Effect of laparoscopic cholecystectomy on the immune function in patients after gallbladder removal

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ABSTRACT

Objective: To explore the effect of open cholecystectomy (OC) and laparoscopic cholecystectomy (LC) on the body immune function. Methods: A total of 80 patients who were admitted in our hospital from October, 2014 to September, 2015 for cholecystectomy were included in the study and divided into the observation group (LC) and the control group (OC) according to different surgical methods. The patients in the two groups were performed with the operation under general anesthesia and tracheal intubation. The patients in the observation group were performed with LC, while the patients in the control group were performed with OC. The morning fasting venous blood 1 d before operation and 1 d and 7 d after operation was collected. The levels of IgA, IgG, IgM, and peripheral blood CD3⁺, CD4⁺, and CD8⁺ were determined. The ratio of CD4⁺/CD8⁺ was calculated. Results: The levels of IgA, IgG, and IgM 1 d after operation were significantly reduced when compared with 1 d before operation, the levels 7 d after operation recovered near to those 1 d before operation, but the comparison before and after treatment was not statistically significant. The levels of peripheral blood CD3⁺, CD4⁺, and CD4⁺/CD8⁺ 1 d after operation were significantly reduced, but CD8⁺ was significantly elevated. The levels of peripheral blood CD3⁺, CD4⁺, and CD4⁺/CD8⁺ 7 d after operation were significantly increased, but CD8⁺ was significantly reduced. The changes of various indicators and the recovering in the observation group were significantly superior to those in the control group. Conclusions: LC has a small effect on the body immune function with a rapid postoperative recovery, showing the advantage of minimal invasiveness with a safety and reliability; therefore, it deserves to be widely recommended in the clinic.

1. Introduction

The gallbladder benign lesions are the common general surgical diseases and are characterized by severe pain, nausea, and vomiting during an acute attack. With no thorough curing, a repeated attack usually occurs; therefore, cholecystectomy is often required in the clinic[1]. Currently, open cholecystectomy (OC) and laparoscopic cholecystectomy (LC) are mostly involved in the clinic. LC is widely applied in the clinic due to its small trauma, rapid postoperative recovery, and maximum reduction of the effect of surgical trauma on the body, achieving the best therapeutic effect[2,3]. Some scholars argue that OC and LC have a certain effect on the immune function, and the mechanism is not yet completely clarified; moreover, there exists a controversy[4]. In the study, a total of 80 patients who were admitted in our hospital from October, 2014 to September, 2015 for cholecystectomy were included in the study in order to explore the effect of the two surgical methods on the body immune function.

2. Materials and methods

2.1. General materials

A total of 80 patients who were admitted in our hospital from
Comparison of the immunoglobulin levels before and after operation in the two groups (Table 1). LC. CO2 was used to establish pneumoperitoneum with air pressure removed. The patients in the observation group were performed with cystic artery and cystic duct were cut off and the gallbladder was removed. The anatomy of Calot triangle was performed. The corresponding tissues were separated to expose the quadrant costal margin, an incision was made with a length of about 10 cm. The observation group, 40 cases were involved, among which 13 were male, and 17 were female; aged from 23 to 62 years old with an average age of (47.9±10.1) years old; 17 had gallstone, 8 had chronic cholecystitis, and 6 had gallbladder polyps. In the control group, 40 cases were involved, among which 14 were male, and 16 were female; aged from 24 to 62 years old with an average age of (46.7±9.5) years old; 16 had gallstone, 8 had chronic cholecystitis, and 6 had gallbladder polyps. The comparison of the general materials between the two groups was not statistically significant (P>0.05).

2.2. Exclusion criteria

Those who were merged with chronic liver diseases, abnormal liver function, serious infection, and dysimmunity; those who were performed with endoscopic retrograde cholangiopancreatography before operation; those who were accompanied by jaundice, cholelithiasis, or hepatolithiasis; those who had pregnancy or were during the lactating period were excluded from the study.

2.3. Methods

The patients in the two groups were performed with the operation under general anesthesia and tracheal intubation. The patients in the control group were performed with OC. Under the right upper quadrant costal margin, an incision was made with a length of about 10 cm. The corresponding tissues were separated to expose the surgical field. The anatomy of Calot triangle was performed. The cystic artery and cystic duct were cut off and the gallbladder was removed. The patients in the observation group were performed with LC. CO2 was used to establish pneumoperitoneum with air pressure from 12 to 15 mmHg. The three-hole method or four-hole method laparoscope was used for operation. The surrounding tissues were separated. The anatomy of Calot triangle was performed. The cystic artery and cystic duct were occluded and separated. The gallbladder was peeled off and removed. The electrocoagulation knife was used for hemostasis. A routine drainage was performed after operation.

2.4. Observation indicators

The morning fasting venous blood 1 d before operation and 1 d and 7 d after operation was collected. The immunoturbidimetric assay was used to detect the levels of serum immunoglobulin IgA, IgG, and IgM. FCM was used to determine the peripheral blood T lymphocyte subsets CD3+, CD4+, and CD8+. The ratio of CD4+/CD8+ was calculated.

2.5. Statistical analysis

SPSS 18.0 software was used for statistical analysis. The measurement data were expressed as mean ± SD, and t test was used. P<0.05 was regarded as statistically significant.

3. Results

3.1. Comparison of the immunoglobulin levels before and after operation in the two groups

The levels of IgA, IgG, and IgM 1 d after operation in the two groups were significantly reduced when compared with 1d before operation (P<0.05), the levels 7 d after operation recovered near to those 1 d before operation, but the comparison before and after treatment was not statistically significant (P>0.05) (Table 1).

3.2. Comparison of the levels of peripheral blood T lymphocyte subsets before and after operation in the two groups

The levels of peripheral blood CD3+, CD4+, and CD4+/CD8+ 1d after operation were significantly reduced, but CD8+ was significantly elevated (P<0.05). The levels of peripheral blood CD3+, CD4+, and CD4+/CD8+ 7 d after operation were significantly increased, but CD8+ was significantly reduced (P<0.05). The changes of various indicators and the recovering in the observation group were significantly superior to those in the control group (P<0.05) (Table 2).

Table 1.

Comparison of the immunoglobulin levels before and after operation in the two groups (n=40).

<table>
<thead>
<tr>
<th>Groups</th>
<th>Time</th>
<th>IgA (mg/L)</th>
<th>IgG (g/L)</th>
<th>IgM (mg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 d before operation</td>
<td>2 761.64±76.21</td>
<td>11.75±1.81</td>
<td>1 559.83±245.21</td>
</tr>
<tr>
<td>Observation</td>
<td>1 d after operation</td>
<td>2 543.41±137.55</td>
<td>10.15±1.35</td>
<td>1 487.71±169.45</td>
</tr>
<tr>
<td></td>
<td>7 d after operation</td>
<td>2 747.63±89.56</td>
<td>11.55±1.43</td>
<td>1 558.37±235.55</td>
</tr>
<tr>
<td></td>
<td>1 d before operation</td>
<td>2 758.75±78.46</td>
<td>11.68±1.87</td>
<td>1 557.94±266.21</td>
</tr>
<tr>
<td>Control</td>
<td>1 d after operation</td>
<td>2 551.27±208.12</td>
<td>10.23±1.22</td>
<td>1 491.05±171.32</td>
</tr>
<tr>
<td></td>
<td>7 d after operation</td>
<td>2 758.57±96.32</td>
<td>11.64±1.85</td>
<td>1 554.77±282.12</td>
</tr>
</tbody>
</table>

P<0.05 when compared with the control group; *P<0.05 when compared with 1 d before operation and 7 d after operation.

Table 2.

Comparison of the levels of peripheral blood T lymphocyte subsets before and after operation in the two groups (n=40).

<table>
<thead>
<tr>
<th>Groups</th>
<th>Time</th>
<th>CD3+ (%)</th>
<th>CD4+ (%)</th>
<th>CD8+ (%)</th>
<th>CD4+/CD8+</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 d before operation</td>
<td>61.25±2.25</td>
<td>32.03±3.58</td>
<td>25.68±2.75</td>
<td>1.35±0.15</td>
</tr>
<tr>
<td>Observation</td>
<td>1 d after operation</td>
<td>54.48±3.70</td>
<td>28.45±3.37</td>
<td>25.65±3.02</td>
<td>1.07±0.15</td>
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<tr>
<td></td>
<td>7 d after operation</td>
<td>60.46±4.32</td>
<td>31.98±4.08</td>
<td>25.27±2.54</td>
<td>1.27±0.16</td>
</tr>
<tr>
<td></td>
<td>1 d before operation</td>
<td>61.17±3.28</td>
<td>32.11±2.55</td>
<td>25.65±3.34</td>
<td>1.32±0.14</td>
</tr>
<tr>
<td>Control</td>
<td>1 d after operation</td>
<td>52.81±3.25</td>
<td>27.15±1.73</td>
<td>27.19±2.38</td>
<td>0.97±0.16</td>
</tr>
<tr>
<td></td>
<td>7 d after operation</td>
<td>58.78±4.15</td>
<td>29.76±4.58</td>
<td>26.19±2.65</td>
<td>1.11±0.15</td>
</tr>
</tbody>
</table>

P<0.05 when compared with the control group; *P<0.05 when compared with 1 d before operation and 7 d after operation.
4. Discussion

OC is a mature surgical technique with a higher effectiveness and safety, but it can create a large trauma to the patients. Moreover, its tolerance is reducing with the increasing age, and the risk is correspondingly increased. LC is a kind of minimally invasive surgery characterized by small incision, rapid postoperative recovery, higher tolerance, and small effect on the respiration, circulation, immunity, and stress; therefore, it is widely applied in the clinic[5,6]. Trauma and any outside bad stimulation can bring added burden to the body and affect the stable internal environment to cause stress and immune reaction, manifesting in the changes of cellular level, physiological level, and molecular level. A series of inflammatory response occurs after trauma. Under the stimulation of traumatic stress factors, the inflammatory mediators and cytokines are produced, which can affect the corresponding tissues and organs to produce stress and immune reaction[7,8].

Under a normal condition, the concentration of immunoglobulin maintains a relatively constant level. Surgery can produce a dual effect of excessive consumption and synthesis inhibition to the immunoglobulin, and the reduced degree is associated with the severity degree of trauma[9]. The specific humoral immunity is mainly mediated by B cells which can synthesize with stimulatory molecules to produce and secrete the specific immunoglobulin and are involved in the elimination of pathogens after receiving the specific stimulation[10]. IgG is synthesized by the spleen and plasma cells. When the body receiving the outside antigenic stimulation, IgG firstly combines with the antigen to form the antigen complex which can integrate with the macrophages to promote the phagocytosis and regulation, protect and maintain the normal physiological function, and reduce the damage of stimulation to the body. IgA is an important factor for protecting the body mucous membrane. When the stimulation antigens invade the skin and intestinal mucosa, IgA can secrete the antibodies to eliminate the antigens. IgM mainly plays a role in the humoral immunity, possessing strong sterilization, phagocytosis, and bacteriolysis function, can activate the complements and regulate the phagocytosis, and promote the phagocytosis by complement mediation[11,12]. The results in the study showed that LC has a small effect on the humoral immunity, manifesting in a less reduced degree of immune function after operation and rapid postoperative recovery, which is no different with OC.

T lymphocyte subsets can reflect the immunoregulation ability. The operative wound can create a stress reaction which can cause the immune dysfunction and the inhibition of systemic immune response, among which the specific immunity change is obviously associated with the trauma degree[13]. CD3+ exists on the surface of T cell, representing all the peripheral mature lymphocytes, and is a main unit for antigen recognition of T cell and signal transduction. CD4+ is an auxiliary and inductive cell, and can secrete a large amount of cytokines, assist the immune cells to play an immune role, and strengthen the anti-tumor effect. CD8+ is a cytotoxic and suppressor cell, possessing virus eliminating and adhesion function. CD4+/CD8+ can reflect the immune regulation status. Reduction of the ratio indicates that the immune function is lower[14-16]. The results in the study showed that the reduced degree of T lymphocyte subsets by LC was significantly lower than that by OC with a rapid postoperative recovery, showing that the immune function inhibition degree by LC was significantly lower than that by OC. LC has a small effect on the body immune function with a rapid postoperative recovery, showing the advantage of minimal invasiveness with a safety and reliability; therefore, it deserves to be widely recommended in the clinic.

References