

Efficacy of Laparoscopic Cholecystectomy in Treating Patients with Gallstones and Its Effect on Interleukin-6 and Tumor Necrosis Factor- α Levels

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Abstract: *Objective:* To investigate the efficacy of laparoscopic cholecystectomy in the treatment of patients with gallstones and its effect on the levels of interleukin-6 (IL-6) and tumor necrosis factor- α (TNF- α). *Methods:* A total of 82 patients with gallstones admitted from July 2020 to July 2023 were recruited and allocated into control and observation groups using the random number table method, with 41 cases in each group. The patients were treated with laparoscopic cholecystectomy, with the anterior triangle anatomical approach to the gallbladder in the control group and the posterior triangle anatomical approach to the gallbladder in the observation group. The treatment effect and inflammatory factor levels of both groups were observed and compared. *Results:* When comparing the clinical outcomes of both patient groups, the key parameters evaluated included time to mobilization, duration of surgery, extubation time, and intraoperative bleeding. The observation group exhibited a significant advantage in these parameters compared to the control group ($P < 0.05$). Regarding the levels of inflammatory factors between the two groups before and after treatment, there was no significant difference in values before treatment. However, following treatment, patients in the observation group showed significantly lower levels of IL-6, TNF- α , and C-reactive protein (CRP) compared to the control group ($P < 0.05$). *Conclusion:* Patients undergoing laparoscopic cholecystectomy for gallstones can benefit from the implementation of the posterior triangular anatomical approach to the gallbladder, which not only enhances therapeutic efficacy but also offers significant advantages in reducing levels of IL-6, TNF- α , and CRP. Therefore, it is recommended for the widespread adoption of this treatment approach in clinical practice.

Keywords: Laparoscopic cholecystectomy; Gallstones; Efficacy; Interleukin-6; Tumor necrosis factor- α

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1. Introduction

Gallstones are a hepato-biliary surgical disease that is highly prevalent in people over 45 years of age. The incidence of this disease increases with age, and treatment is needed as soon as possible to alleviate the disease and improve the therapeutic effect, thereby avoiding the aggravation of patients' condition and affecting physical

function^[1]. If the disease is left untreated or the level of treatment is limited, it is likely to threaten the patient's life. Currently, surgical intervention stands as the prevailing treatment approach for this condition. With advancements in medical practice, laparoscopic surgery is increasingly employed in its management. This modality allows for precise incisions in the abdomen at suitable sites, facilitating specialized surgical procedures aimed at enhancing operative success rates and minimizing incision size. The anterior and posterior triangles of the gallbladder are two important anatomical accesses in the surgical operation, which play a crucial role in the success of the operation. This study aimed to assess the effectiveness of laparoscopic cholecystectomy in managing gallstone patients and its impact on interleukin-6 (IL-6) and tumor necrosis factor- α (TNF- α) levels^[2]. A comparative trial was specifically conducted, involving 82 gallstone patients admitted between July 2020 and July 2023.

2. Materials and methods

2.1. General information

Eighty-two patients with gallstones admitted from July 2020 to July 2023 were selected and randomized into the control and observation groups with 41 cases in each group. The observation group consisted of 21 males and 20 females, with an age range of 38–71 years and an average age of 50.29 ± 7.33 years. The disease duration range was 0.7–5 years, with a mean disease duration of 3.09 ± 1.39 years. The control group consisted of 22 males and 19 females, with an age range of 37–60 years and an average age of 52.61 ± 3.07 years. The disease duration range was 0.5–4 years, with a mean disease duration of 2.70 ± 0.78 years. There was no significant difference between the two groups in terms of general data ($P > 0.05$).

Inclusion criteria: (1) Patients with complete case data, willing to participate in the trial investigation, and signed the trial consent form; (2) Confirmed diagnosis of gallstone disease.

Exclusion criteria: (1) Patients with systemic infectious diseases; (2) Patients with contraindications closely related to the relevant surgery; (3) Patients with functional lesions of the liver, kidney, and other major organs; (4) Patients with cognitive disorders or psychiatric disorders; (5) Patients who are not willing to cooperate with the trial process.

2.2. Methods

All patients were treated with laparoscopic cholecystectomy, with the anterior triangle of the gallbladder as the anatomical approach in the control group and the posterior triangle of the gallbladder as the anatomical approach in the observation group.

In the control group, the patients were placed in the supine position, followed by the establishment of pneumoperitoneum to ensure that the abdominal pressure was stabilized at a level of approximately 12 mmHg. Subsequently, the condition of the gallbladder was observed in detail through laparoscopic placement, and the adhesions present were effectively separated^[3,4]. During the operation, the anterior triangle of the gallbladder was selected as the access route, and the plasma membrane of the anterior and posterior regions of the triangle was cauterized using electrocoagulation techniques to provide precise anatomical separation of the choledochal duct from the arterial tissue. To ensure a smooth operation, a Hem-o-lok clip was used to ligate gallbladder vessels and cystic duct, after which the gallbladder was successfully separated from the biliary bed and resected.

The surgical steps in the observation group were as follows: Similarly to the anterior biliary triangle approach, the gallbladder adhesions were observed through laparoscopy, and the adhesive tissues were finely separated^[5]. Hereafter, the plasma membrane layer of the gallbladder was opened from the posterior biliary triangle approach tightly against the posterior wall of the jugular abdomen for separation. During this process,

the bile duct was clamped and severed. Subsequently, the gallbladder triangle was left open and the gallbladder vessels were ligated using a Hem-o-lok clip. Finally, the gallbladder was separated and excised from the gallbladder bed.

2.3. Observation indexes

The clinical outcomes and levels of inflammatory factors such as IL-6, TNF- α , and C-reactive protein (CRP) were observed and compared between the two groups. The specific observation indexes of clinical outcomes include time to mobilization, duration of surgery, extubation time, and intraoperative bleeding. IL-6 and TNF- α were measured using enzyme-linked immunosorbent assay (ELISA) while CRP was measured using the immunodiffusion method.

2.4. Statistical analysis

SPSS 16.0 software was used for statistical analysis. Count data were expressed as [n (%)], and measurement data were expressed as mean \pm standard deviation (SD). Comparisons were made using the chi-squared or *t*-tests, and *P* values of less than 0.05 were considered statistically significant differences.

3. Results

3.1. Clinical outcomes

Table 1 shows that the observation group had significantly better clinical outcomes as compared to the control group (*P* < 0.05).

Table 1. Comparison of clinical outcomes between the two groups (mean \pm SD)

Groups	Time to mobilization (h)	Duration of surgery (min)	Extubation time (h)	Intraoperative bleeding (mL)
Observation group (<i>n</i> = 41)	13.82 \pm 3.66	67.82 \pm 7.41	24.82 \pm 7.44	42.76 \pm 9.93
Control group (<i>n</i> = 41)	22.79 \pm 8.41	97.49 \pm 10.24	34.71 \pm 10.46	64.18 \pm 12.01
<i>t</i>	6.262	15.030	4.934	8.801
<i>P</i>	< 0.001	< 0.001	< 0.001	< 0.001

3.2. Inflammatory factor levels

As shown in **Table 2**, the inflammatory factor levels before treatment are insignificantly different between the two groups. However, after treatment, the levels of IL-6, TNF- α , and CRP of the observation group were significantly lower than the control group (*P* < 0.05).

Table 2. Comparison of the levels of inflammatory factors between the two groups before and after treatment (mean \pm SD)

Groups	IL-6 (ng/L)		TNF- α (μ g/L)		CRP (ng/L)	
	Before	After	Before	After	Before	After
Observation group (<i>n</i> = 41)	7.49 \pm 1.54	21.25 \pm 5.41	1.14 \pm 0.25	2.75 \pm 0.55	4.41 \pm 1.09	14.01 \pm 3.04
Control group (<i>n</i> = 41)	7.53 \pm 1.61	37.96 \pm 7.58	1.12 \pm 0.18	5.07 \pm 1.16	4.37 \pm 0.96	30.55 \pm 7.22
<i>t</i>	0.115	11.489	0.416	11.571	0.176	13.519
<i>P</i>	0.909	< 0.001	0.679	< 0.001	0.860	< 0.001

4. Discussion

Gallstones are a very common condition in clinical practice and are one of the types of hepatobiliary surgical diseases. Patients suffering from gallstones generally have problems with their living habits and dietary habits. In recent years, people's pace of life has accelerated, the pressure of life has become greater, and unhealthy dietary and living habits have led to an increasing incidence rate of gallstone disease. In the clinic, gallstone disease will lead to persistent fever, abdominal pain, and other symptoms ^[6]. Adopting conservative treatment can relieve the patient's disease in the short term, but gallstone disease can persist for a prolonged period with repeated attacks. Only through the adoption of surgical resection can a permanent solution be achieved.

The traditional mode of surgical resection is usually carried out in the form of abdominal cholecystectomy, which has its advantages and has gained a lot of clinical experience in the long-term application ^[7]. However, in general, the incision caused by abdominal cholecystectomy is relatively large, and patients are prone to various complications during the postoperative recovery process, and the recovery time is longer and slower, which is not conducive to improving the quality of life of patients. Currently, the application of laparoscopic diagnostic and treatment modes has become more and more extensive, and the relevant technical means have made continuous progress in clinical practice. Laparoscopic cholecystectomy can address the issue of extended postoperative recovery time. Additionally, due to the smaller surgical incision, medical personnel can better observe the patient's condition, and surgeons can remove gallstones more efficiently. Laparoscopy aids in detecting gallstone development in patients. Moreover, the smaller incision reduces the likelihood of postoperative infection in patients. In laparoscopic cholecystectomy, the implementation of the posterior triangular anatomical approach to the gallbladder has brought significant benefits to patients with gallstones. As an advanced surgical technique, the posterior triangular anatomical approach to the gallbladder takes full advantage of the wide field of view provided by laparoscopy, which makes the surgical operation more precise and meticulous ^[8]. When performing this technique, the surgeon needs to have an in-depth understanding of the anatomy of the gallbladder triangle, which includes the gallbladder artery, the cystic duct, and their association with the surrounding tissues, to ensure a precise resection of the gallbladder while maintaining surgical safety. According to the results of several studies ^[9], the anatomical approach to the posterior triangle of the gallbladder has demonstrated significant advantages in enhancing treatment outcomes. Firstly, this surgical approach can remove gallstones more thoroughly and significantly reduce the risk of stone retention. Secondly, by precisely removing the gallbladder, damage to the surrounding tissues can be minimized, thus helping to shorten the patient's recovery time. In addition, the anatomical approach to the posterior triangle of the gallbladder can effectively reduce the incidence of surgical complications and further enhance the safety of surgery. In the course of this trial, to understand the advantages of the treatment mode of the posterior triangular anatomical approach to the gallbladder in laparoscopic cholecystectomy, a group comparison test was conducted, in which the two groups of patients with equal numbers of patients were differentiated, and the therapeutic effects as well as the levels of inflammatory factors of the two groups of patients after treatment were also compared ^[10]. Following the surgical procedure, notable discrepancies emerged in the values of the two patient groups. These values underscore the benefits of employing the posterior triangular anatomical approach to gallbladder treatment. Throughout the specific surgical procedure, efforts should be made to alleviate patient concerns regarding the treatment modality and unfamiliarity with the ward environment. Healthcare personnel should collaborate closely with the physician to provide synchronized nursing care, offer timely explanations of the surgical process, and diligently monitor the patient's vital signs ^[11]. In the event of abnormalities in vital signs or other parameters, prompt notification of the attending physician facilitates appropriate interventions, thereby enhancing the surgical success rate ^[12].

In summary, the adoption of the posterior triangular anatomical approach to gallbladder treatment can sig-

nificantly augment the therapeutic effectiveness of laparoscopic cholecystectomy for patients with gallstones. Furthermore, this approach demonstrates clear benefits in lowering the levels of IL-6, TNF- α , and CRP. Therefore, widespread promotion of this treatment modality in clinical practice is strongly advocated.

Disclosure statement

The authors declare no conflict of interest.

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