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## Analysis of the clinical symptoms of patients complicated with acute intestinal obstruction after the surgery of colon cancer

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### ABSTRACT

**Objective:** To study the content of serum inflammatory medium of the patients complicated with acute intestinal obstruction after the surgery of colon cancer.

**Methods:** A total of 150 patients with colon cancer received limited surgery treatment during the period of May 2012 to October 2015 were selected as the study objects. They were divided into postoperative ileus (POI) group and non-postoperative ileus (non-POI) group according to the presence or absence of intestinal obstruction. Then, the contents of serum procalcitonin (PCT), C-reactive protein (CRP), tumor necrosis factor- $\alpha$  (TNF- $\alpha$ ) and interleukin-6 (IL-6) were detected at the 1st, 3rd, 5th and 7th days after the surgery.

**Results:** The levels of serum PCT, CRP, TNF- $\alpha$  and IL-6 of two groups at the 1st day had no differences after the surgery. The level of serum PCT of POI group tended to increase and its levels of serum CRP, TNF- $\alpha$  and IL-6 tended to decrease at the 3rd, 5th and 7th days after the surgery, while the levels of serum PCT, CRP, TNF- $\alpha$  and IL-6 of non-POI group were decreased. The content of serum PCT of POI group and non-POI group at the 3rd day after the surgery had no differences ( $P > 0.05$ ), and the level of serum PCT of POI group was higher than that of non-POI group at the 5th and 7th days after the surgery ( $P < 0.05$ ). The levels of serum CRP, TNF- $\alpha$  and IL-6 of POI group and non-POI group had no differences at the 3rd, 5th and 7th days after the surgery ( $P > 0.05$ ).

**Conclusions:** The raising of the content of serum PCT after the surgery can be used as the laboratory index to predict the incidence of acute intestinal obstruction after the surgery of colon cancer.

## 1. Introduction

Postoperative ileus (POI) mainly happens after major abdominal surgeries causing the clinical symptoms such as abdominal pain, abdominal distension, no flatus and defecation, *etc.* Colorectal cancer is a common malignant tumor in the digestive system, and the incidence and death rates of the disease

were all tending to increase in recent years, and the main way in clinic to treat colorectal cancer is surgical resection<sup>[1–3]</sup>. Acute intestinal obstruction is a kind of serious complications that happens after the surgery of colon cancer, which will cause the prolonging of the hospitalized course and increase the rate of second surgery and rate of death. Early diagnosis of the intestinal obstruction that happens after the surgery of colon cancer is difficult, since it mainly depends on the clinical symptoms, physical signs and X-ray examination, which lacks of the effective laboratory indexes<sup>[4–6]</sup>. Intestinal obstruction that happens after the surgery of colon cancer is mainly inflammatory intestinal obstruction and early intervention can postpone the disease deterioration, alleviate the clinical symptoms and reduce the death rate<sup>[7,8]</sup>.

Cytokines is the substance with multi-biological function *in vivo*, which is identified as the main factor that mediates the systemic inflammatory response syndrome. In the process of

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The study protocol was performed according to the Helsinki declaration and approved by the Affiliated Tumor Hospital of Zhengzhou University Ethics Committee. Informed written consent was obtained from the Affiliated Tumor Hospital of Zhengzhou University.

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activating the inflammatory reaction, various inflammatory cytokines are released and participate in blood circulation. Therefore, the detection of the changes of the related cytokines content in serum has indicative function on the inflammatory reaction after the surgery and can predict the incidence of different complications after the surgery<sup>[9,10]</sup>. Some researches has confirmed that the changes of the cytokines content in serum after the gastrointestinal surgery is related to the incidence of the intra-abdominal complications after the surgery. The procalcitonin (PCT), C-reactive protein (CRP) and tumor necrosis factor- $\alpha$  (TNF- $\alpha$ ) are the important mediators that mediate the acute inflammation of organism<sup>[11,12]</sup>. The contents of the serum inflammatory mediators of patients complicated with acute intestinal obstruction after the surgery of colon cancer were studied and analyzed in order to discuss whether they could be used as the laboratory indexes to predict the incidence of acute intestinal obstruction after the surgery of colon cancer.

## 2. Materials and methods

### 2.1. Clinical data of patients

A total of 150 patients with colon cancer received the limited surgery treatment during the period of May 2012 to October 2015 were selected as the study objects. All of them were diagnosed with colon cancer through the electron colonoscope examination and pathologic biopsy, and accorded with the indications of surgical resection. They were conducted with the open surgery of radical resection of colon cancer after general anesthesia without preventive colostomy. The exclusion criteria included patients received chemoradiotherapy before the surgery, patients with emergency surgery and patients using non-steroidal anti-inflammatory drugs and the immunosuppressor for a long time. The selected patients included 91 males and 59 females with the ages of 32–67 years and the average age of ( $51.9 \pm 7.2$ ) years.

### 2.2. Grouping methods and diagnostic criteria of POI

The patients with colon cancer were divided into POI group and non-POI group according to the presence or absence of intestinal obstruction. The diagnostic criteria of POI reference to the criteria of adhesive ileus in the 7th version of Surgery: (1) medical history: history of abdominal surgery; (2) symptoms: abdominal pain, abdominal distension, nausea, vomiting and no flatus and defecation; (3) physical signs: obvious distension, pressing pain of abdomen, obviously touchable gastrointestinal shape and the peristaltic wave, no peritoneal irritation features and heard hyperactive bowel sounds; (4) imageological examination: multiple air-fluid levels observed through abdominal orthostatic X-ray examination and thickened intestine wall and agglomerate intestinal loop observed through abdominal CT plain scan.

### 2.3. Specimen collection and detection methods

About 10 mL peripheral venous blood of patients in the two groups at the 1st, 3rd, 5th days after the surgery was extracted, and centrifuged for 10 min with the centrifugal force of 12 000 r/min after placed under the room temperature for 10–15 min.

Then, the upper serum was collected to detect the contents of PCT, CRP, TNF- $\alpha$  and interleukin-6 (IL-6) by using ELISA kits.

### 2.4. Statistical analysis

The SPSS 19.0 software was applied to input and analyze the data. The measurement data were expressed as mean  $\pm$  SD, and the *t*-test was used for the analysis between the two groups. The enumeration data were expressed as frequency forms and analysed by *Chi*-square test. The Pearson's correlation analysis was adopted to detect the correlation between two variables. Differences were statistically significant when  $P < 0.05$ .

## 3. Results

### 3.1. Clinical materials of patients in the two groups

Genders, ages and body mass index of patients in the two groups had no significant differences ( $P > 0.05$ ). The contents of serum carcinoembryonic antigen [ $(17.92 \pm 2.85)$  vs.  $(19.14 \pm 2.76)$  ng/mL], CA199 [ $(127.65 \pm 19.37)$  vs.  $(130.18 \pm 21.52)$  IU/mL], CA50 [ $(193.51 \pm 26.29)$  vs.  $(191.03 \pm 22.68)$  IU/mL], PCT [ $(72.61 \pm 9.29)$  vs.  $(74.18 \pm 10.33)$  pg/mL], CRP [ $(15.28 \pm 2.15)$  vs.  $(14.59 \pm 2.42)$  mg/L], TNF- $\alpha$  [ $(105.21 \pm 15.86)$  vs.  $(107.36 \pm 17.18)$  pg/mL] and IL-6 [ $(48.41 \pm 7.49)$  vs.  $(50.12 \pm 6.92)$  pg/mL] had no significant differences before the surgery ( $P > 0.05$ ) (Table 1).

**Table 1**

Clinical materials of patients in the two groups.

| Parameter                               | POI group<br>( <i>n</i> = 14) | Non-POI group<br>( <i>n</i> = 136) | <i>P</i> |
|---|-------------------------------|------------------------------------|----------|
| Genders<br>(Male/Female)                | 9/5                           | 82/54                              | > 0.05   |
| Ages (year)                             | $52.90 \pm 6.90$              | $51.10 \pm 7.80$                   | > 0.05   |
| Body mass index<br>(kg/m <sup>2</sup> ) | $21.30 \pm 2.90$              | $20.90 \pm 3.10$                   | > 0.05   |
| Carcinoembryonic<br>antigen (ng/mL)     | $17.92 \pm 2.85$              | $19.14 \pm 2.76$                   | > 0.05   |
| CA199 (IU/mL)                           | $127.65 \pm 19.37$            | $130.18 \pm 21.52$                 | > 0.05   |
| CA50 (IU/mL)                            | $193.51 \pm 26.29$            | $191.03 \pm 22.68$                 | > 0.05   |
| PCT (pg/mL)                             | $72.61 \pm 9.29$              | $74.18 \pm 10.33$                  | > 0.05   |
| CRP (mg/L)                              | $15.28 \pm 2.15$              | $14.59 \pm 2.42$                   | > 0.05   |
| TNF- $\alpha$ (pg/mL)                   | $105.21 \pm 15.86$            | $107.36 \pm 17.18$                 | > 0.05   |
| IL-6 (pg/mL)                            | $48.41 \pm 7.49$              | $50.12 \pm 6.92$                   | > 0.05   |

### 3.2. The postoperative contents of serum inflammatory cytokines

The levels of serum PCT of patients in the two groups at the 1st day after the surgery had no differences ( $P > 0.05$ ), while the level of serum PCT of POI group tended to increase and the level of serum PCT of non-POI group tended to decrease at the 3rd, 5th and 7th days after the surgery. The contents of serum PCT of the two groups at the 3rd day after the surgery had no differences ( $P > 0.05$ ), but the level of serum PCT of the POI group at the 5th and 7th days after the surgery was higher than that of the non-POI group ( $P < 0.05$ ) (Table 2).

The levels of serum CRP, TNF- $\alpha$  and IL-6 of patients in the two groups had no differences at the 1st day after surgery

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