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Analysis of the Necessity of Stellate Ganglion Block after Anesthesia to Reduce the Risk of Cardiovascular Accidents in Coronary Heart Disease

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Abstract: *Objective:* To adjust the sympathetic nervous system through preoperative ultrasound-guided stellate ganglion block and to explore and analyze the situation and necessity of postanesthesia stellate ganglion block to reduce the risk of cardiovascular accidents in coronary heart disease. *Methods:* 80 patients with cardiovascular risk factors in Songshan Hospital of Chifeng were selected, and the time span would cover from October 2022 to June 2024, with 80 cases of elective surgery and combined coronary heart disease. They will be randomly divided into blocked groups and conventional groups, 40 cases each. Conventional block was performed after anesthesia in patients in the conventional group, and planetary ganglion block was performed after anesthesia in patients in the blocked group. The cardiovascular responses of patients in the two groups were observed, and the number of intraoperative cardiovascular active drugs and the occurrence of cardiovascular adverse events were recorded in patients in the two groups. *Results:* Analysis of the mean arterial pressure (MAP) and heart rate (HR) values of the two groups of patients at the time points before anesthesia (T0), the moment of tracheal intubation (T1), the moment of surgical skin cutting (T2), the end of the operation (T3), and the 6h postoperative period (T4) showed that the MAP and HR of the blocked group were lower than those of the conventional group at the time points of T1 to T4, and the differences in MAP and HR values of the two groups in different time points compared with the T0 time point were statistically significant ($P < 0.05$) and the differences in cardiovascular response ($P < 0.05$) were statistically significant ($P < 0.05$). significance ($P < 0.05$). The number of intraoperative cardiovascular active drugs used in the blocked group was shorter than that in the conventional group, and the incidence of cardiovascular adverse events was lower than that in the conventional group, with a statistically significant difference ($P < 0.05$). *Conclusion:* By implementing preoperative ultrasound-guided stellate ganglion block in patients with cardiovascular risk factors, the frequency and degree of coronary heart disease symptoms will be reduced, thus reducing the risk of patients, which is worth promoting.

Keywords: Stellate ganglion block; Coronary artery disease; Risk of cardiovascular accidents

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1. Introduction

As the population continues to age, there has been a significant increase in the number of elderly patients and complications of coronary artery disease. This trend has resulted in a significant increase in the frequency of perioperative cardiovascular accidents. The situation is further complicated by the fact that patients with coronary artery disease often require a long-term process to improve their condition, and many surgeries need to be performed in an emergency or critical situation, especially emergency surgeries, which have a tight preoperative preparation time, and preoperative pain that may trigger cardiovascular events. However, patients' expectations of the quality and safety of healthcare services are increasing [1]. Therefore, it is imperative that healthcare professionals work to improve the safety of treatments to maximize the safety of patients and their families and to meet the increasingly high standards of patients' needs. In addition to traditional treatments such as conventional medications and stenting where necessary, effective treatments that modulate the sympathetic ganglion have significantly enhanced the safety of treatments, thus becoming an important driving force in the future direction and trend of treatments. Stellate ganglion block therapy has demonstrated significant benefits in patients with coronary artery disease [2,3]. However, its wider and more aggressive use in clinical practice, especially for patients in urgent need of acute and limited-term surgery, is of particular importance. The safety of anesthesia and surgery is severely challenged by the fact that such patients are often unable to undergo comprehensive cardiovascular evaluation and specialized treatment [4]. The active promotion of stellate ganglion block therapies not only helps to advance the field of medicine, including surgery and anesthesiology, but is also in line with the central position of anesthesiology in perioperative medicine, thus ensuring patient safety more effectively [5,6]. The aim of this study was to modulate the sympathetic nervous system and reduce norepinephrine secretion through preoperative ultrasound-guided stellate ganglion block, while increasing cardiac blood supply, thus improving cardiac ischemia, decreasing the risk of cardiovascular events and improving patient safety. The optimal time for implementation is after anesthesia and before surgery for ultrasound guidance to ensure the accuracy, speed and safety of the operation. It is reported as follows.

2. Information and methods

2.1. General information

Patients with cardiovascular risk factors in Chifeng Songshan Hospital were selected and the time span will cover from October 2022 to June 2024, 80 cases of patients with elective surgery and combined coronary heart disease. They will be randomized into blocked groups and conventional groups with 40 cases each. In the blocked group, there were 23 males and 17 females, with a mean age of (49.32 ± 4.28) years old, 24 cases of American Society of Anesthesiologists (ASA) class II and 16 cases of class III; cardiac function classification: 27 cases of class II and 13 cases of class III. In the conventional group, there were 24 males and 16 females, with an average age of (48.75 ± 4.63) years old, 25 cases of ASA class II and 15 cases of class III; cardiac function classification: 28 cases of class II and 12 cases of class III. The basic data of the two groups of patients were comparable ($P > 0.05$). This study was approved by the Ethics Committee of the hospital.

2.2. Inclusion and exclusion criteria

Inclusion criteria: (1) The study population included those patients who needed surgical treatment but had not yet received systematic cardiovascular treatment, as well as those who faced therapeutic difficulties due to uncooperative or unsuitable medical treatment; (2) Both patients and their families were informed and signed a consent form; (3) Specific anesthesia surgical indications.

Exclusion criteria: (1) Those with serious diseases of other organs; (2) Those who are not suitable for anesthesia surgery; (3) Those with poor treatment compliance.

2.3. Methods

Conventional block was performed after anesthesia for patients in the conventional group, and planetary ganglion block was performed after anesthesia for patients in the blocked group. Before the surgery of these patients, the study planned to implement stellate nerve block treatment with 3 mL of 0.15% ropivacaine (manufacturer: Yichang Renfu Pharmaceutical Co., Ltd., State Pharmaceutical License No. H20103636). The anesthesiologist who implemented the ultrasound-guided stellate ganglion block operation was not involved in the implementation and management of intraoperative anesthesia.

2.4. Observation indexes

Observe the cardiovascular response (MAP and HR) of the two groups of patients. Record the number of intraoperative cardiovascular active drugs and the occurrence of cardiovascular adverse events in the two groups of patients.

2.5. Statistical methods

SPSS 26.0 software was applied to statistically analyze the anesthesia-related data collected, and the count data were expressed as % and tested by χ^2. The measure data were expressed as mean ± standard deviation (SD) and tested by t. $P < 0.05$ indicated that the difference was statistically significant.

3. Results

3.1. Comparison of cardiovascular responses at different time points between the two groups of patients

Analyzing the MAP and HR values of the two groups of patients at the time points before anesthesia (T0), the moment of tracheal intubation (T1), the moment of surgical skin incision (T2), the end of the operation (T3), and the 6h postoperative period (T4) showed that the MAP and HR of the blocked group were lower than those of the conventional group at the time points of T1 to T4. The differences in the values of the two groups at the different time points of the MAP and HR values compared with that at the time point of T0 were statistically significant (P <0.05). See **Table 1** and **Table 2**.

Table 1. Comparison of MAP at different time points between the two groups of patients (mean ± SD)

Group	MAP/mmHg				
	T0	T1	T2	T3	T4
Blocked group (n = 40)	106.25 ± 22.14	97.36 ± 10.72*	89.05 ± 12.73*	106.28 ± 15.73	101.67 ± 11.83
Conventional group (n = 40)	107.39 ± 23.72	115.64 ± 13.86*	109.94 ± 19.06	112.81 ± 14.27*	105.13 ± 15.79
t-value	0.894	9.063	8.751	7.254	6.549
P-value	0.631	0.000	0.003	0.008	0.016

*$P < 0.05$ compared to T0 time point.

Table 2. Comparison of HR at different time points between the two groups of patients (mean ± SD)

Group	HR/ beats min^{-1}				
	T0	T1	T2	T3	T4
Blocked group (n = 40)	76.48 ± 18.32	72.76 ± 12.95	70.39 ± 10.67	74.69 ± 15.44	75.17 ± 12.45
Conventional group (n = 40)	75.94 ± 17.65	93.16 ± 10.54*	85.03 ± 14.52*	83.12 ± 16.63	79.04 ± 18.46
t-value	1.067	11.226	8.915	8.063	6.334
P-value	0.462	0.000	0.001	0.004	0.021

*P < 0.05 compared with T0 time point.

3.2. Comparison of the number of intraoperative cardiovascular active drug use and the occurrence of cardiovascular adverse events between the two groups of patients

The number of intraoperative cardiovascular active drugs used in patients in the blocked group (1.03 ± 0.16) was shorter than that in the conventional group (3.18 ± 0.42), and the incidence rate of cardiovascular adverse events was 2.5% lower than that in the conventional group (15.0%) with statistically significant difference (P < 0.05). See **Table 3**.

Table 3. The number of intraoperative cardiovascular active drugs and the occurrence of cardiovascular adverse events in the two groups of patients

Groups	Number of cardiovascular active drug administration /times	Incidence of adverse cardiovascular events /%
Blocked group (n = 40)	1.03 ± 0.16	1 (2.50)
Conventional group (n = 40)	3.18 ± 0.42	6 (15.0)
t/χ^2-value	12.118	7.883
P-value	0.000	0.007

4. Discussion

Intraoperative cardiovascular events can greatly threaten the life and health of patients. With the arrival of aging, more and more elderly patients, combined with the corresponding increase in coronary artery disease patients perioperative cardiovascular accidents, coronary artery disease patients' treatment is difficult to improve in the short term, and many surgeries involve a limited period of time. Especially in emergency surgery, the preoperative preparation time is short, perioperative period is more accompanied by pain, which can trigger a cardiovascular event [7]. Current research focuses on how to maintain circulatory stability during surgery to ensure stable vital signs. This usually requires the implementation of effective monitoring tools, such as invasive arterial blood pressure monitoring and even the determination of pulmonary artery pressure. However, these means of monitoring may entail additional trauma and adverse stimuli [8,9]. In addition, some interventions, including intraoperative coronary artery dilating drugs, tend to have a short duration of action. Also, the management of postoperative cardiac problems is a challenge to be faced. The introduction of ultrasound-guided technology has enhanced the feasibility of the stellate ganglion block treatment method due to its simplicity, rapidity and suitability for obese patients. Notably, the number of elderly surgical patients continues to rise, and these patients are often accompanied by a variety of complications, with cardiovascular diseases such as coronary artery disease, angina pectoris and old myocardial infarction being particularly

significant [10]. Some patients are unable to obtain sufficient time for coronary blood supply adjustment or clinical symptom improvement due to the demands of the deadline or emergency surgery. Therefore, coronary CT scanning or 24-hour ambulatory electrocardiography is difficult to perform. This situation may trigger misunderstanding by the patient's family and may lead to controversy and distress for the anesthesiologist in case of risk. Ways to effectively reduce the risk of anesthesia is an issue that both doctors and patients need to think deeply about.

Stellate ganglion block, as a minimally invasive therapeutic technique, regulates the activity of the sympathetic nervous system by local injection of a low concentration of local anesthetic in the area of the stellate ganglion, which in turn affects the circulatory system, the immune system, the nervous system and the endocrine system. The main pharmacological effects of ropivacaine hydrochloride injection include blocking nerve conduction and inhibiting pain signaling [11]. The stellate ganglion block treatment method can effectively improve coronary blood supply, regulate endocrine levels, and significantly reduce the risk of anesthesia. Therefore, further research, promotion and popularization of this method are of great significance and will have a profound impact on the development of medicine as well as better patient safety [12]. In addition, it reduces the risk of surgeon's practice, reduces unnecessary consultation and waiting time, helps surgery to be performed as early as possible, improves patient satisfaction, enhances postoperative comfort, and promotes recovery, which is in line with the concept of accelerated recovery surgery (ERAS). In this study, the analysis of the MAP and HR values of the two groups of patients at the time points of pre-anesthesia (T0), immediate tracheal intubation (T1), immediate surgical incision (T2), completion of surgery (T3), and 6h postoperatively (T4) showed that the MAP and HR of the block group at the time points of T1 to T4 were lower than those of the conventional group, and the MAP and HR values of the two groups differed at different time points when compared with those of the T0 time point, and that the patients of the block group had a different intraoperative The number of cardiovascular active drugs used (1.03 ± 0.16) times was shorter than that of the conventional group (3.18 ± 0.42) times, and the rate of adverse cardiovascular events was 2.5% lower than that of the conventional group (15.0%). The results suggest that the application of postanesthetic stellate ganglion block is aimed at improving the blood supply to the heart, relieving vasospasm, and preventing the occurrence of adverse cardiovascular events.

5. Conclusion

The study aims to provide practical clinical references for the treatment of patients with coronary artery disease, as well as to explore how to effectively prevent disease recurrence. In conclusion, by implementing preoperative ultrasound-guided stellate ganglion block in patients with cardiovascular risk factors, the frequency and degree of coronary heart disease symptoms will be reduced, thus reducing the risk for patients, which is worthy of promotion.

Disclosure statement

The author declares no conflict of interest.

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