the surgeon, who infiltrated along the wound margin with 22 G Spinal needle after negative aspiration.

If the patient belongs to Group II, then the ilioinguinal and hypogastric nerve block was performed bilaterally using 20ml of 0.5% bupivacaine and adrenaline 1 in 200,000 solution according to the technique described below.

The skin below the umbilicus up to pubic symphysis was cleaned with betadine solution. An imaginary line was drawn from anterior superior iliac spine to the umbilicus and mark was made 2cm from anterior superior iliac spine on the line. A hole was made with a 16 gauge short beveled needle. The ilioinguinal and hypogastric nerve block was given with 22 gauge short beveled needle. The short beveled needle was inserted through the skin at an angle of 90 degrees. The needle was then advanced slowly and after 1-2.0cm a distinct pop was felt. This was the point of penetration of external oblique aponeurosis. After negative aspiration 5ml of 0.5% bupivacaine with 1 in 200,000 adrenaline was injected. The needle was advanced further until another pop of was felt. This was the point of penetration of internal oblique muscle. After negative aspiration another 5ml of drug was injected.

Confirmation that the two layers have been penetrated by the short beveled needle is that the needle is held firmly by the tissues and cannot be pushed easily to one side. The block was performed bilaterally. No attempt was made to

fan the needle. The skin puncture using a 16 gauge needle is done to ensure that there is no resistance from the skin, which could impair the recognition of tissue planes. The short beveled needle was used to facilitate correct needle placement between the tissue planes and to avoid nerve injury.

After skin closure and dressing, patient was transferred to recovery room.

POSTOPERATIVE PERIOD

Patient was then monitored in the recovery room until spinal effect weared off and then transferred to post-operative ward.

In the recovery room and in the post-operative ward they were monitored by staff nurses who were blinded to the study group allocation and had been earlier instructed in measuring the pain scores using Visual Analogue Scale (VAS). As per the proforma, patient was assessed for pain every hour. However she was not disturbed if she was asleep. For any pain score greater than 4, patient was given NSAID (inj. diclofenac sodium 75 mg) analgesics intramuscularly 12^{th} hourly as per our obstetrical protocol. The zero time was the time of wound infiltration or ilioinguinal and hypogastric nerve block. The time of administration of the first dose of diclofenac sodium was the end point of the study. This was documented as the duration of analgesia provided by wound infiltration or ilioinguinal nerve block respectively.

RESULTS

The study was conducted in 40 parturients undergoing caesarean section. The patients were divided into two groups with 20 patients in each group.

Group I patients received Wound infiltration.

Group II patients received Ilioinguinal and Hypogastric nerve block.

The statistical method used for analysis was students “t” test. The demographic data for age and weight was comparable between Group I and Group II and statistically not significant. The mean (SD) duration of analgesia for Group I and Group II was 421.75(121.80) and 427.75(140.30) minutes respectively. The difference between the two groups were clinically and statistically not significant(p=0.9).The mean(SD) of VAS pain scores at time of first dose administration of NSAID analgesic(inj. diclofenac sodium) for Group I and Group II was 6.25(0.94) and 6.25(0.99) respectively. This was clinically and statistically not significant.

The demographic data for age and weight for the two groups were shown in tables 1&2. The duration of surgery for both the groups were shown in table 3. The duration of analgesia and their VAS pain scores at the time of administration of first dose of NSAID analgesic is shown in tables 4&5.

TABLE 1: AGE

	Range(years)	Mean(SD)
Group I	20-30	23.25(2.61)
Group II	19-28	23.15(2.76)

t = 0.12 (not significant)

p = 0.91 (not significant)

TABLE 2: WEIGHT

	Range(kg)	Mean(SD)
Group I	46-72	57.25(7.55)
Group II	45-73	56.8(7.998)

t = 0.18 (not significant)

p = 0.91 (not significant)

TABLE 3: DURATION OF SURGERY

	Range (mins)	Mean (SD)
Group I	30-90	53.75(15.96)
Group II	35-95	54.25(15.59)

t = 0.10 (not significant)

p = 0.92 (not significant)

TABLE 4: DURATION OF ANALGESIA

	Range (mins)	Mean (SD)
Group I	160-690	421.25 (121.80)
Group II	170-665	427.75(138.16)

t = 0.16 (not significant)

p =0.86 (not significant)

TABLE 5: VAS scores at which first dose of inj.diclofenac sodium was given

	Range	Mean (SD)
Group I	5-8	6.25(0.94)
Group II	5-8	6.25(0.99)

t = 0.00 (not significant)

p = 0.99 (not significant)

AGE

The age of the patient in Group I ranged between 20years and 30 years with mean (SD) of 23.25(2.61).

In Group II the range varied between 19 years and 28 years with mean (SD) of 23.15(2.76).

Students “t” test was done t = 0.12 and p = 0.91. Both groups were comparable and statistically insignificant.

WEIGHT

In Group I the range of weight of the patient was between 46kg and 72kg with mean (SD) of 57.25(7.55).

In Group II the range was between 45kg and 73kg with mean (SD) of 56.8 (7.998).

Student “t” test was performed, t = 0.18 and p = 0.86. Both the groups were comparable and statistically not significant.

DURATION OF SURGERY

In Group I the duration of surgery ranged between 30 minutes and 90 minutes with mean (SD) of 53.75 (15.96).

In Group II the range was between 35 minutes and 95 minutes with mean (SD) of 54.25 (15.59).

Students “t” test was performed, t = 0.10 and p = 0.92. Both groups were comparable and statistically insignificant.

DURATION OF ANALGESIA

In Group I the duration of analgesia ranged between 160 mins and 690 mins with the mean (SD) of 421.25 (121.80).

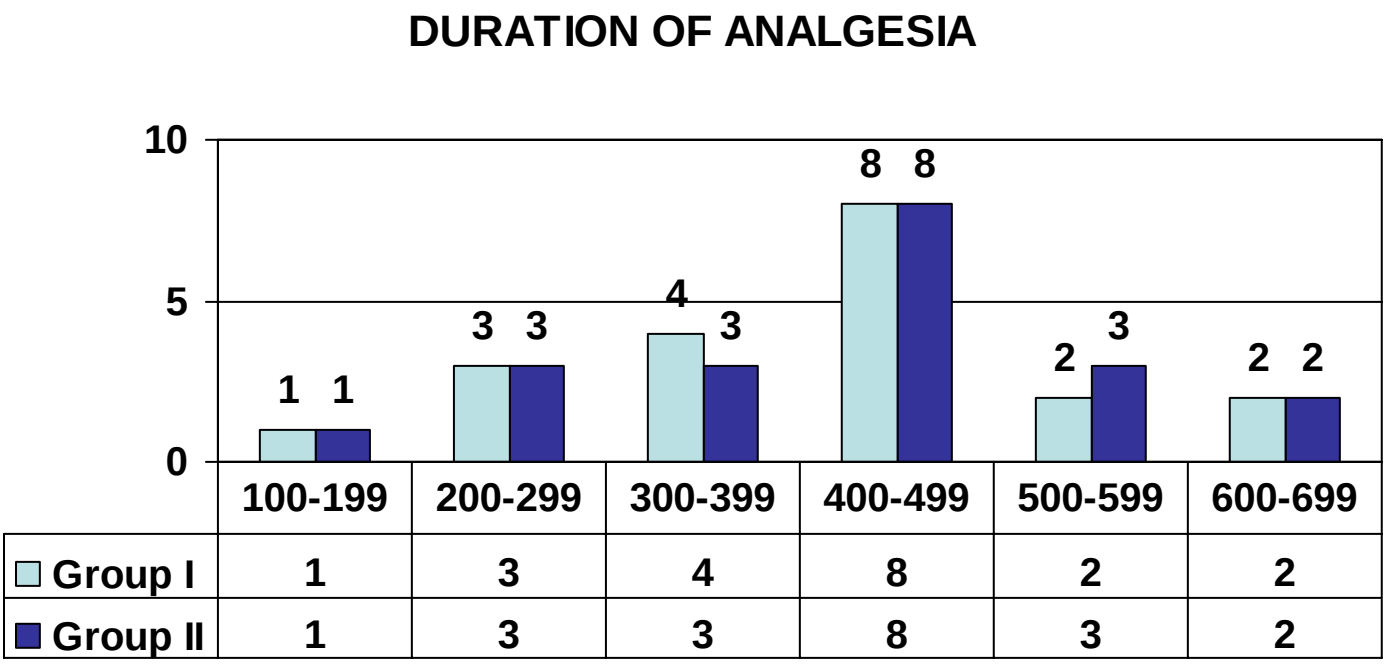
In Group II the range was between 170 mins and 665 mins with the mean (SD) of 427.75 (138.16).

The “t” and “p” values are 0.16 and 0.86 respectively and both were statistically not significant.

VAS SCORES AT THE FIRST DOSE OF NSAIDS

(DICLOFENAC SODIUM)

The range in both the group was 5-8 with Mean (SD) of Group I was 6.25(0.94) and Group II was 6.25(0.99). t = 0.00 and p = 0.99. Both were clinically and statistically not significant.



The above figure shows the comparison of number of patients in the Group I and II receiving the first dose NSAIDS at different time intervals.

Between 100 to 199 minutes one patient in each group received their first dose of rescue analgesia with inj. diclofenac sodium.

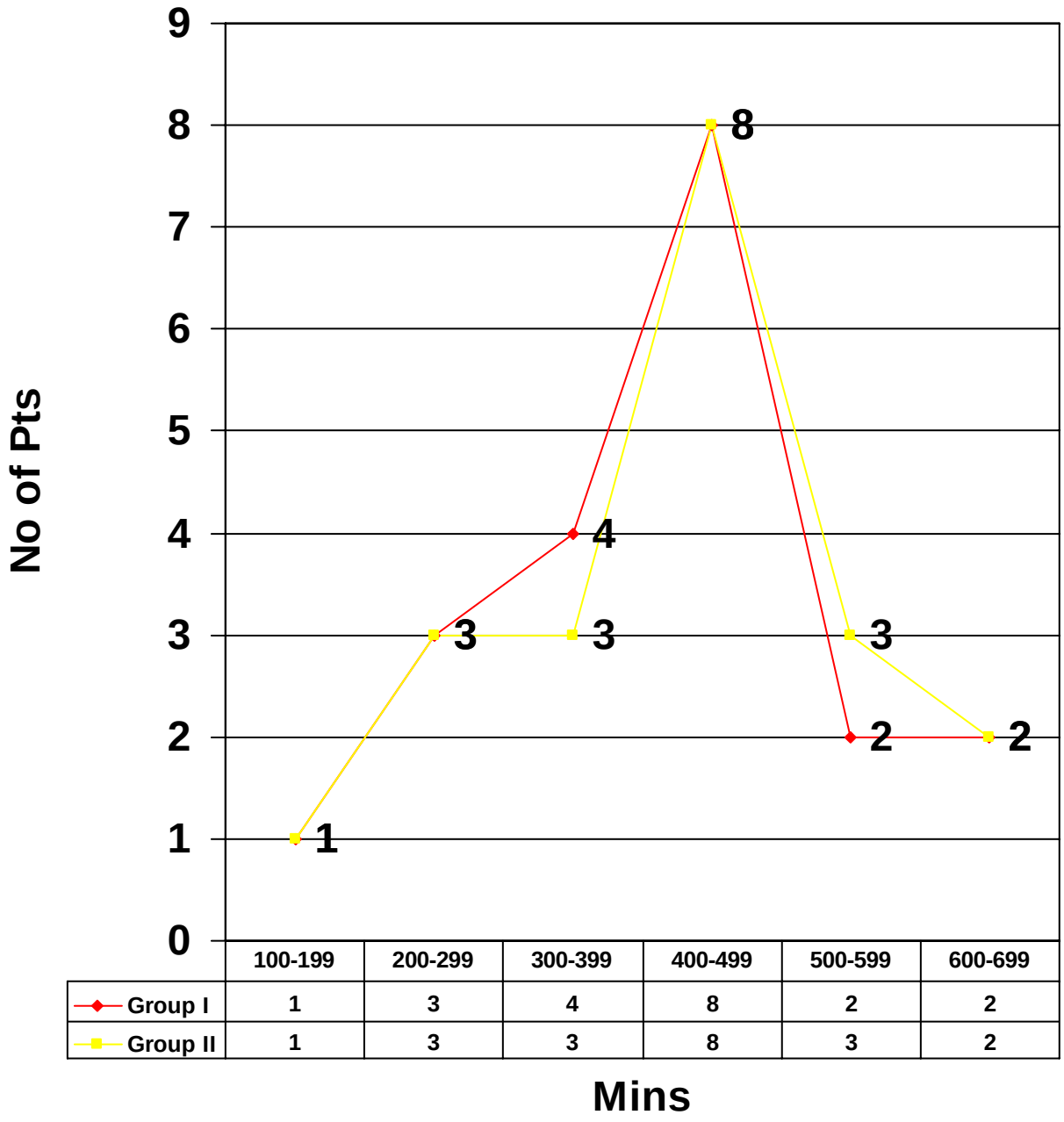
Between 200 to 299 minutes three patients in each group received their first rescue analgesic dose.

Between 300 to 399 minutes four patients in Group I and three patients from Group II patients received their first rescue analgesic dose.

Between 400 to 499 minutes eight patients from each group received their first rescue analgesic dose.

Between 500 to 599 minutes two patients from Group I and three patients from Group II received their first dose of rescue analgesia. Between 600 to 699 minutes two patients from both the groups received their first rescue analgesic dose.

No of Pts. & Duration at which 1st dose of NSAID was given



	100-199	200-299	300-399	400-499	500-599	600-699
Group I	1	3	4	8	2	2
Group II	1	3	3	8	3	2

DISCUSSION

Post-operative pain relief is a major task for the physicians managing the post-operative wards. Effective post-operative pain control depends upon various factors as mentioned earlier.

The purpose of the study was to compare the effectiveness of the wound infiltration with the bilateral ilioinguinal and hypogastric nerve block for post-operative pain relief in caesarean section.

Ilioinguinal and hypogastric nerve block and wound infiltration have been reported to produce excellent post-operative pain control in adults and children following such treatments as hernia repair and groin surgery[44]. They have also been assessed for reducing pain following caesarean section, albeit with less efficacy than with the other procedures[33, 41, 42,45] effectiveness is no doubt due to the diffuse nature of post caesarean section pain.

To avoid problems associated with the use of Opioids and NSAIDS (that was mentioned in the review of literature), physicians have used local anaesthetics for post-operative pain relief. This may be achieved with subarachnoid block, epidural block, peripheral nerve block or wound infiltration as an adjuvant to general anaesthesia. .However subarachnoid and extradural block have a disadvantage in that sympathetic and motor block may accompany sensory block[41]. Subarachnoid

block alone has the disadvantage of providing shorter duration of post-operative analgesia when compared to peripheral nerve block.

Peripheral nerve block does not produce significant autonomic effects. Motor block may be a problem if nerve involved is a mixed nerve. However the ilioinguinal and hypogastric nerves are sensory nerves.

For patients with caesarean section performed by Pfannenstiel incisions, ilioinguinal and hypogastric nerve block will provide analgesia in the post-operative period.

Bilateral blockade of the ilioinguinal and hypogastric nerve blocks at the level of anterior superior iliac spine produces analgesia covering the dermatome supplied by the lumbar nerves in its distal distribution[46]. The Pfannenstiel incision lies with in this dermatome. It is possible, therefore, to provide analgesia of the anterior abdominal wall following this incision using the above technique[33]

Peripheral nerve block requires some amount of expertise and commitment but it is possible to improve considerably the comfort of the patient with these simple blocks[22].

Infiltration with local anaesthetic in the surgical wound inhibits transmission of nerve signals from damaged tissues by blocking voltage dependent sodium channels with in the nerves displacing calcium ions from phospholipids of the nervous membrane. Furthermore local anaesthetics may reduce neurogenic

inflammation by blockade of the axon reflux and sympathetic efferents[47]. In addition invitro studies have demonstrated local anaesthetics to have numerous effects on non-neuronal cellular activities involved in inflammatory and lymphocyte function[48-52], fibroblast growth and collagen synthesis[53, 54], platelet aggregations[55] and production or release of phosphlipase A2, superoxide and histamine[56-59]. A recent study has demonstrated administration of local anaesthetics in surgical wound to reduce leucocyte migration and metabolic activation in the wound area[60]. Further local anaesthetics have been demonstrated to have anti microbial activity[61] and inhibit experimental peritonitis[62].

Ganta et al[41] have shown wound infiltration to be effective in reducing opioid demand and reducing pain scores after caesarean section under general anaesthesia and to be comparable to ilioinguinal and hypogastric nerve block.

Hannibel et al[21] in his study found that pre-operative wound infiltration to the surgical area improve immediate as well as late post-operative pain. In the other study by Cobby and Reid[63] wound infiltration with bupivacaine was not found to be effective in providing post-operative analgesia.

In our obstetric department standard protocol for postoperative analgesia, the first dose of diclofenac sodium is given when the patient complains of pain and twelve hourly thereafter. We therefore wanted to provide an alternative method of pain relief in the immediate post-operative period for an appreciable duration of time and which could avoid other analgesics.

In our study we found that both the Group I and Group II had an appreciable duration of analgesia post-operatively. The mean duration (SD) of analgesia in Group I and Group II were 421.25 (121.80) minutes and 427.75 (138.16) minutes respectively.

The range of duration of analgesia in Group I and Group II were between 160 to 690 minutes and 170 to 665 minutes respectively which was in agreement with Harrison et al[35], who failed to show any effect of Bupivacaine lasting longer than 12 hours.

The visual analogue scale was used asses the degree of pain in our study. Using the student “t” test, the mean (SD) VAS scores at the administration of first dose of rescue analgesia were 6.25(0.94) and 6.25(0.99) in Group I and Group II respectively. The “t” value was 0.00 and “p value was 0.99. These were clinically and statistically found to be insignificant.

Visual analogue scale has been used nowadays widely as a sensitive and valid measure of pain intensity. However some patients find them confusing and they do not require some degree of wakefulness and co-ordination to complete.

In our study since regional anaesthesia was used all the patients were fully awake and co-operative in the immediate post-operative period and were able to complete the visual analogue scale during the study period.

Complications of Ilioinguinal and Hypogastric nerve block

There have been two case reports of weakness in the lower limb following this nerve block as mentioned in the review of literature[18,19]. In our study none of the 20 patients who received ilioinguinal and hypogastric nerve block had the above mentioned complication.

Complication of wound infiltration technique

Hannibal et al[21] reported two complications in their study one being rupture of wound and the other infection of wound following abdominal hysterectomy. In our study none of 20 patients who received the wound infiltration with Bupivacaine had the above mentioned complications.

Thus by using either of the two techniques (Wound infiltration and Ilioinguinal and Hypogastric nerve block) our patients could be enabled to be pain free in the immediate post-operative period. They were able to complete the VAS without any problems. They were mobilized earlier. Early use of rescue analgesia was avoided.

By providing alternative methods of pain relief, these patients can be given oral analgesics and mobilized earlier. Of the two techniques we used, the Wound infiltration seems to be simple and cost effective; where as for the ilioinguinal and hypogastric nerve block, anaesthetist's expertise is needed.

CONCLUSION

In our study we found that both the wound infiltration (Group I) and ilioinguinal and hypogastric nerve block (Group II) had an appreciable duration of analgesia. Both the techniques were simple and take little time to perform.

However, we do feel that wound infiltration which gives the same duration of analgesia as ilioinguinal and hypogastric nerve block is superior in that:

1. It is easier to perform and does not require any special training or expertise- since the surgeon can provide the service.
2. It is less expensive as no special equipment is needed.
3. Side effects like motor blockade or partial paralysis of the lower limb may be avoided.

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	WOUND INFILTRATION GROUP																	
S.NO	NAME	AGE	WEIGHT	HOSPNO	VAS-1	VAS-2	VAS-3	VAS-4	VAS-5	VAS-6	VAS-7	VAS-8	VAS-9	VAS-10	VAS-11	VAS-12	DUR.OF SURGERY(MIN)	DUR.OF ANALGESIA.(MIN)
1	Vimala	24	60	2745	1	1	2	2	2	2	2	3	3	4	6	1	35	630
2	Radha	20	49	2754	1	1	2	2	2	3	3	4	5	1	1	1	90	520
3	Anitha	24	67	2821	1	1	2	2	3	4	5	1	1	1	1	1	75	415
4	Bharathy	20	53	2884	1	2	3	4	4	6	1	1	1	1	1	2	30	350
5	Praveena	22	58	2982	1	2	3	3	4	4	8	1	1	1	1	2	45	405
6	Ramani	23	45	3709	1	1	2	2	2	2	2	3	3	3	4	7	85	690
7	Meenakumari	26	62	3331	1	1	2	2	3	3	6	1	1	1	1	1	50	390
8	Samundeeswari	24	56	3567	1	1	1	2	3	3	4	6	1	1	1	1	55	465
9	Sribala	21	70	3801	1	1	1	2	3	4	4	5	1	1	1	1	40	480
10	Amudha	27	54	3724	1	2	2	2	2	3	3	7	1	1	1	1	35	455
11	Devi	20	55	289	1	2	3	3	4	4	5	1	1	1	1	1	55	390
12	Jayamary	25	52	300	1	1	2	3	4	4	7	1	1	1	1	2	40	375
13	Yamini	22	64	2983	2	4	7	1	1	1	1	1	2	2	2	3	45	160
14	Vijaya	25	54	3344	1	1	2	2	3	3	3	7	1	1	1	1	45	455
15	Govindammal	20	72	3624	1	2	2	3	3	4	4	6	1	1	1	1	50	435
16	Usha	25	53	3534	1	2	3	3	7	1	1	1	1	1	1	3	65	280
17	Devagi	30	46	304	2	3	4	6	1	1	1	1	1	1	2	3	50	240
18	Menaga	21	49	3672	1	2	2	2	2	3	4	4	6	1	1	1	55	525
19	Devimeenakshi	22	66	3597	1	1	3	4	8	1	1	1	1	1	3	3	70	285
20	Dhanam	24	60	3885	1	1	2	3	3	3	4	5	1	1	1	1	60	480
	Mean	23.25	57.25														53.75	421.25
	SD	2.60528	7.549007														15.95893167	121.7977319

		NERVE BLOCK GROUP																
S.NO	NAME	AGE	WEIGHT	HOSPNO	VAS-1	VAS-2	VAS-3	VAS-4	VAS-5	VAS-6	VAS-7	VAS-8	VAS-9	VAS-10	VAS-11	VAS-12	DUR.OF SURGERY(MIN)	DUR.OF ANALGESIA.(MIN)
1	Bhuvana	24	48	2485	1	1	2	2	3	3	3	4	4	8	1	1	45	575
2	Rubythangam	26	65	2734	1	1	2	2	2	3	3	5	1	1	1	2	70	475
3	Saritha	22	47	2740	1	2	2	3	5	1	1	1	1	1	2	2	95	280
4	Manjula	28	66	2441	2	3	4	7	1	1	1	1	1	1	1	1	40	225
5	Jaya	23	52	2696	1	1	1	2	2	2	2	5	1	1	1	1	75	470
6	Sathya	23	61	3709	1	1	2	2	3	4	7	1	1	1	1	3	50	375
7	Rukmani	28	71	3286	1	1	2	3	3	3	4	4	6	1	1	1	35	520
8	Manjula	24	59	2897	1	1	2	3	4	4	6	1	1	1	1	1	65	410
9	Latha	22	45	3361	1	2	3	3	4	4	5	1	1	1	1	1	45	385
10	Shymala	24	55	3566	1	2	2	2	2	2	2	2	3	3	7	1	60	665
11	Noorjahan	28	52	3811	1	1	2	2	2	2	3	5	1	1	1	1	80	480
12	Anitha	21	73	3653	1	1	1	2	2	4	4	8	1	1	1	1	60	435
13	Syedfathima	21	61	271	2	3	3	3	4	7	1	1	1	2	2	3	35	305
14	Tamilselvi	21	59	189	1	1	2	2	3	4	6	1	1	1	1	2	50	400
15	Bharathi	20	45	2884	1	2	2	2	2	2	4	6	1	1	1	1	40	440
16	Shymala	22	52	2291	1	1	2	2	3	3	3	6	1	1	1	1	50	480
17	Sarala	22	64	160	1	2	2	2	2	2	3	4	4	6	1	1	45	585
18	Devi	19	54	3843	1	2	2	8	1	1	1	1	1	2	2	2	55	205
19	Srilatha	19	51	3252	1	1	1	1	1	1	2	2	2	3	4	6	40	675
20	Panchavarnam	26	56	231	3	4	6	1	1	1	1	1	1	2	2	3	50	170
	Mean	23.15	56.8														54.25	427.75
	SD	2.76179	7.9975														15.59447017	138.1618164

PROFORMA

Patient Name :

Age :

Sex :

Height :

Weight :

ASA status :

Diagnosis :

Anesthesia given :

Surgical procedure :

Duration of surgery :

Time of block/Wound infiltration:

VAS:

HRS	1	2	3	4	5	6	7	8	9	10	11	12
VAS												

Duration of analgesia: (VAS<5):

Rescue analgesia (Inj. Diclofenac sodium 75 mg i.m.) time:

Complications :

Comment: