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Original Article

The effects of different epidural analgesia formulas on labor and mode of delivery in nulliparous women

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ABSTRACT

Objectives: Patient-controlled epidural analgesia (PCEA) and continuous epidural infusion (CEI) are popular and effective methods for pain relief during labor; however, there are concerns about increasing rates of cesarean section (C/S) and instrumental delivery. This prospective study investigated the effect of PCEA and CEI with different formulas on labor and the mode of delivery in nulliparous women.
Materials and methods: A total of 480 nulliparous women were randomized into four groups, with 120 in each. Group A received a loading dose of 10 mL of 1 mg/mL ropivacaine with 2 μg/mL fentanyl, then an intermittent bolus of 5 mL with a background infusion of 5 mL/hour by PCEA. Group B received the same PCEA formula as Group A with 0.8 mg/mL bupivacaine. Group C received the same formula as Group A by CEI with 1 mg/mL ropivacaine at a rate of 10 mL/hour. Group D received the same formula as Group C with 0.8 mg/mL bupivacaine. The rates of C/S and instrumental delivery and the incidence of side effects were recorded.
Results: The rates of C/S were significantly different between Groups A and C, Groups A and D, and Groups B and D. The rates of instrumental delivery for normal spontaneous delivery were significantly different between Groups A and B, A and D, B and C, and C and D.
Conclusion: The C/S rate was higher in Groups C and D; however, the instrumental delivery rate was lower in Groups A and C. We conclude that PCEA with 1 mg/mL ropivacaine might provide the greatest benefit for labor analgesia.

Introduction

Epidural analgesia is a popular and effective method for pain relief during labor [1–3]. Bupivacaine is a commonly used local anesthetic. Ropivacaine, an amino acid local anesthetic, is structurally related to bupivacaine but has less cardiac toxicity, less motor blockade, and a shorter duration than bupivacaine. It was recently introduced for labor analgesia [4–8]. However, local anesthetics have disadvantages such as maternal motor blockade and hypotension. Some studies have investigated the relative potency of ropivacaine and bupivacaine with or without opioids and the effects of motor and sensory blockade [9–14]. One study specifically addressed the mode of delivery with different epidural local anesthetics with regard to obstetric outcomes but did not find a difference between groups [15]. However, no study simultaneously evaluated the overall rates of cesarean and instrumental delivery in nulliparous women who received continuous epidural infusion (CEI) or patient-controlled epidural analgesia (PCEA) with bupivacaine or ropivacaine [16–19]. We might reasonably hypothesize that different epidural infusion channels with different local anesthetics could influence the mode of delivery. The primary purpose of this study was to compare the mode of delivery in nulliparous women receiving bupivacaine or ropivacaine for labor epidural analgesia. The incidence of side effects was also assessed.

Materials and methods

This is a prospective, randomized study to analyze American Society of Anesthesiology I or II nulliparous women at term labor

Conflicts of interest: The authors have no conflicts of interest to declare.

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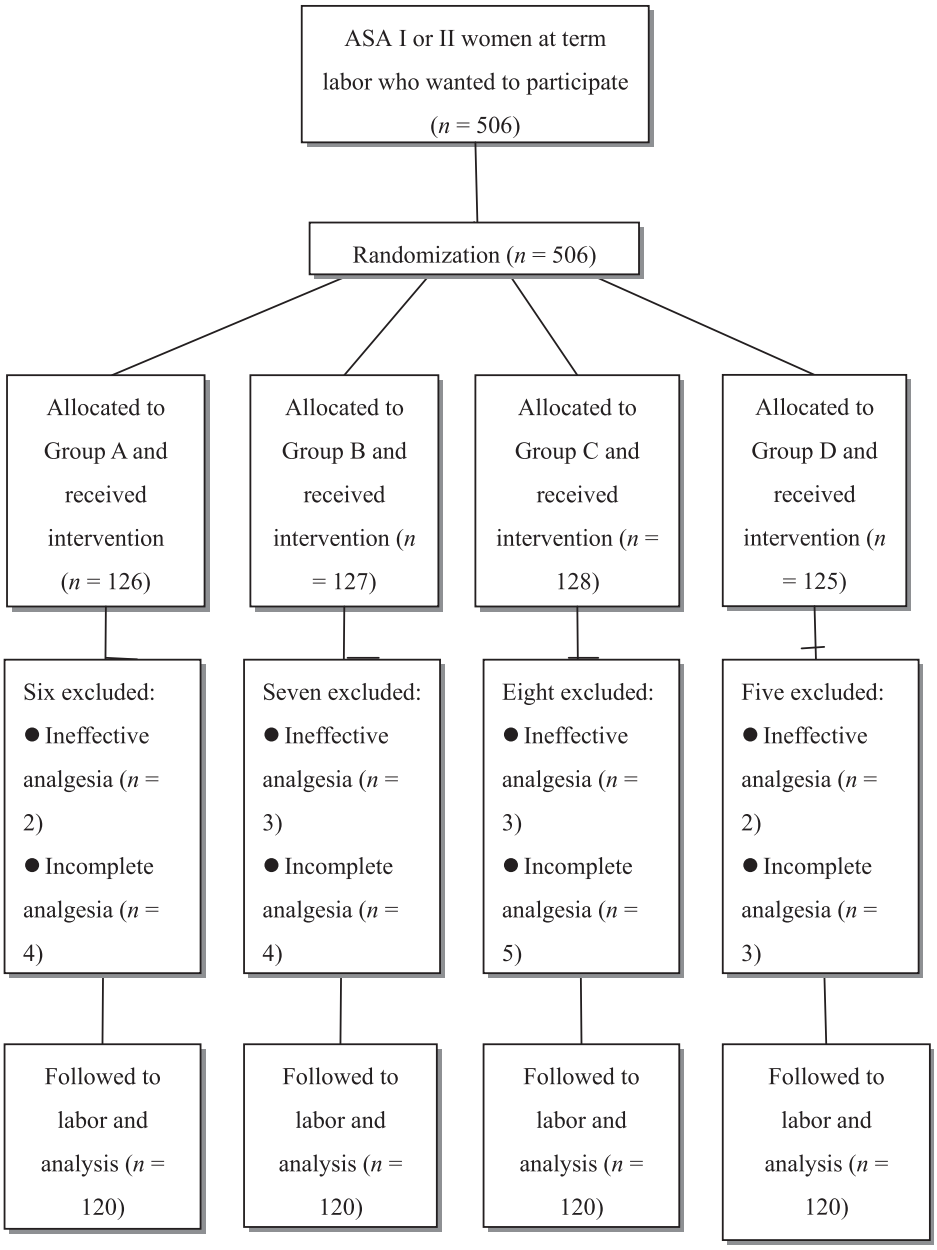

Fig. 1. Participant flow and randomization process. ASA = American Society of Anesthesiology.

using ropivacaine or bupivacaine with either PCEA or CEI at the National Taiwan University Hospital from 2005 to 2006. The protocol was approved by the National Taiwan University Hospital Institutional Review Board and written informed consent was obtained from each patient before the onset of labor pain. Exclusion criteria were multiparous women, contraindications for epidural analgesia, drug or alcohol abuse, known fetal abnormality, maternal obstetric complications (placenta previa and antepartum hemorrhage), previous uterine surgery, ineffective epidural labor analgesia [Verbal Pain Scale (VPS) $\geqq$4 after an epidural loading dose of 15 mL of the study regimen] and incomplete epidural labor analgesia (epidural analgesia duration $<$2 hours). All recruited women were in active labor with cervical dilation of 3–5 cm with regular uterine contractions, and none received parenteral opioids before epidural infusion. For randomization, patients blindly picked a sealed envelope which contained a group number. Group A received a loading dose of 10 mL 1 mg/mL ropivacaine with 2 μg/mL fentanyl, then an intermittent bolus dose of 5 mL with a background infusion rate at 5 mL/hour by PCEA. Group B received a loading dose of 10 mL 0.8 mg/mL bupivacaine with 2 μg/mL fentanyl, then an intermittent bolus dose of 5 mL, with a background infusion rate at 5 mL/hour by PCEA. Group C received the same loading dose as Group A, followed by a continuous infusion dose of 1 mg/mL ropivacaine with 2 μg/mL fentanyl at 10 mL/hour. Group D received the same loading dose as Group B, followed by a continuous infusion dose of 0.8 mg/mL bupivacaine with 2 μg/mL fentanyl at 10 mL/hour.

Epidural analgesia was initiated after the women received 10–15 mL/kg crystalloid solution. The randomization sequence was generated by a table of random numbers. The results of randomization were sealed in an envelope and opened by a nurse not participating in the study. With the patient in the left lateral position, an epidural catheter was inserted at the L3–4 lumbar region using the loss of resistance technique; 3–4 cm of catheter was left