

Comparison of Different Bupivacaine and Fentanyl Combinations When Used with A Single Shut Spinal Block for Labor Analgesia

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Abstract

Background: Single-shot spinal analgesia with bupivacaine plus a short-acting opioid is an effective technique for pain control in labor, and it is particularly useful in the active phase. We compared the effects of adding two different doses of fentanyl (15 µg or 25 µg) to intrathecal bupivacaine, and to evaluate the impacts on duration of labor analgesia, newborn, and side effects.

Method: One hundred and five multiparous healthy women in advanced labor (cervical dilatation \geq 7 cm, and pain score $>$ 5), requesting labor analgesia were included in the study. They were randomly allocated into three groups. Group I received 2.5 mg bupivacaine; Group II received 2.5 mg bupivacaine plus 15 µg fentanyl; Group III received 2.5 mg bupivacaine plus 25 µg fentanyl intrathecally. The patients' demographic characteristics, hemodynamic parameters, pain scores (by using visual analogue scale - VAS), analgesic requirements, duration of analgesia (the time from intrathecal injection to the return of pain $>$ 4), fetal Apgar scores (at 1st and 5th min), and maternal and neonatal side effects were recorded. We used analysis of variance (ANOVA), post hoc test with Bonferroni adjustment, and chi-square test for statistical analysis; the analyses were performed using the SPSS-16 software. Given a significant level of 0.05, overall and pair-wise comparisons were made.

Results: The mean VAS scores were significantly lower in Group II than in the other two groups at 5, 15, 30 min, and 1 h ($P < 0.001$). There was no difference among Group I and Group III. The VAS scores were significantly higher in the Group III than in the other two groups at 2 ($P = 0.005$) and 3 h ($P < 0.001$). The incidence of adverse events was similar in all three groups. There was no difference in Apgar scores at 1 min, but Apgar score at 5 min was higher in Group 2 ($P = 0.02$).

Conclusion: In this study, we found that 2.5 mg of bupivacaine plus 15 µg fentanyl is more preferable option for SSA.

Keywords: Analgesia; Labor; Single shut spinal block; Fentanyl

Introduction

The combined spinal-epidural (CSE), and epidural techniques are considered as the most effective methods for providing labor analgesia. Single Shut Spinal (SSS) block is not routinely preferred due to its limited duration of action, but it is an effective method, especially in advanced stages of labor.

In our department, we prefer single dose spinal analgesia (SSA) with hyperbaric bupivacaine and fentanyl for pain control in advanced labor.

In this study, we aimed to compare the effects of adding two different doses of fentanyl (15 µg or 25 µg) to intrathecal bupivacaine, and to evaluate the impacts on duration of labor analgesia, newborn, and side effects.

After approval of the Local Ethics Committee of Zekai Tahir Burak Hospital, informed consent forms were obtained from each patients. This prospective, double-blinded, randomized study was performed from February 2015 to March 2016. 105 multiparous healthy women in advanced labor (cervical dilatation \geq 7 cm, and pain score $>$ 5),

American Society of Anesthesiologist (ASA) grade I, and consenting for labor analgesia were included in the study (Figure 1).

Patients with a history of allergic reactions to any study drug, with any contraindication to regional anesthesia, with pre-eclampsia, eclampsia, gestational hypertension, diabetes mellitus, cardiac problems or bleeding diathesis were excluded.

The patients were randomly allocated into three groups according to a computer-generated randomization table: Group I received 2.5 mg of bupivacaine, Group II received 2.5 mg of bupivacaine+15 µg fentanyl, Group III received 2.5 mg of bupivacaine+25 µg fentanyl intrathecally.

In our study, the patient as well as the anesthesiologist administering the drug did not know which drug was used. The drug was prepared by another anesthesiologist who was not directly involved in the study.

Before the initiation of analgesia, the following parameters: Maternal age, height, weight, gestational age, cervical dilatation, use of oxytocin and parity were recorded. Baseline pain score was assessed by using visual analogue scale (VAS) (VAS; 10 cm; 0=no pain and 10=worst imaginable pain) before the SSA. An intravenous (i.v.) access

was achieved in every parturient, and preloading was done with 10 ml/kg body weight of lactated Ringer's solution.

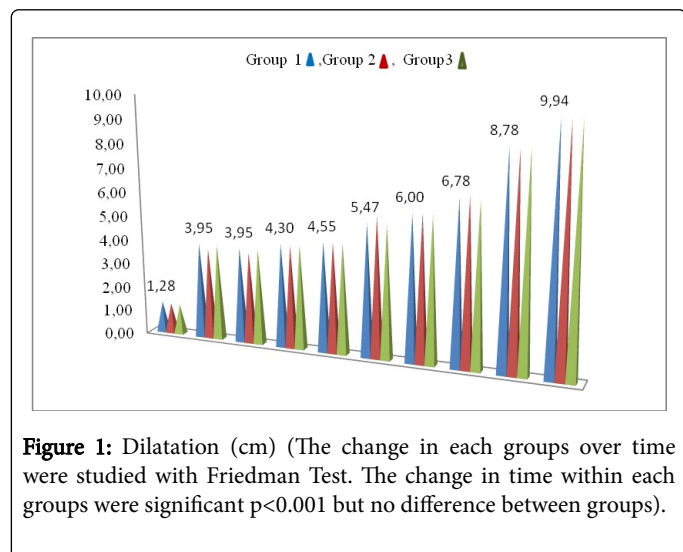


Figure 1: Dilatation (cm) (The change in each groups over time were studied with Friedman Test. The change in time within each groups were significant $p < 0.001$ but no difference between groups).

The SSA was performed with parturients in left lateral position, under all aseptic precautions at L2-L3 or L3-L4 level using a 25-gauge Whitacre spinal needle. After the correct position of the tip in the intrathecal space was confirmed by observation of free flow of cerebrospinal fluid (CSF), the prefilled study drug was injected intrathecally. The parturient was turned supine, and a wedge was placed under the right buttock to prevent aortocaval compression.

Maternal blood pressure, heart rate, respiratory rate, oxygen saturation were measured noninvasively by a blinded observer every 5 min, and recorded.

VAS were evaluated every 5 min and then every 30 min until the delivery. The duration of analgesia (the time from intrathecal injection to the return of pain > 4), and analgesic requirements were recorded. If the VAS score is 4 after spinal injection, 25 mg of pethidine is intravenously (i.v) administered.

Side effects, such as hypotension, nausea-vomiting, bradycardia, shivering, pruritus, tachycardia were also recorded and treated.

The weights of the newborns as well as one-minute and five-minute Apgar scores were recorded.

Results

A total of 105 laboring women were accepted and participated throughout the study. The demofigure data is shown in Table 1. The three groups were comparable in terms of demofigure variables, gestational age, cervical dilatation, oxytocin assisted, and membran ruptured.

The baseline VAS scores were not significantly different among the groups (Figure 1). In all patients, VAS scores were significantly lower at all time intervals compared to baseline. The mean VAS scores were significantly lower in Group II than in the other two groups at 5, 15, 30 min, and 1 h ($P < 0.001$). However; there was no difference among Group I and Group III. The VAS scores were significantly higher in the Group III than in the other two groups at 2 ($P = 0.005$) and 3 h ($P < 0.001$) (Table 2 and Figure 2).

	Group I (n=35)	Group II (n=35)	Group III (n=35)	P-value
Age (years), mean \pm SD	23,74 \pm 3.42	24,14 \pm 4.11	25.31 \pm 3.96	0.12
Height (cm), mean \pm SD	161,94 \pm 12.76	165,11 \pm 10.45	163.33 \pm 10.45	0.72
Weight (Kgs), mean \pm SD	76,05 \pm 6.34	74,51 \pm 8.12	72.64 \pm 7.87	0.41
Gestational age (weeks), mean \pm SD	38,71 \pm 1.13	39,43 \pm 1.04	38.24 \pm 1.36	0.07
Cervical Dilatation (cm), mean \pm SD	7,45 \pm 0.71	7,11 \pm 0.55	7.0 \pm 0.58	0.65
Oxytocin assisted, n (%)	16 (45.71 %)	17 (48.57 %)	15 (42.85 %)	0.81
Membrane ruptured, n (%)	9 (25.71 %)	8 (22.86 %)	10 (28.57 %)	0.78
Data were expressed as mean \pm standard deviation (mean \pm SD), or patient number and percentage (n, %).				

Table 1: The demographic details and obstetric parameters of the study groups.

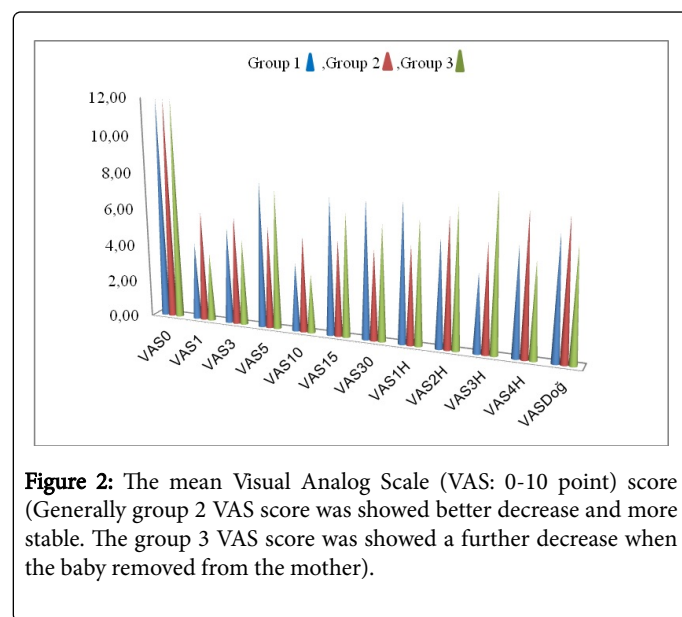


Figure 2: The mean Visual Analog Scale (VAS: 0-10 point) score (Generally group 2 VAS score was showed better decrease and more stable. The group 3 VAS score was showed a further decrease when the baby removed from the mother).

VAS	Group I (n=35)	Group II (n=35)	Group III (n=35)	P-value
Before Spinal	8,25 \pm 1.38	7,61 \pm 1.87	8.12 \pm 1.27	0.728
5 minutes	1,23 \pm 0.69	0,22 \pm 0.63	1.29 \pm 0.71	<0.001*
10 minutes	0,11 \pm 0.32	0,08 \pm 0.29	0.11 \pm 0.32	0.886
15 minutes	1.06 \pm 0.68	0.08 \pm 0.28	1.03 \pm 0.78	<0.001*
30 minutes	1.06 \pm 0.68	0.00 \pm 0.00	0.94 \pm 0.63	<0.001*
1 hours	1.11 \pm 0.83	0.22 \pm 1.01	1.03 \pm 0.78	<0.001*

2 hours	0.91 ± 1.52	0.92 ± 1.73	1.40 ± 1.09	0.005 #
3 hours	0.26 ± 0.61	0.28 ± 0.70	1.69 ± 0.83	<0.001 #

Data were expressed as mean ± standard deviation (mean ± SD), or patient number and percentage (n, %). VAS: Visual Analogue Scale. * VAS scores were significantly lower in Group II than the other groups (P<0.001). # VAS scores were significantly higher in the Group III than in the other two groups at 2 (P=0.005) and 3 h (P<0.001).

Table 2: The mean visual analog scale (VAS) score.

On comparing heart rates and mean blood pressure all groups showed changes over time, but there was no significant difference in the three groups.

The incidence of adverse events was similar in all three groups. There was no difference in Apgar scores at 1 min, but Apgar score at 5 min was higher in Group 2 (P=0.02) (Table 3).

	Group I (n=35)	Group II (n=35)	Group III (n=35)	P-value
Additional analgesic, n (%)	6 (%21)	3 (%8.57)	4 (%11.43)	0.73
Hypotension, n (%)	2 (%5.71)	2 (%5.71)	3 (%8.57)	0.64
Bradycardia, n (%)	1 (%2.86)	0	1 (%2.86)	0.68
Nausea/Vomiting, n (%)	1 (%2.86)	1 (%2.86)	3 (%8.57)	0.61
Pruritis, n (%)	3 (%8.57)	4 (%11.43)	4 (%11.43)	0.70
Apgar 1 minutes	7.85 ± 0.72	7.77 ± 0.47	7.88 ± 0.64	0.95
Apgar 5 minutes	9.92 ± 0.44	10.00 ± 0.00	9.85 ± 0.56	0.02*

Data are represented as mean ± SD or number (%). * P value <0.05; vs. Group II and Group III.

Table 3: Adverse events and Apgar scores.

Discussion

The mean VAS scores were significantly lower in Group II than in the other two groups at 5, 15, 30 min, and 1 h (P<0.001). Moreover; Apgar score at 5 min was higher in Group II.

The most commonly used neuroaxial block methods for labor analgesia are epidural and CSE, but SSA has some advantages, such as providing an effective and rapid analgesia. This method is popular due to its simplicity. Especially, the hospitals where are insufficient equipment and personnel like ours.

Tarek AbdElBarr et al. [1] concluded that single dose spinal analgesia is a good alternative to epidural analgesia in controlling labour pain, because spinal compared to epidural is more easy performed, faster, less expensive, and provide effective analgesia.

Minty et al. examines the safety and efficacy of single dose spinal analgesia for controlling labour pain, and they concluded that single-

dose spinal anaesthesia is useful alternative to epidural analgesia for appropriately selected patients [2]. The advantage of our study was that all pregnant women were multiparous and the cervical openings reached 6-7 cm when they arrived at the hospital. Therefore, the analgesia of a single dose of intrathecal injection provided adequate anesthesia until the baby was born [2-10].

Otokwala et al. showed that low dose spinal bupivacaine either alone or in combination with fentanyl is safe for labour analgesia, but the combination of bupivacaine (2.5 mg) with fentanyl (25 µg) provided much more prolonged pain relief [3].

Anabaha et al. suggested that low-dose intrathecal bupivacaine (2.5 mg), and intrathecal opioids (25 µg of fentanyl and 0.2 mg of morphine) can provide sufficient pain relief without reducing ambulation in labouring parturients [4].

Viitanen et al. studied 671 multiparous women who received spinal analgesia with low dose bupivacaine and fentanyl during labor, and they concluded that single-shot spinal block is an usable method of pain relief in multiparous women in active labour [5]. The combination of an opioid and a local anesthetic for intrathecal analgesia during labour has been well documented in previous studies across the world [8-10].

We, therefore, compared two different combinations of bupivacaine and fentanyl. In this study, we found that 2.5 mg of bupivacaine plus 15 µg fentanyl is more preferable option for SSA.

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