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Original Research Article

A Comparative Study of Efficacy of Intrathecal Levobupicaine and Bupivacaine for Caesarean Section

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Conflict of interest: Nil

Abstract

Introduction: A balancing method for caesarean birth is spinal anaesthesia. It provides total muscle relaxation and quick onset of anaesthesia.

Objective: To evaluate and contrast the beginning, length, neonatal outcome, cardiovascular parameters, and adverse medication reactions.

Material and Methods: It was a double-blind, prospective study. There were enrolled a total of 60 patients, 30 in each group. 8.5 mg of isobaric levobupivacaine and 15 g µg of fentanyl were administered to Group A, and 8.5 mg of hyperbaric bupivacaine and 15 µg of fentanyl were administered to Group B.

Result: There was a statistically significant difference between the two groups in the time it took for the sensory and motor blocks to start and in how long they lasted.

Conclusion: For spinal anaesthesia during caesarean section, the combination of isobaric levobupivacaine and fentanyl can be used as a safe and effective substitute to hyperbaric bupivacaine and fentanyl because it offers similar sensory block characteristics, early motor recovery that enables early mobilisation, stable hemodynamics, and good foetal health.

Keywords: Levobupivacaine, Bupivacaine, Fentanyl, Caeserean section, Spinal Anesthesia.

Introduction

Cesarean deliveries frequently involve the use of spinal anaesthetic. It is straightforward, affordable, and quickly induces anaesthesia and full muscular relaxation [1]. An amide local anaesthetic with a lengthy half-life of 1.5 to 2 hours, bupivacaine [2]. Despite the significant sensory block, intrathecal bupivacaine alone might not be enough to produce full analgesia. 13% of the patients undergoing caesarean delivery had visceral pain even after the intrathecal administration of 15 mg bupivacaine [3, 4]. Furthermore such large doses of intrathecal bupivacaine were associated with severe hypotension and delayed recovery of motor block.[5] Levo-bupivacaine is the (s)-enantiomer of bupivacaine. It is a long-acting local anaesthetic, provides more selective

neuraxial blockade i.e., early motor recovery.

The pharmacokinetic profile is superior, and the clinical profile is comparable to bupivacaine. Compared to bupivacaine, it is less neurotoxic and cardiotoxic [6]. Its baricity has the benefit of providing a block that is less position sensitive [7]. Additionally, it has been suggested that lower dosages of bupivacaine be used in conjunction with intrathecal opioids to provide spinal anaesthesia in pregnant women having caesarean sections [4, 8-11]. Neuraxial administration of opioids along with local anaesthetics improves the quality of intraoperative analgesia and also provide postoperative pain relief for longer duration [10-12]. Therefore, Fentanyl provides better intraoperative analgesia and a safer alternative than morphine. Spinal doses of Fentanyl 10 µg to 25 µg are commonly used for caesarean delivery anaesthesia [8,14]. It has no deleterious effects and appears to be safe for the mother and the newborn [15]. In this study we observed the clinical efficacy of intrathecal Isobaric Levobupivacaine over Hyperbaric Bupivacaine, with Fentanyl for cesarean section.

In two study groups, this study will examine the sensory and motor block properties of spinal anaesthesia. *Group A:* 0.5% Levobupivacaine 8.5 mg plus Fentanyl 15 µg intrathecally (total volume 2 ml) *Group B:* 0.5% hyperbaric Bupivacaine 8.5 mg (1.7 ml) plus Fentanyl 15 µg intrathecally. (total volume 2 ml)

Materials and Methods

Following approval from the ethical council, this prospective, randomised, double-blind clinical trial was carried out in the Department of Anaesthesia at Mata Gujari Memorial Medical College, Kishanganj, during a two-year period from December 2020 to October 2022. The study involved sixty patients.

Inclusion Criteria: American Society of Anaesthesiologists (ASA) Physical status I and II who were to undergo elective caesarean section under Spinal Anaesthesia**,** Patients more than 20 years of age, Patients with height between 150-170 cms**,** Patients with weight between 50-80 kgs**,** Gestational age >37 weeks.

Exclusion Criteria: Parturients for emergency surgery*,* Contraindication for spinal anaesthesia*,* Known allergy for LA/opioid*,* Foetal indication for LSCS.

Statistical Analysis

The required statistical tests were run on a sheet of MS Excel after compiling all the acquired data. A P value of 0.05 or lower is regarded as statistically significant.

Results

60 patients who had been scheduled for elective caesarean delivery made up the study population. They were split into two groups, each with 30 people. None of the baseline variables, including age-based distribution, weight, height, and operation length, were statistically significant.

Table 1: Comparison of Time of onset of Sensory Block (TOSB) Between Two Groups

TOSA (Min)	Group A		Group B	
	No. of patients	Percentage	No. of patients	Percentage
2-3	8	26.67%	4	13.33%
3-4	19	63.33%	8	26.67%
4-5	3	10.00%	18	60.00%
Total	**30**	**100%**	**30**	**100%**

The mean time of onset of sensory block at T_{10} in Group A was 3.45 ± 0.42 minutes, in Group B was 3.92 ± 0.45 minutes. The difference in the mean time between Group A and Group B was statistically highly significant (p= 0.000 which is <0.05).

Table 2: Comparison of Highest Level of Sensory Block (HSLB) between Two Groups

Level	Group A		Group B		χ^2	P-Value/ Difference
	No. of patients	Percentage	No. of patients	Percentage		
T_4	5	16.67%	13	43.33%	5.074	0.0242/ Highly Significant
T_6	25	83.33%	17	56.67%		
Total	30	100%	30	100%		

In Group A, maximum level of sensory block achieved was T_4 (16.67%) and minimum height achieved was T_6 (83.33). The median value was T_6 (T_4-T_6). In Group B, maximum level of sensory block achieved was T_4 (43.33%) and minimum height achieved was T_6 (56.67 %). The median value was T_6 (T_4-T_6).

One of the cornerstones of balanced anaesthesia is the management of pain during and after operation. Despite experiencing varying levels of popularity over the many years since it was first used in clinical practise, spinal anaesthesia remains one of the fundamental procedures in contemporary anaesthesia. To enhance the effectiveness of intraoperative and postoperative pain treatment, many medications have been tested in subarachnoid blocks together with local anaesthetics [16]. Caesarean delivery involves traction of peritoneum and handling of intraperitoneal organs, resulting in intraoperative visceral pain. However, intrathecal Bupivacaine alone may be insufficient to provide complete analgesia despite the high sensory block. 13% of the patients undergoing caesarean delivery had visceral pain even after the intrathecal administration of 15 mg Bupivacaine [3, 4].

Additionally, such high intrathecal Bupivacaine dosages were linked to significant hypotension and a delay in the recovery of the motor block [5]. The most widely used spinal anaesthetic, hyperbaric bupivacaine, has also been reported to cause abrupt cardiac arrest after spinal anaesthesia because it extends the sympathetic block [17, 18]. Its most serious side effect is cardiotoxicity and pregnant women are more susceptible to this effect [19]. It may cause hypotension or bradycardia after moblisation, especially with abrupt position changes [7].

One of the top requirements in anaesthesiology practise has always been the search for newer, safer analgesics. Bupivacaine, the widely used local anaesthetic in regional anaesthesia is available in a commercial preparation as a recemic mixture of its two enantiomers, Isobaric Levobupivacaine, S (-) isomer and dextro Bupivacaine, R (+) isomer. Levorotatory isomers were shown to have a safer pharmacological profile attributed to its faster protein binding rate.

In their study, Duggal R et al. [23] found that Group L's maximal sensory block height (2 out of 30 attained T4) was considerably lower than Group B's (12 out of 30 achieved T4) (P = 0.003). In a study conducted by Gulen et al. [20], 60 patients were divided into two groups at random. The combinations 10 mg Levobupivacaine (0.5%) + fentanyl (15 μcg) for Group LF (n = 30) patients, 10 mg hyperbaric bupivacaine (0.5%) + fentanyl (15 μcg) for BF (n = 30) patients were intrathecally administrated a total of 2.3 cc. The maximum sensory level (T dermatome) in group LF was achieved at T_4 level (2 – 4) and in group BF was at 3(2-4). Our results are similar to this study. Since the dose of the drugs used was more in their study, so sensory level & median were achieved at higher level (LF was at T_4, and BF was at T_3). Even though in Bupivacaine group, higher sensory level was achieved than Levobupivacaine group.

In the current study, Group A received 0.5% hyperbaric Levobupivacaine 8.5 mg plus Fentanyl 15 µg (2 ml) intrathecally, while Group B received 0.5% hyperbaric bupivacaine 8.5 mg plus Fentanyl 15 µg (2 ml) intrathecally, and the combined total duration of spinal block (time for sensory regression to L1) was 125.43 ± 6.88. It was statistically extremely significant that Group A and Group B's mean times differed (p = 0.000). Similar results were noticed with studies carried out by Duggal R *et al* and Gulen *et al.* Duggal R *et al* [23] did a study and the results of the study showed that the duration of sensory block (first analgesic requirement) was shorter in parturients in Group L than those in Group B (80.03 ± 8.12 vs. 103.47 ± 10.18 min), the difference being highly significant ($P < 0.001$). The time to regression by two dermatomes (min) in group L was 54.97 ± 4.61 and in group B was 72.93±7.34 min ($p<0.001$) i.e. highly significant.

The researcher had used the total duration of sensory block as per these two parameters (first analgesic requirement and time to regression by two dermatomes). They also found shorter duration of sensory block in group L as compared to group B. Gulen *et al* [20] did a study to find that time to regression by two dermatomes and time to regress to T12 dermatome was found to be significantly long in Group BF. [21]

Time to regression by two dermatomes for the sensory block in Group LF was 71.43 ± 12.96 whereas in group BF was 76.16 ± 13.86 min. Regression time to T12 dermatome in Group LF was 145.50 ± 11.01 and in Group BF was 162.33 ± 10.56 min with $p < 0.05$ and hence difference is statistically significant. The researcher had used the total duration of sensory block as per these two parameters. Since higher doses of drugs were used in their studies so difference in values from our study was seen.

Conclusion

Hyperbaric Bupivacaine (0.5%) can be replaced by Isobaric Levobupivacaine (0.5%) 8.5 mg and Fentanyl (15 g) in a safe and efficient manner. 8.5 mg combined with 15 g of fentanyl is recommended for spinal anaesthesia during caesarean delivery because it has equivalent sensory block features, quick motor recovery that allows for quick mobilisation, stable hemodynamics, and good foetal health.

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