Effect of laparoscopic cholecystectomy on the inflammatory reaction, oxidative stress and cellular immune function

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ABSTRACT

Objective: To explore the effect of laparoscopic cholecystectomy on inflammatory response, oxidative stress and cellular immune function in the body. Methods: A total of 116 patients receiving cholecystectomy from January 2014 to January 2015 in our hospital were selected. According to random single blind method, they were divided into two groups with 58 cases in each group. The control group was treated with open cholecystectomy (OC), while the observation group were treated with laparoscopic cholecystectomy (LC), and the changes of inflammatory reaction, oxidative stress and cellular immune function were detected before and after operation. Results: In the observation group, the serum inflammatory factor IL-6 was (26.34±5.27) ng/L, TNF-α was (2.65±0.42) μg/L and CRP was (20.46±3.58) mg/L at postoperative 24 h. All the levels of these indexes were significantly higher than before operation, but significantly lower than the control group; the SOD was (121.61±9.47) U/mL, GSH-Px was (2.79±0.26) U/mL and MDA was (0.74±0.10) U at postoperative 24 h in the observation group. All of them were not significantly changed compared with before treatment, but they were significantly different compared with the control group; the levels of CD3+, CD4+, CD8+, and CD4+/CD8+ in the observation group at postoperative 24 h were (49.32±4.68)%, (36.28±4.12)% and (1.17±0.24), respectively. They were significantly lower than before treatment, but significantly higher than the control group. Conclusion: Compared with open cholecystectomy, the laparoscopic cholecystectomy has a less effect on inflammatory reaction, oxidative stress and cellular immune function and is more beneficial to postoperative recovery, making it worthy of clinical promotion and application.

1. Introduction

Cholecystectomy is a common treatment means in clinical biliary surgery. In recent years, with the continuous development and betterment of minimally invasive technology, laparoscopic techniques have become increasingly widely used in abdominal surgery, with an increasingly acceptable and recognized therapeutic effect[1-3]. However, as a strong source of stressor, surgical operation has different effects on inflammatory reactions, oxidative stress and cellular immune function to a certain extent, which can affect the postoperative rehabilitation and prognosis of patients[4-6]. This study focuses on the effect of laparoscopic cholecystectomy on inflammatory response, oxidative stress and cellular immune function, and details as follows.

2. Material and methods

2.1. General data

From January 2014 to January 2015, a total of 116 patients receiving cholecystectomy in our hospital were selected and all of them met the surgical indication. Those who had serious cardiopulmonary disorder, liver and kidney function deficiency, incorporative acute inflammation, fever or other systemic diseases, malignant tumors, a history of abdominal surgery, administration of hormone drugs or antioxidants 3 months before surgery were eliminated. According to random single blind method, all selected subjects were divided into two groups with 58 cases in each group. In the observation group, there were 32 males and 26 females at the age of 25-71 with an average age of (46.82±7.39). Among them, there were 29 cases with gallstone, 17 cases with cholecystic polypus and 12 cases with chronic cholecystitis. In the control group, there were 30 males and 28 females at the age of 24-73 with an average age of (47.26±8.13). Among them, there were 27 cases with gallstone, 18 cases with cholecystic polypus and 13 cases with...
chronic cholecystitis. There was no significant difference between the control group and the observation group in terms of gender, age and types of disease (P>0.05).

2.2. Surgical methods

All subjects received venous inhalation anesthesia via trachea cannula. The control group received open cholecystectomy through an incision below right costal margin, while the observation group received a standard four-hole laparoscopic cholecystectomy. The pressure of abdominal cavity was maintained at 12-14 mmHg.

2.3. Observation indexes

In the morning 24 h before and after surgery, fasting venous blood samples were collected. After centrifugal separation, serum samples were stored at -80 °C waiting for detection. The level of IL-6 was measured by double-antibody sandwich ELISA; the level of TNF-α was measured using radioimmunoassay; the level of CRP was measured by immunoturbidimetry. The activity of serum SOD was measured using xanthine oxidase method; the level of serum MDA was measured by thiobarbituric acid colorimetric assay; the activity of GSK-Px was measured using DTNB chromogenic method directly. The T lymphocyte cell subsets including CD3+, CD4+ and CD8+ were detected by flow cytometry.

2.4. Statistics

Data were analyzed using statistically medical software SPSS 17.0 and described as Mean ± Standard Deviation (Mean ± SD). Between-group comparisons were carried out by group t test, while intra-group comparison were conducted using independent sample t test. P<0.05 was considered as statistical significance.

3. Results

3.1. Comparison of the changes of inflammatory factors

Before surgery, the levels of IL-6, TNF-α and CRP were not significantly different between the two groups (P>0.05); in the observation group, the serum IL-6 was (26.34±5.27) ng/L, TNF-α was (2.65±0.42) μg/L and CRP was (20.46±3.58) mg/L at postoperative 24 h. All the levels of these indexes were significantly higher than before operation (P<0.05), but significantly lower than the control group (P<0.05). See Table 1.

3.2. Comparison of the changes of oxidative stress

Before surgery, the levels of SOD, MDA and GSH-Px were not significantly different between the two groups (P>0.05); in the observation group, the SOD was (121.61±9.47) U/mL, GSH-Px was (2.79±0.26) U/mL and MDA was (0.74±0.10) U at postoperative 24 h. All of them were not significantly changed compared with before treatment (P>0.05), but they were significantly different compared with the control group (P<0.05). See Table 2.

3.3. Comparison of the changes of cellular immune function

Before surgery, the levels of CD3+, CD4+ and CD8+ were not significantly different between the two groups (P>0.05); after surgery, the levels of CD3+, CD4+ and CD8+ in the two groups were significantly lower than before treatment (P<0.05), but cases were better in the observation group compared with the control group (P<0.05). See Table 3.

4. Discussion

Currently, cholecystectomy is commonly used in the clinical treatment of a variety of gallbladder diseases, including gallstones and gallbladder polyps. Compared with traditional open cholecystectomy, laparoscopy has various strong points such as small trauma, less pain, quick recovery, etc. It has gradually become the preferred operation for clinical treatment of gallbladder diseases and been recognized by patients[7,8]. However, at present, many clinical studied are restricted to the comparisons involved in surgical indexes and postoperative recovery. When it comes to the effect of laparoscopic cholecystectomy on oxidative stress, there are only limited studies. On the contrary, the change of stress index can be used as an essential marker for the evaluation of surgical application, and should be placed great emphasis on in clinic[9,10].

Oxidative stress is an essential index to evaluate the state of the body after surgery, which is of high value in the evaluation of postoperative rehabilitation. Because of all sorts of stimulation, a large amount of active oxygen can be produced in surgical patients,
resulting in a state of oxidative stress in patients. As a consequence, a certain degree of oxidative damage can occur in the body, which can aggravate the inflammatory responses[11-13]. MDA can indirectly reflect the extent of oxidative stress, while SOD and GSH-Px are two important antioxidant enzymes. If there are obvious changes in these mentioned indicators, then oxidative stress must have been taken place in the body[14]. In this study, the SOD was (121.6±9.47) U/ml, GSH-Px was (2.79±0.26) U/ml, and MDA was (7.4±0.10) U at postoperative 24 h in the group receiving laparoscopic cholecystectomy, which were not significantly changed compared with before treatment, but were significantly different compared with the group receiving open cholecystectomy.

Surgical trauma can also break the body’s normal immune barrier causing alteration of immune function. When the body is in stress state, various indicators of immune function can experience a great change. These changes are normal for the body to respond to stress reactions, an should be regarded as objective indexes to measure the size of stress[15]. In this study, the levels of CD3+, CD4+, CD8+, and CD4+/CD8+ in the observation group at postoperative 24 h were (49.32±4.68)%, (36.28±4.12)%, (20.48±2.65)%, and (1.17±0.24)%, respectively. They were significantly lower than before treatment, but significantly higher than the control group. As a result of surgical trauma and CO2 pneumoperitoneum, laparoscopy could also lead to the change of internal environment homeostasis, but compared with the traditional laparotomy, its stress reaction was less.

Surgical trauma can affect and destroy a variety of physiological mechanism of the body, leading to multiple tissue injuries and inflammation. The extent of damage has a certain correlation with the size of surgical trauma. Inflammatory factors such as CRP, TNF-α and IL-6 can be significantly increased when stress happens to the body, and the levels of them are positively correlated with the degree of trauma[16]. In this study, the results show that the serum inflammatory factor IL-6 was (26.34±5.27) ng/ml, TNF-α was (2.65±0.42) μg/L, and CRP was (20.46±3.58) mg/L at postoperative 24 h. All the levels of these factors were significantly higher than before operation, but significantly lower than the control group, indicating laparoscopy has smaller surgical trauma and less distress, and it is better for postoperative recovery.

In summary, compared with open cholecystectomy, the laparoscopic cholecystectomy has a less effect on inflammatory reaction, oxidative stress and cellular immune function and is more beneficial to postoperative recovery, which is worthy of clinical promotion and application.

References