International Journal of Clinical and Experimental Medicine Research, 2023, 7(4), 706-711
https: //www.hillpublisher.com/journals/ijcemr/
ISSN Online: 2575-7970
ISSN Print: 2575-7989

Effects of Different Anesthesia Methods on Heart Rate and Oxygen Saturation After Hip Surgery

Hui Ding*, Ziyu Zhao

Department of Anesthesiology, Shaanxi Provincial People's Hospital, Xi'an, Shaanxi, China.

How to cite this paper: Hui Ding, Ziyu Zhao. (2023) Effects of Different Anesthesia Methods on Heart Rate and Oxygen Saturation After Hip Surgery. *International Journal of Clinical and Experimental Medicine Research*, 7(4), 706-711.
DOI: 10.26855/ijcemr.2023.10.034

Received: September 30, 2023
Accepted: October 29, 2023
Published: November 30, 2023

***Corresponding author:** Hui Ding, Department of Anesthesiology, Shaanxi Provincial People's Hospital, Xi'an, Shaanxi, China.

Abstract

Objective: To investigate the effect of different anesthesia methods on heart rate and oxygen saturation after hip joint surgery. **Methods:** A retrospective analysis was conducted on the clinical data of 60 patients undergoing hip joint surgery in our hospital from February 2018 to February 2020. According to anesthesia and analgesic methods, they were divided into two groups: the continuous analgesia group guided by B-ultrasound and the continuous analgesia group with iliac fascia tube insertion, and the tracheal intubation general anesthesia combined with intravenous self-control analgesia group (self-control analgesia group), with 30 patients in each group. The anesthesia effects of the two groups were statistically analyzed Analgesic effect, vital signs, stress reactions, and occurrence of adverse reactions. **Results:** The excellent and good anesthesia rate of patients in the continuous analgesia group was 96.67% (29/30), which was higher than 76.67% (23/30) in the patient-controlled analgesia group (χ^2=5.192, P<0.05). At 2 hours, 12 hours, 1 day, and 2 days after surgery, the visual analogue scale (VAS) scores of patients in the continuous analgesia group were lower than those in the self-control analgesia group (P<0.05). T1, T2, T3, T4, diastolic blood pressure (DBP), systolic blood pressure (SBP), heart rate (HR), oxygen saturation (SaO2) in the continuous analgesia group were higher than those in the patient-controlled analgesia group (P<0.05). T1, T2, T3, T4, the cortisol (Cor), interleukin-6 (IL-6), and blood glucose levels in the continuous analgesia group were lower than those in the self-control analgesia group on average (P<0.05). The incidence of adverse reactions in the continuous analgesia group was 6.67% (2/30), lower than the 30.00% (9/30) in the patient-controlled analgesia group (χ^2=5.455, P<0.05). **Conclusion:** The continuous analgesia value of lumbar plexus sciatic nerve block combined with iliac fascia catheterization under B-ultrasound guidance during hip joint surgery is higher than that of tracheal intubation general anesthesia combined with intravenous patient-controlled analgesia, and it can more stabilize the postoperative heart rate and oxygen saturation of patients.

Keywords

Hip joint surgery, Perioperative period, B-ultrasound guidance, Lumbar plexus sciatic nerve block, Continuous analgesia with iliac fascia catheterization, Intravenous controlled analgesia, Heart rate, Oxygen saturation

1. Introduction

The main population for hip joint surgery is patients, and intraoperative stress stimulation may be enhanced un-

der spinal anesthesia or general anesthesia, which can have adverse effects on the hemodynamic stability of the body [1]. At the same time, patients have extremely poor tolerance to surgery and anesthesia, which promotes a significant increase in surgical risk [2]. This study analyzed the clinical data of 60 patients undergoing hip joint surgery in the anesthesia department of our hospital from February 2018 to February 2020 and explored the value of B-ultrasound guided lumbar plexus sciatic nerve block combined with iliac fascia catheterization for continuous analgesia in hip joint surgery. The current report is as follows.

2. Materials and methods

2.1 General information

A retrospective analysis was conducted on the clinical data of 60 patients undergoing hip joint surgery in the anesthesia department of our hospital from February 2018 to February 2020. According to anesthesia and analgesic methods, they were divided into two groups: the continuous analgesia group guided by B-ultrasound with lumbar plexus sciatic nerve block and iliac fascia catheter insertion, and the tracheal intubation general anesthesia combined with intravenous patient-controlled analgesia group (patient-controlled analgesia group), with 30 patients in each group. Continuous analgesia group, aged 60-82 years, with an average age of (71.32 ± 10.42) years; 12 females and 18 males; Body weight: 20 cases ranging from 43 to 63 kg, 10 cases ranging from 64 to 84 kg; Accompanying diseases: coronary heart disease 7 cases, hypertension 6 cases, diabetes 3 cases, chronic obstructive pulmonary disease 2 cases. Patient controlled analgesia group, aged 61-83 years, with an average age of (71.85 ± 10.23) years; 11 females and 19 males; Body weight: 19 cases with a weight range of 43-63 kg, 11 cases with a weight range of 64-84 kg; Accompanying diseases: 8 cases of coronary heart disease, 5 cases of hypertension, 4 cases of diabetes, and 1 case of chronic obstructive pulmonary disease. The general data comparison between the two groups of patients showed no statistically significant difference (P>0.05), indicating comparability. Inclusion criteria: (1) Normal heart, liver, and kidney function; (2) Age 60 and above; (3) There were indications for hip joint surgery [3]. Exclusion criteria: (1) Had a history of drug allergy; (2) Recently received glucocorticoid treatment; (3) There were contraindications to anesthesia. This study was approved by the Hospital Medical Ethics Committee.

2.2 Methods

2.2.1 Continuous analgesia group

Establish a venous pathway and perform electrocardiogram monitoring on the patient. During the process of lumbar plexus block guided by ultrasound, the patient is placed in a lateral position and protected with sterile film for the ultrasound probe. The intersection point between the spinal spinous process line and the iliac spine high point line is selected, and the puncture point is set to move down 4 cm to the affected side and 3 cm to the tail end. With the assistance of ultrasound, the nerve stimulation needle is located on the target nerve, After confirmation, inject 20 mL of 0.5% ropivacaine (manufacturer: Shanghai Hefeng Pharmaceutical Co., Ltd., approval number: Guoyao Zhunzi H20163174, specification: 10 mL: 75 mg); During the process of sciatic nerve block, a ischial nodule 6 cm from the posterior superior iliac spine was selected as the puncture point. With the assistance of ultrasound, 20 mL of 0.5% ropivacaine was injected into the fixed puncture area. After the surgery was completed, an analgesic pump was connected, and the patient was continuously injected with 5 mL of 0.2% ropivacaine at a rate of 4-6 mL/h for continuous analgesia. The catheter was locked for 25 minutes.

2.2.2 Patient-controlled analgesia group

30 minutes before surgery, the patient was given intramuscular injection of 0.01 mg/kg midazolam (manufacturer: Jiangsu Enhua Pharmaceutical Co., Ltd., approval number: National Drug Approval Number H19990027, specification: 1 mL: 5 mg). Application of 0.05 mg/kg midazolam+0.2 mg/kg cisatracurium (manufacturer: Dongying (Jiangsu) Pharmaceutical Co., Ltd., approval number: Guoyao Zhunzi H20060927, specification: 5 mL: 10 mg)+4 μ G/kg fentanyl (manufacturer: Langfang Branch of China National Pharmaceutical Group Industry Co., Ltd., approval number: H20123297, specification: 2ml: 0.1mg)+1 mg/kg propofol (manufacturer: Sichuan Guorui Pharmaceutical Co., Ltd., approval number: H20030115, specification: 20 mL: 0.2 g) for anesthesia induction. After tracheal intubation, the anesthesia machine is connected to control the patient's breathing. Intraoperative intravenous infusion of 0.2 to 0.3 to the patient μ G/(kg · min) remifentanil (manufacturer: Yichang Humanwell Pharmaceutical, approval number: GYZZ H20030197, specification: 1 mg)+60~100 μ G/(kg · min) propofol is used for anesthesia maintenance, muscle relaxants are added according to the surgical situation, and the dosage of

anesthesia is adjusted promptly based on the patient's heart rate and blood pressure. Stop using anesthetics 5 minutes before completing the surgery, and remove the tracheal catheter after the patient's spontaneous breathing is restored and their eyes are opened. Give the patient an intravenous injection of 10 minutes before completing the surgery μ G load dose of sufentanil (manufacturer: Chengdu Forst Pharmaceutical Technology Co., Ltd., approval number: GYZZ H20020623, specification: 2 mL: 0.1 mg), connect the analgesia pump through intravenous indwelling needle, and the drug in the pump is 2 μ G/kg sufentanil+100 mL 0.9% sodium chloride injection, background flow, patient-controlled dose, interval time were 2 mL/h, 0.5 mL/time, 15 min, respectively.

2.3 Efficacy evaluation criteria

Excellent: With complete anesthesia, the patient has completely relaxed muscles and is painless; Good: The patient has relatively poor muscle relaxation, which slightly affects the surgical procedure, and the pain is not significant; Poor: The intraoperative pain is severe, and the patient cannot tolerate the surgery. The anesthesia method needs to be changed [4].

2.4 Outcome measures

(1) Anesthetic effect. Excellent=Excellent+Good. (2) Analgesic effect. At 2 hours, 12 hours, 1 day, and 2 days after surgery, visual analog scale (VAS) was used, with a score range of 0-10 points, indicating painless to severe pain [5]. (3) Vital signs, stress reactions. Diastolic pressure (DBP), systolic pressure (SBP), heart rate (HR), oxygen saturation (SaO2), cortisol (Cor), interleukin-6 (IL-6), and blood glucose levels were measured before anesthesia (T0), at skin incision (T1), 30 minutes after surgery (T2), at the completion of surgery (T3), and 30 minutes after surgery (T4). (4) The occurrence of adverse reactions.

2.5 Statistical analysis

Using SPSS 28.0, the counting data is expressed in terms of rate, using χ^2 Inspection; The measurement data conforming to the normal distribution is expressed by (), and it is statistically significant by t test (P<0.05).

3. Results

3.1 Comparison of anesthesia effects between two groups

The excellent and good anesthesia rate of patients in the continuous analgesia group was 96.67%, which was higher than 76.67% in the patient-controlled analgesia group (χ^2=5.192, P=0.023), as shown in Table 1.

Table 1. Comparison of anesthesia effects between two groups [cases (%)]

Group	n	Excellent	Good	Bad	Excellent and good
Continuous analgesia group	30	21 (70.00)	8 (26.67)	1 (3.33)	29 (96.67)
Patient controlled analgesia group	30	8 (26.67)	15 (50.00)	7 (23.33)	23 (76.67)
χ^2 value					5.192
P value					0.023

3.2 Comparison of analgesic effects between two groups

The VAS scores of both groups of patients gradually decreased at 2 hours, 12 hours, 1 day, and 2 days after surgery (P<0.05); At 2 hours, 12 hours, 1 day, and 2 days after surgery, the VAS scores of patients in the continuous analgesia group were lower than those in the self-control analgesia group (P<0.05) (see Table 2).

Table 2. Comparison of analgesic effects between two groups [points, ($\bar{x} \pm s$)]

group	n	2 h after surgery	12 h after surgery	1 d after surgery	2 d after surgery
Continuous analgesia group	30	3.15±0.41	2.77±0.47	2.05±0.32	1.86±0.36
Patient controlled analgesia group	30	4.83±0.84	4.20±0.55	3.18±0.62	2.10±0.30
t value		9.844	10.826	8.871	2.805
P value		<0.001	<0.001	<0.001	0.007

3.3 Comparison of two sets of vital signs

There was no statistically significant difference in DBP, SBP, HR, and SaO2 among T0, T1, T2, T3, and T4 patients in the continuous analgesia group (P>0.05); The DBP, SBP, HR, and SaO2 of T1, T2, T3, and T4 patients in the patient-controlled analgesia group gradually increased (P<0.05), all lower than T0 (P<0.05); T0, there was no statistically significant difference in DBP, SBP, HR, and SaO2 between the two groups of patients (P>0.05). T1, T2, T3, T4, DBP, SBP, HR, and SaO2 in the continuous analgesia group were higher than those in the self-control analgesia group (P<0.05) (see Table 3).

Table 3. Comparison of Vital Signs between Two Groups ($\bar{x} \pm s$)

group	time	DBP (mmHg)	SBP (mmHg)	HR (次/min)	SaO2 (%)
Continuous analgesia group (n=30)	T_0	77.62±8.85	142.42±12.42	87.78±9.42	97.71±9.40
	T_1	73.86±8.26$^{\#*}$	135.86±11.42$^{\#*}$	83.84±8.36$^{\#*}$	93.82±8.39$^{\#*}$
	T_2	75.42±8.36$^{\#*}$	138.35±12.84$^{\#*}$	85.56±10.62$^{\#*}$	95.53±10.68$^{\#*}$
	T_3	76.14±7.65$^{\#*}$	141.32±10.62$^{\#*}$	85.75±10.23$^{\#*}$	95.74±10.27$^{\#*}$
	T_4	77.02±7.26$^{\#*}$	143.85±12.02$^{\#*}$	86.24±10.48$^{\#*}$	96.25±10.46$^{\#*}$
Patient controlled analgesia group (n=30)	T_0	76.53±5.23	141.32±10.23	86.14±9.02	96.16±9.05
	T_1	52.02±7.54$^{\#}$	94.75±12.56$^{\#}$	69.03±9.25$^{\#}$	79.07±9.24$^{\#}$
	T_2	56.32±7.02$^{\#}$	105.12±10.68$^{\#}$	71.35±10.38$^{\#}$	81.38±10.33$^{\#}$
	T_3	61.86±6.52$^{\#}$	120.08±13.15$^{\#}$	75.64±11.32$^{\#}$	85.69±11.32$^{\#}$
	T_4	63.75±6.45$^{\#}$	125.32±12.26$^{\#}$	77.02±10.14$^{\#}$	87.00±10.11$^{\#}$

Note: Compared with T0 in the same group, $^{\#}P$<0.05 Compared with the patient-controlled analgesia group, $^{*}P$<0.05.

3.4 Comparison of stress responses between two groups

There was no statistically significant difference in the Cor, IL-6, and blood glucose levels of T0, T1, T2, T3, and T4 patients in the continuous analgesia group (P>0.05); The Cor levels of T2, T3, and T4 in the patient-controlled analgesia group gradually decreased (P<0.05), all higher than T0 (P<0.05). The IL-6 and blood glucose levels of T1, T2, and T3 gradually increased (P<0.05), all higher than T0 (P<0.05). The IL-6 and blood glucose levels of T4 were on average higher than T0 (P<0.05); There was no statistically significant difference in the levels of Cor, IL-6, and blood glucose between the two groups of patients (P>0.05). For T1, T2, T3, and T4, the Cor, IL-6, and blood glucose levels of patients in the continuous analgesia group were on average lower than those in the self-control analgesia group (P<0.05) (see Table 4).

Table 4. Comparison of stress responses between two groups ($\bar{x} \pm s$)

Group	Time	Cor (μg/L)	IL-6 (pg/mL)	Blood sugar (mmol/L)
Continuous analgesia group (n=30)	T_0	5.23±0.46	1.52±0.25	176.57±15.22
	T_1	5.31±0.50$^{\#*}$	1.75±0.24$^{\#*}$	179.23±17.57$^{\#*}$
	T_2	5.37±0.51$^{\#*}$	1.86±0.32$^{\#*}$	182.34±19.23$^{\#*}$
	T_3	5.33±0.47$^{\#*}$	2.01±0.36$^{\#*}$	181.11±18.20$^{\#*}$
	T_4	5.24±0.41$^{\#*}$	1.86±0.34$^{\#*}$	178.20±16.23$^{\#*}$
Patient controlled analgesia group (n=30)	T_0	5.21±0.43	1.62±0.24	178.31±16.53
	T_1	6.68±0.77$^{\#}$	2.10±0.34$^{\#}$	198.68±19.51$^{\#}$
	T_2	7.31±0.96$^{\#}$	2.35±0.37$^{\#}$	218.95±20.66$^{\#}$
	T_3	6.64±0.74$^{\#}$	2.75±0.45$^{\#}$	232.31±19.10$^{\#}$
	T_4	5.97±0.84$^{\#}$	2.41±0.36$^{\#}$	220.10±18.22$^{\#}$

Note: Compared with T0 in the same group, $^{\#}P$<0.05 Compared with the patient-controlled analgesia group, $^{*}P$<0.05.

3.5 Comparison of adverse reactions between two groups

The incidence of adverse reactions in the continuous analgesia group was 6.67%, lower than the 30.00% in the patient-controlled analgesia group (χ 2=5.455, P=0.020), as shown in Table 5.

Table 5. Comparison of adverse reactions between two groups [cases (%)]

Group	n	Nausea and vomiting	Bronchospasm	Hypoxemia	Amount to
Continuous analgesia group	30	2 (6.67)	0 (0.00)	0 (0.00)	2 (6.67)
Patient controlled analgesia group	30	5 (16.67)	1 (3.33)	3 (10.00)	9 (30.00)
χ^2 *value*					5.455
P value					0.020

4. Discussion

In hip joint surgery, the anesthesia effect of peripheral nerve block is relatively ideal, which can locate the target nerve. With the assistance of ultrasound, it can effectively avoid nerve and peripheral vascular block damage, and exert the efficacy of local anesthetic drugs; Lumbar plexus sciatic nerve block has been widely used in clinical practice. With the assistance of ultrasound, it can promote the accuracy of nerve localization, effectively ensuring the blocking effect. At the same time, it can also monitor the diffusion of local anesthetic drugs and the distribution of target nerves, effectively avoiding the phenomenon of damage to the body. The anesthesia effect of continuous analgesia with ropivacaine replacement is significant, which can promote the improvement of analgesic and sedative effects, effectively ensure the smooth progress of surgery, and promote the reduction of patient stress response.

Literature studies have shown that in hip joint surgery [6], B-ultrasound guided lumbar plexus sciatic nerve block combined with continuous iliac fascia catheterization can promote postoperative pain relief in patients, and patients have relatively small stress responses. The results of this study showed that the excellent and good anesthesia rate of patients in the continuous analgesia group was 96.67% higher than that in the self-control analgesia group, which was 76.67%; At 2 hours, 12 hours, 1 day, and 2 days after surgery, the VAS scores of patients in the continuous analgesia group were lower than those in the self-control analgesia group. T1, T2, T3, T4, DBP, SBP, HR, SaO2 of patients in the continuous analgesia group were higher than those in the self-control analgesia group. T1, T2, T3, T4, Cor, IL-6, and blood glucose levels of patients in the continuous analgesia group were lower on average than those in the self-control analgesia group; The incidence of adverse reactions in the continuous analgesia group was 6.67%, lower than the 30.00% in the patient-controlled analgesia group, consistent with the above research results.

5. Conclusion

To sum up, the continuous analgesia value of lumbar plexus sciatic nerve block combined with iliac fascia intubation guided by B-ultrasound during hip joint surgery is higher than that of tracheal intubation general anesthesia combined with intravenous self-control analgesia, which can more stabilize the postoperative heart rate and oxygen saturation of patients and is worth promoting.

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