

# Feasibility of prophylactic laparoscopic appendectomy in obese patients

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## Summary

**Purpose:** To investigate the feasibility of prophylactic laparoscopic appendectomy in obese patients. **Materials and Methods:** A retrospective study was performed in obese patients undergoing total laparoscopic hysterectomy (TLH) alone (66 patients, TLH group) or in combination (55 patients, THL+LA group) with laparoscopic appendectomy (LA) between 2007 and 2012. Operation time, intraoperative bleeding volume, postoperative exhaust time, analgesic use, and the incidence of major complications, hospital stay and cost of hospitalization were compared. **Results:** The operation time was longer in THL+LA group than in TLH group ( $p < 0.05$ ), while the intraoperative bleeding volume, postoperative exhaust time, postoperative morbidity, the incidence of major postoperative complications, and hospitalization time were not significantly different between the two groups. **Conclusion:** It is safe and feasible for obese patients to undergo simultaneous LA and prophylactic appendectomy, and the combined procedure does not increase the risk of infection of hysterectomy and avoids reoperation of patients due to the recurrence of appendicitis.

**Key words:** Laparoscopy; Hysterectomy; Appendicitis; Appendectomy; Obesity.

## Introduction

Obese patients are the high-risk population for various surgical operations. For those whose lesions are in the abdominopelvic cavity, laparotomy was the most common before laparoscopic surgery was well established. Because of the physiological characteristics of obesity, longer incision is needed in obese patients than in normal patients for better exposure in the traditional laparotomy. In obese patients with relative low resistance, metabolic disease and hypertrophic abdominal wall, this would increase the risk of infection of the surgical incision or fat liquefaction, as well as the trauma. With the development and improvement of laparoscopic techniques and equipment, a considerable number of the laparoscopic operations that were considered taboo in obese patients can now be performed, such as total laparoscopic hysterectomy (TLH) and laparoscopic appendectomy (LA) [1]. As people's health consciousness increases, appendectomy is frequently requested by patients undergoing gynecologic operations. The combined surgery was disputed because of difficulty in selecting the operation indications, increase in operation time and the risk of infection, and possible financial overburden on the patient. However, with advancements in science and technology and availability of effective antibiotics, combined gynecological and surgical procedures have been proposed [2]. Since January 2007, the authors have performed appendectomy in obese patients undergoing LA. These patients had chronic and recurrent appendicitis with a history of repeated attacks. All operations were performed under the informed con-

sent of patients. In this study, a retrospective cohort study was performed to compare these patients with patients from the same periods who underwent THL.

## Materials and Methods

### General information

The study included 318 obese patients that underwent LA between January 2007 and December 2012 in the present department. Fifty-six and 66 cases that underwent TLH or THL and LA, respectively, were selected for retrospective analysis. As shown in Table 1, the general data were similar between the two groups of patients.

The study was approved by the ethics committee of the present hospital, and informed consent was obtained from each patient who voluntarily participated the study. Patients were included if their body mass index (BMI) was  $\geq 28 \text{ kg/m}^2$ ; they had clear indications of TLH and had a history of chronic appendicitis and more than two conservative treatments. The patients requested an appendectomy with signed informed consent; their gynecological surgery was completed by a chief physician with aid of two to three residents and appendectomy was completed by a deputy physician in general surgery department and had no taboo of laparoscopic operation. Patients were excluded if they had severe anemia and needed blood transfusion, serious heart, lung, liver, kidney and other complications, or over five days of therapy for these diseases, were conducting other gynecologic operation, and had a history of pelvic or abdominal operation or a fixed and unmovable uterus in gynecological examination.

### Surgical procedure

The patients were subjected to general anesthesia and laid flat on supine position in the Trendelenburg position.

Hysterectomy: a one-cm incision was made along the upper edge of umbilicus. With the abdominal pressure set at 13 mmHg, the sec-

Table 1. — *Patients' data.*

| Clinical data | TLH+LA group (n=56) | TLH group (n=66) | <i>p</i> value |
|---------------|---------------------|------------------|----------------|
| Age           | 44.3±6.7            | 42.2±7.2         | 0.10           |
| BMI           | 28.8±1.4            | 29.1±1.2         | 0.21           |

*Complication*

|                              |    |    |       |
|------------------------------|----|----|-------|
| Diabetes                     | 17 | 21 | 0.086 |
| Hypertension                 | 32 | 40 | 0.70  |
| Coronary heart disease       | 21 | 23 | 0.76  |
| History of cerebral embolism | 2  | 3  | 0.85  |

*Size of uterus*

|                       |          |          |      |
|-----------------------|----------|----------|------|
| Transverse diameter   | 8.4±4.1  | 8.2±4.8  | 0.81 |
| Longitudinal diameter | 11.8±3.6 | 12.4±4.4 | 0.42 |

TLH: total laparoscopic hysterectomy; LA: laparoscopic appendectomy; size of uterus based on B ultrasound.

ond and third ports were inserted from the left side of the abdomen, and the fourth port inserted from the right side of the abdomen. If the intestinal fat and tubes were found to seriously affect the operation field, auxiliary puncture port may have been added. The uterus was handled in an auxiliary manner with a uterine manipulator. The round ligament of the uterus, ovarian ligament, and fallopian tube near the uterus were coagulated and cut off using bipolar electric electrodes after pushing aside the intestinal fat with the modified Parthenocissus clamp. The uterus was lifted up with a uterine manipulator by the assistants, and opened for bladder peritoneum. The bladder was then posteriorly push from both sides to separate the broad ligament and the anterior and posterior leaves were cut open. The tissues around the uterine veins and arteries were separated, and the veins were coagulated by bipolar electric electrodes. The bilateral veins and arteries were dissected and cut off near the uterus. The cut ends were coagulated. At this point, the uterus body became black due to ischemia. A uterus lifting apparatus was inserted into the vagina and cut into vaginal fornix along the edge using unipolar electric electrode. The dissected uterus body was removed from the vagina. The vagina stump was plugged with sterile gloves, wrapped with gauze after stopping the bleeding to prevent leakage, and left unsutured.

LA: after hysterectomy, auxiliary puncture holes were made to examine the appendix and the surrounding lesion with the patient's body tilted at 10° to the left. The appendix was located down the ascending colon and the head of appendix was grasped with toothless grasping forceps. The mesoappendix was spread and the appendix vascular was coagulated piecewise with bipolar electric electrodes. The appendix was cut off at the root. The appendix root was clipped with biological clip 0.2 - 0.3 cm from the root and the distal end was coagulated by bipolar electric electrodes and cut off with an ultrasonic knife. If the root of appendix had severe edema, it was sutured with no. 4 thread in form of a figure "eight", or covered with the great omentum when necessary. The appendix was placed in a specimen bag and taken out from the vagina.

Suture of vaginal stump: the abdominopelvic cavity was washed with saline solution and the vaginal stump and peritoneal reflection were closed continuously with no. 2-0 absorbable catgut.

Preoperative and postoperative treatment: the patients were intravenously injected with 1,000 mg of ceftazole sodium 30 minutes before surgery. After operation, they were given oral or intramuscular injection of analgesic drugs according to their conditions. Antibiotics were used for routine infection prevention. When intestinal function was restored (venting), patients were asked to eat. Patients were followed-up at least once after discharge.

Table 2. — *Parameters of patients in the two groups during and after the surgery.*

| Clinical data   | TLH+LA group (n) | TLH group (n) | <i>p</i> value |
|-----------------|------------------|---------------|----------------|
| Number of cases | 56               | 66            |                |

*Surgery-related*

|                           |              |              |        |
|---------------------------|--------------|--------------|--------|
| Operation time (min)      | 138.2±34.3   | 122.4±26.5   | 0.0049 |
| Bleeding (ml)             | 88.3±45.4    | 101.2±62.6   | 0.20   |
| Postoperative exhaust (d) | 2.5±0.8      | 2.2±1.0      | 0.07   |
| Postoperative morbidity   | 4 (7.1%)     | 4 (6.0%)     | 0.81   |
| Hospital stay (d)         | 5.2±0.8      | 5.3±1.0      | 0.55   |
| Hospital cost (RMB)       | 7294.6±928.8 | 6930.4±912.6 | 0.03   |

*Complication*

|                              |          |          |      |
|------------------------------|----------|----------|------|
| Total                        | 3 (5.4%) | 3 (4.5%) | 0.83 |
| Incision infection           | 1 (1.8%) | 2 (3.0%) | 0.89 |
| Pelvic abscess               | 1 (1.8%) | 1 (1.5%) | 0.55 |
| Intestinal obstruction       | 0 (0%)   | 0 (0%)   | 0    |
| appendiceal stump fistula    | 0 (0%)   | 0 (0%)   | 0    |
| Phlebitis of lower extremity | 1 (1.8%) | 0        | 0.93 |

TLH: total laparoscopic hysterectomy; LA: laparoscopic appendectomy.

*Observation*

In this study, the parameters observed were as follows: (1) operation time (the time from making skin incision to the end of surgery when the wound hole was closed with a band aid or suture; hysterectomy time was the time to remove the uterus from vagina and to coagulate the vaginal stump; (2) the amount of bleeding during operation; (3) postoperative exhaust time; (4) postoperative morbidity (two times >38°C); (5) the number of postoperative analgesic use; (6) the days of hospital stay; (7) the hospitalization expenses (the sum of all hospitalization costs); (8) the incision infection (cases); (9) the pelvic abscess (cases); (10) small bowel obstruction (cases); and (11) the appendiceal stump fistula (cases).

*Statistical analysis*

Data were processed using the statistical software SPSS19.0. Numbers between the groups were tested using  $\chi^2$  test and measurements were tested using *t* test. Differences with *p* < 0.05 were considered statistically significant.

**Results**

The parameters for the two groups were analyzed and are presented in Table 2. Due to large amount of abdominal contents and exposure difficulty, two patients suffered mesenteric injury in TLH+LA group, one intestinal contusion, and one peritoneal subcutaneous emphysema during the Veress needle puncture. The total intraoperative complication rate was 7.1% (4/56). In TLH group, there was one case of mesenteric injury and one case of peritoneal subcutaneous emphysema. The total intraoperative complication rate was 3% (2/66), which was significantly lower than that of TLH+LA group (*p* < 0.05). In postoperative pathological observation, there were 49 cases of chronic appendicitis, one case of suppurative appendicitis and six cases of simple appendicitis.

Among the 56 cases followed up, 48 (88%) were followed up for six to 12 months with average of 7.5 months. One case

in TLH+LA group had vaginal bleeding 20 days after the surgery and had polyps in the vaginal stump. The patient was given LEEP conization to stop bleeding. Seven days later, she was found cured without other complications such as chronic abdominal pain and appendix stump inflammation.

## Discussion

### *The advantages of laparoscopic surgery for prophylactic appendectomy in obese patients*

In obese patients, due to thick abdominal wall and accumulation of intraperitoneal mesenteric fat, it is often difficult to expose in traditional laparotomy. The advantage of laparoscopic surgery is small wound, wide operation space, clear vision and long-distance operation with slender instruments, and quick recovery [3-5]. Obesity was considered to be a risk factor of adverse events in perioperative period [6-9]. The combined surgery of adjacent diseased organs has been less frequent due to fear of increased operation time and complications such as infection. There are few reports on prophylactic appendectomy after hysterectomy on obese patients. In the present study, the operation time in TLH+LA group was longer than that of TLH group due to expected additional time for appendectomy ( $p < 0.05$ ). However, there was no difference in the amount of bleeding during operation, postoperative morbidity, postoperative exhaust time, and hospital stay between the two groups ( $p > 0.05$ ), illustrating that TLH+LA group did not increase the amount of bleeding and infection rate, and that postoperative recovery was similar in the two groups. However, due to the sample size, this conclusion can only be applied to the combined surgery in this study.

### *The advantages of prophylactic laparoscopic appendectomy in obese patients*

All basic principles of surgical operation should be followed when conducting combined laparoscopic surgery for obese patients. The objective should be to safely and effectively treat the main lesions while making efforts to treat minor abdominal and associated gynecological diseases. For prophylactic appendectomy, the principle of operation of appendectomy should be followed and patients should be strictly selected based on indications, not just their request. In the TLH+LA group, the intraoperative complications was 7.1%, not different from that of the TLH group ( $p > 0.05$ ). Most of the complications occurred as mesenteric injury and intestine contusion. This might be due to more celiac content and exposure difficulty in the obese patients, leading to frequent pushing and moving of the intestine and omentum during the procedures. The above complications are unique to laparoscopic surgery. In the TLH+LA group, incision infection, pelvic abscess, intestinal obstruction, and deep phlebitis rate were 1.8% (1/56), 1.8% (1/56), 0% (0/56), 1.8% (1/56), respectively, and were not different from those in the TLH group ( $p > 0.05$ ), indicating that prophylactic appendectomy fol-

lowing laparoscopic hysterectomy did not increase the incidence of complications. In both groups, no patients was found to have appendiceal stump fistula, showing that LA is well established.

### *Cost reduction*

Economically, the regulation is that for the same cut, the charge is reduced in half. Therefore, when charged one time for equipment use, the TLH+LA group was more expensive than the TLH group. However, the combined procedure eliminated duplicated charges for equipment, anesthesia, operation fee, and bed. The increased cost with the combined surgery and operation fee was much smaller than the sum of two separate surgeries. Furthermore, it avoided suffering of patients for two operations. Therefore, the combined surgery has significant social and economic benefits and had advantages for obese patients.

In summary, prophylactic appendectomy following laparoscopic hysterectomy can eliminate the effect of obesity with advantages such as less bleeding, faster postoperative recovery, and lower cost. It also avoids trauma and risk in subsequent surgery. As long as the indication for prophylactic appendectomy is strictly controlled, the surgery is safe and effective. It is therefore a clinical option for obese patients.

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