

Original Article

Combined spinal-epidural anesthesia with sufentanil and ropivacaine for labor pain in women with pregnancy-induced hypertension

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Abstract: Objective: To investigate the effects of sufentanil combined with ropivacaine for intraspinal labor pain in women with pregnancy-induced hypertension, and to evaluate its effects on pregnancy complications and fetuses status. Methods: A total of 116 parturients with hypertensive disorder with pregnancy who underwent painless labor were randomized into two groups. Both groups received CSEA, in which the observation group received epidural ropivacaine combined with sufentanil, and the control group received only ropivacaine, 58 cases in each. Visual Analogue Scale (VAS) score, labor duration, maternal blood pressure changes, delivery methods, neonatal Apgar scores, neonatal asphyxia rate, adverse reactions and maternal satisfaction scores for analgesia were recorded, analyzed and compared between the two groups. Results: The analgesic score in group S was significantly lower than that in group R ($P>0.05$). There was no significant difference in labor duration, Apgar score and incidence rate of adverse reactions (all $P>0.05$), however, the control of mean arterial pressure at T1 and T2 in group S was significantly stable than that in group R ($P<0.05$), with higher maternal satisfaction ($P>0.05$). Conclusion: Combined spinal-epidural anesthesia with sufentanil and ropivacaine can achieve great analgesic effect in the delivery of pregnant mothers with pregnancy-induced hypertension syndrome, which is suitable for clinical promotion.

Keywords: Hypertension syndrome, sufentanil, ropivacaine, labor pain

Introduction

Pregnancy-induced hypertension, a kind of disease characterized by hypertension, edema and proteinuria, is the main cause of postpartum hemorrhage of pregnant mothers [1, 2]. However, postpartum hemorrhage, as a serious complication, is the primary cause of death of patients after surgery. The disease seriously affects the health of mothers and infants. At present, the main treatment of this syndrome is to terminate pregnancy in time [3, 4]. Therefore, adopting safe and effective delivery method is very crucial in hypertensive patients during pregnancy.

Painless labor, that is maximum block of sympathetic nerve innervating uterus and vagina with no block of motor nerve and maternal labor in painless state, can shorten labor duration as well as reduce cesarean section rate [5, 6]. Labor analgesia can not only decrease the

stress state during delivery, but also increase the blood supply of uterus and placenta, thus reducing the risk of fetal intrauterine hypoxia [7, 8]. At present, intrathecal injection is mostly used to realize painless labor, but the analgesic effect of combined sufentanil and ropivacaine has not been studied yet.

This study intended to analyze the application effect of sufentanil combined with ropivacaine for intraspinal labor analgesia in vaginal delivery for hypertensive disorder complicating pregnancy, and evaluate its influence on labor analgesia, pregnancy complications as well as fetuses.

Materials and methods

General data

From June 2018 to December 2018, 161 pregnant women with hypertensive disorder compli-

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cating pregnancy who underwent painless labor in Suzhou Kowloon Hospital were included in the study, according to the inclusion and exclusion criteria. After selection, 116 patients were enrolled. According to the computer random number table method, 116 patients were randomized into ropivacaine combined spinal-epidural anesthesia group (group R) and combined spinal-epidural anesthesia with sufentanil and ropivacaine group (group S), 58 cases in each. This study was approved by the Ethics Committee of Suzhou Kowloon Hospital, and all patients were willing to participate in this study and sign an informed consent.

Inclusion criteria were as follows: (1) patients with hypertensive disorder complicating pregnancy, undergoing painless labor; (2) full term pregnancy; (3) no fetal distress founded by Color Doppler ultrasound combined with fetal heart monitoring before surgery; (4) estimated newborn birth weight more than 2500 g; (5) hemoglobin above 90 g/L; (6) singleton pregnancy confirmed by B-ultrasound; (7) ASA (American Society of Anesthesiologies) grading: I-III [9].

Exclusion criteria were as follows: (1) patients with preeclampsia and eclampsia with severe manifestations; (2) patients combined with dysfunction of important organs; (3) patients with severe mental diseases; (4) patients allergic to narcotic drugs; (5) contraindication of intrathecal anesthesia.

Anesthesia methods

In both groups, combined spinal-epidural anesthesia percutaneous catheter drainage was conducted at lumbar 2-3 gap, while combined spinal-epidural anesthesia needle was punctured into subarachnoid space to inject 0.1% ropivacaine (3 mL), and catheter was placed 3-4 cm away from epidural space. Epidural analgesic pump was used 30 min after subarachnoid injection. There was 1 mg/mL ropivacaine of analgesic pump in group R, while a mixture of 1 mg/mL ropivacaine and 0.5 g/mL sufentanilin in group S. The dosage of painless labor analgesic pump was set at 8 mL/h, PCA dosage was 2 mL each time, locking time was 15 min, and the dosage per hour was not more than 15 mL, with a total of 100 mL. When pregnant mothers felt the analgesic effect was

weakened, they could press the PCA device to add medicine on their own, and the analgesic pump should be stopped when the uterine orifice was opened fully. The anesthetist was a person who mastered the anesthesia technology and did not know the relevant contents of the test.

Outcome measures

Analgesic score, visual analogue scale (VAS), maternal blood pressure changes, and labor duration of patients in the two groups before analgesia (T0), 5 min after analgesia (T1), 20 min after analgesia (T2), full opening of uterine orifice (T3), and delivery of fetal head (T4) were observed and recorded.

1, 5 and 10 min after the delivery of the fetuses, Apgar scores in the two groups were observed and recorded (Apgar score, also called Aristotle score, is a simple clinical method to evaluate the degree of neonatal asphyxia, including: activity, pulse, grimace, appearance and respiration; after the child is born, the score is made according to five physical signs as appearance, heart rate, respiration, activity, movement and reflex, of which Apgar score between 7-10 is normal, 4-6 is moderate asphyxia, 0-3 is severe asphyxia [10]).

Complications such as intraoperative hypotension, postoperative nausea, vomiting, bradycardia and shivering were recorded (if severe hypotension occurred during operation, phenylephrine was injected intravenously to boost pressure; in case of serious nausea and vomiting, tropisetron should be used to stop vomiting and prevent reflux as well as aspiration; atropine was used to increase the heart rate when bradycardia (the heart rate was lower than 60 beats/minute) occurred; in case of severe shivering after operation, the patients shall be heated by an inflatable warming device and treated by tramadol).

Evaluation of postoperative satisfaction: 3 days after surgery, satisfaction with analgesic effect was investigated by satisfaction questionnaire, and the patients were selected one among very satisfied, satisfied, general and dissatisfied anesthetic effect. Patient satisfaction = (number of very satisfied cases + number of satisfied cases)/total number ×100%.

Table 1. Comparison of basic data

	Case	Ages	BMI (kg/m ²)	ASA Grading			Gestational week
				I	II	III	
Group R	58	29.9±3.2	26.7±3.7	30	20	8	38.8±4.9
Group S	58	29.8±2.9	27.0±4.1	28	18	12	39.2±5.1
P	1.000	0.647	0.784	0.456	0.643	0.734	0.512

Note: BMI: Body Mass Index; ASA: American Society of Anesthesiologists.

Table 2. VAS scores at different time points

	T0	T1	T2	T3	T4
Group R (n=58)	8.7±1.2	7.4±1.1	5.3±0.8	2.6±0.5	2.3±0.6
Group S (n=58)	8.8±0.9	4.8±1.2*	1.5±0.3*	1.5±0.7*	1.3±0.4*

Note: Compared with Group R, *P<0.05. VAS, visual analogue scale.

test, and P>0.05 was considered to be statistically significant difference.

Results

Pregnancy basic data

Both groups of patients successfully completed the test. There was no patient quitting midway or appearing irreversible serious injury, and there was no significant difference

in the baseline data between the two groups (P>0.05) (**Table 1**).

VAS scores

The VAS scores of group S at 5 min after analgesia (T1), 20 min after analgesia (T2), full opening of uterine orifice (T3), and delivery of fetal head (T4) were significantly lower than those of group R (P>0.05) (**Table 2**).

Labor duration

The stage of labor was divided into the first stage of labor and the second stage of labor, and there was no statistical significance between two groups in the duration of first stage and second stage (P>0.05, **Figure 1**).

Apgar score and the incidence of asphyxia

Compared with group R, group S had no significant difference in the Apgar score and incidence rate of neonatal asphyxia 1 min, 5 min and 10 min after delivery (P>0.05, **Table 3**).

Hemodynamics

There was no significant difference in heart rate at T0, T1, T2, T3 and T4 between the two groups, so was mean arterial pressure at T0, T3 and T4 between group S and group R, and the control of mean arterial pressure at T1 and T2 in group S was significantly better than that in group R (all P>0.05, **Table 4**).

Adverse reactions

Adverse reactions such as nausea, vomiting, muscle soreness, bradycardia and shivering

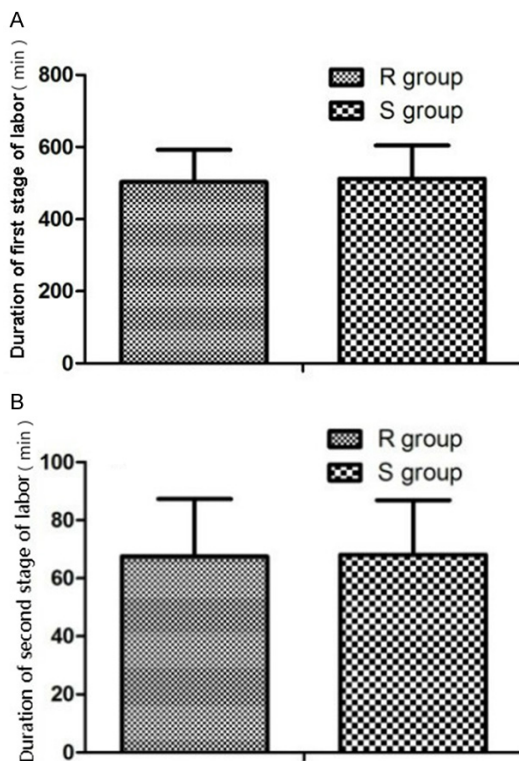


Figure 1. Duration of the labor. A. Comparison of the first stage of labor between the two groups. B. Comparison of the second stage of labor between the two groups.

Statistical analysis

In this study, the data were analyzed by SPSS 22.0, the measurement data were expressed by Mean ± SD, and independent-samples T test was for comparison. In addition, the counting data were expressed as case number/ratio (n/%), statistical analysis was carried out by χ^2

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Table 3. Comparison of Apgar scores and incidence of asphyxia in two-part maternal newborns

	Apgar score			None asphyxia	Mild asphyxia	Severe asphyxia	Incidence rate of asphyxia
	Delivery 1 min	Delivery 5 min	Delivery 10 min				
Group R (n=58)	8.9±0.9	9.5±0.6	9.8±0.1	43	10	5	25.9%
Group S (n=58)	8.8±0.8	9.6±0.7	9.9±0.2	41	9	8	29.3%
t/x ²	4.562	5.247	4.832				6.246
P	0.742	0.628	0.713				0.586

Table 4. Comparison of hemodynamics

	Group R (n=58)		Group S (n=58)	
	HR (Beat/min)	MAP (mmHg)	HR (Beat/min)	MAP (mmHg)
T0	89.1±12.3	109.2±14.3	90.2±13.6	110.1±13.1
T1	91.2±13.1	103.4±11.8	91.5±12.9	98.3±12.0*
T2	93.4±14.2	101.5±10.4	93.5±10.6	96.9±11.8*
T3	89.5±11.9	102.4±12.8	89.9±12.0	103.4±12.3
T4	87.3±12.8	106.3±13.3	88.3±11.5	105.7±11.6

Note: Compared with Group R, *P<0.05. HR, heart rate; MAP, mean arterial pressure.

Table 5. Comparison of postoperative adverse reactions between the two groups

	Nausea	Vomiting	Muscle soreness	Bradycardia	Shivering
Group R (n=58)	3	1	2	2	3
Group S (n=58)	4	1	3	1	2
T	5.474	0.536	4.647	9.264	7.373
P	0.546	1.000	0.746	0.147	0.362

Table 6. Comparison of maternal satisfaction scores of postoperative treatment

	Very satisfied	Satisfied	General	Not satisfied	Satisfaction
Group R (n=58)	17	13	10	18	69.0%
Group S (n=58)	22	16	14	6	89.7%
x ²					14.478
P					0.006

occurred in both groups. There was no significant difference in the incidence rate of adverse reactions between the two groups (P>0.05) (Table 5).

Satisfaction

According to the investigation and statistical analysis of patients' postoperative satisfaction, the score in group S was significantly higher than that in group R (P=0.006, Table 6).

Discussion

Hypertensive disorder complicating pregnancy is a specific disease during pregnancy. It has a

high morbidity in our country and seriously affects the health of mothers and infants. Besides, it is also the main cause of morbidity and mortality of pregnant woman and perinatal infants. Timely termination of pregnancy is the best treatment method, and delivery in special period provides higher requirements for optimizing anesthesia strategy.

In order to reduce the risk of pregnancy-induced hypertension syndrome, some studies suggested cesarean section [10, 11]. However, cesarean section bears the double risks of surgery and anesthesia, and its massive hemorrhage rate is 3 times that of vaginal delivery; postoperative recovery is slow and pelvic adhesion is easy to occur, which increases the chance of wound infection,

annexitis and endometriosis [12, 13]. Previous studies pointed out that the progress of stages of labor in hypertensive disorder complicating pregnancy develops faster and there is no need to increase the unnecessary cesarean section rate [14]. At present, the most widely used method of labor analgesia in clinical practice is intraspinal block, of which combined spinal-epidural anesthesia has small dosage, quick effect and more accurate effect [15, 16]. The study revealed that local anesthetics combined with narcotic analgesic drugs could enhance analgesic effect and reduce dosage, so as to achieve minimum motor block [17, 18]. This study also demonstrated that suf-

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entanil combined with ropivacaine could decrease VAS score of patients and increase labor analgesic effect, and better analgesic effect further improved patient satisfaction.

Studies indicated that local anesthetics in epidural and subarachnoid space could block sympathetic nerve, and reduce the level of epinephrine in blood circulation [19]. At the same time, it also increased uterine blood flow, thus improving uterine placenta oxygenation [20, 21]. The results of this study showed that the two intraspinal block methods both led to maternal blood pressure drop, but in the normal range, guaranteeing the circulation stability during delivery, while combining sufentanil had better analgesic effect.

Nowadays, Apgar score has been used as the standard for diagnosing neonatal asphyxia [22, 23]. 1-min Apgar score is helpful to understand the situation of newborns at birth, and 5-min Apgar score contributes to predict the prognosis of newborn. It is generally believed that intraspinal labor analgesia has no adverse effects on fetal heart rate, Apgar score and neonatal asphyxia rate, which is consistent to this study. Although some studies pointed out that intravenous overdose of sufentanil might cause respiratory depression, it might not occur due to the small dose of sufentanil injected into the epidural space. At the same time, the combined use of the two drugs did not increase the adverse reactions of patients during and after operation, which might also be related to the lower dosage of sufentanil.

To sum up, for patients with pregnancy-induced hypertension, combined spinal-epidural anesthesia with sufentanil and ropivacaine could achieve better analgesic effect and significantly reduce blood pressure during labor, without affecting neonatal prognosis and increasing the incidence rate of adverse reactions, while improving patient satisfaction, which are better than ropivacaine alone. Hence, it could be safely and effectively applied to pregnant mothers with hypertensive disorder complicating pregnancy, which was suitable for wide clinical promotion. However, the results might be biased due to short research time and small sample size. In the future, prospective trials with larger sample size, longer follow-up time, better grouping and more reasonable design need to be further carried out.

Disclosure of conflict of interest

None.

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