INTRATHECAL FENTANYL ADDED TO LIDOCAINE FOR CESAREAN DELIVERY UNDER SPINAL ANESTHESIA

- A Randomised Clinical Trial -

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Abstract

The addition of opioids to local anesthetics improves the analgesic potency of spinal analgesia. The purpose of this study was to evaluate the efficacy and safety of intrathecal fentanyl 15 μg when added to lidocaine 80 mg in patients undergoing Cesarean section under spinal anesthesia.

Forty healthy parturients scheduled for elective Cesarean section using 80 mg of 5% lidocaine were randomly allocated to additionally receive intrathecal fentanyl 15 μg or 0.9% saline, as control. Characteristics of spinal block, intraoperative quality of spinal anesthesia, side effects, time of first feeling of pain (complete analgesia) and time to first request of analgesics (effective analgesia) were assessed.

Duration of sensory block was prolonged in the fentanyl group ($p < 0.05$). The quality of intraoperative analgesia was also better. Incidence of side effects did not differ between groups. Duration of complete analgesia (140.2 ± 29.06 minutes vs 77.90 ± 20.21 minutes: $P < 0.001$) and effective analgesia (195.50 ± 34.06 minutes vs 98.05 ± 23.48 minutes: $P < 0.001$) were prolonged in fentanyl group.

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Adding fentanyl 15 μg to lidocaine 80 mg for spinal anesthesia for Cesarean section, improves the quality of intraoperative analgesia and increases the duration of analgesia in the early postoperative period without increasing maternal or neonatal side effects.

Key Words: Cesarean delivery, Spinal Anesthesia, Intathecal fentanyl, Lidocaine.

Introduction

Small doses of opioids administered directly into the cerebrospinal fluid (CSF) have been found to be very effective in controlling symptoms of pain in patients[1]. This technique has also been used to increase post operative analgesia and maternal satisfaction after Cesarean section[2].

Prolonged analgesia has to be balanced against some side effects, such as respiratory depression, nausea, vomiting and pruritis. Opioids are acceptable drugs for use intrathecally, and improve analgesic potency of local anesthetics with an synergetic effect, without increasing the sympathetic block, but an effective dose with minimal side effects has to be attempted[3].

Fentanyl, a short acting lipophylic opioid, is known to augment the quality of subarachnoid block. The addition of fentanyl to lidocaine increased the intraoperative and early postoperative quality of subarachnoid block for Cesarean section[4-8]. Use of intrathecal fentanyl in Cesarean section has become more popular in these years[9].

The principal objective of the present study was to evaluate the postoperative analgesic effects and characteristics of subarachnoid block of fentanyl 15 μg added to 80 mg lidocaine for Cesarean delivery.

Methods and Materials

The present prospectively designed study was approved by the Ethics and Clinical Studies Committee of Zahedan University of Medical Sciences, and informed and signed consent was obtained from all patients

enrolled in the study.

Forty full term women (ASA I, 50-75 kg), scheduled for elective cesarean section under spinal anesthesia were enrolled for a randomized clinical trial. Parturients who had obstetric complications or evidence of fetal compromise were excluded.

Participants were randomly allocated equally to either of fentanyl or control groups using a sealed envelope technique. Neither the anesthesiologist nor the patient were aware of the group assignment. All patients fasted over night and received premedication of ranitidine 150 mg orally the night before and 2 h prior to surgery.

After arrival in the operating room, intravenous access, 15 ml/Kg of Ringer solution was infused within 10 min before the initiation of spinal block. Spinal anesthesia was performed in the sitting position using 25 gauge Whitacre needle, in a midline approach at L4-5 interspace. Once free flow of CSF had been confirmed, the intrathecal anesthetic solution was injected over 15s. Aspirating CSF at the end of injection was done to confirm needle position. All patients received 80 mg of 5% lidocaine with an adjuvant of either 15 μg fentanyl (Fentanyl group), or (0.25 ml 0.9% saline) Control group. Following the intrathecal injection, patients were turned in supine position with left uterine displacement. Surgery was started when a sensory block up to T5 dermatome was attained.

The adjuvant solutions were prepared by a separated anesthetist who had no further involvement with patients.

Baseline maternal heart rate and arterial blood pressure were measured by an automatic non-invasive monitor and were recorded before induction, every 2 minutes before delivery, and every 5 minutes until discharge from recovery room. Hypotension (defined by a decrease in systolic blood pressure to less than 90 mmHg or less than 30 mmHg from baseline value, was treated with IV ephedrine 5 mg and incremented doses as required and additional Ringer solution. Maternal bradycardia (defined as heart rate less than 60 beats/min) was treated with IV atropine 0.5 mg. The nausea not related to hypotension or occurring, after the intervention for hemodynamic parameters, was treated with, midazolam 2

mg IV.

Assessments of sensory block to pinprick, using a small needle, were performed every one minute until 15 min after intrathecal injection and then every 15 min until regression to L5. Motor block was assessed 3 min after intrathecal injection using a modified Bromage scale (0 = no paralysis, 1 = unable to raise extended leg, 2 = unable to flex knee. 3 = unable to flex ankle). The Ramsey sedation score graded between 1 (anxious) and 6 (unarousable) were recorded.

Times of skin incision, delivery of baby and completion of surgery were recorded. The surgical technique was uniform for all patients. Apgar scores were obtained at 1 and 5 min.

The quality of intraoperative analgesia was judged by an investigator at the end of surgery as:

- Excellent (no discomfort or pain, not requiring additional analgesic).

- Good (mild pain not requiring additional analgesics).

- Fair (pain requiring additional analgesics), or

- Poor (moderate or severe pain requiring more than 100 μg fentanyl or general anesthesia).

The times of first feeling of pain and first request of analgesics were recorded.

On the first and second day after surgery, patients were evaluated for possible adverse effects, including pruritus, nausea, vomiting, headache and back pain. Anti-emetic and anti-pruritic were prescribed if needed.

Statistical tests were performed using SPSS 11 for Windows. Results were reported as absolute value, mean ± SD. Continuous variables were analyzed using Student's T test. Nominal or ordinal variables were analyzed by Chi square test and Fisher exact test or Mann-Whitney U test. $P < 0.05$ was considered statistically significant.

Results

No differences were noted between the Fentanyl and Control groups with regard to patient age, weight, gestational age and duration of surgery (Table 1).

Table 1
Patients characteristics and duration of surgery

Characteristics	Fentanyl (n = 20)	Control (n = 20)
Age (yr)	24.6 ± 7.3	25.8 ± 8.1
Weight (Kg)	62.3 ± 7.8	63.4 ± 6.8
Height (cm)	155.6 ± 3.7	157.2 ± 4.7
Gestational age (weeks)	38.3 ± 0.4	38.2 ± 0.3
Duration of surgery (min)	48.4 ± 11.2	46.6 ± 10.7

Data are expressed as mean ± SD.

Apgar score did not differ between those two groups, and all neonates had an Apgar score ≥9 at 5 min.

The subarachnoid puncture was achieved in the first attempt in all patients. The characteristics of spinal block are summarized in Table 2.

Table 2
Characteristics of spinal anesthesia

Characteristics	Fentanyl (n = 20)	Control (n = 20)	P value
Highest block	T3 (T1-T5)	T3 (T3-T5)	NS
Onset times (min)			
To T5	2.4 ± 0.6	2.7 ± 0.5	NS
Complete motor block	4.6 ± 0.6	3.7 ± 0.9	NS
Regression to T_{10}	136.7 ± 24.6	73.8 ± 19.4	0.00

Data are expressed as median ± SD.

All patients developed sensory block above T5 dermatome. The maximal height of sensory block was similar in both groups. All patients developed complete motor block of lower extremities (Bromage score 3). Regression to T10 was significantly prolonged in the Fentanyl group compared with Control group ($P < 0.001$).

Intraoperative analgesic supplementation was required in 4 (20%) patients in Control group compared with 0 (0%) patients in Fentanyl

group ($P < 0.05$).

The overall quality of intraoperative analgesia was better in the Fentanyl group as compared with Control group. The investigator rated the quality of analgesia good to excellent in 100% of patients in Fentanyl group and good in 80% of patients in Control group (Table 3) ($P < 0.05$).

Table 3

The judgment of investigator for intraoperative analgesia

Quality of intraoperative analgesia	Fentanyl n = 20	Control n = 20
Excellent	19 (95)	11 (55)
Good	1 (5)	5 (25)
Fair	0 (0)	4 (20)
Poor	0 (0)	0 (0)

Data are expressed as n(%).

Duration of complete and effective analgesia was significantly longer in Fentanyl group compared with the Control group ($p < 0.001$) (Table 4).

Table 4

Efficacy of spinal anesthesia

Characteristics	Fentanyl (n = 20)	Control (n = 20)	P value
Duration of complete analgesia (min)	140.2 ± 29.06	77.90 ± 20.21	0.00
Duration of effective analgesia (min)	195.50 ± 34.06	98.05 ± 23.48	0.00

Data are expressed as mean ± SD.

The incidence of hypotension (60% v 65%), mean dose of ephedrine administered (8.5 ± 5.2 vs 9.1 ± 5.7) and bradycardia (5% vs 10%) did not differ between the two groups (Table 5).

There were no recorded episodes of respiratory depression (respiratory rate of les than 10 bpm) in any patient during surgery and in the recovery room.

Nausea and vomiting during surgery did not differ between the two groups.

The sedation score ≥3 was seen in 80% of patients in Fentanyl group versus 20% of patients in Control group ($p < 0.001$).

Pruritus or postdural headache or backache was not seen in any patient in the time or two days after surgery (Table 5).

Table 5

Comparison of side effects between the Fentanyl and the Control groups

Side effects	Fentanyl (n = 20) mean ± SD	Control (n = 20) mean ± SD	P value
Hypotension	12 (60)	13 (65)	NS
Bradycardia	1 (5)	2 (10)	NS
Respiratory depression	0 (0)	0 (0)	NS
Nausea	4 (20)	5 (25)	NS
Pruritus	0 (0)	0 (0)	NS

Data are expressed as n (%).

Discussion

The present study demonstrated that the addition of Fentanyl to lidocaine produced better quality of intraoperative analgesia and increased duration of complete and effective analgesia, as compared to the Control group. Patients undergoing cesarean section under spinal anesthesia may benefit from the co-administration of local anesthetic and opioid agents because of improved intraoperative comfort[10], apparent prolongation of spinal analgesic action[11], and reduction of post operative requirements of additional analgesia[12].

Intrathecal fentanyl has been shown to improve intraoperative analgesia in dose ≥6.25 μg[4]. The addition of fentanyl to hyperbaric bupivacaine or lidocaine increases the intraoperative and early postoperative quality of subarachnoid block for cesarean delivery[7,8].

Other studies have shown that adding 15 μg and 25 μg fentanyl, produce longer postoperative analgesia[13,14]. These studies seem to indicate that in order to maximize postoperative analgesia and minimizing respiratory depression and pruritus, a dose of 20 μg would appear to be optimal.

In our study, fentanyl increased the duration of complete analgesia by approximately 62 min and duration of effective analgesia by approximately 97 min when compared with control group. This prolongation is similar to that reported for bupivacaine/fentanyl mixture[7].

A systemic review of intraoperative analgesia identified that approximately 24% of patients who received only hyperbaric bupivacaine experience unacceptable levels of discomfort during spinal anesthesia for Cesarean section[10]. The addition of opioid to local anesthetic attenuate this effect[15].

In our investigation the onset time and maximum height of sensory block did not differ in the Fentanyl and Control groups, although intrathecal fentanyl prolonged the recovery of sensory block a compared with lidocaine alone. In addition, no patient in the Fentanyl group needed analgesia intraoperatively in contrast to 20% of patients in Control group. These results are similar to other studies reported previously[16].

Addition of fentanyl to intrathecal local anesthetic for Cesarean delivery has been reported to provide protective effect with regard to nausea and vomiting[7,8], although not confirmed by other studies[5,6]. In our study, the incidence and severity of nausea in the intraoperative and postoperative periods were similar in both groups. In contrast to previous studies[4,5], pruritus was found to be of low incidence. This may be attributed to the smaller dose of fentanyl used in our studies as compared with others[6,17].

Respiratory depression is associated with the use of intrathecal narcotics[18]. Previous reports have demonstrated that patients undergoing Cesarean section exhibit a degree of resistance to the respiratory depression effects of intrathecal opioid[19]. Our study showed that intrathecal fentanyl with a dose of 15 μg was not associated with a respiratory depression effect, and this in agreement with other studies[11,13,20].

The condition of neonates was good and similar in both groups, and similar to that already reported[16,21].

In conclusion our study has shown that the addition of Fentanyl 15

μg to lidocaine 80 mg, for spinal anesthesia for Cesarean section, improves the quality of intraoperative analgesia and increases the duration of analgesia in the early postoperative period, without increasing maternal or neonatal side effects.

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