

Clip Versus Ligature of The Appendicular Stump in Laparoscopic Appendectomy

Mostafa Ebrahim Omar ^{1,*} M.B.B.CH, Magdy Mahmoud Mostafa ¹ MD,

Mohammed Fathy Labib ¹ MD

General Surgery

*Corresponding Author:

Mostafa Ebrahim Omar

mostafaebrahim.omar@gmail.com

Received for publication November 21, 2021; Accepted March 24, 2022; Published online March 24, 2022.

Copyright The Authors published by Al-Azhar University, Faculty of Medicine, Cairo, Egypt. Users have the right to read, download, copy, distribute, print, search, or link to the full texts of articles under the following conditions: Creative Commons Attribution-Share Alike 4.0 International Public License (CC BY-SA 4.0).

doi: 10.21608/aimj.2022.107132.1670

¹General Surgery Department, Faculty of Medicine, Al-Azhar University Cairo, Egypt.

Disclosure: The authors have no financial interest to declare in relation to the content of this article. The Article Processing Charge was paid for by the authors.
Authorship: All authors have a substantial contribution to the article.

ABSTRACT

Background: The most prevalent commo etiology of acute abdomen is appendicitis; Laparoscopic appendectomy was made possible due to advancements in endoscopic surgery. Increased numbers of laparoscopic appendectomies have been conducted during the last few decades, with devices like loops, clips, and endoscopic staplers commonly used.

Aim of the work: To assess the safety, time, difficulty, and post-operative consequences of clipping versus ligation of the appendiceal stump.

Patients and methods: Studu was conducted from march 2021 to September 2021 at G.S department Al-Azhar University Hospital. A total of 40 people with acute appendicitis were included in the study. Two equal groups of patients were categorized: As an example, a laparoscopic appendectomy with clips vs a laparoscopic appendectomy with ligatures.

Results: Forty patients who underwent laparoscopic appendectomy, 20 of whom had Ligation and the other had Clipping of Appendicular Stump, participated in the research over the time period examined. It is safe and successful to use an endoclip to close the appendicular stump in complex cases of acute appendicitis, Clip application is associated with shorter operative times, easier application, and less difficulty for trainees than ligation methods, which need more experience and training.

Conclusion: The appendicular stump was held in place using ligation and clipping procedures, which were both safe, successful with low serious outcomes. The use of clips saves time during surgery, is quicker to apply, and is simpler for trainees to learn than ligation techniques, which necessitate previous expertise with a huge, hard, and friable appendiceal stump.

Keywords: Laparoscopic; Appendectomy clip ; Ligature.

INTRODUCTION

For Acute abdomen, appendicitis is the most prevalent cause, with an estimated 7 percent incidence rate in the population, peaking between the ages of 10 and 30. Appendectomy is the most often done abdominal operation.¹

To improve the accuracy of the diagnosis of acute appendicitis, several diagnostic scores have been created. The diagnostic scores for acute appendicitis, such as Lintula, RIPASA, Tzanakis, and Alvarado scores, have been the subject of numerous investigations in the scientific literature.²

When it comes to appendix masses, some argue that they should be surgically removed as soon as possible while others suggest that conservative treatment is the best option.³

Laparoscopic appendectomy (LA) was made possible due to advancements in endoscopic surgery. More and more people are having laparoscopic appendectomies around the world in recent years.⁴

Troublesome complications follow some negative appendectomies, including wound sepsis, respiratory and urinary tract infections, incisional hernias, sterility due to fimbrial adhesions and late adhesive small bowel obstruction requiring laparotomy. In the

continuing debate about laparoscopic versus open appendectomy, proponents of laparoscopy propose that this approach reduce the rate of negative appendectomy even up to 1%.⁵

Appendicitis can be diagnosed with laparoscopic surgery because it allows for a complete examination of the peritoneal cavity.⁶

Even if the tumor disappears after conservative treatment, it is common to do a delayed appendectomy 6-8 weeks later. A small percentage of individuals will return to the hospital after the interval appendectomy with similar symptoms.⁷

Instruments such as clips, endoscopic staplers, loops and bipolar or mobobolar electrosurgery are commonly used for standard laparoscopic appendectomy.⁸

PATIENTS AND METHODS

At Al-Azhar University Hospitals, Egypt, we conducted this randomized prospective experiment from January 2021 to July 2021 in the Department of General Surgery. It included 40 adult patients with Acute Appendicitis. All patients were given a full assessment that included a detailed medical history, a thorough physical exam, laboratory tests, and an

imaging study Ultra Sound (US) was performed to all patients.

Two equal groups of patients were categorized: Individuals whose appendicular stumps were surgically clipped during Laparoscopic Appendicectomy (Group 1), and Group in whom Laparoscopic Appendectomy by using intra corporeal ligature (Group 2). Laparoscopic Appendectomy was done in all patients by the same surgical team using the standard technique of operation. The operative time was calculated from the start of the incision until placement of the last suture. The outcome and complications of Laparoscopic Appendectomy, surgery time and length of hospitalization were all documented.

Follow up: All patients asked to come to our hospital 1st and 4th week post operative to detect both early and late complications. All patients were subjected to: History taking, Clinical examination including general examination (pulse, blood pressure, temperature, respiratory rate) and abdominal examination. Laboratory investigations: CBC. Na and K in patients with paralytic ileus. pelviabdominal ultrasound if indicated.

Statistical Analysis:

SPSS version 15 was used to analyze the data gathered (SPSS Inc., Chicago, IL, USA). quantitative data was represented as mean standard deviation \pm (SD), whereas numbers and percentages (%) were used to depict the qualitative data. The independent student test was used to determine the significance of the difference in quantitative data, whereas the Chi square or Fisher's exact test was used to determine the significance of the difference in qualitative data. P-values less than five percent were considered statistically significant.

The following tests were done:

Independent-samples t-test of significance: was used when comparing between two means (for normally distributed data).

Mann-Whitney U test: was used when comparing between two means (for abnormal distributed data).

Chi-square test: was used when comparing between non-parametric data.

Pearson's correlation coefficient (r): test was used for correlating data.

Probability (P-value)

P-value < 0.05 was considered significant.

P-value < 0.001 was considered as highly significant.

P-value > 0.05 was considered insignificant.

RESULTS

In our study total number of patients is forty (40) patients in which we use clips with 20 patients and ligature for 20 patients.

Clipping and intracorporeal ligation are compared in this randomized, prospective trial for difficulty, safety, and operation time.

		Group A (N = 20)		Group B (N = 20)		Stat. test	P-value
Age (years)	Mean \pmSD	26.1 \pm 5.3		25.3 \pm 4.7		T = 0.5	0.616 NS
	Range	12 – 45		15 – 50			
Sex	Male	14	70%	13	65%	X ² = 0.01	0.915 NS
	Female	6	30%	7	35%		

Table 1: Age and sex are compared among the examined groups.

A p-value of less than 0.05 indicates that there is no statistically significant difference between the studied groups in terms of age and sex.

		Group A (N = 20)		Group B (N = 20)		Stat. test	P-value
Condition of the base	Normal	11	55%	12	60%	X ² = 0.1	0.749 NS
	Edematous	9	45%	8	40%		

Table 2: Comparison between studied groups as regard condition of the base.

According to this table, there is no statistically significant difference (p-value > 0.05) between the analyzed groups when it comes to baseline condition.

		Group A (N = 20)	Group B (N = 20)	Stat. test	P-value
Duration of symptoms (hours)	Mean	18.2	19.3	T = 0.49	0.622 NS
	±SD	± 6.7	± 7.3		
Body temp. (C ⁰)	Mean	37.6	37.7	T = 0.69	0.489 NS
	±SD	± 0.5	± 0.4		
TLC (X10 ³ /ul)	Mean	14.9	15.8	T = 0.99	0.326 NS
	±SD	± 2.6	± 3.1		
Neutrophils (%)	Mean	82.3	86.4	T = 1.35	0.183 NS
	±SD	± 8.9	± 10.2		

Table 3: Comparison of the clinical and analytical data between the several groups under investigation.

Clinical (symptom duration and body temperature) and laboratory data (p-value > 0.05) demonstrate no statistically significant differences between the studied groups (TLC & neutrophils).

		Group A (N = 20)	Group B (N = 20)	Stat. test	P-value
Operative time (min)	Mean ±SD	43.2 ± 5.8	54.3 ± 4.9	T = 6.5	< 0.001 HS
	Range	35 – 55	45 – 65		
Hospital stay (hours)	Mean ±SD	12.3 ± 2.5	17.5 ± 3.1	T = 5.8	< 0.001 HS
	Range	8 – 20	10 – 25		

Table (4): comparison of the operational and post-operative hospital stays of the examined groups.

There was highly statistical significant (p-value < 0.001) decreased operative time in group A (43.2 ± 5.8, Range = 35 - 55 min) when compared with group B (54.3 ± 4.9, Range = 45 - 55 min). there was highly statistical significant (p-value < 0.001) decreased post-operative hospital stay in group A (12.3 ± 2.5, Range = 8 - 20 hours) when compared with group B (17.5 ± 3.1, Range = 10 - 25 hours).

		Group A (N = 20)	Group B (N = 20)	Stat. test	P-value
Intestinal injury	Absent	20	100%	X ² = 0.0	1.0 NS
	Present	0	0%		
Ileus	Absent	20	100%	X ² = 3.2	0.071 NS
	Present	0	0%		
Pelvic abscess	Absent	20	100%	X ² = 0.0	1.0 NS
	Present	0	0%		
Port site infection	Absent	20	100%	X ² = 3.2	0.071 NS
	Present	0	0%		
Failure of technique	Absent	20	100%	X ² = 0.0	1.0 NS
	Present	0	0%		
Re-admission	Absent	20	100%	X ² = 0.0	1.0 NS
	Present	0	0%		
Re-operation	Absent	20	100%	X ² = 0.0	1.0 NS
	Present	0	0%		

Port site hernia	Present	0	0%	0	0%	$X^2 = 0.0$	1.0 NS
	Absent	20	100%	20	100%		
Adhesions	Present	0	0%	0	0%	$X^2 = 0.0$	1.0 NS
	Absent	20	100%	20	100%		
Leak	Present	0	0%	0	0%	$X^2 = 0.0$	1.0 NS
	Absent	20	100%	20	100%		
Applying of peritoneal drain	Present	0	0%	0	0%	$X^2 = 0.36$	0.548 NS
	No	18	90%	19	95%		
	Yes	2	10%	1	5%		
Conversion to ligation due to wide base	No	19	95%	----	----	----	----
	Yes	1	5%	----	----	----	----

Table 5: comparison between studied groups as regard post-operative complications.

This table reveals no statistically significant difference (p-value 0.05) in post-operative complications between the tested groups. Ileus and port site infection occurred in only three cases (15 percent) in group B.

DISCUSSION

Approximately 6% of the population develop appendicitis in their life time, with peak incidence between the ages of 10 and 30 years, thus making appendectomy the most frequently performed abdominal operation⁹

In our study total number of patients is forty (40) patients in which we use clips with 20 patients and ligature for 20 patients

Clipping and intracorporeal ligation are compared in this randomized, prospective trial for difficulty, safety, and operation time

For patients with acute appendicitis, laparoscopic appendectomy is now the standard treatment.¹⁰ However, laparoscopic appendectomy is associated with a shorter hospital stay and probably with a quicker return to work, but the surgery duration for laparoscopic appendectomy is greater.¹¹

Closing the appendix stump in laparoscopy should be as straightforward as possible from a technical standpoint, while also being safe, readily available, dependable, and requiring less time during procedure and lower money costs.¹²

Laparoscopic appendectomy relies heavily on the proper closure of the appendicular stump. Techniques for laparoscopic appendix stump closure might vary widely. These include endostaplers, endoloops closure of the appendiceal stump by means of intracorporeal clipping and meta clip. Laparoscopic appendiceal stump closure is safe and rapid with the use of previously stated items, according to numerous researches. However, the use of endoloops and endostaplers necessitates an advanced degree of laparoscopic expertise that is not available in all facilities.⁸

A study was carried out by Gomes and his colleagues. A total of 131 patients who underwent laparoscopic appendectomy for severe acute appendicitis between January 2011 and January 2013 were studied. Metal endoclips were used to close 118 of those appendicular stumps. From the age of 12 to 75 (31.7±13.3), 52.7 percent of patients were men.¹³

An appendix that is gangrenous and/or perforated is considered to have complicated appendicitis. Abscesses and degrees of peritonitis can occur as a result. Evaluation of the procedure was based on its feasibility, operating time, infection, complication, and conversion rates.

Using a metal endoclip to close the appendicular stump was employed in 90% of the cases studied. It was necrosis of the appendix base that was the most significant element in the procedure's failure. These options included laparoscopic intra corporeal ligation (1.5 percent), laparoscopic knotting (3.8 percent), and video-assisted laparotomy (4.7 percent).

67.54 ±28.13 minutes was the average operating time. The wound infection rate was 2.54 percent, while the intra-abdominal infection rate was 5.08 percent. Only 0.85 percent of patients who underwent surgery experienced problems.

Clipping and intracorporeal ligation are compared in this randomized, prospective trial for difficulty, safety, and operation time.

In our study There was highly statistical significant (p-value < 0.001) decreased operative time in group A (43.2 ± 5.8, Range = 35 - 55 min) when compared with group B (54.3 ± 4.9, Range = 45 - 55 min). there was highly statistical significant (p-value < 0.001) decreased post-operative hospital stay in group A (12.3 ± 2.5, Range = 8 - 20 hours) when compared with group B (17.5 ± 3.1, Range = 10 - 25 hours).

In our study there is no statistically significant difference (p-value > 0.05) between the analyzed groups when it comes to baseline condition.

In our study Clinical (symptom duration and body temperature) and laboratory data (p-value > 0.05) demonstrate no statistically significant differences between the studied groups (TLC & neutrophils).

In our study statistically significant difference (p-value 0.05) in post-operative complications between the tested groups. Ileus and port site infection occurred in only three cases (15 percent) in group B. In a study by Hansen and his colleagues, the incidence of port site infection was 2% which was lower than our study. Simply this can be attributed to endobags used in Hansen study. No doubt, the use of commercially available endobag will decrease the possibility of port site infection but its cost is the main obstacle for its routine use. The formation of endobag from sterilized glove is a good alternative with lower cost¹⁴

According to a study by Kiudelis and colleagues, intracorporeal ligation is safe and less expensive than the endoloop approach.¹⁵ Because end loops are six to twelve times less expensive than laparoscopic staplers, they have an advantage in our study since no major complications occurred during intra-corporeal ligation, and the cost of ligation is less because we only used one polyglactin ampoule, which might be used to close the port site as well in many cases. Furthermore, intra-corporeal ligation can be used in any situation¹⁶

In line with previous research by Ates et al.¹⁷, we found that metallic clips were effective in closing the appendicular stump.

Commercially available titanium and absorbable clip can sustain a high degree of intraluminal pressure and cannot be displaced by a pressure of 300mmHg, and are lower in cost, their use is acceptable for securing the appendicular stump like the cystic duct¹⁸

All patients followed-up for 6 months postoperatively and were subjected to: History taking. Clinical examination including PR and PV. Laboratory investigations: CBC. Na and K in markedly dehydrated patients.

In laparoscopic appendectomy, the two approaches of clip application and ligature are successful in securing the appendicular stump. We choose ligation over clipping in large, hard, and friable appendiceal stumps because of our growing expertise in ligation.

Clip application is associated with shorter operative times, easier application, and less difficulty for trainees than ligation procedures, that require a lot of experience.

CONCLUSION

The appendicular stump was held in place using ligation and clipping procedures, which were both safe, successful with low serious outcomes. The use of clips saves time during surgery, is quicker to apply, and is simpler for trainees to learn than ligation techniques, which necessitate previous

expertise with a huge, hard, and friable appendiceal stump.

REFERENCES

1. Kumar V, Robbins S, Cotran RS. Robbins pathological basis of disease. 10th ed., 2017; Pp. 902-3.
2. Chong C, Thien A, Mackie A et al. Comparison of RIPASA and Alvarado scores for the diagnosis of acute appendicitis. *Singapore Med J.* 2011; 52(5):340-5.
3. Schwartz S. Appendix. Cited by Seymour, I. Schwartz. Principles of surgery. 17th edition. *McGraw Hill Inc.* 2012; Pp. 1315-26.
4. Humes DJ and Simpson J. Acute appendicitis. *BMJ.* 2006; 333: 530-4.
5. Guller U, Hervey S, Purves H, et al. Laparoscopic versus open appendectomy: outcomes comparison based on a large administrative database. *Ann Surg.* 2004; 239: 43–52.
6. Minutolo V, Licciardello A, Di Stefano B, et al. Outcomes and cost analysis of laparoscopic versus open appendectomy for treatment of acute appendicitis: 4-years' experience in a district hospital. *BMC Surgery.* , 2014; 14 (1): 14-9.
7. Daniel R, Courtney M, Mark B, et al. Sabiston textbook 19th edit., 2012; Pp. 1279-1291.
8. Sahm M, Kube R, Schmidt S, et al. Current analysis of endoloops in appendiceal stump closure. *Surg Endosc.* 2011; 25: 124-9.
9. KUMAR B., SAMAD A., KHANZADA T., LAGHARI M. and SHAIKH A.: Superiority of laparoscopic appendectomy over open appendectomy: The Hyderabad experience. *Rawal*
10. Davila D, Russek K, Franklin J. Laparoscopic Appendectomy: Vascular Control of the Appendicular Artery Using Monopolar Cauterization Versus Clips. *Journal of Laparo Endoscopic & Advanced Surgical Techniques.* 2012; 22: 1-5.
11. Wullstein C, Barkhausen S, Gross E. Result of laparoscopic Vs Conventional Appendectomy in Complicated appendicitis. *Dis Collon Rectum.* 2001; 44(11):1700-5.
12. Palanisamy V, Vinoth S, Rajan V, et al. Review of techniques in occluding appendicular stump during laparoscopic appendectomy. *J Surg (Jurnalul de chirurgie).* 2019; 15(1): 1-4
13. Gomes CA, Junior CS, de Peixoto RO, et al. Appendiceal stump closure by metal endoclip in the management of complicated acute appendicitis. *World Journal of Emergency Surgery.* 2013; 8(1):35-9.
14. N J., SMITHERS B., SCHACHE D., et al.: Laparoscopic versus open appendectomy. *World J. Surg.*, 239: 43-52, 1996
15. Kiudelis M, Ignatavicius P, Zviniene K, et al. Analysis of Intra-corporeal knotting with invaginating suture versus endoloops in appendiceal

- stump closure. *Wideochirurgia i Inne Techniki Małoinwazyjne*. 2013; 8: 69-73.
16. Wherhan WE, Tangren CM, Ing TH. Cost analysis of ligature versus stapling techniques of laparoscopic appendectomy in children. *J Laparoendosc Adv Surg Tech A*. 2007; 17: 371-4.
17. Ates M, Dirican A, Ince V, et al. Comparison of intra-corporeal knotting suture (polyglactin) and titanium endo clips in laparoscopic appendiceal stump closure: a prospective randomized study. *Surg Laparosc Endosc Percutan Tech*. 2012; 22: 226-31.
- 1- DEANS G.T., WILSON M.S. and BROUGH W.A.: The ability of laparoscopic clips to withstand high intraluminal pressure. *Arch. Surg*. 1995; 130: 439-41.