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Original article

COMPARATIVE EVALUATION OF HYPERBARIC BUPIVACAINE AND LEVOBUPIVACAINE AS SPINAL ANESTHESIA AGENTS IN FEMALES UNDERGOING CESAREAN SECTION: A CLINICAL PROSPECTIVE STUDY.

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Abstract.

Background:

Due to the anesthetic substance used, obstetric anesthesia treatments must achieve the right level of muscular relaxation and analgesia while minimizing any adverse effects on the mother or fetus. In the current study, levobupivacaine and hyperbaric bupivacaine were compared as spinal anesthetic agents for patients undergoing Lower Segment Cesarean Sections (LSCS).

Materials and methods:

120 pregnant women who were scheduled for elective cesarean procedures and belonged to the American Society of Anesthesiologists (ASA) I-II groups participated in the research study. The patients were divided into two groups at random. The combinations of 10 mg levobupivacaine (0.5%) + 15 cg fentanyl for Group L patients (n = 60) and 10 mg hyperbaric bupivacaine (0.5%) + 15 cg fentanyl for Group B patients (n = 60) required 2.3 cc to administer.

Results:

The maximal dermatome for the sensory block, a two-dermatome regression, and a regression to the T12 dermatome all took a lot longer for Group B than for Group A. It was demonstrated that Group B's motor block evolution advanced faster and persisted longer. Group L saw fewer instances of hypotension, bradycardia, and nausea, but Group B needed more ephedrine ($p \leq 0.05$). Hyperbaric bupivacaine was more frequently associated with hypotension and bradycardia, which affected 66% and 33% of the patients.

Conclusion:

Levobupivacaine and hyperbaric bupivacaine both quickly and effectively induce surgical anesthetic for elective C-section procedures without having any negative effects on newborns, we would like to state as a conclusion to our study. Levobupivacaine and fentanyl together, however, offer a shorter motor block period, lower risk of side effects so they should therefore be the preferable choice for elective C-sections.

Recommendation:

Isobaric levobupivacaine 0.5% can be good alternative for hyperbaric bupivacaine 0.5% for elective caesarean sections.

Keywords: Hyperbaric bupivacaine, levobupivacaine, cesarean section, spinal anesthesia, Submitted: 2023-09-29, Accepted: 2023-09-29

1. Introduction.

For caesarean deliveries, spinal anesthesia is a frequent anesthetic method. For the surgeon to execute a caesarean section without inflicting pain or suffering on the patient, local anesthetics, opioids, or both, are injected into the spinal region to create weakness and numbness in the lower half of the body. The most widely used local anesthetic is bupivacaine, which has a lengthy half-life. Opioids like fentanyl, sufentanil, and morphine are occasionally used in conjunction with local anesthetics to enhance their effects. Isobaric and hyperbaric bupivacaine are the two types of bupivacaine that are commercially accessible. Total spinal anesthesia and hypotension are two negative effects of regional anesthesia for caesarean sections. The volume, concentration, and dosages of the medicine administered will all have an impact on this effect, though [1, 2]. Spinal anesthesia for Caesarean Sections (CS) is more frequently performed using 0.5% hyperbaric bupivacaine [3]. Although the use of hyperbaric local anesthetic solutions has a fantastic track record of safety, there are certain hazards involved [4-6]. Patients should get up quickly from a lateral or sitting position to prevent unilateral or saddle blocks, since this may cause the block to extend or return too soon. Due to the sympathetic block's extension following spinal anesthesia, hyperbaric solutions may result in a rapid cardiac arrest [7, 8]. When using isobaric solutions, positional sensitivity may be reduced. Because isobaric solutions are used because they have less sensitivity to position change, hyperbaric solutions may cause hypotension [9].

The L enantiomer of bupivacaine, levobupivacaine, now favored for anesthetic since it has fewer adverse cardiovascular effects and central nervous system damage [10]. Pregnant women's cerebrospinal fluid (CSF) has been demonstrated to be really isobaric to simple levobupivacaine [11]. Because of this feature, which could result in a more predictable spread, its use in this situation may offer specific benefits. When local anesthetics are combined with low doses of opioids during spinal anesthesia for CS, the frequency of side effects associated with local anesthetics is reduced, the time it takes for the anesthetic effect to take effect is sped up, and the quality of intra- and post-operative analgesia is improved by lowering the local anesthetic administered dose [12]. Fentanyl can be used for spinal anesthesia alone or in combination with local anesthetics to widen the sensory block and extend the duration of action [13]. Bupivacaine and fentanyl have been combined for lower limb surgery, inguinal hernia repair, and CS [14]. We wanted to investigate the starting point and duration of action, the degree of sensory and motor blocks, and adverse reactions in voluntarily cesarean patients using similar dosages of hyperbaric bupivacaine and levobupivacaine mixed with intrathecal fentanyl addition in spinal technique. The aim of this research is to evaluate the clinical results of patients undergoing lower segment cesarean sections (LSCS) who were given either levobupivacaine or hyperbaric bupivacaine as a spinal anesthetic medication.

2. Methods.

2.1. *Study Design, Setting, and Participants:*

This prospective, randomly assigned, double-blind study included 120 women who were scheduled for voluntary cesarean deliveries, had gestations longer than 37 weeks (about 8 and a half months), and were in ASA physical status I or II.

2.2. *Data Collection and Analysis:*

Followed by routine monitor (blood pressure, ECG, pulse oximetry). The average of the three recordings was used to compute baseline systolic blood pressure (SBP) and heart rate. The left lateral posture was used to position the patients. A 25-gauge Quincke spinal needle was used to do a lumbar puncture in the L3-4 interspace after cleaning the skin and injecting it with 2% lidocaine. The patients were split into two groups at

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random. The combinations of 10 mg levobupivacaine (0.5%) + 15 cg fentanyl for Group L patients (n = 60) and 10 mg hyperbaric bupivacaine (0.5%) + 15 cg fentanyl for Group B patients (n = 60) required 2.3 cc to administer. A facial mask was used to provide 4 L/min of oxygen. A short beveled 25-gauge needle and cotton swab were used to evaluate the sensory degree of spinal anesthetic bilaterally in the midclavicular line before the spinal injection, every minute for the first 15 minutes following the injection, and every 5 minutes until the treatment was complete. After attaining a T4-T6 level, permission was granted to carry out the procedure. We kept track of the times that the motor block started, when we got to Bromage 3, and when we completely vanished.

Pulse rates under 50 beats per minute were considered bradycardia, and atropine 0.6 mg IV was used to treat it. Treatment for hypotension, which was defined as systolic blood pressure < 90 mmHg or a reduction in systolic pressure of more than 30% from the baseline value, included IV boluses of 6 mg ephedrine and extra IV fluids. It was noted how much ephedrine was administered to each subject. The planned treatment included a 75 mg IV infusion of diclofenac during the surgical time. It was also noted whether perioperative analgesia was required and when the first rescue analgesic was needed. Other side effects, such as nausea and vomiting during and after surgery, were also noted.

3. Results.

In the current investigation, a total of 120 women were included. At the initial stage a number of 173 patients were examined for eligibility, however 53 patients were excluded from this study due to not being eligible. Patients scheduled for C-section under spinal anesthesia were given either plain levobupivacaine with fentanyl or hyperbaric bupivacaine with fentanyl to compare their analgesic effects. Between the two study groups, there was no statistically significant difference in the demographics or length of the procedure (Table 1).

While the duration of the sensory block and the time it took to reach T10 were both shorter in Group B, the duration of the regression of two dermatomes was longer. In comparison to Group L, the time it took for motor block to start in Group B was noticeably shorter. Hyperbaric bupivacaine was more frequently associated with hypotension and bradycardia, which affected 66% and 33% of the patients, respectively (Table 2).

4. DISCUSSION.

Levobupivacaine and hyperbaric bupivacaine combined with fentanyl generated equivalent levels of sensory blocking in this study's CS patients who were under spinal anesthesia, as well as mother hemodynamic and neonatal consequences. Fentanyl and levobupivacaine administered intrathecally resulted in less motor obstruction than hyperbaric bupivacaine.

Intrathecal opioids increase the effectiveness of neuraxial local anesthetics. These mixtures are typically linked to enhanced anesthesia and analgesia. Additionally, it permits the administration of extremely small amounts of local anesthetic, which helps to maintain more stable hemodynamics [15]. The first investigation on the intrathecal use of 0.5% levobupivacaine with fentanyl was published by Lee et al. [16]. They found that in spinal anesthesia for urological surgery, 2.3 ml of 0.5% levobupivacaine plus fentanyl (15 g) was just as effective as 2.6 ml of 0.5% levobupivacaine alone. Hemodynamic alterations and the level of sensory and motor blockage were not significantly different between the two groups [16]. SBP and diastolic blood pressure drops, as well as variations in heart rate, were within acceptable limits in the current investigation. In comparison to low-dose bupivacaine plus fentanyl, Erdil et al.'s [17] study found that low-dose levobupivacaine with fentanyl provided greater hemodynamic stability during spinal anesthesia. In patients receiving elective C-section with combined spinal-epidural anesthesia, Coppejans and Vercauteren [18] discovered that the three groups' hemodynamic values were equivalent, albeit levobupivacaine tended to improve systolic blood pressure and had a decreased occurrence of severe hypoten-

Table 1: **Demography**

	Group L	Group B
Age (yrs.)	24 ± 3.3	23 ±4.3
Weight (kg)	60 ± 10	62 ± 10
Height (m)	1.6 ± 0.5	1.6 ± 0.4
Gestation period	37 ± 0.6	38 ± 0.3
Surgical time	51 ± 8	53 ± 7.5

Table 2: **Side effects**

	Group L	%	Group B	%
Bradycardia	8	13.3	20	33.3
Shivering	4	6.6	0	0
Headache	4	6.6	8	13.3
Hypotension	16	26.6	40	66.6
Backache	4	6.6	0	0
Nausea	8	13.3	36	60
Itching	4	6.6	4	6.6
Vomiting	8	13.3	16	26.6

sion. When compared to hyperbaric bupivacaine in the current investigation, maternal hemodynamics were also steady with levobupivacaine.

In this study, the most frequent adverse reaction observed during spinal anesthesia in almost 50% of parturient (26.67% in levobupivacaine and 66.67% in bupivacaine) was hypotension. This is brought on by aortocaval compression during pregnancy, which causes displacement of the cerebral spinal fluid and engorgement of the epidural veins. This can lead to unintended cephalad extensions of the blockage, which can raise the risk of hypotension. In the current study, we preferred to administer 25 g of fentanyl together with 10 mg of 0.5% hyperbaric bupivacaine and levobupivacaine respectively for patients having C-section. In accordance with earlier investigations, levobupivacaine provided adequate and equivalent sensory blockage to bupivacaine but induced less motor blockade. Bupivacaine administered under hyperbaric conditions caused sensory block to begin more quickly and last longer in the current investigation, which is similar with the results of previous studies.

5. Conclusion.

Levobupivacaine and hyperbaric bupivacaine both quickly and effectively induce surgical anesthetic for elective C-section procedures without having any negative effects on newborns, we would like to state as a conclusion to our study. Levobupivacaine and fentanyl together, however, offer a shorter motor block period, lower risk of side effects such as bradycardia and hypotension, and improved hemodynamic stability, lowering danger and allowing for early mobility. Levobupivacaine and fentanyl should therefore be the preferable choice for elective C-sections.

6. Limitations.

The limitations of this study include a small sample population who were included in this study. The findings of this study cannot be generalized for a larger sample population.

7. Recommendation.

Isobaric levobupivacaine 0.5% can be good alternative for hyperbaric bupivacaine 0.5% for elective caesarean sections.

8. Acknowledgement.

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9. List of abbreviations.

LSCS- Lower Segment Caesarean Sections
ASA- American Society of Anesthesiologists
CS- Caesarean Sections
CSF- Cerebrospinal Fluid
ECG- Electrocardiogram
SBP- systolic blood pressure
IV- Intravenous

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11. Conflict of interest.

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