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Effect of opioid anesthesia on radical postoperative complications in patients with esophageal cancer

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Abstract: *Anesthesia is necessary in painless gastroscopy, and it is very important to select anesthetic drugs reasonably. Anesthetic drugs commonly used in painless gastroscopy are propofol and opioid analgesics. In this study, 170 patients with inflammation were selected and the combined analgesic effects of propofol and different opioid analgesics were further analyzed from the aspects of inflammatory factors, stress indicators, adverse reactions and anesthetic effects through randomized controlled study. The study found that the analgesic anesthetic effect of propofol combined with piperidine hydrochloride was better. Therefore, it can be seen that for patients with painless gastroscopy, propofol combined with piperidine hydrochloride can be used for labor anesthesia, so as to realize painless examination and further prolong the analgesic anesthetic time, which is of great significance.*

Keywords: *no opioid anesthesia; esophageal cancer; complications; effects*

1. Introduction

As a common malignancy of the digestive system, esophageal cancer has various causes, which may be related to environmental factors, genetic tendencies and long-term poor dietary habits[1]. Globally, the incidence and mortality of esophageal cancer are among the tumors of the digestive system, putting a serious burden on public health problems. According to epidemiological investigations, despite the advances in the treatment of esophageal cancer in recent years, the 5-year survival rate is still unsatisfactory. In the treatment process of esophageal cancer, radical surgery is one of the most important treatment means[2]. However, surgical treatment is often accompanied by various complications that are largely influenced by the anesthetic method used intraoperatively[3]. Traditionally, intraoperative anesthesia usually relies on opioids to achieve pain management and maintain a stable state of patients, but there are multiple adverse factors, such as respiratory depression, digestive system response and dependence, which may increase the risk of postoperative complications[4]. To this end, the present study aims to investigate the application of opioid-free anesthesia in radical resection of esophageal cancer and its impact on postoperative complications, in order to provide a safer and more effective anesthesia scheme for clinical practice. By comparing and analyzing the effects of opioid free anesthesia and traditional opioid anesthesia in radical resection of esophageal cancer, we aim to gain a deeper understanding of their actual impact on postoperative complications and provide more accurate basis for future clinical decision-making.

The details are presented as follows:

2. Data and methods

2.1 General information

Sixty-four patients with esophageal cancer from January 2020 to January 20203 were divided into two groups according to different Afghan anesthesia methods, 32 in the control group and 32 in the experimental group.18 males and 14 females; age range was 55-73 years with mean age (63.89 ± 2.98). The control group included 17 males and 15 females; age range 56-73 years, mean age (64.48 ± 2.76). Both sets of general data were comparable (P> 0.05).

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2.2 Methods

Control group: Use conventional anesthesia: ① Preoperative preparation: ensure that patients have enough fasting time, usually 6 hours of light food and 2 hours of clear fluid before surgery. Patients were given appropriate prophylactic antibiotics 1 hour in advance to reduce the risk of infection.② Induction of anesthesia, using a mask giving 100% oxygen for 2-3 minutes to improve the patient's oxygen reserve. Using the inducer, propofol was given 1-2.5mg/kg, fentanyl 2 – 4 μ g / kg, and muscle relaxant rocuronium 0.6-1.2mg/kg according to the patient's condition. When given a muscle relaxation agent, endotracheal intubation should be performed to ensure a patent airway. Maintenance maintain anesthesia with isoflurane 1-1.5MAC. The analgesic fentanyl, the usual dose was maintained at 0.3 – 3.0 μ g / kg / h. Intraoperative monitoring to maintain appropriate oxygen saturation, heart rate and blood pressure. Monitoring the patient's body temperature to ensure it is within normal range. The analgesic agent parecoxib is used, and the value is controlled at 40mg. postoperative analgesia can be given in advance. The above values are the basic values, which are adjusted according to individual differences of patients and intraoperative conditions.

Experimental group: use opioid-free anesthesia, the specific steps are as follows: ① Preoperative preparation, to ensure that patients have enough fasting time, usually should ensure fasting for 6 hours. A moderate amount of prophylactic antibiotics was given 1 hour in advance to reduce the risk of infection.② Induction of anesthesia, using a mask giving 100% oxygen for 2-3 minutes to improve the patient's oxygen reserve. Use of inducer propofol: 1-2.5 mg / kg, and analgesic lidocaine: 1-2 mg / kg IV parecoxib: 40 mg IV. Muscle relaxant rocuronium: 0.6-1.2 mg / kg. After muscle muscle administration, tracheal intubation was performed to patent the patient's airway. Maintaining anesthesia with an inhalant, isoflurane: 1-1.5 MAC, selenofurane: 1-1.5 MAC, and a long-acting local anesthetic can be administered in the spinal canal to reduce intraoperative and postoperative pain.③Intraoperative monitoring to maintain appropriate blood oxygen saturation, heart rate, and blood pressure. Monitor the patient's body temperature to ensure it is within the correct range.④ Postoperative analgesia, lidocaine: Postoperative pain can be reduced by continuous infusion. Non-steroidal anti-inflammatory drugs: they can provide good postoperative analgesia. The above values are basic quantitative values, adjusted for individual patient differences and intraoperative conditions.

2.3 Observed indicators

Monitoring of surgical indicators in both groups included extubation time, PACU stay time, ICU stay time, and postoperative hospital stay time.The emodynamic parameters in both groups, including postoperative start (T_0), 1 hour after the operation (T_1), 2 hours into the operation (T_2), End of surgery (T_3), Gas extraction time (T_4) Of the mean arterial pressure, and the heart rate.The pain scores of the two groups were evaluated and recorded, including 2h, 12h, 24h and 48h of surgical treatment. The score was between 0 and 10. The higher the score, the score, the more severe the pain was, and the score and the pain were positively correlated.The incidence of complications in both groups was recorded and counted, including nausea, vomiting, respiratory depression, dizziness, fatigue, itchy skin, and urinary retention.

2.4 Statistical methods

$\overline{x} \pm s$Data analysis was performed by SPSS 25.0 software, measurement data by (), data with normal distribution by independent sample t test, count data by percentage (%) and data between groups by χ^2Test, $P < 0.05$ was considered statistically significant.

3. Results

3.1 Comparison of surgery-related indicators between the two groups

The extubation time, PACU stay time, ICU stay time, and postoperative hospitalization time of the experimental group were significantly lower than that of the control group, and the difference was statistically significant ($P < 0.05$), as shown in Table 1.

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Table 1: Comparison of surgery-related indicators in the two groups (± s)$\overline{x}$

group	Example number	Extubation time (min)	PACU residence time (min)	ICU stay time (h)	Postoperative length of hospital stay (days)
control group	32	12.48±4.96	42.61±3.41	29.36±2.63	18.24±2.15
experimental group	32	7.65±2.96	35.17±2.15	22.19±1.35	12.64±1.32
t	-	4.730	10.440	13.720	12.556
P	-	<0.05	<0.05	<0.05	<0.05

3.2 Comparison of patient hemodynamics between the two groups

In terms of hemodynamic indicators, the mean arterial pressure and heart rate at the beginning of surgery were higher than the control group, and the difference was statistically significant (P <0.05), as shown in Table 2.

Table 2: Comparison of hemodynamic indexes at different time points between the two groups (± s)$\overline{x}$

group	time	MABP	heart rate
Control group (n=32)	T_0	72.13±5.96	69.45±6.59
	T_1	73.42±6.39	73.69±3.59
	T_2	75.45±6.49	74.69±2.69
	T_3	78.98±7.16	76.59±8.12
	T_4	80.46±9.36	83.49±5.18
Experimental group (n=32)	T_0	81.45±6.02	79.52±4.36
	T_1	76.69±4.65	75.45±2.79
	T_2	77.63±6.49	73.49±2.78
	T_3	77.48±6.79	76.89±3.15
	T_4	88.69±9.39	83.59±5.20
Between t / P (T_0)		5.496/0.001	5.386/0.004
Between t / P group values (T_1)		1.003/0.456	0.984/0.269
Between t / P group values (T_2)		0.698/0.639	0.498/0.159
Between t / P group values (T_3)		0.563/0.398	0.357/0.678
Between t / P group values (T_4)		0.968/0.421	0.956/0.534

3.3 Comparison of postoperative pain scores between the two groups

The pain score of the experimental group was lower than that of the control group at 2h after surgery, and the difference was statistically significant (P <0.05), as shown in Table 3.

Table 3: Comparison of postoperative pain scores between the two groups (± s)$\overline{x}$

group	Example number	Two h after surgery	12h after surgery	Twenty-four h after surgery	Forty-eight h after surgery
control group	32	2.96±0.39	2.91±0.23	1.85±0.36	1.76±0.64
experimental group	32	2.06±0.42	2.80±0.45	1.76±0.48	1.64±0.79
t	-	8.883	0.236	0.849	0.668
P	-	<0.05	0.426	0.399	0.507

3.4 Comparison of the complication rates in the two patient groups

The complication rate in the experimental group was significantly lower than that in the control group, and the difference was statistically significant (P <0.05), as shown in Table 4.

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Table 4: Comparison of complication rates in the two groups [n; (%)]

group	Example number	N and V	Respiratory depression	Dizziness and fatigue	Itch of skin	retention of urine	Overall incidence of complications
control group	32	2(6.25)	2(6.25)	6(18.75)	2(6.25)	4(12.50)	16(50.00)
experimental group	32	1(3.13)	1(3.13)	0(0.00)	1(3.13)	0(0.00)	3(9.38)
X^2	-	-	-	-	-	-	12.650
P	-	-	-	-	-	-	<0.05

4. Discussion

Opioid-free anesthetic strategies are gaining attention, aiming to reduce opioid use and thus reduce the adverse effects and complications associated with them[5]. However, the application and effect of opioid-free anesthesia in radical resection of esophageal cancer still lacks sufficient scientific basis and long-term follow-up study.

The results of this study showed that the extubation time, PACU stay time, ICU stay time, and postoperative hospital stay time of the experimental group were significantly lower than the control group, and the difference was statistically significant (P <0.05). The effect of opioid-free anesthesia on the time to extubation deserves further exploration. According to some studies, opioid-free anesthesia provides better stability of the respiratory system and thus potentially less time to extubation[6]. This may be attributed to the opioid-free reduced risk of respiratory depression and thus increased flexibility in the timing of extubation. Faster extubation time can not only reduce patient discomfort during recovery, but also accelerate the rehabilitation process, helping to quickly restore normal physiological function. The duration of stay in the postoperative emergency care unit (PACU) is an important indicator for evaluating the quality of patient rehabilitation. Theoretically, by avoiding the possible side effects caused by opioids, opioid-free anesthesia can accelerate the recovery rate of patients, thus shortening the PACU stay time. Moreover, rapid patient recovery can be further promoted by reducing the risk of postoperative nausea and vomiting, thereby achieving patient stability and comfort in a short time[7]. When considering ICU stay time, opioid-free anesthesia may shorten ICU stay time by reducing drug-related complications. Faster rehabilitation can reduce the ICU resource footprint and allow for more efficient bed management. However, more studies are needed to determine whether opioid-free anesthesia can significantly reduce ICU stay time while keeping the patient safe and comfortable. Considering the postoperative hospital stay, it can be speculated that opioid-free anesthesia has the potential to shorten hospital stay by reducing postoperative complications and improving recovery speed. This could not only improve bed turnover, but also reduce the risk of hospital-related infections and other complications, thus improving the overall rehabilitation and quality of life[8].

In terms of hemodynamic indicators, the mean arterial pressure and heart rate at the beginning of surgery were higher than the control group, and the difference was statistically significant (P <0.05). In terms of hemodynamic measures, multiple measures including mean arterial pressure and heart rate can be used to evaluate the effect of opioid-free anesthesia. Stability of these indicators can be better maintained by avoiding possible cardiovascular inhibition caused by opioids. The pain score of the experimental group was lower than that of the control group at 2h after surgery, and the difference was statistically significant (P <0.05). Local anesthetics such as lidocaine can be used via the spinal canal or nerve block route to produce analgesia directly at the surgical site. Such an intervention could greatly reduce the severity of postoperative pain and thus contribute to lower pain scores. Applying multimodal analgesic strategies, among those which include NSAIDs and other adjuvant analgesic agents, can produce synergistic effects and thus lower pain scores. This strategy controls pain through multiple channels and multiple mechanisms, providing more comprehensive pain management[9]. To assess and meet each patient specific needs by implementation of individualized pain management strategies. This includes adjusting medication dosage according to the patient's pain threshold and body weight, and predicting and preparing for potential pain management challenges based on preoperative evaluation.

In terms of the complication rate, the experimental group was significantly lower than the control group, and the difference was statistically significant (P <0.05). Opioids are known to potentially contribute to respiratory depression and other respiratory complications. Intervention without opioid anesthesia can reduce the risk of these complications, thereby reducing the time that patients require

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mechanical ventilation after surgery and potentially reducing the risk of pulmonary complications. The use of opioid-free drugs reduces the risk of postoperative nausea and vomiting, a common side effect due to the effects of opioids on the gastrointestinal tract. By reducing these complications, faster patient recovery can be facilitated and additional medical interventions due to gastrointestinal complications may be reduced. Opioid-free anesthesia may maintain a more stable circulatory system by reducing these drug-related cardiovascular complications. Using opioid-free medication reduces the risk of CNS complications, including altered mental status and agitation. By accelerating rehabilitation and reducing other complications, opioid free indirectly reduces the risk of infection. Faster rehabilitation can reduce hospital stay and thus the chance of hospital-associated infections.

Esophageal cancer patients undergoing opioid free anesthesia can reduce the incidence of complications, shorten extubation time, PACU hospitalization time, ICU hospitalization time, and postoperative hospitalization time, which is worth promoting.

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