

A Comparative study between Analgesic Efficacy of Levobupivacaine and Buprenorphine v/s Levobupivacaine and Dexamethasone in Transversus Abdominis Plane block following a Caesarian Delivery

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Abstract

Objective: The aim of this study was to evaluate and compare the post operative analgesic efficacy of Levobupivacaine and Buprenorphine v/s Levobupivacaine and Dexamethasone following a Transversus Abdominis Plane block in a patient following a caesarean section. **Materials and Methods:** Fifty-Two American Society of Anaesthesiologists grade I and II pregnant women aged between 20 and 40 years requiring lower segment caesarean section were included in this study. **Study Design:** A Prospective, Double Blinded, Randomized Comparative Study. **Study Groups:** Group LB Patients received 19.5 ml 0.25% Levobupivacaine with 0.5 ml (150 mcg) Buprenorphine in TAP BLOCK (total volume 20 ml) given on each side of Abdomen and Group LD Patients received 19.5 ml 0.25% Levobupivacaine with 0.5 ml (2 mg Dexamethasone) in TAP BLOCK (total volume 20 ml) given on each side of Abdomen. **Results:** The time to first rescue analgesic requirement was significantly longer in Group LB than in Group LD (680.79 ± 28.10 min, 593.40 ± 31.80 min, respectively; $P < 0.001$) The mean total tramadol consumption in first 24 hours was lower in Group LB than compared to Group LD (150.10 ± 40.10 mg, 174.10 ± 22.40 mg, respectively; P value is 0.0104 considered significant). Group LB displayed significantly lower VAS Score both at rest and movement than Group LD. **Conclusion:** Levobupivacaine with Buprenorphine in TAP block after caesarean section facilitates prolonged analgesia and reduced requirements for rescue analgesia compared to Levobupivacaine with Dexamethasone, without significant side effects.

Keywords: Analgesic Efficacy, Levobupivacaine, Buprenorphine, Dexamethasone, Transversus Abdominis Plane Block, Caesarian Delivery.

INTRODUCTION

Lower section caesarean section is routinely done under spinal anaesthesia, except few emergencies. Pain following a caesarean section is moderate to severe and that may vary in all patients and failure to provide adequate analgesia post caesarean section may affect care of baby, breastfeeding, mother-baby bonding, risk for thrombo-embolism as a result of immobility due to pain.¹

Pain of caesarean section has somatic component (from abdominal wall incision) and visceral component (from the uterus). The postoperative analgesia should be adequate as well as safe for the breastfeeding baby, and can be provided by systemic (IV / Oral), regional analgesic technique or multimodal analgesia.²

Systemic opioids have multiple side effects like nausea, vomiting, pruritus, sedation, urinary retention and respiratory depression. Regional analgesic techniques have minimum systemic side effects as drug's site of action is peripheral.³

The transversus abdominis plane (TAP) block is a regional anaesthesia technique that provides analgesia to the parietal peritoneum, skin and muscles of the anterior abdominal wall. (T6-L1 dermatomal area). In TAP block, local anaesthetic is

deposited into a plane between the internal oblique and transversus abdominis muscles where the anterior branches of thoracolumbar nerves originating from T6 to L1 are located.⁴

This blind TAP block technique is a regional anaesthetic techniques in which large volume are administered bilaterally some authors administer volumes to an extent that a so called “flank bulge sign” is visible.⁵ This blind TAP block technique is described as easy to perform and with few complications.^{6,7} however, the triangle of Petit may be difficult to palpate in obese patients.⁸

Buprenorphine and dexamethasone have been used as adjuvants to local anaesthetics in various peripheral nerve blocks^{9, 10, 11}, but a search of the available literature did not reveal any study comparing perineural buprenorphine and dexamethasone as adjuvants to levobupivacaine used for post-operative analgesia in a blind TAP block after a lower segment caesarean section.

The present study was planned to test the hypothesis that the addition of perineural 0.3 mg buprenorphine or 4 mg dexamethasone as adjuvants to 0.25% levobupivacaine in TAP block would enhance the duration of post operative analgesia and reduce opioid consumption in the first 24 hours after a caesarean section.

Aims and Objectives

To compare Buprenorphine and Dexamethasone as adjuvants to levobupivacaine in Transversus Abdominis Plane block.

- Time taken for first analgesia requirement.
- Total rescue analgesia in first 24 hours.
- VAS Score in first 24 hours at rest and movement.

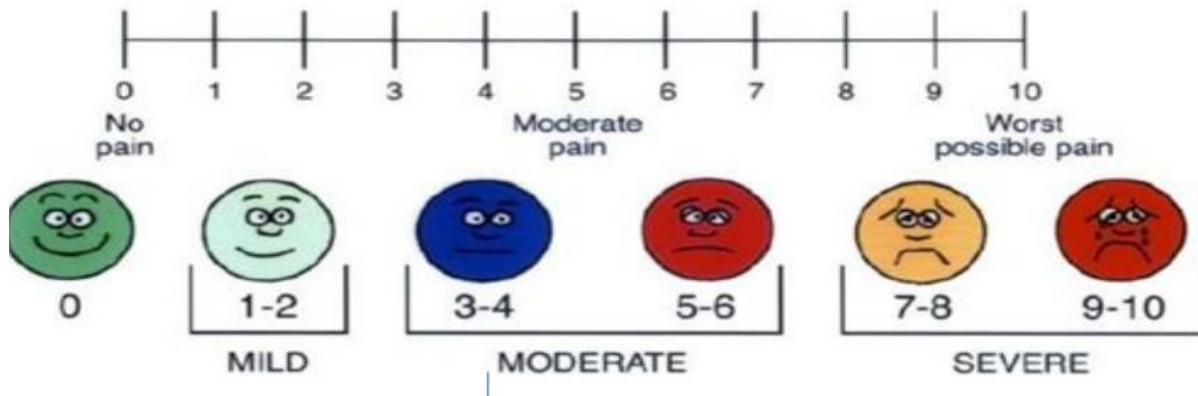
Materials and Methods

The prospective randomized control study was conducted among the patients posted for Caesarean delivery admitted to Krishna Hospital, Karad, and Maharashtra.

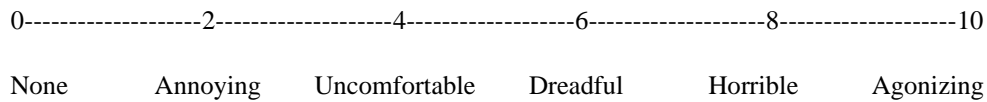
- Adult parturient undergoing caesarean section was divided in two groups -
 1. Group LB Patients received 19.5 ml 0.25% Levobupivacaine with 0.5 ml (150 mcg) Buprenorphine in TAP BLOCK (total volume 20 ml) given on each side.
 2. Group LD Patients received 19.5 ml 0.25% Levobupivacaine with 0.5 ml (2 mg Dexamethasone) in TAP BLOCK (total volume 20 ml) given on each side.

The patients were randomized into 2 groups of 26 each by using a computer-generated random number table, and the allotment was done using coded sealed opaque envelopes which were opened just before performing the TAP block. All was done by different persons i.e. Drug Preparation, Performing the block and assessing the pain level.

Each patient was assessed at 0, 4, 8, 12, 24 hour after surgery by an independent observer for pain at rest and on movement using Visual Analogue Scale, Time taken for first analgesia and Total rescue analgesia in first 24 hours.



VISUAL ANALOGUE SCALE



Observation and Results

After studying 52 cases, observation and results were summarized in tabulated form and described below. Both groups comprised of 26 patients.

Demographic Profile

Characteristics	Group LD	Group LB	P value
	(n=26)	(n=26)	
Age in years (mean ± SD)	22.5±1.6	23.7±4.6	>0.05
Weight in Kgs (mean ± SD)	58.7±6.51	59.64 ± 7.7	>0.05
Duration of Surgery in min (mean ± SD)	51.16±6.51	50.51±3.68	>0.05

No significant difference seen in age, weight and duration of surgery among both groups.

All the patients observed among both groups were under ASA grade I/II.

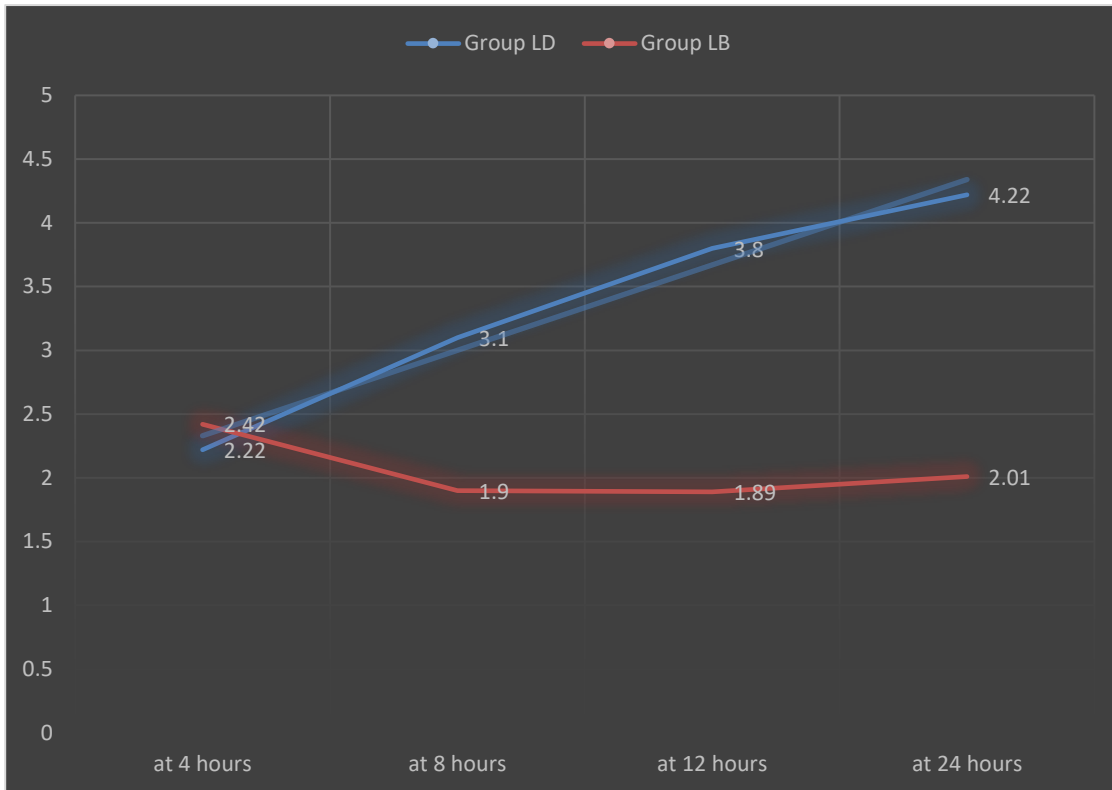
Comparison of pulse and blood pressure in both groups

Pulse and blood pressure of patients were comparable in both groups. Among which no significant difference was observed in either groups for pulse, SBP, DBP at respective pre-operative, intra-operative, post-operative, immediately after TAP block, at 4 hour, at 8 hour, at 12 hour, and at 24 hour.

Pain score (VAS) at rest, at 4 hours, 8 hours, 12 hours, 24 hours timeline expressed as mean ± SD

	First 4 hours	First 8 hours	First 12 hours	First 24 hours
Group LD (n=26)	2.2±0.62	3.1±1.29	3.8±1.37	4.22±2.21
Group LB (n=26)	2.42±0.78	1.9±0.87	1.89±0.85	2.01±1.28
P value	>0.05	<0.05	<0.05	<0.05
Inference	NS	S	S	S

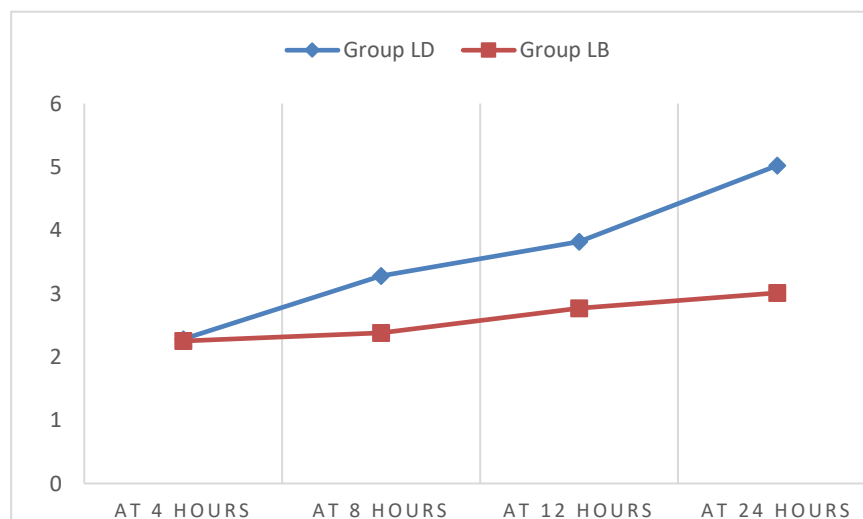
Comparison of VAS score AT REST in both study groups



Pain score (VAS) at movement, at 4 hours, 8 hours, 12 hours, 24 hours timeline expressed as mean (SD)

	First 4 hours	First 8 hours	First 12 hours	First 24 hours
Group LD (n=26)	2.28 ±0.21	3.28 ±1.09	3.82 ±1.37	5.02 ±2.25
Group LB (n=26)	2.25 ±0.65	2.38 ±0.9	2.77 ±0.8	3.01 ±2.08
P value	>0.05	<0.05	<0.05	<0.05
Inference	NS	S	S	S

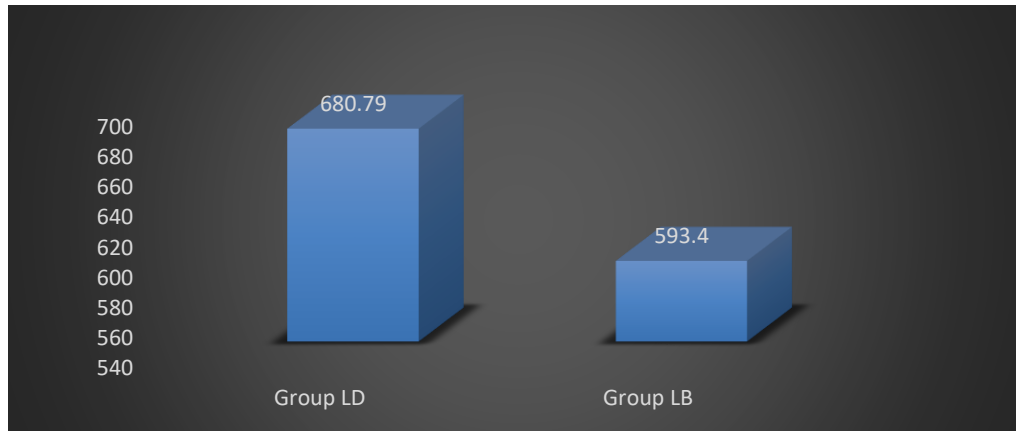
Comparison of VAS score AT MOVEMENT in both study groups



Pain scores at rest and at movement was lower in patients who received TAP block with Levobupivacaine and Buprenorphine (Group LB) as compared to patients who received TAP block with Levobupivacaine and Dexamethasone (Group LD).

Total duration of post-operative Analgesia supplement and time of first rescue analgesia in mins (mean SD)

Time	Group LD (n=27)	Group LB (n=27)	P value	Inference
Time in minutes	680.79±28.10	593.40±31.80	<0.001	S

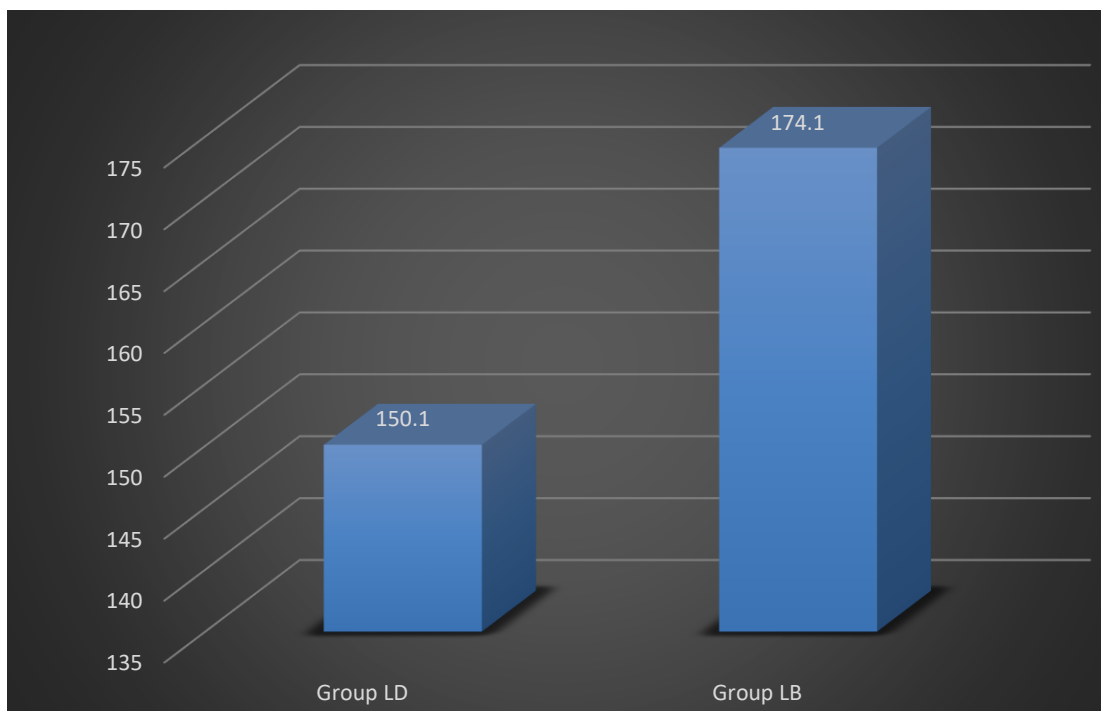


Comparison of Total Duration of Post-operative analgesia in both study groups.

The mean total tramadol consumption in first 24 hours in mg (mean ± SD)

total tramadol consumption	Group LD (n=26)	Group LB (n=26)	P value	Inference
mg	150.10±40.10 mg	174.10 ±22.40 mg	0.0104	S

Comparison of Total Tramadol Consumption of post-operative analgesia in both study groups



Discussion

The results of our study demonstrated that addition of 0.3 mg of Buprenorphine or 4 mg of Dexamethasone to 0.25 % Levobupivacaine in a Bilateral TAP block provides a prolonged duration of analgesia, reduced opioid consumption and decreased VAS score over a post operative period of 24 hours in patients undergoing elective Lower segment cesarean section.

Due to easy availability, cost effectiveness, lack of significant side effects like respiratory depression, sedation, longer duration of action, highly lipophilic nature and high affinity to mu receptors buprenorphine was selected for this study as an adjuvant.¹²

Buprenorphine is a partial opioid receptor agonist and blocks voltage-gated Na⁺ channels similar to local-anaesthetic agents.¹³ Decreases K⁺ ion conduction and increases Ca²⁺ ion conduction in the cell body of the neurons, which reduces the excitability of the nociceptive neurons and accentuates the prolongation of action potential. Got high molecular weight (481), high lipophilicity, and high affinity for opiate receptors that limit cephalad spread and likelihood of delayed respiratory depression.¹⁴ It is "25 times more potent than morphine and has a low level of physical dependence.¹² The side effects include nausea, vomiting, pruritus, drowsiness, and respiratory depression. Buprenorphine is a long-acting, promising analgesic by the epidural and intrathecal route. It enhances the sensory blockade of local anaesthetic without affecting the sympathetic activity.¹⁵

Further, it inhibits the release of the excitatory neurotransmitter substance P from the peripheral sensory nerve endings. The peripheral administration of opioids also has central action due to centripetal movement of opioids binding to opioid binding proteins from the periphery to the dorsal horn. Buprenorphine and its metabolite norbuprenorphine has anti hyperalgesic effects attributable to the fact that both have been shown to act on κ and δ opioid receptors in addition to μ receptors.¹⁵

Dexamethasone is a glucocorticoid which is used predominantly for its anti-inflammatory and antiemetic actions. Its mechanism of action as an adjuvant is not known. It exhibits anti-inflammatory and analgesic effects through the inhibition of phospholipase A2 and the activation of glucocorticoid receptors. It has also been demonstrated that locally administered corticosteroids inhibit signal transmission of nociceptive C-fibres, decrease ectopic neuronal discharge, and decrease the release of local inflammatory mediators.¹⁶

The study done by Kosel et al.¹⁷, 0.3 mg of buprenorphine as an adjuvant with bupivacaine in femoral nerve blocks enhanced the duration of analgesia following total knee arthroplasty and El Sharnouby and El Gendy¹⁸ observed that the addition of 4

mg dexamethasone was equipotent to 8 mg dexamethasone in a TAP block. Based on the above 2 studies, we used similar doses of adjuvants in our study with levobupivacaine.

Limitations

- Plasma levels of Dexamethasone and Buprenorphine were not monitored.
- The time at which the TAP block began to work could not be differentiated.
- The time at which the sensory effect of the intrathecal block began to wear off could not be clearly differentiated.

Conclusion

Levobupivacaine with Buprenorphine in TAP block after caesarean section facilitates prolonged analgesia and reduced requirements for rescue analgesia compared to Levobupivacaine with Dexamethasone, without significant side effects.

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