

An Epidural Initial Dose is Unnecessary in Combined Spinal Epidural Anesthesia for Caesarean Section

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Abstract

Combined spinal epidural anesthesia is widely used for Caesarean section. Bolus administration of an epidural initial dose introduces the risk of drug flux from the epidural space to the subarachnoid space, and the volume effect of the initial dose may cause epidural top-up and extension of subarachnoid blockade. These problems may be avoided if the initial dose is not administered. This study investigated whether epidural continuous infusion without an initial dose (continuous group) can decrease postoperative pain as well as an epidural continuous infusion with an initial dose (initial dose group). Sixty-one patients undergoing elective Caesarean section were randomly assigned to the initial dose group or the continuous group. Twenty patients undergoing emergency Caesarean section with spinal anesthesia (spinal group) were also investigated to confirm that epidural block is effective for postoperative pain. Data in this study were obtained retrospectively from each patient's records. Between the initial dose group and the continuous group, there was no significant difference in the number of times flurbiprofen or pentazocine were used for postoperative pain relief. However, the number of times that pentazocine was used was significantly higher in the spinal group than in other groups. This finding suggests that an epidural initial dose is unnecessary for postoperative pain relief in combined spinal epidural anesthesia for Caesarean section.

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Key words: combined spinal epidural anesthesia, Caesarean section, initial dose

Introduction

Spinal anesthesia is frequently used for Caesarean section, and the use of combined spinal epidural anesthesia (CSEA) has become widespread over the past several years. One advantage of CSEA is that it facilitates the use of epidural analgesia for

postoperative pain relief. Continuous epidural analgesia now plays an important role in postoperative pain control¹. In the standard continuous epidural infusion technique, the initial dose is administered to establish that an adequate extent of analgesia can be expected. However, CSEA involves intentional dural puncture followed by epidural drug administration. Therefore, the

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initial dose introduces the risk of drug flux from the epidural space to the subarachnoid space, which may alter the characteristics of the block²⁻⁴. Furthermore, the volume effect of the initial dose may cause epidural top-up and extension of the subarachnoid blockade^{5,6}. These problems may be avoided if the initial dose is not used.

Recently, 0.5% bupivacaine has been widely used for spinal anesthesia, and 0.2% ropivacaine has been frequently administered for continuous epidural analgesia to decrease postoperative pain. These drugs are longer-acting than the drugs used previously⁷.

We hypothesized that the epidural initial dose is unnecessary to confirm an adequate extent of analgesia. Because longer-acting drugs are being used, we considered that until the analgesia of spinal anesthesia disappeared, epidural continuous infusion without an initial dose could spread widely in epidural space to obtain adequate postoperative pain relief. Therefore, this study investigated whether epidural continuous infusion without an initial dose can decrease postoperative pain as well as epidural continuous infusion with an initial dose decreases postoperative pain.

Patients and Methods

The subjects were patients who were scheduled to undergo elective or emergency Caesarean section at Katsushika Japanese Red Cross Maternity Hospital where anesthesiologists from the Department of Anesthesia, Nippon Medical School, are dispatched. After approval was received from the ethics committee of the hospital, 61 patients with American society of anesthesiologists (ASA) I~II undergoing elective Caesarean section with CSEA from December 2004 through March 2005 were assigned to either the initial dose group or the continuous group. The spinal group consisted of 20 ASA IE~IIE patients undergoing emergency Caesarean section with spinal anesthesia to confirm that epidural block was effective for controlling postoperative pain. How the epidural initial dose and epidural continuous infusion were administered was left to the attending anesthesiologist in each case.

Data in this study were obtained retrospectively from patient's records.

Patients who did not receive epidural anesthesia throughout the operation to manage surgical pain but did receive epidural continuous infusion of 0.2% ropivacaine at a rate of 3 ml/hr participated in this study. We divided these patients into two groups depending on whether they had received an epidural initial dose. The initial dose group included 30 patients who received 5 ml of 0.2% ropivacaine as an initial dose just before the start of epidural continuous infusion. The continuous group included 31 patients who did not receive an initial dose before the start of epidural continuous infusion.

Before arriving in the operating room, all patients received from 500 to 1,000 ml of i.v. preload with lactated Ringer's solution and 5% glucose solution. They were premedicated with ranitidine, 20 mg i.v., and metoclopramide, 10 mg i.v.. In the operating room, standard monitoring was applied, including continuous pulse oximetry, electrocardiogram, and noninvasive arterial pressure.

Patients undergoing elective Caesarean section (initial dose group and continuous group) underwent placement of an 18-gauge epidural catheter at the Th11-12 or Th12-L1 interspace in the right lateral position using the paramedian approach. An epidural test dose of 2 ml of 1% lidocaine was injected through the catheter. Spinal anesthesia was performed sequentially with a 25-gauge Quincke-tipped needle at the L2-3 or L3-4 interspace, and 2.2 to 2.5 ml of 0.5% hyperbaric bupivacaine was injected intrathecally. Patients undergoing emergency Caesarean section received spinal anesthesia (spinal group) with a 25-gauge Quincke-tipped needle at the L2-3 or L3-4 interspace, and 2.2 to 2.5 ml of 0.5% hyperbaric bupivacaine was injected intrathecally with the patient in the right lateral position.

After receiving spinal anesthesia, all patients were placed in the supine position. Surgery was started after the level of the spinal block was checked. Vasopressor and infusion solutions were used appropriately. Patients with a low spinal block were treated with epidural bolus infusion of 2% mepivacaine and excluded from the study. Patients

Table 1 Demographic Data of the Patients and Operation Time

	initial dose group	continuous group	spinal group
n	30	31	20
Age, yr	33.5 ± 4.1	32.5 ± 5.0	31.4 ± 5.0
Height, cm	157.3 ± 6.0	156.3 ± 5.5	154.7 ± 4.4
Body weight, kg	63.3 ± 10.2	63.2 ± 8.8	59.0 ± 4.9
Operation time, min	30.4 ± 8.0	31.8 ± 6.9	34.9 ± 9.9

Values are presented as mean ± SD or n.

were awake throughout surgery. Nausea and vomiting were treated with droperidol, 1 mg intravenously.

In the continuous group, 3 ml/hr of 0.2% ropivacaine was started for epidural continuous infusion about 10 minutes before the end of surgery. In the initial dose group, 5 ml of 0.2% ropivacaine was injected as an initial dose through the epidural catheter about 10 minutes before the end of surgery, after which epidural continuous infusion of 3 ml/hr of 0.2% ropivacaine was started sequentially.

Postoperative pain was treated by the attending obstetrician with flurbiprofen axetil, 50 mg, and 50 ml of saline i.v. as a first choice. If the flurbiprofen axetil, 50 mg, was not effective, pentazocine, 15 mg, and 50 ml of saline were selected as a second choice. The severity of postoperative pain was evaluated on the basis of type of medicine administered and how many times it was used. Epidural continuous infusion was 100 ml of 0.2% ropivacaine, and the infusion rate was at a fixed rate of 3 ml/hr and lasted about 33 hours.

Statistical Analysis. Demographic data of patients are presented as mean ± SD. The frequency of flurbiprofen axetil or pentazocine use is presented as median ± quartile deviation (QD). The Wilcoxon signed rank test was used to detect differences between two groups, and the Kruskal-Wallis test was used to detect differences among three groups.

Results

Eighty-one patients were enrolled in the study. There were no significant differences among the three groups in demographic data or operation time (**Table 1**).

The numbers of times flurbiprofen axetil and

pentazocine were used were 2.5 ± 1.5 (median ± QD) and 0.0 ± 0.0 (median ± QD), respectively, in the initial dose group and 3.0 ± 0.5 (median ± QD) and 0.0 ± 0.0 (median ± QD) in the continuous group (**Fig. 1, 2**). There was no significant difference between the two groups.

However, the numbers of times flurbiprofen axetil and pentazocine were used were 2.5 ± 0.5 (median ± QD) and 0.0 ± 0.5 (median ± QD), respectively, in the spinal group (**Fig. 1, 2**). There were no significant differences among the three groups with respect to the number of times flurbiprofen axetil was used. However, the number of times that pentazocine was used was significantly higher in the spinal group than in the two epidural groups ($P=0.03$) (**Fig. 2**)

Discussion

Epidural bolus dosing can cause local anesthetics to spread to the epidural space. Yokoyama et al.⁸ and Ueda et al.⁹ have shown that the mode of spread through the epidural space differs between bolus dosing and continuous infusion. In the present study, there were no differences between the initial dose group and the continuous group with regard to postoperative pain. We speculate that a possible cause of this result is that the epidural initial dose may have decreased the analgesic effects during the remaining period of spinal analgesia. The diminution of analgesia is characterized by a reduction in the number of blocked spinal segments. Spinal analgesia with 0.5% bupivacaine persists for 3 or 4 hours, and the effect of the epidural initial dose may disappear within this interval.

However, the phenomenon may also be considered inversely: epidural continuous infusion without an initial dose may spread the requisite extent of

Frequency of Flurbiprofen axetil

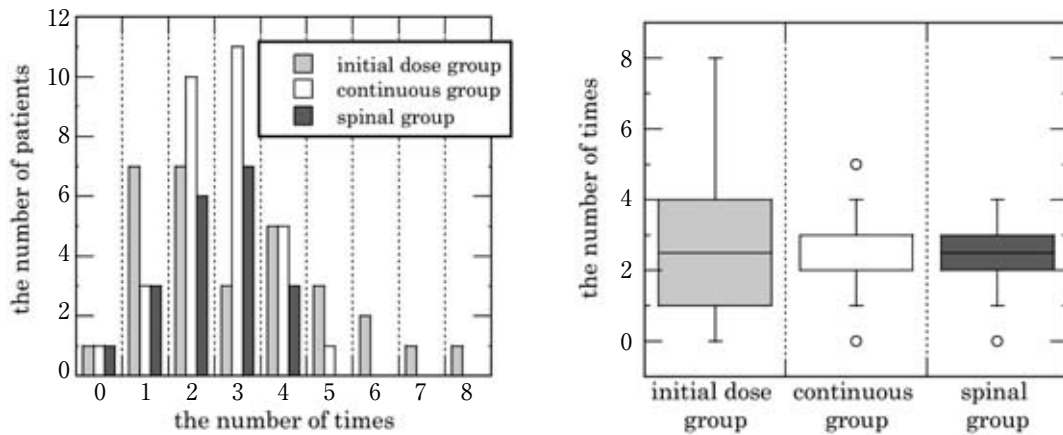


Fig. 1 Bar graph and boxplot of the frequency of flurbiprofen axetil use. In the boxplot, the length of the box shows the interquartile range, the bar in the box shows the median, and the open circles show the outliers. There was no significant difference among the three groups.

Frequency of Pentazocin

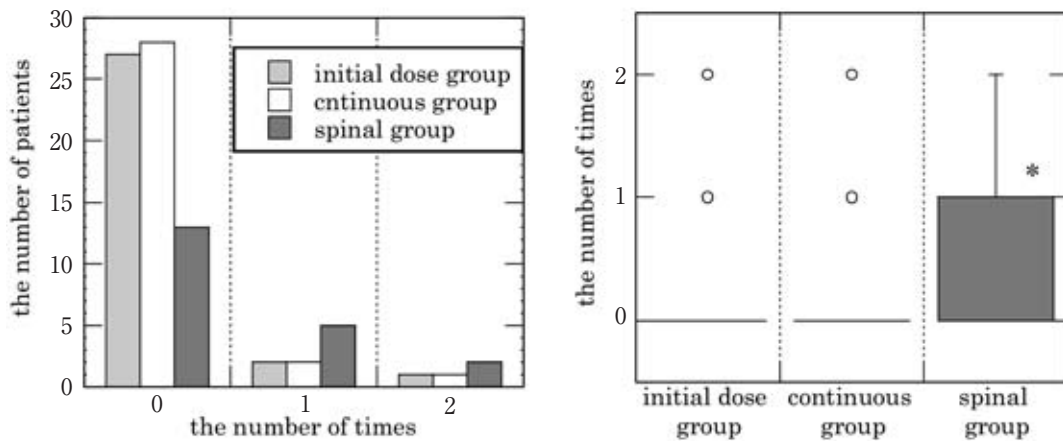


Fig. 2 Bar graph and boxplot of the frequency of pentazocin use. In the boxplot, the length of the box shows the interquartile range, the bar in the box shows the median, and the open circles show the outliers. There was no significant change between the initial dose group and the continuous group. * The frequency of pentazocin use in the spinal group was significantly greater than that in the initial dose group or the continuous group ($P < 0.05$).

analgesia within the period that spinal analgesia acts. Ropivacaine acts for 4 or 5 hours. This prolonged action may maintain an adequate extent of analgesia in the continuous group similar to that in the initial dose group. It is not clear which explanation is correct, but both epidural groups had less postoperative pain than did the spinal group. In this study a spinal block was performed before epidural blockade. Thus, the spread of the epidural initial dose is unknown.

In this study, subarachnoid block levels had

reached above Th6 preoperatively, and surgery began after drug injection to induce spinal anesthesia about 5 minutes later. Therefore, the level of anesthesia may have risen higher during surgery. Operation times of Caesarian section averaged 30 minutes (**Table 1**). The epidural initial dose was injected about 20 to 30 minutes after spinal anesthesia was finished. Because the intervals between spinal anesthesia and the epidural initial dose were short, epidural top-ups might occur in CSEA, although it is undesirable for the level of

anesthesia to rise more than this. So, episodes of hypotension and breathing difficulties might have occurred after administration of the initial dose. To treat these episodes safely, the initial dose was administered 10 minutes before the end of surgery. Therefore, it was safer to not administer an epidural initial dose, if postoperative pain relief was equal to the initial dose group. Unfortunately, there was insufficient data on the subarachnoid block level at the end of surgery. As for the heart rate and blood pressure intraoperatively, there was no apparent effect of anesthesia or any correlation between the volume of blood loss and the quantity of infusion solution.

Epidural analgesia with continuous infusion has commonly been induced with a local anesthetic combined with opioids to increase the degree of pain relief. However, the adverse effects of opioids can cause complications¹⁰. Myint et al. have reported cardiopulmonary arrest after Caesarian section under needle-through-needle CSEA¹¹. The possibility of opioid transfer from the epidural space to the subarachnoid via the dural hole has been proposed as a cause. Eldor et al. have reported a similar case of respiratory depression after epidural morphine given during CSEA¹². To avoid such adverse effects of opioids, only local anesthetics were used for epidural analgesia in our study.

In the present study, spinal anesthesia was performed with full-dose techniques¹³. An adequate block level for Caesarean section was obtained with a full dose of spinal anesthesia. Rapid onset, profound blockade, and low drug dosage are advantages of spinal blockade, and the full-dose technique can assure that these advantages are fully realized. Also in this study, CSEA was performed with separate needles from separate interspaces. This allowed the epidural catheter to be placed and tested before subarachnoid block was initiated. The theoretical risk that the spinal needle may strike the epidural catheter may be avoided by combining thoracic epidural and lumbar spinal approaches^{14,15}.

In conclusion, an epidural initial dose was unnecessary for postoperative pain relief in CSEA for Caesarean section, but epidural continuous

infusion provided greater pain relief than did spinal anesthesia.

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