Objective: To observe the effect of remifentanil combined with propofol anesthesia on stress response, blood gas index in patients with laparoscopic cholecystectomy.

Methods: A total of 88 patients with laparoscopic cholecystectomy were randomly divided into the observation group (46 cases) and the control group (42 cases). After anesthesia induction, the observation group was given remifentanil combined with propofol intravenous anesthesia for continuous anesthesia, and control group was given isoflurane and propofol. Stress response (TNF-α, CRP, BG, COGT), blood gas index (PaO2, PCO2, PH value) before surgery, before anesthesia maintained, and after surgery between two groups were compared.

Results: Before anesthesia maintained and after surgery, PaO2 and PCO2 levels of the two groups increased with before surgery (P<0.05), but there were no statistically significant between the two groups (P>0.05). pH value of the two groups showed no change before and after surgery. Before anesthesia maintained and after surgery, TNF-α, CRP, BG, COGT of the two groups increased with before surgery (P<0.05), and these index had no significant difference between the two groups (P>0.05) at before anesthesia maintained. While to the end of surgery, these index of the control group was significantly higher than that in the observation group (P<0.05).

Conclusions: Remifentanil combined with propofol anesthesia can make blood gas index stable as well as isoflurane combined with propofol anesthesia, but inhibit stress response more significantly.

1. Introduction

Laparoscopic cholecystectomy (LC) is a common surgical procedure with the small operation and the quick recovery. The trend of replacing the traditional open cholecystectomy is increasingly clear[1]. Reasonable and effective anesthesia management is the basis of the successful implementation of the LC and the reduction of postoperative complications[2]. Selection anesthetic drugs which can ensure the depth of anesthesia meanwhile can reduce the stress response to surgery and with very small inhibition to respiratory and circulatory system is very important[3]. In order to provide reference for clinical application, this study observed the effects of remifentanil combined with propofol anesthesia on the stress response and blood gas parameters in patients with laparoscopic cholecystectomy. Now the reports are as follows.

2. Materials and methods

2.1. General information

Choose patients with laparoscopic cholecystectomy in our hospital from May 2013 to August 2015 as the research object, by ultrasound and CT, all the patients were diagnosed as chronic cholecystitis with gallstone, with recurrent disease and surgical treatment. Exclusion criteria: ①Patients with brain, heart, liver, kidney disease and endocrine diseases and severe cancer patients; ②pregnancy / lactation women, cognitive impaired, and as well as drug abuse, allergic constitution patients; ③Patients did preoperative endoscopic retrograde pancreatic duct radiography, intraoperative bile duct exploration and laparotomy surgery; ④Patients didn’t sign a consent form. A total of 88 cases were included in the study. Patients were randomly divided into the observation group and control group. In the observation group, with total 46 cases including male 27 cases, female 19 cases; aged 23 to 70 years old with an average(46.23±14.53) years; Weight from 48 kg to 72 kg with average(62.33±7.56) kg; Height from 155 cm to 180 cm with average(163.23±4.33) cm; Preoperative hemoglobin from 110 g/L to 150 g/L with average(130.23±11.53) g/L; Preoperative white blood cell count from 4.5×10⁹/L to 7.5×10⁹/L with average(5.53±1.23)×10⁹/L; Preoperative C-reactive protein from 0.10 mg/L to 0.60 mg/L with average(0.23±0.13) mg/L; Preoperative procalcitonin from 0.05 ng/mL to 0.15 ng/mL with average(0.09±0.03) ng/mL; Preoperative blood glucose from 4.0 mmol/L to 6.5 mmol/L with average(5.33±0.33) mmol/L; Preoperative blood pressure from 120 mmHg to 150 mmHg with average(130.23±4.33) mmHg; Preoperative heart rate from 70 bpm to 100 bpm with average(90.23±4.33) bpm; Preoperative respiratory rate from 18 rpm to 22 rpm with average(20.23±4.33) rpm; Preoperative mean arterial pressure from 70 mmHg to 90 mmHg with average(80.23±4.33) mmHg; Preoperative mean arterial pressure from 70 mmHg to 90 mmHg with average(80.23±4.33) mmHg. In the control group, with total 42 cases including male 23 cases, female 19 cases; aged 23 to 70 years old with an average(46.23±14.53) years; Weight from 48 kg to 72 kg with average(62.33±7.56) kg; Height from 155 cm to 180 cm with average(163.23±4.33) cm; Preoperative hemoglobin from 110 g/L to 150 g/L with average(130.23±11.53) g/L; Preoperative white blood cell count from 4.5×10⁹/L to 7.5×10⁹/L with average(5.53±1.23)×10⁹/L; Preoperative C-reactive protein from 0.10 mg/L to 0.60 mg/L with average(0.23±0.13) mg/L; Preoperative procalcitonin from 0.05 ng/mL to 0.15 ng/mL with average(0.09±0.03) ng/mL; Preoperative blood glucose from 4.0 mmol/L to 6.5 mmol/L with average(5.33±0.33) mmol/L; Preoperative blood pressure from 120 mmHg to 150 mmHg with average(130.23±4.33) mmHg; Preoperative heart rate from 70 bpm to 100 bpm with average(90.23±4.33) bpm; Preoperative respiratory rate from 18 rpm to 22 rpm with average(20.23±4.33) rpm; Preoperative mean arterial pressure from 70 mmHg to 90 mmHg with average(80.23±4.33) mmHg; Preoperative mean arterial pressure from 70 mmHg to 90 mmHg with average(80.23±4.33) mmHg.
to 75 kg with an average (63.57±9.21) kg; ASA classification: 29 cases of grade I, 17 cases of grade II. In the control group, with total 42 cases including male 26 cases, female 16 cases; aged 25 to 70 years old with an average (46.23±15.54) years; Weight from 46 to 73 kg with an average (62.86±10.52) kg; ASA classification: 28 cases of grade I, 14 cases of grade II. There were no significant differences in gender, age, weight and ASA grade between the two groups (P>0.05).

2.2. Anesthesia and operation method

After entering the operation room, connect the oxygen device and start oxygen, connect the oxygen saturation, ECG monitoring and other monitoring equipment, and open the venous access. Then start of anesthesia induction, Using sufentanil, midazolam, CIS atracurium, etomidate, doses were 0.6-0.8 g/kg; 0.03 mg/kg; 0.2 mg/kg; 0.3 mg/kg respectively. Then the endotracheal intubation, anesthesia ventilator connection (setting parameters: respiratory frequency 12-15/ min; tidal volume 8-10 mL/kg; end tidal carbon dioxide partial pressure 35-45 mmHg). The observation group was given remifentanil and propofol for anesthesia maintenance. The usage of the two drugs was 0.03 μg/(kg•min) and 4 mg/(kg•h) respectively. The control group was given 2% isoflurane inhalation and intermittent intravenous infusion of propofol, and propofol usage was the same as the observation group. All patients were given intermittent injection of atracurium to maintain muscle relaxation.

Laparoscopic cholecystectomy was performed using three hole method.

2.3. Observation indexes

Blood gas indexes that including oxygen partial pressure (PaO₂), carbon dioxide partial pressure (PaCO₂) and pH value, stress response indicators that including C reactive protein (CRP), tumor necrosis factor alpha (TNF-α), blood glucose (BG), plasma cortisol (COGT) were determined. Before the operation, anesthesia maintenance and the end of the surgery, samples were also detected.

2.4. Statistical analysis

All data were analyzed by SPSS17.0, the measurement data were analyzed by t test, and P<0.05 was considered to be statistically significant difference.

3. Results

3.1. Blood gas indexes of two groups before and after surgery

Before surgery, there was no significant difference in PaO₂, PaCO₂ and pH between the two groups (P>0.05); Before anesthesia maintained and after surgery, PaO₂ and PCO₂ levels of the two groups increased compared with the same group before surgery (P<0.05), but the change of the two groups was similar, and there were no statistically significant between the two groups (P>0.05).

### Table 1

Blood gas indexes of the two groups (mean±SD).

<table>
<thead>
<tr>
<th>Groups</th>
<th>PaO₂ (mmHg)</th>
<th>PaCO₂ (mmHg)</th>
<th>pH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observation group</td>
<td>Before surgery</td>
<td>93.63±12.01</td>
<td>38.75±3.15</td>
</tr>
<tr>
<td></td>
<td>Before Anesthesia maintenance</td>
<td>208.45±43.25</td>
<td>42.08±3.64</td>
</tr>
<tr>
<td></td>
<td>After surgery</td>
<td>213.24±47.86</td>
<td>43.45±4.12</td>
</tr>
<tr>
<td>Control group</td>
<td>Before surgery</td>
<td>94.17±13.09</td>
<td>39.14±2.81</td>
</tr>
<tr>
<td></td>
<td>Before Anesthesia maintenance</td>
<td>206.36±45.56</td>
<td>42.15±3.41</td>
</tr>
<tr>
<td></td>
<td>After surgery</td>
<td>215.27±53.19</td>
<td>43.48±3.92</td>
</tr>
</tbody>
</table>

Compared with the same group before operation, △P<0.05. pH value of the two groups showed no change before and after surgery (P>0.05) (Table 1).

3.2. Stress response indicators of two groups

Before surgery, there was no significant difference in the levels of TNF-α, CRP, BG and COGT of the two groups (P>0.05); Before anesthesia maintained and after surgery, TNF-α, CRP, BG, COGT of the two groups increased compared with the same group before surgery (P<0.05), and before anesthesia maintained, these indexes had no significant differences between the two groups (P>0.05). While to the end of surgery, these indexes of the control group were significantly higher than that in the observation group (P<0.05) (Table 2).

### Table 2

Stress response indicators of the two groups (mean±SD).

<table>
<thead>
<tr>
<th>Groups</th>
<th>TNF-α (ng/L)</th>
<th>CRP(mg/L)</th>
<th>BG (mmol/L)</th>
<th>COGT (mg/mL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observation groups</td>
<td>Before surgery</td>
<td>9.87±3.32</td>
<td>10.36±2.43</td>
<td>5.34±0.65</td>
</tr>
<tr>
<td></td>
<td>Before Anesthesia maintenance</td>
<td>12.13±3.49</td>
<td>14.24±4.71</td>
<td>5.73±0.87</td>
</tr>
<tr>
<td></td>
<td>After surgery</td>
<td>14.34±1.04</td>
<td>16.54±5.10</td>
<td>5.82±0.90</td>
</tr>
<tr>
<td>Control groups</td>
<td>Before surgery</td>
<td>9.96±2.95</td>
<td>10.46±3.47</td>
<td>5.40±0.69</td>
</tr>
<tr>
<td></td>
<td>Before Anesthesia maintenance</td>
<td>12.22±3.51</td>
<td>14.25±4.46</td>
<td>5.79±1.04</td>
</tr>
<tr>
<td></td>
<td>After surgery</td>
<td>17.46±3.62</td>
<td>19.52±6.14</td>
<td>6.37±1.23</td>
</tr>
</tbody>
</table>

Compared with the same group before operation, △P<0.05; Compared with the control group, ▲P<0.05.
4. Discussion

LC is the "gold standard" for cholecystectomy[4], but the implementation of the operation is far from perfect, such as CO₂ pneumoperitoneum, traction can cause immune suppression, liver injury and also damage for patients[5]. The stress reaction that caused by LC is an important cause of trauma and postoperative complications of patients, this kind of stress including tracheal intubation, surgical wound and pull factors[6-8]. The intensity of the stress response has a direct relationship with the depth of anesthesia, as well as the anesthetic drug selection. Choose a better anesthesia scheme is very important, and this requires a clinical summary of validation. The safety of anesthesia is the guarantee of the operation, the function of the respiratory and circulatory system is the key content of its safety. The blood gas indexes can reflect the function of the two systems[9]. The two groups in our study were used the same anesthesia induction method, but the anesthesia maintenance scheme was different. The observation group was given remifentanil combined with propofol, while the control group was given isoflurane combined with propofol, both the two schemes are the commonly used anesthesia. But the two schemes have not yet reached the same conclusion in laparoscopic operation. Gong’s study[10] pointed out that remifentanil combined with propofol in LC, patients' vital signs were more stable and the stress intensity was smaller. Qi’s study[11] pointed out that isoflurane combined with propofol in gynecologic laparoscopic surgery with less influence on the blood flow dynamics and the intensity of the stress response was also lower. Are the differences due to different surgical procedures? We need to be clear about the merits of these two kinds of anesthesia maintenance schemes in LC.

Remifentanil is a new type of opioid receptor agonist with rapid and effective analgesic effect and no obvious respiratory depression, and can control the stress response by inhibiting the autonomic nervous system and central nervous system. Meanwhile, it has the function of expanding the arterial blood pressure, lowering blood pressure and reducing the heart rate[12]. Propofol anesthesia works fast, but it has a certain inhibitory effect on the circulatory system, resulting in decreased cardiac output and the elevation of the blood pressure[13], by Inhibition of respiratory system, it leads to breathing shallow. Isoflurane is colorless and tasteless gas, which has certain inhibitory effect on the circulatory system, it also can control the stress response by inhibiting the central nervous system[14]. Analysis of these two schemes, the combination of remifentanil and propofol can be seen more excellent, there were studies[15,16] considerate that it can be faster to reach the intended depth of anesthesia, and the central nervous system can be inhibited and play a better role in inhibiting the stress response. The results of our study show that there had no significant differences in blood gas indexes between the observation group application of remifentanil combined with propofol and the control group application of isoflurane combined with propofol before anesthesia maintained and after surgery, suggesting that the effect of these two schemes on respiratory and circulatory system is similar, and both has better security. In the observation group, the levels of the stress response indexes were still at the same levels as the control group before anesthesia maintained, but they were significantly lower than that in the control group after the end of operation, suggesting that the inhibitory effect of remifentanil combined with propofol on stress response was stronger than isoflurane combined with propofol.

In summary, remifentanil combined with propofol anesthesia had the same effect on blood gas indexes compared with isoflurane combined with propofol in LC, but the former had more obvious inhibition on the stress response.

References