



LIGASURE IN LAPAROSCOPIC SUTURELESS APPENDECTOMY: A CLINICAL REVIEW OF EFFECTIVENESS AND BENEFITS

General Surgery

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ABSTRACT

Background: Sutureless Laparoscopic Appendicectomy is fast becoming a popular modality for treating acute appendicitis. The aim of this paper is to evaluate the benefits of Ligasure Vessel Sealing System in helping divide the mesoappendix and seal the base of appendix during Laparoscopic Appendicectomy. **Materials and Methods:** Sutureless Laparoscopic Appendicectomy was performed in 57 patients using the 5mm Ligasure vessel sealing system. The mesoappendix and base of appendix was divided and sealed. Patient parameters including Post-operative complications was assessed and subjected to statistical analysis. **Results:** Out of 57 patients, (32 patients male) and (25 patients female), 54 suffered no complications. The mean age was 28.4. The mean operative time for 57 Appendicectomies was 34 minutes. The mean duration of hospital stay was 3.6 days. One patient developed mild fever (1.7%) and two patients developed surgical site infections. **Conclusion:** We conclude that usage of Ligasure Vessel Sealing System is beneficial and effective in Laparoscopic sutureless appendicectomy and has a negligible complication rate and should certainly be employed more.

KEYWORDS

INTRODUCTION

Appendicitis is Inflammation of the appendix. Seven percent of the population will suffer from acute appendicitis in their lifetime, with the peak occurrence between the second and third decade [1]. Appendectomy is the most commonly done emergency abdominal operation worldwide. The open method of appendectomy has remained the gold standard technique for acute appendicitis for over a century due to the procedure's low morbidity and mortality [2]. Laparoscopic appendectomy (LA) has advanced from the time it was first performed. Laparoscopic appendectomy has emerged as a diagnostic and therapeutic method and is fast gaining popularity. It has advantages over the open approach in less postoperative pain, shorter hospital stay, faster postoperative rehabilitation, and fewer postoperative complications.

Probably, the most critical part of this procedure is effective closure of the appendix stump to prevent catastrophic intra-abdominal complications from a faecal leak into the abdominal cavity. Currently, two techniques are most commonly used for laparoscopic appendectomy division of the mesoappendix with the harmonic scalpel (HS) and ligation of the appendix with an endoloop, and division of the mesoappendix and appendix with an endo stapler.

LigaSure™ tissue fusion, like LigaSure™ vessel sealing, uses the body's own collagen and elastin to create a permanent fusion zone. This technology can fuse vessels up to and including 7mm, lymphatics, and tissue bundles, and has an average seal cycle of two to four seconds in most surgical situations.

LigaSure™ uses a combination of pressure and continuous bipolar energy to create vessel fusion. LigaSure™ seals vessels by applying high, uniform mechanical compression while monitoring and adjusting energy delivery to the tissue. Collagen and elastin fibres in the compressed vessel walls are denatured; during the cool-down phase, crosslinking reoccurs, effectively creating a new, solid wall of collagen and elastin tissue. An algorithm in the generator determines optimal time and energy delivery to achieve consistent seals for vessels as large as 7 mm in diameter [3].

The energy source is the ForceTriad™ energy platform, designed to precisely manage energy delivery, creating a range of options for desired tissue effect. There is a feedback-controlled response system (TissueFect™ sensing technology), which automatically discontinues energy delivery when the seal cycle is complete, eliminating the guesswork.

This paper aims to share our work experience with using Ligasure in laparoscopic sutureless appendicectomy

MATERIALS AND METHODS

Fifty-seven cases of laparoscopic appendectomy were done using the 5-mm LigaSure Vessel Sealing System and were subsequently assessed.

All the procedures were conducted in the Department of General Surgery, Sarojini Naidu Medical College, Agra, from July 2022 to July 2023.

Patients were included in the study after proper clinical examination, laboratory investigations, and ultrasonographic evidence of acute appendicitis in the outpatient department and emergency. Written informed consent was obtained from all patients participating in the study. All patients diagnosed with uncomplicated appendicitis admitted for laparoscopic appendectomy were included in the study. Patients with findings of appendicular lump, appendicular abscess, appendicular perforation were excluded from the study. The patients were given an intravenous antibiotic before the induction of anaesthesia.

Patient demographic details, duration of surgery, return of bowel sounds with passage of flatus and faeces, return to oral feeds, intraoperative and postoperative complications, and duration of hospital stay were noted.

Procedure

The patient was placed in the supine position, along with the Trendelenburg position and left lateral position. A 10 mm infraumbilical incision was given, and a Veress needle was introduced. Pneumoperitoneum was created by insufflating carbon dioxide (CO₂) gas at a pressure of 12-14 mmHg. A 30° telescope was inserted, and two 5-mm working ports were placed in the bilateral suprapubic region. Diagnostic laparoscopy was performed, and the appendix was identified. LigaSure was used to coagulate the mesoappendix. Thereafter, the base of the appendix was coagulated, sealed, and divided by the repeated application of LigaSure and retrieved through a 10-mm port. The stump was verified after appendectomy regarding complete sealing.

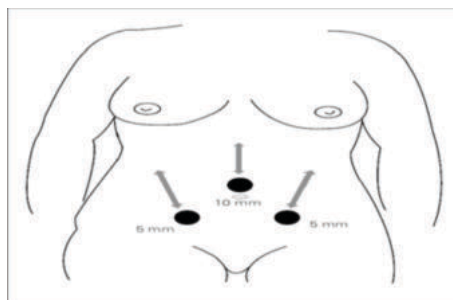


Fig. 1 - Port position in laparoscopic appendicectomy

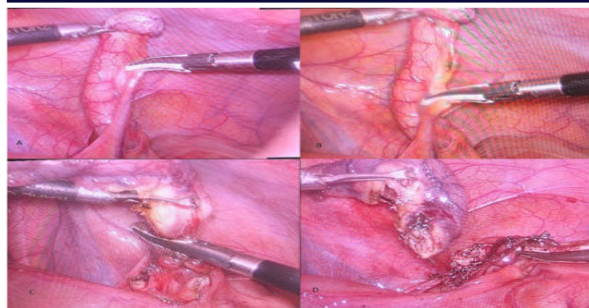


Figure 2 : Steps for Laparoscopic Appendectomy using Ligasure

A&B : Division of Mesoappendix

C : Cutting and Coagulation of Appendix

D : Dissected Appendix along with appendiceal stump

Postoperative care and follow-up

Postoperatively, oral intake of fluids was allowed after the return of bowel sound, and patients were discharged about 24 hours after tolerating oral feed. The patients were followed for three months from the time of discharge and looked after for any complications.

RESULTS

Out of 57 patients, 32 (56.14%) patients were male and 25 (43.86%) patients were female. The maximum age was 65 years, and the minimum age was 15 years. None of our patients had any preexisting comorbid conditions such as diabetes, hypertension, or any chronic illness.

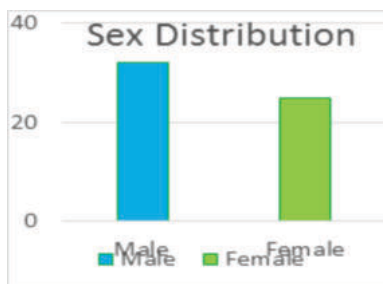


Figure 3 : Sex Distribution

Table 1 Patient parameters with operative outcomes

Parameters	Range
Age (years)	28.4 ± 9.56 (15-65)
Sex (male:female)	1.28:1
WBC count (109/L)	12.0 ± 2.30
Operation time (minutes)	34 ± 5.72 (30-60)
Return of bowel sound	
POD1	48 (84.21%)
POD2	6 (10.5%)
POD3	3 (5%)
Return to oral feed	2.1 ± 0.5
Length of hospital stay after surgery (days)	3.6 ± 0.68
Postoperative complications	3/57 (5.2)
Mild fever	1/57 (1.7%)
Surgical site infection	2/57 (3.4%)

The mean operative time for 57 appendectomies by LigaSure was in the range of 30-50 minutes.

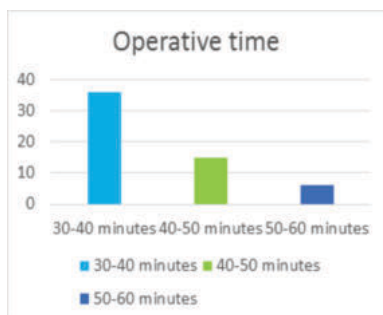


Figure 4: Mean operative time

Return of bowel sound occurs on postoperative day 1 (POD1) in 48 cases (84.21%), POD2 in 6 cases, and POD3 in three cases.

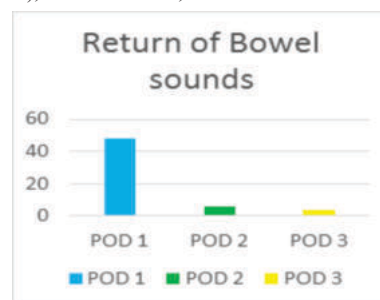


Figure 5 : Return of Bowel Sounds

Post-operative complications

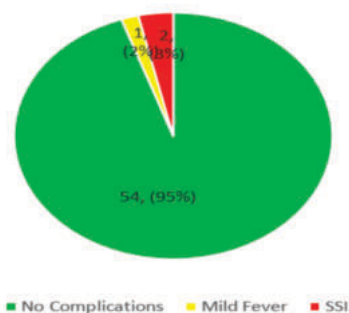


Figure 6 : Post-operative complications

The mean duration of hospital stay after surgery was 3.6 ± 0.68 days. Out of 57 appendectomies, no complications occurred in 54 cases. One patient developed mild fever, which was managed conservatively (1.7%), and postoperative surgical site infection occurred in two (3.4%) cases, which was managed by cleaning and regular dressing. No patient underwent a conversion to an open appendectomy. Fortunately, no serious postoperative complications such as intestinal perforation, faecal fistula, abdominal abscess, postoperative peritonitis, and sepsis occurred in any patient. We observed no intraoperative complications and no mortality in any patient during our study.

DISCUSSION

LigaSure has been used widely in many surgical approaches in several fields including gynaecology, gastrointestinal system, endocrinology, and urology. There are no clinical reports of LigaSure usage in laparoscopic appendectomy; however, experimental studies have shown it to be of use. As the world moves on to newer, more efficient practices, we feel there is a need to explore and implement newer, cutting edge techniques replacing conventional procedures.

In case of appendicectomy, LigaSure was found to have higher burst pressure than HS with faster cutting time and has been found effective and safe in preclinical studies [4]. de Souza et al. conducted studies on rabbits to find out the efficacy of LigaSure in appendectomy and compare it with simple ligature and conventional therapy. The group in which LigaSure was applied had fibrosis in 100% of animals. This technique induces enough fibrous tissue to obstruct the leakage of enteric content [5]. A study conducted by Helpman and Covens used the LigaSure device for the performance of an appendectomy during laparoscopic surgery for gynecologic malignancies in 14 patients. There were no conversions to laparotomy and no major intraoperative or postoperative complications [6]. Yavuz et al. studied 24 specimens of subtotal colectomy or right hemicolectomy and used a harmonic scalpel, conventional technique, and LigaSure for appendectomy. All three techniques were found to be equally safe [7].

The mean operative time for 57 appendectomies by LigaSure was 34 ± 5.72 minutes (range: 30-60 minutes). All operations were performed by the same surgeon with experience of more than 10 years in laparoscopic surgeries. We found out that our data was consistent with the other studies done using energy devices. Two similar studies that have been conducted in Egypt and Pakistan using HS have a mean operative time of 38.95 ± 3.55 and 31.6 ± 4.17 minutes, respectively.

with no significant morbidity [8,9]. Khanna et al. utilised bipolar cautery for sealing the lumen of the appendix in 47 patients with a median duration of surgery of 25 minutes and a postoperative hospital stay of three days [10].

We observed a reduced operative time with respect to the use of ligature and various mechanical devices as cited in a recent Cochrane review [11]. We feel that applying a ligature, or even a mechanical device, will lead to an increase in the duration of surgery. LA by LigaSure has the potential to decrease the operative time as the mesoappendix and appendix can be dissected with a single device, and there is no need for the interchange of the instrument. The division of the mesoappendix can be done without vessel isolation, therefore making it possible to divide the mesoappendix rapidly without bleeding.

Our institute is a tertiary-level government hospital, and the cost of performing LA by LigaSure device is INR 1500 or \$17.98. The methods are covered in the national public health insurance scheme (Ayushman Bharat Yojana), which covers the cost of surgery. So, the surgery was performed irrespective of the financial status of the patient.

In some studies, concerns of lateral thermal damage of the appendicular stump due to heat dissipation have been raised; however, we do not find the lateral heat dissipation by LigaSure of any clinical relevance, and we did not observe any complication due to it [12].

Two cases of surgical site infection occurred during our study. The small percentage of surgical site infections and no intra-abdominal abscess formation indicate that the technique for appendicular stump closure is safe. A single case of mild fever was observed, which was managed conservatively.

According to our study results, appendiceal stump closure by LigaSure is an acceptable laparoscopic procedure with encouraging intraoperative and postoperative results. The potential benefits perceived by the use of the LigaSure device include preventing spillage of the appendiceal contents into the peritoneal cavity as both the appendiceal stump and the severed appendix are closed. Tissue sealing and division can be achieved with one application of the LigaSure sealer/divider. The thermal effects are confined within the jaw, minimising the probability of adjacent tissue injury. Tissues can be sealed and divided without dissection of the vessels lying within it. Consequently, the need for instrument interchange is reduced, thereby reducing the operative time. Because of these perceived advantages, the LigaSure system was found to be very helpful in performing a laparoscopic appendectomy.

CONCLUSION

Our study provides a small yet significant contribution to the debatable approaches to appendectomies and how to proceed with one. We demonstrated that LigaSure can be used confidently in laparoscopic appendectomy in handling the base of the appendix. The important benefits of it are non usage of any suture or stapling device, ease of performing, precise dissection with fine jaw design, and insignificant thermal spread. Complications are minimal. It further demonstrates that there is room to believe that the method is safe and feasible; thus, there is a reason to do larger studies to further validate and evaluate this method of appendectomy.

Disclosure of Conflict of Interest: No conflict of interest noted

Statement of Ethical approval: Institutional Ethical committee approval received

Statement of informed consent: Informed consent was obtained from all the individual participants in the study

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