

Securing Mesoappendix during Laparoscopic Appendicectomy: Ligation vs. Ligasure

Original
Article

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ABSTRACT

Background: Securing the mesoappendix during appendectomy is a crucial step in this procedure. The current study aimed to evaluate the perioperative outcomes of intracorporeal ligation versus Ligasure in securing the mesoappendix during laparoscopic appendicectomy (LA).

Patients and Methods: A prospective randomized comparative study was carried out in a tertiary care hospital. Patients who had laparoscopic appendectomy for acute appendicitis between January 2021 and January 2024 were included in this study. Patients were allocated to one of two groups. Group I: the mesoappendix was secured by intracorporeal suture ligation. Group L: the mesoappendix was secured by LigaSure. Demographic and perioperative data were collected, tabulated, and analyzed by SPSS 23.

Results: A total of 100 patients underwent LA. No statistically significant difference was found between the two groups regarding age, sex ratio, or BMI. The technique duration was 8.9 ± 3.5 min in group I, while the duration was 4.9 ± 2.3 min in group L (statistically significant difference $P \leq 0.05$). None of the patients required conversion to an open surgery. The duration of postoperative hospital stay was 12.1 ± 2 h for group I, and 11.1 ± 8 h for group L ($P > 0.05$). One (2%) patient in group I had a postoperative right iliac fossa-infected hematoma. In group L, there was no postoperative complications.

Conclusion: In LA, the incidence of perioperative complications is not affected by the method used for securing the mesoappendix. However, intracorporeal ligation takes a longer time, which could be improved with training, it is cost-effective, safe, and suitable when energy-sealing devices are not available or in low-resource facilities.

Key Words: Intracorporeal ligation, laparoscopic appendectomy, LigaSure.

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INTRODUCTION

When comparing between Laparoscopic Appendicectomy (LA) and open appendectomy, LA had a longer time of surgery, a shorter hospital stay, and facilitates better exposure of the abdominal cavity for the diagnosis of other pathologies that mimic the clinical picture of acute appendicitis^[1] with no difference in complications and can be considered the 'gold standard'^[2].

Obtaining a safe division of the mesoappendix is a critical step in LA that may be difficult due to tissue edema and inflammation^[3]. Currently there are many techniques for securing of the mesoappendix and to seal the appendix artery including, clips, ligation with loop (loop Roeder, end loop, intracorporeal knot), endostapler (endo-GIA), monopolar or bipolar coagulation, radiofrequency coagulator and ultrasonic coagulation^[4-6]. Although they have been shown to safely decrease operative time, safe and efficient means to divide the mesoappendix^[4,7], the hemostatic effectiveness, the possibility of thermal perforation of adjacent other viscera and costs of such

devices are variable. Endo-staplers require 12 mm trocars and also may cause bowel obstruction due to the presence of metal staples in the peritoneal cavity^[8].

A comparison between the devascularization of the mesoappendix using a monopolar diathermy and LigaSure revealed that the latter is safer and faster^[9,10]. However, endo-clips, monopolar electrocautery, and straightforward ligation procedures are thought to be less expensive alternatives to minimize the expense of LA^[10].

Conventional monopolar diathermy has a number of disadvantages, including the potential for thermal damage, difficulties achieving hemostasis, the formation of smoke, and the requirement for the use of extra instruments^[11].

Aim

Our aim of this study was to compare the use of: Intracorporeal ligation + scissor cutting versus LigaSure to devascularize the mesoappendix during LA.

PATIENTS AND METHODS:

A prospective randomized comparative study was conducted in Qena University Hospital, Qena Faculty of Medicine, South Valley University, Egypt. This study recruited 100 patients who underwent LA for acute appendicitis. The study was approved by local institutional ethical committee.

Inclusion criteria***All cases diagnosed as acute appendicitis including:***

- (a) Adults above 18 years.
- (b) ASA score I, II, and III.

Exclusion criteria

- (a) Complicated appendicitis (including the cases either diagnosed preoperative or intraoperative).
- (b) Patients refused to sign the written consent.
- (c) Acute appendicitis during pregnancy.

Full clinical evaluation plus abdominal US were used for proper diagnosis of patients. Urine analysis was asked for patients complained of urinary manifestations. Also computed tomography abdomen was indicated in old patients to roll out possibility of abdominal malignancies.

We recruited 100 patients to participate in this study and patients were randomly categorized after induction of anesthesia according to the technique used to secure the mesoappendix into two equal groups:

Group I: patients who had intracorporeal ligation of mesoappendix combined with scissor cutting.

Group L: patients who had division of the mesoappendix by LigaSure (Valley lab, Tyco, USA).

The points of comparison were:

- (a) Mesoappendix securing time (min): required for control of the mesoappendix down to the base of the appendix.
- (b) Incidence of conversion to open approach due to intra-operative bleeding, massive adhesions around the appendix.
- (c) Postoperative hospital stay (h): criteria for hospital discharge: absence of postoperative fever, tolerance of oral diet, spontaneous ambulation and normal postoperative white blood cell.

- (d) Postoperative complications as ileus, fecal fistula, abscess formation.

Statistical analysis

Analysis of the Data was done using SPSS (Statistical Package for the Social Science (SPSS 26, SPSS Inc., Chicago, IL, USA) version 26 as follow:

- (a) Quantitative variables will be described using Mean and SD (M±SD) and compared using student's t-test.
- (b) Qualitative variables will be described using frequency and percentages [n (%)] and compared using χ^2 for parametric variables and using Mann–Whitney U test for nonparametric variables.
- (c) The significance level will be set to 0.05.

Operative technique

Under general anesthesia, we completed the procedure while the patient was lying supine with his left arm tucked next to his torso. On the patient's left side stood the surgeon and his assistant.

As a prophylaxis, third generation IV antibiotic plus metronidazole are administered 'with induction of anesthesia'.

LA was carried out using the traditional three-port method. The patient was in the supine position, with the laparoscopy tower positioned on the right side of the patient and the operating surgeon and assistant standing on the left side. The pneumoperitoneum was created via the umbilical camera port, which was introduced using the open Hasson technique (pneumoperitoneum was established at 12–15 mmHg). Two further 5 mm ports under vision, one in the left iliac fossa and one in the suprapubic area were added after that.

Then, the patient positioned in the Trendelenburg with slight left tilt. Once the diagnosis of acute appendicitis is confirmed, patient is categorized into one of the two groups according to the technique used to secure the mesoappendix into (here we started to calculate the time in minutes):

Group I: a window was created in the mesoappendix for intra-corporeal ligation by absorbable suture (Vicryl 2/0). This was followed by the division of the mesoappendix by scissor (Fig. 1a).

Group L: patients who had division of the mesoappendix by LigaSure (Fig. 1b).

Time counting was terminated.

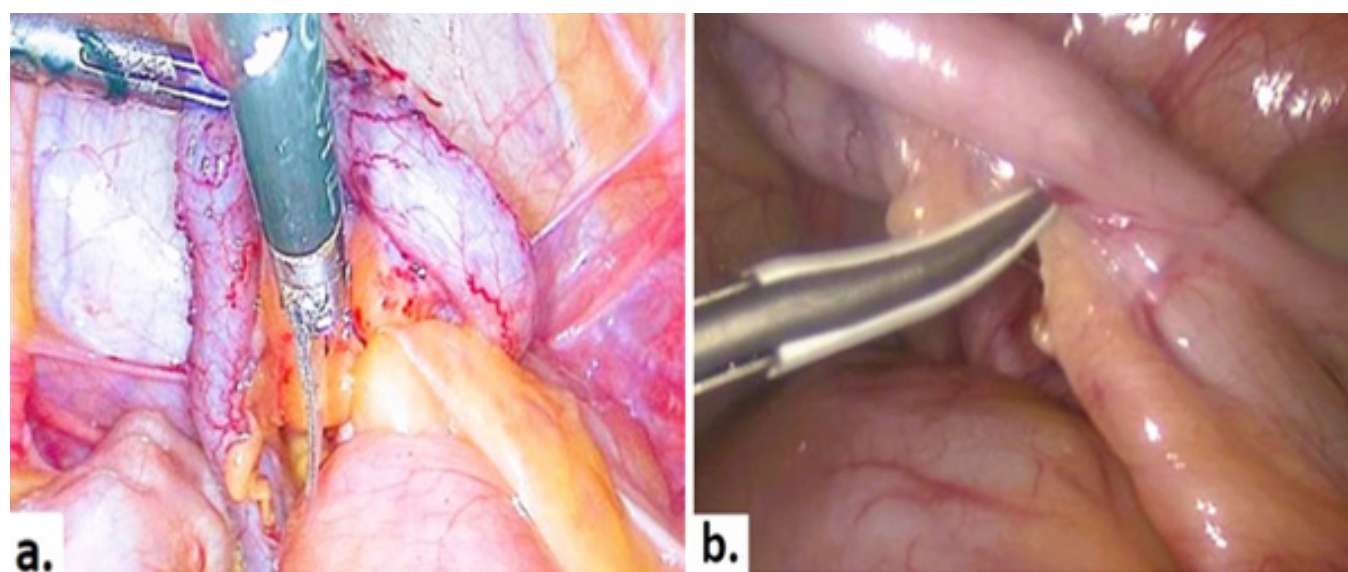


Fig. 1: Methods used for securing mesoappendix. a. Intracorporeal ligation and scissor cutting of Mesoappendix b. Securing mesoappendix by LigaSure.

Base of appendix was secured in all patients using double extracorporeal ligation by 2/0 Vicryl.

Finally, the appendix was extracted by pushing the appendix directly through the 10 mm umbilical port.

Saline irrigation of the abdomen may be required following removal of appendix. The umbilical port was closed with 0 Prolene suture and a simple non-absorbable suture was used to close all of skin the incisions.

We strictly followed the Enhanced Recovery After Surgery 'ERAS' protocol. Patients were released according

to the discharge guidelines. Patients were checked at our surgery outpatient clinic, on the fifth and 10th postoperative days, as well as 30 days thereafter.

RESULTS:

Demographic data of the two studied groups showed that there was no statistically significant difference between the three groups regarding age (years), sex ratio, and BMI (Table 1).

Table 1: Preoperative demographic data of patients

Variable	Group I (50 patients)	Group L (50 pats)	P value
Age (years)	27.2±8.5	29.3±9.7	>0.05
Sex (M: F)	26 : 24	24 : 26	>0.05
BMI (%)	28.2±3.5	27±3.1	>0.05

The technique time (min): group I was 8.9±3.5 min, group L was 4.9±2.3 min. (statistically significant $P < 0.05$).

None of the patients required conversion to open operation.

Duration of postoperative hospital stay: for group I it was 12.1±2 h, while for group L it was 11.1±8 h (Statistically nonsignificant difference. $P > 0.05$).

Among patients of group I there was a single patient (2%) who showed postoperative right iliac fossa infected hematoma (this was treated by US-guided pigtail drainage). In group L there was no postoperative complications (Table 2).

Table 2: Perioperative data of the studied patients

Variable	Group I (50 patients)	Group L (50 patients)	P value
Mesoappendix securing time in minutes	8.9±3.5	4.9±2.3	≤0.05
Postoperative hospital stay in hours	12.1±2	11.1±8	>0.05
Postoperative complications	1 (2%)	0	>0.05

DISCUSSION

Many techniques and instruments are used for appendiceal mesentery dissection at LA^[12]. But save dissection may be hindered by tissue edema and inflammation^[13].

Our study tried to compare two different methods to gain a secure dissection of the mesoappendix containing the appendicular artery running in it; using intracorporeal knotting by 2/0 vicryl then cutting the mesoappendix by scissor, or using LigaSure vessel sealing device.

The two groups were matched to each other as regard the age, sex and BMI.

On comparing the time required to achieve save dissection of mesoappendix; time required to ligate mesoappendix by intracorporeal ligation was significantly longer than time required to use LigaSure vessel sealing system 4.3±2.1 min versus 4.3±2.1 min.

None of our patients were converted into open appendicectomy.

In our study, the length of hospital stays showed no significant difference between the two groups.

When Sucullu *et al.*^[3], and Aydogan *et al.*^[10], compared LigaSure vs. endoclips, they showed that the mean operative time and the conversion rate was significantly shorter in the LigaSure group. But there was no significant difference in the hospital stay and the overall postoperative complication rate between the two groups.

Yang *et al.*^[14], and Elgohary *et al.*^[1], compared radiofrequency coagulator 'LigaSure' versus endoclip and concluded that radiofrequency coagulator facilitates the mesoappendix dissection and reduces the mean total operative time (41 vs. 54 min) and the conversion rate (9.4% vs. 11.1%).

Macario *et al.*^[15], compared LigaSure, Harmonic versus suture ligation versus. electro-cauterization in their meta-analysis. They found that the operation duration was 28% less if LigaSure, Harmonic and suture ligation vs. classical hemostasis method. This

was achieved with less blood loss, lower complication rate, and less postoperative pain.

Intra-corporeal ligatures of the mesoappendix might be significantly time-consuming (when compared with LigaSure). This result is similar to what was concluded by Elgohary *et al.*^[1].

We observed a single (2%) incident in group I (operative bed hematoma) 'which may be related to the technique of mesoappendix ligation'. This is contrary to the findings of Elgohary *et al.*^[1], who reported that they could safely divide the mesoappendix using monopolar diathermy after ligating a large bulk of tissues with nearly little danger of bleeding. We have not to forget that group L declared zero complications.

LA is safe, and the occurrence of complications is not affected by the method of mesoappendix division. The average operative duration is significantly shorter if energy-sealing devices are utilized during LA. Before any definite conclusions are drawn, future studies addressing individual tools with surgeons using similar methods to secure both the base of the appendix and the mesoappendix need to be conducted.

CONFLICT OF INTEREST

There are no conflicts of interest.

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