

Clinical Comparison of Single-Port and Three-Port Laparoscopic Appendectomy

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Abstract: Purpose: To compare the operation situation and therapeutic effect of single-port laparoscopic appendectomy and traditional three-port laparoscopic appendectomy with conventional instruments.

Methods: A retrospective analysis was performed on patients diagnosed with acute appendicitis who underwent laparoscopic appendectomy from 2023 to 2024. Among them, 82 patients underwent single-port laparoscopic appendectomy. Among the patients who underwent traditional three-port laparoscopic appendectomy, 82 cases were selected as the control group using propensity matching. Collect the preoperative and intraoperative conditions of the two groups and compare the two groups, postoperative recovery, incision infection rate, and residual abdominal infection.

Results: Preoperative conditions of the two groups [age, sex, anesthesia risk score (ASA), body mass index (BMI), admission. There were no significant differences in body temperature, white blood cell count, days of abdominal pain, concomitant diseases, and previous history of abdominal surgery]. A slightly higher proportion of complicated appendicitis (32.9%) was observed in the single-port group, and in the three-port group (25.6%), but the difference was not statistically significant ($P=0.303$). The average operation time of the single-port group (76.3 ± 32.9) min was significantly longer than that of the three-port group (59.5 ± 28.9) min ($P=0.001$), 6 cases were converted to three-port surgery. There was no conversion to laparotomy in both groups.

The postoperative eating time, days of antibiotic use, and days of hospitalization in the single-port group were significantly lower than those in the three-port group. There was no significant difference in wound infection rate and abdominal residual infection rate between the two groups.

Conclusion: Single-port laparoscopic appendectomy compared with traditional surgery three-port laparoscopic appendectomy, there is no increase in postoperative infection rate. However, in the treatment of complicated appendicitis, its clinical significance needs to be confirmed by more studies.

Keywords: single port; three-port, abdominal appendectomy; acute appendicitis.

1. OBJECTS AND METHODS

1.1 Object

Retrospectively included patients who were admitted to our hospital from emergency department during 2023-2024, 567 patients who underwent laparoscopic appendectomy. All patients the previous diagnosis was acute appendicitis, and the diagnosis was based on the presence of the acute attack, migratory right lower quadrant pain, with or without fever, anorexia, nausea, vomiting, right lower quadrant tenderness with or without rebound tenderness, white blood cell count in routine blood test, or the proportion of neutrophils increased; Abdominal B-ultrasound or CT examination confirmed appendicitis. Agree to laparoscopic surgery and sign an informed consent. Letter of intent and completed laparoscopic surgery. Collect patient preoperative status [Age, sex, body mass index (BMI), preoperative body temperature, duration of abdominal pain, white blood cell count, associated symptoms, previous abdominal pain operation history], intraoperative process (ASA score, operation time, conversion rate, appendice inflammation severity score [7], peritoneal effusion, treatment of the root of the appendice, incision selection, intraoperative washing, indwelling abdominal drainage tube, etc.) and postoperative situation status (duration of antibiotics and analgesics, length of hospital stays, recovery time to eat and drink).

Patients who underwent single-port laparoscopic appendectomy. There were 82 patients who underwent traditional three-port laparoscopic appendectomy. Propensity scoring for age, gender, ASA score, and paired, in the traditional three-port laparoscopic surgery group, 82 cases were selected as control group. The contact information of the two groups of patients and the follow-up visits after discharge were collected, and whether there was wound infection or infection within 1 month after operation was recorded.

The incidence of abdominal residual infection and compare the difference between the two groups.

1.2 Method

Single-port laparoscopic appendectomy: after general anesthesia and intubation, patients who take the supine position. Complete the disinfection of the surgical field and pay attention to the disinfection inside the navel. Toxic, remove the dirt in it. The operator and the assistant are placed on the patient's left and right sides. Use a median incision through the navel or a left side around the navel the length of the incision is about the length of the navel of the patient and can be appropriately extended according to the situation. Extend downward or upward, and the general length is controlled at 2.0-2.5 cm. layer by layer open the skin, subcutaneous, Linea alba and peritoneum. Probe around the incision after entering the abdomen. If there is no intestinal or omental adhesion, put the incision protection sleeve (caliber 40 mm) on the into it, take a 6# left hand glove, with the palm of the glove facing on the left side of the patient, turn the edge of the glove and the incision protector to the belly navel. Cut small openings on the thumb, middle finger and little finger of the glove, and insert them into insert 12 mm, 12 mm, 5 mm trocar, and wrap it with infusion patch set on fingertips. Pneumoperitoneum was established, and the pressure was controlled at 12-14 mmHg. Adjust the patient's position so that the head is low, and the feet are high, and the right side is raised by 15°~30°. Help move the hand to the left side of the patient and place the laparoscope from the Trocar at the middle finger of the glove.

After entering the abdominal cavity, a routine laparoscopic operation was placed on the thumb and little finger of the glove. For equipment. Due to the extrusion of the navel hole on the instrument, the instrument on the right-hand side often appears on the left side of the laparoscopic field, while the left side will appear on the right side, the left and right hands can exchange positions to achieve the left and right alignment of the surgical field. Turn the small intestine in the right lower quadrant to the left quadrant to expose the ileocecal. After lifting the tip of the appendice with forceps, use an ultrasonic scalpel with your right hand to cut off the appendice membrane and bare the base of the appendice. Retract the laparoscope into the glove, place the lock clip of the Hemiblock enters the abdominal cavity under direct vision of the laparoscope, and then insert the laparoscope into the abdominal cavity from the upper left direction of the navel hole. always will the locking clip is controlled on the right side of the operative field, and the root of the appendice is searched. left hand use grasping forceps to pull the tip of the appendice toward the pelvic side. After straightening the appendice, the lock is clamped at the base of the appendice. If the root of the appendix is too thick, the lock cannot be clamped. If it is closed, use a fisherman's knot to tie or sew the roots. Clamping of distal and proximal appendice, cut off the appendice. Under direct vision of the laparoscope, the appendice was lifted out of the incision, and put it into the index finger of the glove, and the vascular clamp clamps the base of the finger of the glove. After peritoneal effusion, do local flushing of the operation area. A 3 cm incision was made on the pubic symphysis, and a flat tube was placed for drainage. will cut after the mouth protection cover was removed, the gloves were changed, and 3-0 microjoule sutures were used for interrupted sutures. After washing the incision with povidone iodine and normal saline in sequence, the umbilicus skin was closed with interrupted sutures.

Traditional three-port laparoscopic appendectomy selects 1 cm below the navel, transverse incision, 5 mm incision 3 cm above the pubic symphysis at the ventral midline and right lower quadrant 12 mm incision, intraperitoneal operation with single-port laparoscopic hand technique is similar.

1.3 Statistical methods

Statistical software SPSS24.0 was used for data analysis. For numeric variables mean \pm SD ($x \pm s$) are expressed and comparisons were made using ANOVA. Classification variables are expressed as frequency or percentage, and comparisons are made by chi-square test or Fisher exact probability method. Propensity pairing using age, sex, ASA rating points as paired variables. In statistical analysis, two-sided $P \leq 0.05$ for the difference was statistically significant.

2. RESULTS

The preoperative conditions of the two groups are as follows: the average ages were (39.6 ± 16.1) years old and (38.6 ± 14.5) years old, and female sex ratio was 61%, no significant difference. Single hole group and three- port group in BMI [(22.1 ± 3.0) kg/m² vs (21.84 ± 3.0) kg/m²], body temperature [(37.3 ± 0.7) °C vs (37.2 ± 0.8) °C], white blood cell count [$(13.7 \pm 5.1) \times 10^9$ vs (14.2 ± 3.8) $\times 10^9$], abdominal pain days number [(1.3 ± 0.9) d vs (1.5 ± 1.1) d], concomitant diseases (17.1%vs. 12.2%) and history of previous abdominal surgery (12.2% vs. 8.6%) there was no significant difference.

The results showed that there were 27 cases of complicated appendicitis in the single port group (32.9%), slightly higher than the 21 cases (25.6%) of the traditional three-port group, there was no statistical significance ($P=0.303$). The average operation time of the single port group (76.3 ± 32.9) min was significantly longer than that of the three-port group (59.5 ± 28.9) min ($P<0.001$). Among them, there were 6 cases converted to three-port operation in the single-port group, the conversion rate was 7.3%. The reasons for transfer were: 1 case of massive empyema in the abdominal cavity, 2 cases with severe adhesion in the right lower quadrant, 2 cases of massive empyema between intestinal loops, 1 case needed to expand the scope of exploration due to ascites around.

There was no conversion to laparotomy in both groups. In the treatment of the root of the appendice, the single- port group is ligated with a fisherman's knot or double clamped with a lock, and a few roots are too wide or in transit use sutures. The three-port group is embedded with a purse mainly. The intraoperative peritoneal washing rate (43.9%) of the single port group was higher than that of the three-port group (17.1%) significantly increased ($P < 0.001$), but the indwelling rate of the flow tube (28.0%) was not significantly higher than that of the three-port group (29.3%). Compared with the single-port group and the three-port group, the number of days to resume eating after surgery [(2.1 ± 1.3) d vs $(. 1.6 \pm 1.1)$ d], days of antibiotics after operation number [(4.1 ± 1.8) d vs (2.6 ± 2.2) d], abdominal drainage tube indwelling days [(3.9 ± 1.8) d vs (2.6 ± 1.3) d], hospitalization days [(4.9 ± 2.1) d vs 3.7 ± 2.4 d] were both prolonged, and the difference was significant ($P < 0.01$). However, the postoperative infection complication rate was similar in the two groups ($P=0.942$), 7 cases (8.5%) of incision infection occurred in the single port group, 4 cases (4.8%) of intraperitoneal infection, and 7 cases of incision infection occurred in the three port group (8.5%), abdominal infection in 3 cases (3.7%), the difference was not statistically significant. One case of abdominal infection was cured by CT-guided puncture and drainage; the rest were cured by anti-infective treatment.

3. DISCUSSION

In the study, the incision infection rate of the single-hole group was 8.5%, which was slightly higher than that of the three-port group, the reason may be that this study contains more complicated appendicitis (32.9%). It is worth mentioning that postoperative antibiotic use in the single hole group in this study days of use, duration of abdominal drainage tube, and hospitalization days were all higher than those of three-port drainage tube the group lengthened, but the overall lengthening was only about 1 day. The reason may be related to the single due to the need for daily dressing changes to the navel incision after port surgery, due to the navel itself is sunken, and effusion is prone to occur around the incision. If it is not timely handling can induce incision infection. Navel incision for single port surgery the characteristics that the mouth is easily contaminated by intra-abdominal pus or fecal stones determine the need for the observation and treatment time should be extended accordingly. Placement of abdominal drainage tube in single-port surgery, this study single-port the rate of abdominal drainage tube placement in the group was 28.0%, which was significantly higher than that reported in the literature 6.3%~8.8% [6,10].

There are many reasons for this single-port laparoscopic appendectomy reported because of concerns about surgical outcomes pursuit, often selecting uncomplicated appendicitis as the research object, or in order to avoid the placement of drainage tubes, choose to re-infect the abdominal cavity after surgery way to intervene. Moreover, most studies did not clearly report the flow tube placement rate. In this study, the single port group contains more complex appendicitis, so there was a higher proportion of peritoneal washing (43.8%), found in when the single-port operation cannot completely absorb the peritoneal effusion, choose to place an abdominal drain. The results showed that the postoperative abdominal infection rate only 4.8%, like traditional three-port surgery [4].

As a retrospective study, this study used propensity-matched, narrowing the influence of controllable factors, but after pairing the two groups in the complexity of the appendice, there are still small differences in the proportion of inflammation and intraoperative management. Due to the number of cases limitations, this study did not investigate the difference between simple appendicitis and complicated appendicitis, perform classification analysis. Single port laparoscopy in complicated appendicitis appendectomy is still controversial, but abdominal irrigation and radiotherapy placement of abdominal drainage tube, you can look forward to a better outcome. Single port in this study, the proportion of complicated appendicitis in the three-port group was higher than that in the three-port group, but the postoperative infection rate, there is no difference.

The results of this study demonstrated that single-port laparoscopic appendectomy was no increase in postoperative infection compared with traditional three-port laparoscopic appendectomy rate, while providing a more aesthetically pleasing surgical incision. But in the complexity in the treatment of tail inflammation, it is especially necessary to indwell the peritoneal drainage tube. However, its clinical significance needs to be confirmed by more studies.

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