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Study of Effectiveness of Premptive Analgesia and Duration of Analgesia Provided by Central Neuro Axial Blockade in LSCS Patients

Authors
Dr Rajeev. D.S[1], Dr C. Jayakumar[2*]
[1]Assistant Professor, Department of Anesthesiology, Government Medical College, Trivandrum
[2]Associate Professor, Department of Anesthesiology, Government Medical College, Trivandrum
*Corresponding Author
Dr C. Jayakumar
Associate Professor, Department of Anesthesiology, Government Medical College, Trivandrum, India

Abstract
Background: *LSAB (Lumbar subarachnoid blockade) is being used as a standard methodology for LSCS patients. Spinal Anesthesia is being associated with a profound advantage compared to general anaesthesia in obstetric patients. This anaesthetic method with definitive end points is administered before the pfannesfeil or vertical incision as the case may be. After the provision of the surgical anesthesia, the analgesic effect of LSAB is continued in to the postoperative period for some time. Thereby it provides premptive analgesia, which can be continued into the entire postoperative period, by use of NSAIDS or opiods*
Materials and Method: *In this study 50 patients posted for lower segment caesareans section on elective or emergency basis are selected fitting into the study after assigning into the exclusion and inclusion criteria. After the administration of spinal Anesthesia for the patients, then level of blockade confirmed using the spirited cotton. After surgery is over, the time of administration of the rescue analgesia in ers in the form of morphine hydrochloride is noted. Thereby it is noted that the LSAB administered before the surgery serves as an analgesic too in the postoperative period. This means that the LSAB serves as a premptive analgesic.*
Results: *It was found that in post LSCS patients the analgesic effect of LSAB lasts for 70 minutes. There by we can extend the preemptive analgesia by the administration of various agents in the form of diclofenac suppository or opioids or Ketanov or ilioinguinal or iliohypogastric blocks etc.*
Conclusion: *By the administration of the analgesics, early mobilization of the mother increases maternal bonding with child, increased breast feeding and prevents hypoglycemic complications in the newborn.*
Keywords: *VAS –Visual analogue scale LSCS- Lower segment caesarian section, LSAB-lumbar subarachnoid blockade.*

Introduction

In LSCS Patients spinal anaesthesia (Lumbar sub Arachnoid Block) is the anaesthetic Method of choice in USA[1] and it is becoming increasingly popular in UK. Bupivacaine, the most common LA popularly used in these surgeries, is a relatively insoluble local anesthetic Compared to lignocaine and precipitates at a concentration of 830[2] ug/ml in CSF. The µ Concentration of bupivacaine in clinical practice is much lower 150[3,4,5,6]-420 µgm/ml

If lumbar subarachnoid block is given in lateral position It is more successful with the patient In right lateral position and then truned supine along with a left lateral tilt or left uterine displacement. This is found effective for both hyperbaric[7,8,9] and isotonic solutions of bupivacaine. There will be incomplete blockade on one side if injection is made with patient in left lateral position and then turned supine with patient left lateral for uterine displacement.

Clinical exposure suggests adequate blockade may be obtained with hyperbaric solutions[10]

Where patients are in sitting position.

There are three types of spinal anaesthesia in pregnancy, saddle block for sacral roots

Only, for forceps delivery and perineal surgeries, low spinal block of sacral, lumbar and thoracic

Roots as far as T10 which is suitable for instrumental deliveries and mid spinal block of the sacral, Lumbar and thoracic root as for as T4 suitable for LSCS.

The various analgesic modalities employed for pre emptive analgesia in post LSCS

Patients are Transverse Abdominal plain Blockade (TAP), local Anaesthetic wound Infiltration, NSAIDS such as acetaminophen diclofenac etc, ilioinguinal– ileohypogastric block, intrathecal additives, Epidural analgesia, Ketamine and gabapentine, etc.

Since the lumbar sub arachnid blockade is given before the incision on the abdomen LSAB acts as the preemptive analgesia.

A level of sensory blockade extending to the T4 dermatome is desired for LSCS.

The major advantage of LSAB in obstetrics are, easy to perform, reliable ,Excellent operating condition and less costly than general anesthesia, Normal GIT function returns faster compared to GA, Maintain airway, Decreased pulmonary complications compared to GA, Decreased incidences of deep vein thrombosis and pulmonary embolism.

Compared to GA Disadvantage include risk of failure even in skilled hand and operation could outlast spinal anaesthesia.

Complications are: hypotension, bradycardia, cardiac arrest, post spinal headache.

Arachnoiditis, cerebro spinal meningitis , epidural and subdural hematoma.

Four factors that affect the uptake of local anaesthetic in the subarachnoid space are Concentration of local anaesthetic, Surface area of neuronal tissue exposed, Lipid content of neuronal tissue and, blood flow to tissue.

Local anaesthetic concentration is highest at the site of injection. Spinal nerve roots lack epineuria and are easily blocked. The surface area of the exposed nerve allows for the absorption of the local anaesthetic. As the local anaesthetic travel away from the site of injection, its concentration decreases secondary to absorption into the neural tissue, dilution by CSF, absorption of the local anaesthetic by the spinal cord tissue through piamater and the space of Virchow- Robin which is an extension of the subarachnoid space.

Site of action is not the spinal cord, but the spinal nerve and dorsal root ganglion. Elimination occur through absorption into subarachnoid and epidural space. Intial vascular absorption occurs through the blood vessels in the piamater. The rate of absorption deprnds on the vascular surface area that the local anaesthetic occurs comes into contact. Local anaesthetic also diffuse into the epidural space along the epidural space along concentration gradient.

Factors that determine the distribution of spinal anaesthetic,4 main categories are Characteristic of local anaesthetic medication, Patient character-istics, Technique of injection ,Characteristics of the spinal fluid, With head down position, hyperbaric solution will spread cephalad and hypobaric solution caudal. With lateral position, hyperbaric solution spreads to dependent position. With head position, hyperbaric solution spreads caudally and hypobaric cephalad. Any position with isotonic saline will stay with general area of injection.

Characteristics of local anaesthetic Solution are

1. Dose- High dose produces higher blockade

2. Concentration - with higher concentration higher level is obtained
3. Temperature- If the solution is cold, it become viscous and spread in CSF downwards
4. Volume - good volume, greater spread.

Patient characteristics

1. Age - plays negilible role
2. Height - If the patient is very short, dose of the local anaesthetic is to be decreased
3. Increased intrabdominal pressure
   Intra abdominal pressure plays a role in the engorgement of epidural veins. This causes decreases in CSF volume and high subarschnoid blockade. Thereby increase the intracranial pressure.
4. Anatomic configuration of the cord.
   Normal lordosis and thoracic kyphosis increases the spread of the local anaesthetic
5. Patient position– this is one of the most important factor along with the local anaethetic dose and baricity to affect the spread of the local anaethetic.

Materials and Methods

This study was conducted at Sree Avittom Thirunal Hospital, the women and children wing of Medical College, Thiruvananthapuram during the period 2006-2008. After getting approval from the research and Ethical Committee of the hospital, 50 patients undergoing Lower Segment Caesarian Section under Lumbar subarachnoid (LSAB) block were studied by the prospective randomized clinical trial. Sample size[N] was calculated using the formula

$$N = \frac{2\sigma^2 \times f(\alpha,\beta)}{\delta^2}$$

σ = std deviation

δ = effect size α 5% β 5%

Study setting

The study was conducted at SAT Hospital attached to the Govt. Medical College, Trivandrum

1. **Study period**
   Study was done during the period from 2007-2008 December
2. **Study Design**
   It was randomized clinical trial study
3. **Study population**
   Patient scheduled for elective or emergency LSCS under subarachnoid blockade.

Inclusion Criteria

1. Lower Segment Caesarian Surgery patients undergoing surgery under spinal anaesthesia.
2. Those between 18-30 years of age.
3. Those having height between 155 cm to 175 cm
4. ASA grade I and ASA grade II patients
5. Duration of surgery not beyond 90 minutes.
6. Initial Spinal Sensory level above T_6 segment

Exclusion Criteria

1. Failed Spinal Anaesthesia
2. Inadequate spinal Sensory level
3. Those with previous hypersensitivity to NSAIDS
4. Patients with angioedema, urticaria and Bronchial Asthma
5. Patients having bleeding and coagulation disorders
6. Patients with severe renal disease, Congestive Cardiac failure, severe preeclampsia and hepatic insufficiency
7. Those patients having Acid peptic disease, Gastiritis, melena
8. Those with history of proctitis or Ulcerative Colitis

All patients were, in patients. Study was conducted in both emergency and elective caesarian section cases. Thorough preanaesthetic check up and investigations like Blood, Urine routine examinations, VDRL, HIV, HBsAg,

Blood grouping and cross matching and bleeding time & clotting time are done prior to surgery. Inclusion and exclusion criteria were strictly followed.

Informed consent and consent for conducting the study were taken. All elective cases were fasted for a minimum of eight hours and for emergency cases high risk consent was taken.

Procedure

All elective cases premedicated with Ranitidine 150mg and metoclopramide 10mg orally at 10 pm day before surgery and the same repeated at 6 am on the morning of surgery. In emergency caesarian section cases Inj. Ranitidine 50mg 1/V and Inj. Metoclopramide 10 mg were given as premedication immediately before spinal anaesthesia. After premedication baseline blood pressure pulse rate and oxygen saturation were noted. Patients were randomized according to a computer generated random number table. The patients were monitored with noninvasive blood pressure, pulse oximeter and continuous electrocardiography.

Pre-loaded with 250-500ml normal saline. Patient positioned in the left lateral position, with hip and knee flexed, spine also flexed for administering spinal anaesthesia taking care of the monitors already attached. Patient's back prepared, wiped with iodine solution, followed by spirit, draped sterile under sterile precautions lumbar subarachnoid block at the level of L_3-L_4 or L_4-5 using 23G Quincke needle, after freeflow of cerebrospinal fluid. 2ml of 0.5% heavy Bupivacaine administered. Patient immediately turned from the left lateral to supine position. Oxygen is administered via polymask and 15-30° left lateral tilt given.

Spinal Sensory level checked after few minutes and table tilt adjusted to keep sensory level at or above T4 – T6 segment level. Then the surgery started and once the baby delivered, Inj. Midazolam 1mg i/V plus Inj. Oxytocin 20 units I/V infusion in 500ml normal saline administered via the I/V cannula in mother,. Tilt of table adjust so that patient was in supine position.

At the end of surgery spinal sensory level again checked.

After surgery blood pressure and pulse rate and time were noted.

In the post operative period, intensity of pain was assessed using VAS scoring system. visual analogue scale which is a 10 cm long horizontal line with no pain at one end and worst imaginable pain at other end. The distance from 'no pain' to the patient's mark numerically quantitates pain. visual analogue scale which is a 10 cm long horizontal line with no pain at one end and worst imaginable pain at other end. The distance from 'no pain' to the patient's mark numerically quantitates pain.VAS score of zero means no pain and score of 9&10 corresponds to severe degree of pain. VAS score of 5&6 indicates moderate degree of pain.

VAS > 5 cm in considered as moderate pain and It is a self assessment method for pain by patient himself when the numerical score is more than 5 patient has moderate pain and rescue analgesic in the form of inj. Morphine 0.05mgm/kgwt I/V incremental doses until patient is relieved of the pain, as suggested by VAS score. Total dose of rescue analgesic needed also recorded .Time at which the rescue analgesic administered also noted.

Duration of analgesia extends from the time at which surgery is over to the time at which patient has moderate degree of pain occurs and rescue analgesic was administered. It was measured in hours

All the patients were observed for occurrence of nausea, shivering, vomiting, excessive bleeding, itching etc.

Observations and Statistical Analysis

It is a prospective randomized clinical study. The data collected were entered in to a master chart and necessary statistical tables were constructed. The statistical constants like arithmetical mean standard mean and percentages were computed to

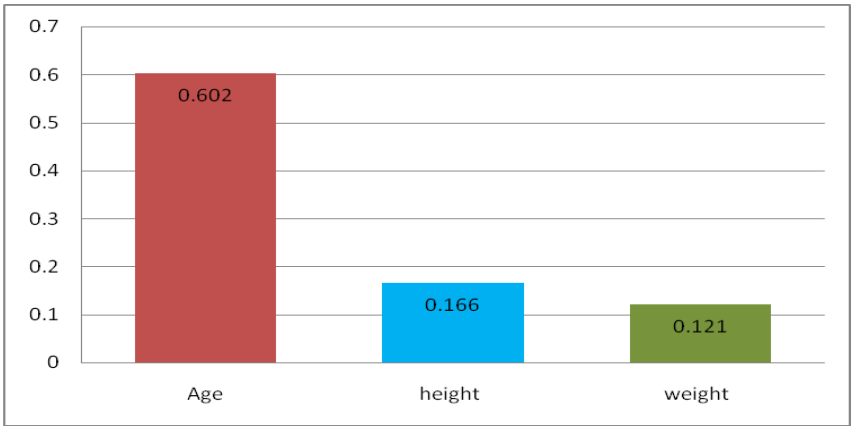
get valid inferences about the data for comparison. In order to see whether the differences in the estimate in the control group and study groups are statistically significant the students `t' test was applied.

Invariably for the computation of all statistical constants statistical package is used, diagrams and charts were also drawn to give due importance to the most salient finding.

In this study 50 patients undergoing lower segment caesarian section under lumbar subarachnoid blockade in the age group of 18-30 yrs and having height between 155cm to 175 cm were studied for the duration of post-operative analgesia. Randomization was done according to a computer generated random number tables. No blinding was done. Quality of analgesia in the postoperative period was assessed by the mean VAS score and dose needed for rescue analgesia

Table 1 Comparison of base line variables

Variable	Study Group	P value
Age 18-24 yrs 25-30 yrs	 56 44	0.602
Height 156 – 164 cm	 160.9±4.5	0.166
Weight 55 – 69 kg	61.8±2.4	0.121



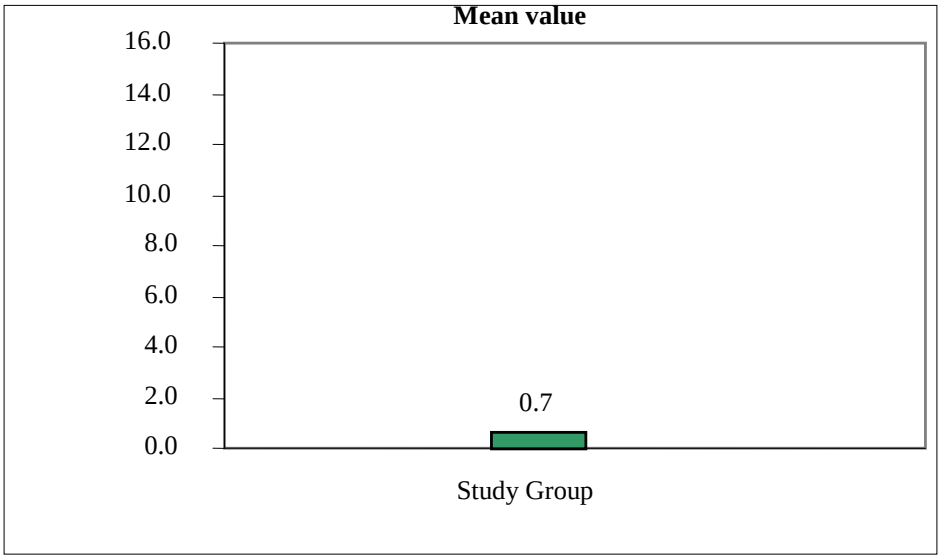
As p value is >0.01 difference in mean weight was not statistically significant. It is convinced from table that there is no statistical difference in mean height in three groups since p value is 0.1666

Table 2 Comparison of duration of analgesia

Group	Mean	SD	N	F	p
Study Group	0.7	0.2	50	3641.1**	0.000

** : significant at 0.01 level

Fig. 7 Comparison of duration



From table 7 the mean value for duration of analgesia for study group is 0.7 hr. Standard deviation being 0.2. F value is 3641.1 which corresponds to a p value = 0.000.

Table 3 Comparison of mean VAS score

	Mean + SD	P Value
Study Group	**3.6±0.5**	**0.000**

Table 4 Comparison of mean rescue analgesic dose

	Mean + SD	P value
Study Group	**4.8±0.5mg**	**0.000**

Mean dose of rescue analgesia was 4.8+_0.5mgm

Table 5 Comparison of side effects in Study Group

Complications	Study Group N - 50		χ^2	P value
	Count	%		
Shivering	**2**	**4%**	**5.25**	**0.155**
Vomiting	**2**	**4%**	**4.29**	**0.125**

4% patients developed postoperative shivering and 4% patients developed postoperative vomiting hence this study shows that the pre emptive analgesia extending in to the postoperative period for an average duration of 70 min by the time multimodal analgesia plays an excellent role.

Discussion

Lumbar sub Arachnoid Blockade for casesarian section remains a popular method over the epidural technique because of easinesss of the procedure and rapid onset of action. In pregnant females, there is engorgement of the epidural veins from the aortocaval compression with displacement of CSF leading to under ended and of the blockade. Caesarian section is a short duration procedure associated with early mobilization[11] . Hypobaric solution produces late cephalic extension of blockade[12].

Physiological changes in pregnancy affect various systems in the body. There is a 25-40% decrease in spinal dose of the local anaesthetic since the end of the 1 trimester implying that changes in the epidural space anatomy is not sole reason. It has been found that progesterone increases the sensitivity of neuronal mechanisms to local anaesthetic[13]. Pregnant Females are more prone to hypotension and circulatory instability following sympathetic blockade caused by neuroaxial anaesthetic.

Lordosis can decrease the distance between the spinous processes and can make lumbar flexion difficult thereby making spinal and epidural anaesthesia unsuccessful sometimes.

Widening of the pelvis leads to a head down position in lateral decubitus. It may lead to cephalic spread of the anaesthetic during spinal anaesthesia in lateral position. A pillow placed beneath the dependent shoulder can avoid this effect.

Hormonal alterations and weight gain result in a series of musculoskeletal effects. To compensate for alteration in centre of gravity, the lumbar lordosis is exaggerated with anterior flexion of the neck and downward movement of shoulders. Due to relaxin, progesterone and the mechanical effects of pregnancy, joint laxity is increased to prepare for child birth[14].

The secretory and absorptive functions of the gastrointestinal tract are not much altered, but mobility is changed. There is displacement of intra abdominal portion of the oesophagus into the thorax in majority of the obstetric population. Progesterone can cause relaxation of the lower esophageal sphincter[15]. These anatomical and hormonal effects cause a decrease in the tone of the lower esophageal sphincter resulting in gastro esophageal reflux disease (GERD) of pregnancy.

Gastro oesophageal tone is slowed in labour and immediate post partum period, owing To inhibition of gastrointestinal contractile activity by progesterone. Oesophageal peristalsis and intentional transit slow down resulting in constipation. 80% of pregnant females experience nausea and vomiting.

Dilutiion due to an increased plasma volume cause causes a decline in serum albumin concentration by upto 60 %. Plasma choline esterase level fall by 25 %.

There is increased risk of aspiration of gastric contents due to increased intra abdominal pressure and low lower esophageal sphincter tone. The risk is increased during general anesthesia and intubation.

Important steps in prevention include preference for neuroaxial techniques and use of aspiration prophylaxis. If general anesthesia is induced rapid sequence induction {RSI) technique is employed.

There is an increased production of platelets, but due to enhanced destruction and hemodilution, rise in count does not occur. In a minority platelet counts decrease (90,000/mm^3) Which is physiological and resolves in post operative period. The hyper coagulable state, increase in clotting factors[16] (except II,V, XI,XIII), decreased prothrombin time and APTT, elevated fibrin degradation products (FDP), and plasminogen

In this study, patients scheduled for elective or emergency LSCS under LSCS under LSAB were randomly selected. After the strict inclusion and exclusion criteria as described under materials and methods, patients were selected for this study. LSAB was administered and during the postoperative no oral NSAID or rectal suppository, or opiod was administered. The intensity of pain was assessed using the VAS scoring system.VAS score of Zero means no pain , score of 5 and 6 moderate pain and score of 9,10 mean severe degree of pain. It is a self assessment tool for pain by the patient herself, when the numerical score is more than 5, the patient has moderate pain and rescue analgesia in the form of injection morphine 0.05 mg/kg incremental doses was given until patient was relieved of pain as indicated by the VAS score.

Total dose of rescue analgesic and the time at which the rescue analgesic was administered were also noted. Duration of the analgesic effect in these patients under study ranged from 50 to 75 minutes, the average being 75 minutes. It means that the analgesia is extended for 75 minutes in the post operative period, which can be extended by the postoperative analgesic.

Since the LSAB was administered before curvilinear and Pfannensteil incision of LSCS, it acts as a method of preemptive analgesia too . If we use combined spinal epidural blockade (CSEB), the preemptive analgesia can be extended by the use of epidural local anaesthetic as bolus doses or infusion in combination with opioids like fentayl. 48 ml of ropivacaine 0.2% and 2 ml per hour to provide post operative analgesia is continuation with preemptive analgesia via LSAB .This can provide high quality multimodal analgesia in combination with the NSAID suppository.

Diclofenac suppository 100 mg bd in the post operative period immediately after the PV examination at the end of surgery can provide good quality analgesia without inter fering with breast feeding and respiration in the newborn baby unlike opioids.

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