

## Neuraxial block versus general anaesthesia for cesarean section: post-operative pain scores and analgesic requirements

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### Abstract

**Objective:** To evaluate the suitability of spinal and general anaesthesia for cesarean section.

**Methods:** The prospective, double-blinded study, done between March and December 2009, at Central Education and Research Hospital, Erzurum, Turkey, involved 60 patients undergoing elective cesarean surgery. They were grouped according to the kind of anaesthesia, with each group having 30 patients each. Post-operative pain scores, opioid requirement, side effects and patient satisfaction were compared through statistical analysis using SPSS version 10.

**Results:** Patient demographics were similar in both groups. Patients in the general anaesthesia group consumed  $638.4 \pm 179.1 \mu\text{g}$  fentanyl, while patients in the spinal anaesthesia group consumed  $356.3 \pm 87.1 \mu\text{g}$ . The number of patients requiring opioid via Patient Controlled Analgesia in the first 24 hours was significantly higher in the general anaesthesia group. Patient satisfaction was significantly higher in the spinal anaesthesia group.

**Conclusion:** Type of anaesthesia for elective cesarean section is important to provide sufficient post-operative analgesia and patient satisfaction.

**Keywords:** Analgesia, Post-operative pain, Cesarean delivery, Fentanyl (JPMA 62: 441; 2012).

### Introduction

Many surgical procedures can be performed with General Anaesthesia (GA) or neuraxial anaesthesia. The choice of anaesthetic technique depends on patient characteristics and risks of the anaesthetic techniques.<sup>1</sup> GA is both essential and quicker method in emergency surgeries, but regional anaesthesia is the most commonly used method for elective procedures.<sup>2</sup> Cesarean delivery is a common obstetric surgery that can be performed by neuraxial or general anaesthesia. Fentanyl, as a potent opioid, is commonly used to prevent post-operative pain after surgical procedures. Traditionally, fentanyl is administered via oral, IM, IV or transdermal ways. Because of its high lipid solubility, resulting in rapid onset of analgesia, a low incidence of side-effects and a low risk of delayed respiratory depression, fentanyl is frequently preferred.<sup>3</sup> Patient Controlled Analgesia (PCA) method is widely used for post-operative pain management. It allows patients to self-administer small pre-determined doses of analgesic medication within the limits prescribed by their physicians, resulting in improved pain relief, avoidance of over and under-medication, and greater patient satisfaction.<sup>4</sup> This study was conducted to compare post-operative pain scores and

analgesic requirements for both anaesthesia techniques in patients undergoing cesarean delivery. The effectiveness was evaluated by comparing post-operative analgesic needs and side-effects.

### Patients and Methods

The protocol for this randomised, prospective, double blinded study was approved by the regional ethics committee. After written informed consent, 60 patients undergoing elective cesarean surgery were enrolled between March and December 2009 in Central Education and Research Hospital, Erzurum, Turkey. Exclusion criteria had multiple factors: contraindications to neuraxial blockage (patient refusal, coagulation defects, intracranial masses, use of acetyl salicylic acid in the preceding 10 days, skin infection on interspace location, lumbar disc hernia, peripheral neuropathy), allergy to local anaesthetics or opioids, history of chronic pain, American Society of Anaesthesiologists (ASA) physical status grade more than III, inability to understand how to use the PCA device, and age below 18 years. All surgical procedures were performed by one of two surgeons. The anaesthetists who collected the data were not aware of the patient groups. Patients were monitored through finger pulse

oximetry, electrocardiogram and non-invasive blood pressure readings in the operating room. The patients were randomly assigned to receive either spinal anaesthesia (Group SA, n=30) or general anaesthesia (Group GA, n=30). For an  $\alpha$  of 0.05 and 90% power, 30 patients in each group were needed to reveal a significant decrease in total analgesic requirements and VAS scores between two groups, assuming that 30% reduction on the two counts in previously performed studies.

All patients in Group GA were premedicated with atropin 0,5 mg im. The use of the PCA system and the standard visual analogue scale (VAS) for pain was explained to the patients the day before the operation. VAS=0 would mean 'No pain,' and VAS=100 would mean 'Worst possible pain imaginable'.

The patients in Group SA were also informed about the regional anaesthesia procedure. Spinal anaesthesia was performed through the lumbar 4-5 or lumbar 3-4 interspace using a 25-gauge sharp Quincke needle (Excel Int, 72 mm) in sitting position. Each parturient received an intrathecal injection of 1.8 ml 0.5% isobaric bupivacaine with 20  $\mu$ g fentanyl. Intravenous fluid preloading was used by crystalloid solutions to reduce the frequency of maternal hypotension simultaneously with the spinal anaesthesia procedure. We discharged the patients in Group SA from the recovery room when the sensory analgesia decreased to T12 level. However, we did not wait until the regression of motor blockade. GA was induced by thiopental 5 mg kg<sup>-1</sup>, atracurium 0.5 mg kg<sup>-1</sup> and inhalation of 1% Sevoflurane, 50% nitrous oxide in oxygen. After the baby was extracted, fentanyl 2  $\mu$ g kg<sup>-1</sup> was given iv and anaesthesia was maintained with 1.5% sevoflurane in oxygen-nitrous oxide (FIO<sub>2</sub> = 0.5). Isotonic saline was used for intra-operative fluid maintenance.

Post-operatively, the patients received boluses of 20 $\mu$ g fentanyl, a lockout interval of 10 minute without infusion rate. For the PCA, 1 mg of fentanyl was diluted in 100 ml of isotonic saline. Pain scores were then recorded using VAS at rest and during motion for two days following the surgery. The patients in Group SA began to receive medication via PCA when they felt pain.

The intensity of pain was assessed at 0, 1, 2, 4, 8, 12 and 24 hours on the 100-point VAS. The record of pain scores were then noted. If the VAS score was more than 30, the physician incharge could give 2cc bolus via PCA, without changing the bolus dose and lockout interval. Time to first analgesia requirement and side-

effects like pruritus, nausea and vomiting were recorded: 0= no episode; 1= at least one episode.

Nausea and vomiting were treated with metoclopramide 10 mg iv. Pruritus was treated with diphenhydramine 25mg iv. All patients were questioned at the end of the 24th hour if they would accept the same anaesthetic procedure in future. The answers and the related reasons were noted and accepted as the criteria for satisfaction.

Statistical Package for Social Sciences (SPSS) for Windows 10.0 programme was used for statistical analysis. The values were expressed as mean  $\pm$ SD. Independent samples t-test was used for comparison between the groups for normal distributed parameters, while Wilcoxon test was used for non-normal distributed parameters. A p<0.05 was considered significant.

All patients were interviewed about the satisfaction on the first post-operative day by a blinded interviewer. Complaints and observations about the anaesthesia technique were noted.

## Results

The study had 61 patients who underwent elective cesarean operation, with 31 requesting spinal anaesthesia. One patient in the group was excluded from the analyses because of failure to perform the block. The parturient was given an intra-operative bolus of propofol and muscle relaxant. This left 30 patients in Group SA to match the 30 in Group GA.. Patients' age, weight, height, ASA physical status and operating room time were similar between the groups (Table). There were no major anaesthetic or surgical complications. Less postoperative fentanyl was required in the SA group than the GA group. The GA group consumed 638.4 $\pm$ 179.10 $\mu$ g fentanyl compared to 356.3 $\pm$ 87.1 $\mu$ g by Group SA (Figure-1) (P<0.001). The number of patients requiring opioids within the first 24 hours was significantly higher in the GA group: 27 (90%) in GA against 18 (60%) in the SA (Figure-2). Besides, 44.0 $\pm$ 26.5  $\mu$ g fentanyl was consumed additionally by GA group and 20.7 $\pm$ 19.3 $\mu$ g by

**Table: Patient demographics and duration of surgery (Values are mean).**

	Group SA	Group GA	p
Age (year)	27.4 $\pm$ 5.3	27.2 $\pm$ 6.0	0.892
Weight (kg)	74.5 $\pm$ 9.2	77.3 $\pm$ 8.1	0.220
Height (cm)	163.4 $\pm$ 4.3	163.7 $\pm$ 4.6	0.772
Duration of surgery (min)	30.8 $\pm$ 8.3	30.9 $\pm$ 6.3	0.958
ASA Grade	74% ASA1, 26% ASA2	82% ASA1, 18% ASA2	

Group GA (n=30): general anaesthesia group, Group SA (n=30): spinal anaesthesia group. ASA: American Society of Anaesthesiologists.

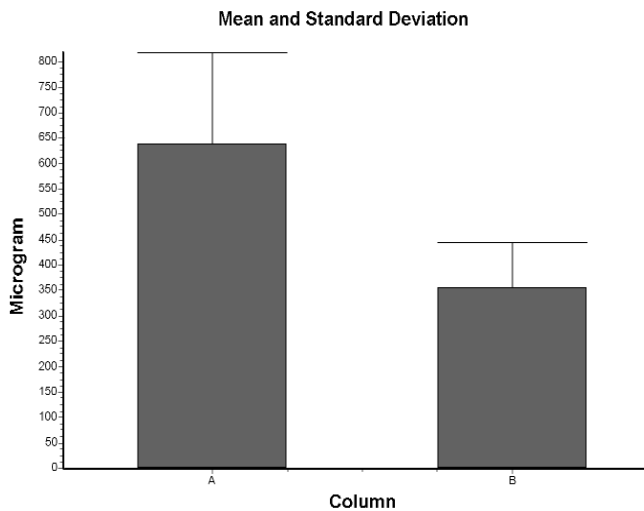
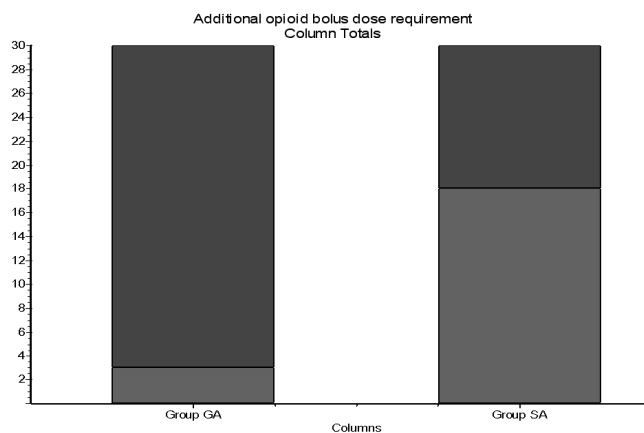


Figure-1: Total post-operative fentanyl consumption of groups (Values are mean).



The patients in the dark area had post-operative additional bolus dose of fentanyl. Group SA (n=30): spinal anaesthesia group, Group GA (n=30): general anaesthesia group. PCA: Patient Controlled Analgesia.

Figure-2: The number of patients who required additional opioid dose via PCA.

the SA group ( $P < 0.001$ ). The patients received the bolus dose via PCA when VAS score was above 30. Post-operative pain was compared at 1, 2, 4, 8, 12 and 24 hours after surgery. Pain scores in the post-operative period were lower in the SA group compared with the GA group. Pain scores differed significantly between groups at 4th hour ( $p = 0.032$ ), 8th, 12th and at the 24th hour ( $p < 0.05$ ). Post-operative nausea and vomiting scores were similar for the groups. Three SA patients complained of time-limited itching. Antiemetics were necessary for two GA patients. The time of first analgesic requirement was

also significantly shorter for the GA group compared to the SA group ( $p < 0.05$ ). All patients from both groups received paracetamol 1g iv post-operatively every six hours as an additional analgesic.

In the SA group 28 patients were pleased by the technique. One complained about the difficulty of pre-operative respiration and was provided oxygen support by facemask. One complained about the length of the motor blockade. However, it took almost 4 hours. In the GA group, 12 reported that they would choose SA next time. Five said they wanted to see the surgical procedure or hear the first cry of their baby. The others complained about the pain they had felt in the recovery room.

## Discussion

General and regional anaesthesia techniques have been used widely for cesarean surgeries. Regional anaesthesia techniques reduce post-operative morbidity and mortality. Neuraxial anaesthesia for cesarean section seems to be associated with shorter duration of hospital stay than GA.<sup>5</sup> Spinal anaesthesia also has economic advantages over GA.<sup>6</sup> Failed intubation and aspiration of gastric contents in parturients with GA are other factors favouring regional anaesthesia. On the other hand, GA is associated with an increased need for neonatal resuscitation.<sup>2</sup> In the light of these factors, GA is recommended only for emergency cesarean section and when regional anaesthesia is contraindicated.<sup>7</sup> SA is not only a safe and low-cost method for cesarean delivery, it is also accepted as safe and useful for different types of surgeries. The use of GA for cesarean section has decreased and the use of spinal anaesthesia has become more widespread. However, GA was still used for 12.6% of cesarean deliveries across all levels of hospitals.<sup>2</sup>

In two different randomised, prospective studies, the observers found that laparoscopic cholecystectomy under spinal anaesthesia is associated with an extremely low level of post-operative pain, better recovery and lower cost than general anaesthesia.<sup>8,9</sup> Our results were similar in respect with post-operative pain scores. Although high sensorial levels after spinal anaesthesia could be needed for laparoscopic cholecystectomy, T10-T12 sensorial levels were mostly enough for cesarean surgery. Patients' assessment of sensory levels after SA changed within the range of T4 to T12 in this clinical trial. In the previously published retrospective study by Fassoulaki et al.<sup>5</sup> comparing general ( $n = 582$ ), epidural ( $n = 423$ ), and combined spinal and epidural (CSE) ( $n = 614$ ) anaesthesia for cesarean section in patients, neuraxial anaesthesia for cesarean section was associated with shorter duration of hospital stay than GA. In our study, patient satisfaction was higher in the

SA group, but this result did not affect the discharge rates from the hospital, with the SA group on an average taking 28 minutes longer discharge time.

We started to collect the data post-operatively. The patients in the GA group received a bolus dose of 1  $\mu\text{g kg}^{-1}$  fentanyl immediately after the surgical procedure in the recovery room. We waited for the first time when patients required analgesics. However, the patients in SA group started to receive an analgesic via their PCA when they first felt pain and subsequently whenever they had a VAS value over 30.

Intrathecal fentanyl with bupivacaine provided effective SA. As we had a long post-operative period without analgesics in the SA group, opioid requirement and the side-effects related to opioid consumption were lower. The efficacy of fentanyl was also evaluated in this setting. Several randomised, prospective clinical trials with different concentrations of fentanyl, such as 25  $\mu\text{g}^{10}$  or with different type of opioids like morphine<sup>11</sup> can be planned. We used paracetamol as an additional analgesic in order to applicate multi-modal analgesia. Multi-modal analgesia was needed for acute post-operative pain management in order to reduce opioid consumption and adverse effects of opioid analgesics. The dose of iv paracetamol was arranged as 15 mg  $\text{kg}^{-1}$  and the mean values for weight were pregnant weights.

In a review from cochrane database of systemic review with 16 studies and 1586 women,<sup>12</sup> patient satisfaction with GA was higher. More women preferred to have GA for subsequent procedures when compared with epidural or spinal anaesthesia. In our setting, regional block was performed by anaesthetists who had 8 years of clinical experience. The SA procedure, as such, was simple and the satisfaction was higher for the patients.

### Conclusion

The SA group in the study had better post-operative

parameters compared to the GA group. Spinal anaesthesia provided sufficient post-operative analgesia, allowing the mother to have more liveliness and comfort. Further studies can be planned to compare the post-operative pain scores and patient satisfaction following neuraxial anaesthesia or general anaesthesia with different opioids when used via PCA technique. These two anaesthesia techniques can also be studied for different types of surgeries.

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