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Application of body temperature protection in patients receiving laparoscopic total gastrectomy as well as its influence

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Abstract. With the extensive development of the laparoscopic total gastrectomy, increasing attention has been paid to the influence of hypothermia during the intraoperative period on patients. Therefore, effective body temperature monitoring and heating protection on patients receiving laparoscopic total gastrectomy is one of the important protective measures for guaranteeing perioperative safety of patients. This research observed the changes of the core body temperature as well as the intraoperative blood glucose and lactic acid at various time points during the perioperative period, and postoperative awakening and extubation time in patients receiving laparoscopic total gastrectomy under general anesthesia, with an aim to provide reference for clinical practice.

1 Data and methods

1.1 Object of study

The research was approved by the ethics committee of the hospital, and informed consent was obtained from all patients. 40 cases of patients that received laparoscopic total gastrectomy in our hospital were selected, among which 24 were male and 16 were female, with the age ranging from 45 to 71 years, the body weight from 45 to 66 kg, and the ASA grading of grade I to II; the cardiac, pulmonary, liver and renal functions were basically normal, the estimated duration of operation was above 2 hours, and the infusion was above 2000ml. Those with coagulation disorders, a recent history of fever or infection, hyperthyroidism or hypothyroidism were excluded. The surgeries were performed in the operating room with the room temperature of 24℃ and the humidity of 40% to 60%; the patients were randomly divided into the control group and the heating group, with 20 cases in each group, and there was no statistical difference in the general conditions between the two groups. Group A was the control group which did not take any insulation measure, and the infused liquid and the washing fluid were under room temperature. Group T was the experiment group which received temperature-adjusting blanket insulation, and the infused fluid and the washing fluid were heated to 37℃ by the infusion heating box (Mallinckrodt Medical, USA) before use.

1.2 Anesthesia method

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Intramuscular injection of penehyclidine hydrochloride was conducted 30 min preoperatively; the venous access of the two groups of patients was opened through entering the heart chamber; the invasive arterial blood pressure, electrocardiography, pulse and oxygen saturation were monitored through radial artery puncture under local anesthesia; and the temperature measurement probe was inserted into the nasopharynx of the patients after entering the chamber so as to continuously monitor the nasopharynx temperature. The two groups of patients received intravenous inhalation combined with general anesthesia; 0.05mg/kg of midazolam, 0.1mg/kg of vecuronium bromide, 1mg/kg-2mg/kg of propofol, and 0.5ug/kg of sufentanil were used for post-general anesthesia induction intubation; and sevoflurane was inhaled continuously after intubation to maintain the depth of anesthesia of 1.2 to 1.4 MAC. The intraoperative fluid infusion was Lactated Ringer's solution and hydroxyethyl starch (Voluven), with the proportion of crystal liquid to colloid liquid of 1:1. Sevoflurane inhalation was ceased after the surgery, and 1mg of neostigmine and 0.5mg of atropine were administered upon the end of the surgery and the recovery of the autonomous respiration to antagonize the remaining muscular relaxation.

1.3 Observation indicators

The core body temperature at the time points of immediately after intubation (T1), as well as 30min (T2), 60min (T3), 90min (T4), 120min (T5) and 150min (T6) after anesthesia induction, and immediately after the surgery (T7) of patients in the two groups were recorded; the blood gas analysis was conducted to compare and observe the changes of blood glucose and blood lactic acid at all time points; and the duration from the closure of the anesthesia gas inhalation to extubation and to the awakening time of patients was observed and recorded.

1.4 Statistical method

The SPSS 11.0 statistical analysis software was adopted for statistical processing, all the measurement data were expressed as mean± standard deviation ($\bar{x} \pm s$), one-way analysis of variance was applied in intra-group comparison, and paired T test was adopted for inter-group comparison. The difference with $P<0.05$ was of statistical significance.

2 Results

2.1 Changes of intraoperative nasopharynx temperature between the two groups

There was no statistical significance in the nasopharynx temperature before anesthesia between the two groups ($P>0.05$). The variation trend after anesthesia: the nasopharynx temperature changes were stable at all time points in group T, which showed a decreasing trend; the nasopharynx temperature at T5, T6 and T7 in group A was remarkably decreased compared with that before anesthesia ($P<0.05$), and that was distinctly reduced at T4, T5, T6 and T7 in group A relative to group T ($P<0.05$) (refer to Table 1).

Table 1. Comparison of the intraoperative nasopharynx temperature changes between the two groups

Group	n	T1	T2	T3	T4	T5	T6	T7
A	20	36.39±0.51	36.31±0.35	36.19±0.81	35.98±0.23	35.87±0.32△	35.73±0.31△	35.61±0.68△
T	20	36.43±0.47	36.30±0.76	36.18±0.64	36.10±0.22*	36.07±0.22*	36.07±0.97	36.06±0.89*

2.2 Changes of the blood glucose at various time points between the two groups

The blood glucose of the two groups of patients showed a rising trend. There was significant difference in T6 and T7 between the two groups (refer to Table 2).

Table 2.

Project	Group	T1	T2	T3	T4	T5	T6	T7
blood sugar	A	6.30±0.64	6.88±0.71	7.74±0.78	7.60±0.94	8.00±0.95	9.50±1.05	9.95±1.15
(mmol/L)	T	6.22±0.94	6.69±1.04	7.38±1.38	7.88±1.72	8.00±1.81	8.17±1.88*	8.22±1.97*

3 Discussion

Hypothermia means that the core body temperature is lower than 35℃ by accident. Intraoperative hypothermia is not rare, but its harm has not attracted our high attention. As is demonstrated in reports, the occurrence rate of hypothermia is about 50% to 70% [1]. Sometimes, hypothermia may be beneficial to the body, but under most circumstances, it will have adverse effects. People lack the understanding towards the drawbacks of the laparoscopic surgery previously, and there are even few reports regarding the influence of hypothermia in laparoscopic surgery. In this experiment, we compare the changes of the perioperative core body temperature, blood glucose and blood lactic acid as well as their influence on the extubation and awakening time of patients receiving laparoscopic total gastrectomy under conventional and heating protection, so as to probe into the clinical significance of heating protection.

The laparoscopic total gastrectomy is relatively complicated, which has long duration of operation and CO2 pneumoperitoneum time and requires perioperative infusion of a large amount of room temperature fluid and peritoneal washing liquid, leading to progressive reduction of body temperature. This is consistent with the results in this experiment. The perioperative hypothermia can induce neuroendocrine enhancement, insulin resistance [7] and may cause blood glucose elevation. The stress response in the patients exists during the whole perioperative period as a result of the anesthesia and the surgical stimulation, in the meantime, the inhibition of anesthetics on the blood glucose metabolism also exists during the entire anesthesia and surgery process. Hypothermia can inhibit myocardial contractility, which reduces cardiac output; in addition, it can elevate the catecholamine, induce vasoconstriction, and increase peripheral resistance and blood viscosity, leading to myocardial ischemia and arrhythmia [8], peripheral vasoconstriction and reduced blood flow. All these changes will result in circulatory disturbance and being unable to completely avoid the hypoxia and increased anaerobic metabolism. Lactic acid is the product of anaerobic metabolism, which can be served as the symbol of hypoxia. For perioperative patients and those with severe trauma, blood lactic acid is an excellent indicator for evaluating disease and prognosis [9], which is verified by the changes of blood glucose and blood lactic acid at time points after 2 hours between the two groups in this experiment. The influence of longer duration of laparoscopic surgery on the internal environment changes remains to be further investigated.

The above results indicate that taking the insulation measure in patients receiving laparoscopic total gastrectomy can avoid substantial decrease in body temperature since a large amount of heat will be absorbed after the cold fluid and gas enter the body. Making the body temperature decrease becomes gentle will alleviate the perioperative stress response, and reduce the extent of elevated blood glucose. Intraoperative insulation can reduce the occurrence rate and severity of acidosis, improve the perioperative internal environment disturbance, and lower the extent of elevated lactic acid; improve the metabolism of the general anesthetics and shorten the postoperative awakening and extubation time. The core body temperature in patients receiving laparoscopic surgery for more than 2 hours may be greatly changed, thus the influence on body temperature, blood glucose, lactic acid and postoperative recovery of patients should not be neglected. The comprehensive insulation measures can obviously improve the body temperature decrease in patients and improve the internal

environment homeostasis of the perioperative patients.

References

1. Junjie Liu, Zhao Jun, ed. modern anesthesiology [M]. second edition. Beijing: People's publishing house.1997:674-676.
2. Andrzejow ski J , Hoyl e J , E apen G , et al. Ef f ect of prew arming on post induction core temperature and the incidence of inadvertent perioperet ive h ypoth ermia in pati ent sundergoin g general anaesthesia[J]. Br J Anaes th, 2008,101:627
3. Zhao Jing, Luo Luo. [J]. Chinese Journal of clinical medicine, anesthesia and perioperative period. 2003,1(10):887.
4. Puttick MI, Scott-Coombes DM, Dye J ,et al. Comparison of immunologic and physiologic effects of CO2 pneumoperitoneum at room and body temper atures[J]. Surg Endosc, 1999,13(6):572.
5. Castillo V, Gutierrez2Crespo A, Suarez F ,et al. Body temperature variations dur2ing laparoscopic cholecystectomies[J]. Rev Esp Anestesiol Reanim, 1996,43(6):201
6. Zhang Liqing, Lin Weihong, Qian Huang Jing, et al. The establishment of carbon dioxide pneumoperitoneum on the heating effect of laparoscopic hand the patient's body temperature and shivering [J]. Chinese Journal of nursing, 2007,42(10):953.
7. An Gang, Xue Fushan. Modern anesthesiology technology [M]. Beijing: Science and Technology Literature Press, 1999:804.
8. Zhang Shuyue, Zhu Junyu, Peng Yanzeng, et al. Effects of hypothermia on recovery of anesthesia and nursing intervention in patients with low temperature [J]. Chinese Journal of nursing, 2003,38(3):177.
9. Hu Xingguo. Perioperative mild hypothermia [J]. Foreign Medical Sciences – anesthesiology, 2000,21(4):225.