ORIGINAL ARTICLE

The use of the extracorporeally prepared hand-made endo-loop technique in laparoscopic appendectomy

Tuba Atak, M.D.

Department of Surgery, Bursa Cekirge State Hospital, Bursa-*Türkiye*

ABSTRACT

BACKGROUND: Acute appendicitis is the leading emergency condition among surgical abdominal diseases. The treatment of choice for appendicitis is open or laparoscopic appendectomy. There are different methods for appendiceal stump closure. Laparoscopic appendectomy became more applicable with hand-made endo-loop applications to close the appendiceal stump, especially in state hospitals where the resources were limited. This article aims to evaluate the outcomes of patients undergoing laparoscopic appendectomy with the appendiceal stump closure using a hand-made endo-loop.

METHODS: Fifty patients undergoing laparoscopic appendectomy with the appendiceal stump closure using a hand-made endo-loop in the General Surgery Department of our hospital between June 2014 and December 2018 were evaluated. The ages, genders, length of stay in the hospital, complications, and histopathological investigation results of the patients were gathered retrospectively. Laparoscopic appendectomy was performed with three ports. The appendiceal stump was closed using two hand-made endo-loops. The loop was made with a modification of Roeder's loop whose safety was proven in the literature. The first port was introduced to the abdomen with the open method. SPSS 26.0 statistical program was used for statistical analysis.

RESULTS: Thirty-one (62%) of patients were males and 19 (38%) of them were females. The mean age was 32.2±11.9 years. The age ranged between 19 and 74 years. The median length of stay in the hospital of the patients was 1.12±0.47 days. One of the patients was 21 weeks pregnant. A surgical site infection occurred in one patient during the post-operative period. Recovery was obtained with antibiotherapy. No leakage through the base of the appendix or cecal fistula was determined in none of the patients.

CONCLUSION: One of the most important parameters in the cost of laparoscopic appendectomy is the closure technique of the stump. The cost comes into question much more especially in state hospitals where the resources are limited. Appendiceal stump closure using a hand-made endo-loop is an easy, safe, and cost-effective method.

Keywords: Appendicitis; hand-made loop; laparoscopic appendectomy.

INTRODUCTION

Acute appendicitis is a surgical pathology requiring surgery most commonly among presentations to the emergency departments.[1-5] The treatment is appendectomy. Due to lesser post-operative pain, shorter length of stay in the hospital, ensuring an earlier return to normal daily life, and providing more satisfactory cosmetic outcomes, laparoscopic appendectomy is increasingly performed in recent years.[2] One of the most important differences between laparoscopic appendectomy and open appendectomy is the method used to close the appendiceal stump. The methods such as titanium endoclips, nonabsorbable polymer clips (hem-o-loc clips), stapler, endo-loop, knot pusher, extracorporeal or intracorporeal tying, use of Ligasure®, and cutting with bipolar cautery were used in the laparoscopic appendectomy.[1,3,4] The high cost of materials used during the closure of the appendiceal stump decreases the popularity of the laparoscopic approach,

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Address for correspondence: Tuba Atak, M.D.
Bursa Cekirge State Hospital, Department of Surgery, Bursa, Türkiye
E-mail: drtuba81@yahoo.com

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especially in state hospitals.

This article aims to present the effect of using a hand-made endo-loop with quite a low cost on the surgical outcomes of patients undergoing laparoscopic appendectomy with the appendiceal stump closure.

MATERIALS AND METHODS

Fifty patients undergoing laparoscopic appendectomy with the appendiceal stump closure using a hand-made endo-loop in the General Surgery Department of our hospital between June 2014 and December 2018 were evaluated. The ages, genders, length of stay in the hospital, complications, and histopathological investigation results of the patients were gathered retrospectively. Laparoscopic appendectomy was performed with three ports. The appendiceal stump was closed using two hand-made endo-loops. The loop was made with a modification of Roeder's loop whose safety was proven in the literature. The first port was introduced to the abdomen with the open method in all patients. SPSS 26.0 statistical program was used for statistical analysis.

Ethical approval for the study was granted by the Local Institutional Review Board with the following decision number: 2022-13-5.

Surgical Procedure

Surgeries were performed by the same surgeon using the three ports laparoscopic appendectomy technique. One g of ampicillin-sulbactam was administered to the pregnant patient simultaneously with the induction and 1 g of the first generation of cephalosporin group antibiotic was given to the other patients. Two loops were prepared using 2.0 Vicryl suture with a modification of the Roeder's loop that has been proven to be safe during the induction (Fig. 1). The operating table was arranged in the 15–20° Trendelenburg position and tilted 15° to the left side. Pneumoperitoneum was created by introducing the camera trocar through the left upper quadrant into the abdomen with an open technique in the pregnant patient. Two 5 mm trocars were placed into the abdominal cavity under direct vision. Pneumoperitoneum was created by introducing the camera trocar through the umbilicus into the abdomen with an open technique in the other patients. Five mm ports were placed through the median suprapubic area and the left iliac fossa. The mesentery of the appendix was dissected using Ligasure®. The extracorporeal loop was prepared (Fig. 2). The prepared loop was pushed through the suprapubic trocar hole into the abdominal cavity and placed on the base of the appendix. The loop was grasped by the knot with a laparoscopic dissector inside the abdominal cavity (Fig. 3). The knot was placed on the base of the appendix by pulling the long end out of the abdomen simultaneously. After placing the first knot, the same procedure was repeated by placing a second loop 5 mm above the first knot (Fig. 4). The base of the appendix was cut just above the knots. The specimen was retrieved through the umbilical camera trocar within a simple bag made from a surgical glove. Douglas pouch and appendectomy lodge were irrigated with saline solution in patients with much purulent drainage.

RESULTS

Nineteen of the patients (38%) were females and 31 of them (62%) were males. The mean age was 29.61±8.09 years (age range: 19–47 years). The mean length of stay in the hospital of patients was 1.12±0.49 days. One of the patients was 21

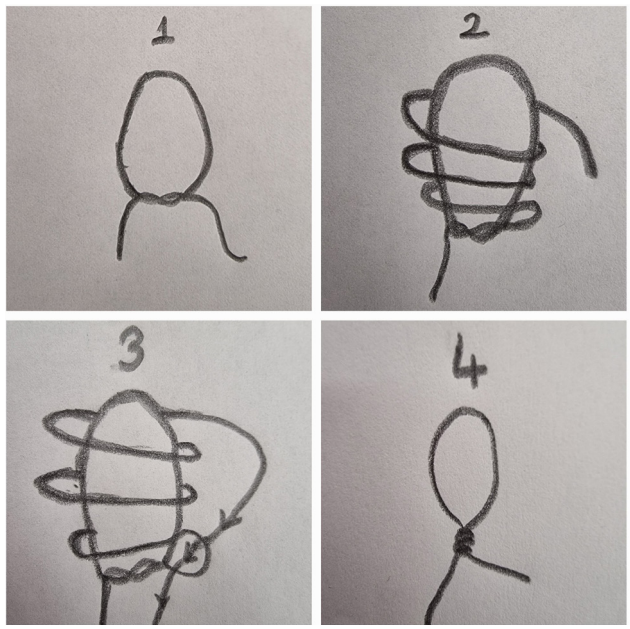

Figure 1. Preparation of the loop

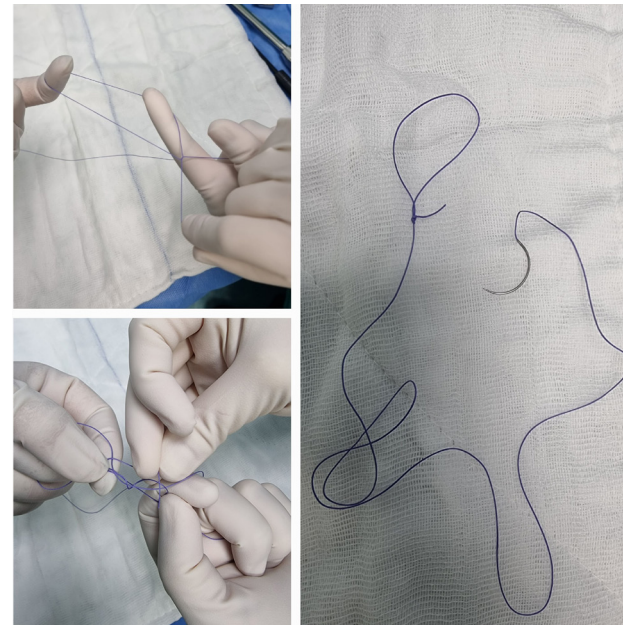

Figure 2. Preparation of the loop

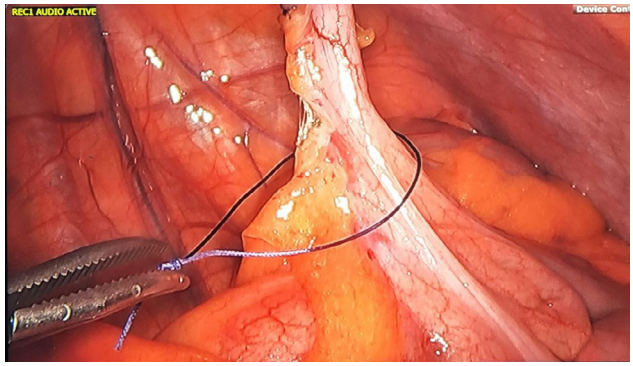

Figure 3. Loop placement with laparoscopic dissector

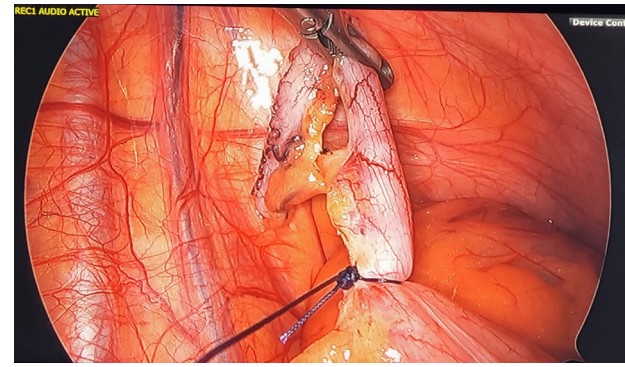

Figure 4. Appendiceal stump ligation with the loop

weeks pregnant. A healthy-term delivery occurred at clinical follow-up. A surgical site infection occurred at the umbilical trocar sites of 1 patient (2%) during the post-operative follow-up. Recovery was obtained with antibiotherapy. No leakage through the base of the appendix or cecal fistula was determined in none of the patients. The histopathological investigation results of the patients were reported as follows: 22 patients (44%) with acute appendicitis, 6 patients (12%) with suppurative appendicitis, 7 patients (14%) with catarrhal appendicitis, 1 patient (2%) with gangrenous appendicitis, 10 patients (20%) phlegmonous appendicitis, 2 patients (4) with perforated appendicitis, 1 patient (2%) fibrous obliteration, and 1 patient (2%) lymphoid hyperplasia.

DISCUSSION

Acute appendicitis is the most common medical condition requiring emergency surgery. The lifetime incidence is between 7% and 9%.[3] Etiology is unknown. Familial factors, insufficient fiber diet, tumors and a number of reasons such as fecalitis, lymphoid hyperplasia, and parasites are thought to be the cause of obstruction of the appendix. Acute appendicitis is seen more often in male patients and there is an increased incidence between the ages of 15 and 30.[3-5] The incidence in pregnant women is 0.05–0.13%.[6] Although it is seen in every trimester, it is most commonly detected in the second trimester. In our series, the demographic characteristics of the patients were consistent with the literature.

Open appendectomy is the classical approach for treatment. It is a minimally invasive method with some advantages such as lesser post-operative pain, shorter length of stay in the hospital, better cosmetic outcomes, and the ability to return faster to daily activities and work. It is recommended as a first-choice treatment in especially elderly people, women, and obese patients.[4] Its disadvantages are as follows: Higher cost, longer operation time, and a high likelihood of the development of an intra-abdominal abscess.[1,4,5,7] No intra-abdominal abscess developed in none of our patients.

The most common complications after appendectomy are wound infection, intra-abdominal abscess, and ileus. Serious complications such as an inadequate closure of the appendix stump, post-operative fistula, peritonitis, and sepsis are closely associated with morbidity and mortality.[3,8] The incidence rate of development of an intra-abdominal abscess increases in especially complicated appendicitis. The use of convenient antibiotic regimens and keeping drainage catheters in their places for a few days more is recommended in these patients regarding the development and treatment of abscesses.[1,5] In our study, a surgical site infection occurred in one patient determined to have complicated appendicitis. Recovery was obtained with antibiotherapy. No leakage through the base of the appendix or cecal fistula was determined in none of the patients.

Expensive trocars used during laparoscopy but not reused, endoscopic vessel-closing and sealing devices, and materials for closure of the stump or removal of the appendix increase the cost.[9] Some surgeons try to reduce the cost by decreasing the number of ports and the number of laparoscopic devices used.

The methods such as endo-loop, titanium endoclips, non-absorbable polymer clips (hem-o-loc clips), hand-made loop, knot pusher, intracorporeal tying, stapler, use of Ligasure®, or cutting with bipolar cautery alone have been used to close the appendiceal stump in the laparoscopic appendectomy.[4,5] Although each of them has some advantages and disadvantages, the most commonly preferred method is the use of an endo-loop or stapler.[10]

While titanium endoclips is an easy-to-use method, since its reliability decreases, it is not recommended in conditions especially when the appendicular base is inflamed and the diameter of the appendiceal stump is >1 cm.[1,4,8,10]

The endo-loop is made up of a silk or polyglactin loop that is pre-prepared as a commercial product. It similarly provides stump closure in open appendectomy. It is similar to the stapler regarding the operation time and offers an advantage in terms of cost.[5,11]

The use of the stapler is recommended especially in conditions where the appendicular base is inflamed and wide.[4,5,11,12]

While a 10–12 mm trocar is needed for the use of the stapler, a 5 mm trocar is enough for the application of the endo-loop.

In the study performed by Sahm et al. and comparing 1790 patients undergoing appendiceal stump closure using an endo-loop and linear stapler, the authors emphasized that appendiceal stump closure using an endo-loop was a safe, easy, and cheap procedure.[10] Although the endo-loop is cheap compared to the stapler, this method still has a higher cost. In the laparoscopic method, as the knot can be tied out of the abdomen and pushed into the abdominal cavity, it can also be tied inside the abdomen. The method was shown to be as safe and cheap as the other methods in the studies performed.[5,10,14] The most important advantage of the method is to lower the cost. Appendiceal stump closure technique using intracorporeal knotting with invaginating suture can prolong the operative time considerably in parallel to the experience of the surgeon.[4,15,16] In our study, laparoscopic appendectomy was performed in all of our patients with a 2.0 Vicryl suture and a loop made with a modification of Roeder's loop whose safety was proven in the literature.[17] Except for the preparation of the loop out of the abdomen, no need for a knot pusher and an additional 10–12 mm trocar are the other factors that lower the cost.

Conclusion

All methods used to close the appendiceal stump seem to have similar safety. The degree of inflammation in the appendix, the experience of the surgeon in laparoscopic applications, and opportunities in the working place affect the approach to appendicitis treatment. Appendiceal stump closure using a hand-made loop is a safe and cost-saving method. A hand-made loop is cheap, an easy-to-come-by in every set consisting of standard laparoscopic instruments and equipment, and a practical method. Considering especially the conditions of our country, we think that laparoscopic appendectomy application will increase through a hand-made loop in many state hospitals.

Ethics Committee Approval: This study was approved by the Bursa State Hospital Clinical Research Ethics Committee (Date: 12.10.2022, Decision No: 2022-13/5).

Peer-review: Externally peer-reviewed.

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Conflict of Interest: None declared.

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ORİJİNAL ÇALIŞMA - *ÖZ*

Laparoskopik apendektomide ekstrakorporeal hazırlanan el yardımlı loop kullanılması

Dr. Tuğba Atak

Bursa Çekirge Devlet Hastanesi, Genel Cerrahi Kliniği, Bursa

AMAÇ: Akut apandisit, cerrahi akut karın olgularında ilk sırada yer almaktadır. Tedavisi açık veya laparoskopik appendektomidir. Apendiks güdüğünü kapatmak için farklı yöntemler mevcuttur. Özellikle imkanların daha kısıtlı olduğu devlet hastanelerinde güdüğü kapatmak için el yardımlı loop uygulaması ile laparoskopik apendektomi daha yapılabilir hale gelmiştir. Bu yazıda, apendiks güdüğünün el yapımı loop ile kapatıldığı laparoskopik appendektomi uygulanan olguların sonuçlarının değerlendirilmesi amaçlandı.

GEREÇ VE YÖNTEM: Hastanemiz genel cerrahi kliniği'nde Haziran 2014-Aralık 2018 tarihleri arasında apendiks güdüğünün el yapımı loop ile kapatıldığı laparoskopik appendektomi uygulanan 50 olgu değerlendirildi. Hastaların yaşı, cinsiyeti, yatış süresi, komplikasyonlar ve histopatolojik inceleme sonuçları retrospektif olarak toplandı. Laparoskopik appendektomi üç port ile yapıldı. Apendiks güdüğü iki adet el yardımı ile yapılan loop kullanılarak kapatıldı. Loop literatürde güvenilirliği kanıtlanmış olan Roeder's loop' un modifiye edilmesi ile yapıldı. Tüm olgularda ilk port batına açık yöntemle girildi. İstatistiksel değerlendirme için SPSS 26,0 istatistik programı kullanıldı.

BULGULAR: Hastaların 31'i (%62) erkek, 19'u (%38) kadın idi. Ortalama yaş 32.2±11.9 olup yaş aralığı 19-74 idi. Hastaların ortalama yatış süresi 1.12±0.47 gündü. Olgulardan biri 21 haftalık gebe idi. Ameliyat sonrası dönemde bir hastada cerrahi alan enfeksiyonu meydana geldi. Antibiyoterapi ile düzelme sağlandı. Hiçbir olguda appendiks güdüğünden kaçak veya çekal fistül saptanmadı.

TARTIŞMA: Laparoskopik appendektominin maliyetinde en önemli parametrelerden biri güdüğün kapatılma tekniğidir. Özellikle kısıtlı imkanlara sahip devlet hastanelerinde maliyet daha fazla önem kazanmaktadır. El yapımı loop ile apendiks güdüğünün kapatılması kolay, güvenli ve ucuz bir yöntemdir.

Anahtar sözcükler: Apandisit; laparoskopik apendektomi; el yapımı loop.

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