

Loop Knots Versus Harmonic Scalpel in Laparoscopic Appendectomy

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ABSTRACT

Background: Acute appendicitis is the most common indication for intra-abdominal emergency surgery, and appendectomy is one of the most commonly performed procedures in abdominal surgery. Although laparoscopic appendectomy (LA) has not yet achieved the status of a “Gold Standard” treatment, it is being progressively accepted as the treatment of choice for acute appendicitis. Numerous studies have shown many benefits of LA, including a faster recovery, less postoperative pain, reduced wound infections, shorter hospital stay and earlier return to work. **Aim of the Work:** To assess the feasibility of using the ultrasonic-activated device (harmonic) scalpel in sealing and division of the appendicular stump during laparoscopic appendectomy. **Patients and Methods:** This prospective study was carried out at the surgical department of Al Hussein University hospital during the period from June 2016 to April 2018. 40 patients diagnosed as acute appendicitis were included and divided into two groups: group 1 containing 20 patients using loop knots and group 2 containing 20 patients using harmonic scalpel (as a method of appendicular stump sealing). A comparative analysis was done for both techniques considering the post-operative leakage, the post-operative pain, hospital stay, surgery time, post-operative bleeding (if), and post-operative infection. **Results:** A total of 40 patients were included in this study, 20 in the loop knots group and 20 in the harmonic scalpel group. An analysis of the patients data showed that there was no significant difference between the first group and the second group with respect to difference in either age or gender. There was no mortality occurred in this study. There was no significant difference in the overall complication rates (10% in the LOOP group versus 10% in the harmonic group). **Conclusion:** Harmonic scalpel and loop knots tying are two promising techniques to secure the appendix stump in laparoscopic appendectomy with similar complication rates. Harmonic scalpel costs were higher than loop knots tying but has shorter operative times. Because of the simplicity of techniques, we highly recommend using of the harmonic scalpel especially by surgeons learning laparoscopic procedures.

Keywords: Loop Knots, Harmonic Scalpel, Laparoscopic Appendectomy

INTRODUCTION

Acute appendicitis is the most common indication for intra-abdominal emergency surgery, and appendectomy is one of the most commonly performed procedures in abdominal surgery⁽¹⁾.

Although laparoscopic appendectomy (LA) has not yet achieved the status of a “Gold Standard” treatment, it is being progressively accepted as the treatment of choice for acute appendicitis. Numerous studies have shown many benefits of LA, including a faster recovery, less postoperative pain, reduced wound infections, shorter hospital stay and earlier return to work⁽¹⁾.

LA also offers surgeons a better visualization and identification of another abdominal pathology that can mimic acute appendicitis⁽²⁾.

Although the technique used for LA was first described more than 20 years ago, the technical details are still not being modified, and improvements can be measured in terms of complications and costs. There are several technical variations that can potentially affect the outcome of LA, including the techniques used for skeletonization of the appendix, the use of single-port versus multiple-port instrumentation and the technique used for closure of the appendiceal stump⁽³⁾.

There are several techniques used to close the appendicular stump during laparoscopic appendectomy. The most commonly used surgical methods are connected with the use of endo-loop ligature, laparoscopic staplers, metal or polymer clips or application of purse string suture with the invagination of the appendicular base into the cecum, as in the classic surgery⁽⁴⁾.

These techniques have been compared in many retrospective and prospective studies without reaching a consensus for prioritizing one particular technique over the other^(5,6,7).

In this study, there was a comparative study was carried out to clarify the difference between using harmonic scalpel and loop knots tying in managing the appendicular stump.

AIM OF WORK

To assess the feasibility of using the ultrasonic-activated device (harmonic) scalpel in sealing and division of the appendicular stump during laparoscopic appendectomy. To assess efficiency, safety, ease, and flexibility of the technique. To assess possible complications. To compare the loop knots with harmonic scalpel in sealing appendicular stump

in laparoscopic appendectomy, as regarding surgery time, the post-operative leakage, the post-operative pain, hospital stay, surgery time, post-operative bleeding (if), post-operative infection.

PATIENTS AND METHODS

This prospective study was done at the surgical department of Al Hussein University hospital during the period from June 2016 to April 2018.

The study was approved by the Ethics Board of Al-Azhar University.

40 patients have been diagnosed as acute appendicitis were included And divided into two groups: group 1 containing 20 patients using loop knots and group 2 containing 20 patients using harmonic scalpel (as a method of appendicular stump sealing. A comparative analysis was done for both techniques giving attention to the post-operative leakage, the post-operative pain, hospital stay, surgery time, post-operative bleeding (if), and post-operative infection.

Inclusion Criteria: Patients with appendicitis were included in the study performed at Al Hussein Hospital at Al-azhar University. History of right lower quadrant pain or periumbilical pain migrating to the right lower quadrant with nausea and/or vomiting, fever of more than 38°C and/or leukocytosis above 10,000 cells per mL, right lower quadrant guarding, and tenderness on physical examination. All patients included were 16 years old or more.

Exclusion Criteria: Patients who were excluded have been diagnosis with appendicitis was not clinically established and if they had a history of symptoms for more than 5 days and/or a palpable mass in the right lower quadrant, suggesting an appendiceal abscess treated with antibiotics and possible percutaneous drainage. Patients with the following conditions were also excluded if they suffered history of cirrhosis and coagulation disorders, generalized peritonitis, shock on admission, absolute contraindication to laparoscopic surgery (large ventral hernia, history of laparotomies for small bowel obstruction, ascites with abdominal distension), contraindication to general anesthesia (severe cardiac and/or pulmonary disease), inability to give informed consent due to mental disability, and pregnancy.

Statistical analysis: Recorded data were analyzed using the statistical package for social sciences, version 20.0 (SPSS Inc., Chicago, Illinois, USA). Quantitative data were expressed as mean± standard deviation (SD). Qualitative data were expressed as frequency and percentage.

RESULTS

Table (1): Comparison between the two groups according to their demographic data.

Demographic Data	Group I: Harmonic scalpel (N=20)	Group II: Loop knots (N=20)	t/x2#	p-value
Gender				
Male	10 (50.0%)	11 (55.0%)	0.100#	0.752
Female	10 (50.0%)	9 (45.0%)		
Age (years)				
Mean±SD	28.95±8.87	27.85±8.96	0.152	0.699
Range	19-48	18-47		

t- Independent Sample t-test; #x2: Chi-square test; p-value >0.05 NS

This table shows no statistically significant difference between groups according to demographic data.

Table (2): Comparison between the groups according to operation time.

Operation time (Minutes)	Group I: Harmonic scalpel (N=20)	Group II: Loop knots (N=20)	t-test	p-value
Mean±SD	38.95±3.55	49.95±3.63	93.856	<0.001**
Range	34-46	45-57		

t- Independent Sample t-test; **p-value <0.001 HS

This table displays a highly statistical significant difference between the groups according to operation time.

Table (3): Comparison between the groups according to hospital stay.

Hospital stay (Days)	Group I: Harmonic scalpel (N=20)	Group II: Loop knots (N=20)	t-test	p-value
Mean ±SD	3.45±0.83	3.50±1.00	0.030	0.864
Range	2-5	2-5		

t- Independent Sample t-test; p-value >0.05 NS

This table reveals no statistical significant difference between the groups according to hospital stay.

Table (4): Comparison between the two groups according to reoperation.

Reoperation	Group I: Harmonic scalpel (N=20)	Group II: Loop knots (N=20)	x2	p-value
Negative	20 (100.0%)	20 (100.0%)	0.000	1.000
Positive	0 (0.0%)	0 (0.0%)		

x2: Chi-square test; p-value >0.05 NS

This table demonstrates no statistical significant difference between groups according to reoperation.

Table (5): Comparison between groups according to wound infection.

Wound infection	Group I: Harmonic scalpel (N=20)	Group II: Loop knots (N=20)	x2	p-value
Negative	18 (90.0%)	18 (90.0%)	0.000	1.000
Positive	2 (10.0%)	2 (10.0%)		

x2: Chi-square test; p-value >0.05 NS

This table shows no statistical significant difference between groups according to wound infection.

Table (6): Comparison between groups according to post-operative leak.

Post-operative leak	Group I: Harmonic scalpel (N=20)	Group II: Loop knots (N=20)	x2	p-value
Negative	20 (100.0%)	20 (100.0%)	0.000	1.000
Positive	0 (0.0%)	0 (0.0%)		

x2: Chi-square test; p-value >0.05 NS

This table shows no statistical significant difference between both groups according to post-operative leak.

DISCUSSION

Abdominal pain is one of the most common symptoms of patients seeking medical attention. Acute appendicitis is the most common cause of acute abdominal pain, and distinguishing appendicitis from other disorders is sometimes difficult, particularly in young, preverbal children ⁽¹⁾. The acceptance of LA among surgeons is increasing ⁽⁸⁾.

LA has been shown to be advantageous compared to OA in regard to early postoperative parameters such as postoperative pain and recovery of the bowel functions, and is also associated with a lower wound infection rate ⁽⁹⁾.

Despite the lack of a clear outcome benefit of LA, most cost studies have confirmed a substantially higher cost of LA compared to OA, due to expensive disposable equipment used during the procedure ⁽¹⁾.

The closure of the appendiceal stump is an important step during a LA, because most of the postoperative complications are caused by its inappropriate management. The development of life-threatening events such as stercoral fistulas, postoperative peritonitis and sepsis is included in these complications. Among the alternatives, studies advocate the use of an endostapler, endoloop, intracorporeal suturing, Gea extracorporeal sliding knot (GESK), titanium clips, polymeric clips and bipolar endocoagulation. All alternatives have advantages and disadvantages for the different clinical stages of acute appendicitis, but endoloops and endostaplers are used most frequently ^(8,10,11).

In these studies, harmonic scalpel was used to close appendix stump. In this procedure, outcomes between two laparoscopic techniques used for appendiceal stump closure have been compared harmonic scalpel and loop knots tying.

We recommend the use of the harmonic scalpel, although the results did not show a significant difference between the harmonic scalpel and loop knots techniques with respect to intra abdominal abscess formation ⁽³⁾.

In our study, there was no tendency toward a higher rate of stump insufficiency and intra abdominal abscess formation due to inefficient closure of the base of the appendix among the two groups. In fact, our data showed that harmonic scalpel and loop knots tying were both safe for stump closure.

In our study, the patients were divided into in subgroups according to the intra-operative and post-operative findings. There were no significant differences in the intra operative or postoperative complications between the subgroups.

The most important factor in deciding which technique to use in routine clinical practice is the cost-benefit analysis. We believe that surgeons have to be more selective, and this selectively should include appendiceal stump closure using cost-effective endoloops, with the selective use of a harmonic scalpel in specific cases where it is indicated.

There was no recorded mortality occurred during our study. This is consistent with the majority of previous research studies carried on the same topic. The overall reported mortality of appendectomy is very low and was estimated in a review of a large administrative database at 0.05% for LA and 0.3% for OA ⁽¹²⁾, reinforcing the fact that appendectomy in the absence of peritonitis is a safe procedure, regardless of the technique performed. Our complication rates were similar in both groups. This is similar to most randomized studies, reviews, and meta-analyses.

The length of hospital stay in our study was the same, and there was no significant difference between the two groups.

In our study, the blinding of our patients and nurses and the adherence to strict discharge criteria can be a factor explaining the absence of difference between the groups.

CONCLUSION

Harmonic scalpel and loop knots tying are two promising techniques to secure the appendix stump in laparoscopic appendectomy with similar complication rates. Harmonic scalpel costs were higher than loop knots tying but has shorter operative times. Because of the simplicity of techniques, we highly recommend and appreciate using of the harmonic scalpel especially by surgeons learning laparoscopic procedures. However, more experienced surgeons in poor economic setups and surgeons trying to refine their technical skills should opt for loop knots tying. Our study showed that there is no evidence for routine method to secure the appendiceal stump. The appendiceal stump can be secured safely with the use of loop knots in the majority of patients, and a selective use of a harmonic scalpel should be

considered in a small minority of patients. Using loop knots is a safe and cost-effective method for securing the appendiceal stump. Based on our findings, we believe that the use of harmonic scalpel increases the cost and decreases duration of an operation.

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