

Case Series

Zaragoza technique of laparoscopic appendicectomy

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ABSTRACT

Introduction: Appendectomy is one of the most frequent emergency surgical procedures, currently with a preference for laparoscopic management worldwide.

Objective: To report a new laparoscopic appendectomy technique and its results.

Material and methods: Cohort study of patients with a diagnosis of appendicitis who are managed laparoscopically. In a total 1063 patients, 148 were operated on with the Zaragoza technique during the period from January 2002 to December 2018. The technique consists of making a window in the appendicular base between the meso and the appendicular wall, two prolene or silk sutures are placed, and the cecal appendix is cut between the two sutures, finally the mesoappendix is sectioned with a harmonic scalpel or bipolar clamp.

Results: From our results, we had 1.4% residual abscesses, 1.4% umbilical surgical wound infection and 0% mortality.

Discussion: Various laparoscopic management methods for appendectomy are reported in the literature, with a wide range in the results. We have obtained good results in patients subjected to our technique.

Conclusions: The Zaragoza technique for laparoscopic appendectomy is an effective and safe option that prevents excessive manipulation of the inflamed appendix and is easily reproducible.

1. Introduction

Acute appendicitis is one of the most common problems in daily practice [1]. Since the first open appendectomy in 1894 credited to McBurney, for more than a century, it has remained unchanged [2]. It was until 1983 that Semm described the first laparoscopic appendectomy, quickly becoming the gold standard in complicated and uncomplicated appendicitis [2–5]. An incidence of 100/100 000 cases per year is reported, with an 8% lifetime risk of developing appendicitis [6]. Currently, the execution of the laparoscopic technique is in the range of 46–58%, even up to 90% in some countries, with a conversion rate to the open technique of 8.6%, but with a decrease in conversion as more experience is acquired in the laparoscopic technique [2,7].

In particular, four populations have potentially benefited from the laparoscopic technique: women, the morbidly obese, pediatric and geriatric patients [8]. Among the disadvantages, the laparoscopic approach has a slightly higher intraabdominal abscess rate, especially in

perforated appendicitis, with a rate of 5.4% being reported in some series [2]. Possible reasons for this complication are spread of infection during pneumoperitoneum and noninvagination of the appendicular stump [9]. Patients with appendicitis and abscess, gangrene or perforation do not have clear evidence to support the use of laparoscopy as the primary choice since they have a higher conversion rate [10]. An annual incidence of perforated appendicitis of about 2 per 10 000 is reported. The proportion of perforated appendicitis is about 25%. With a higher rate in patients younger than 5 years and older than 65 years of 45% and 51%, respectively [7]. Other entities that are difficult to diagnose and approach are anomalous positions of the appendix, such as subhepatic, mesocolic, intraherniary or in situs inversus, so the placement of the ports is planned according to the initial inspection and thus modify the technique according to the needs of each case [11]. As is known with the laparoscopic technique, the incidence of wound infection is lower, it requires a lower dose of analgesics in the postoperative period, a shorter hospital stay, a rapid return of intestinal function and a

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better cosmetic result by avoiding large scars [3,12]

2. Material and methods

At the “General Ignacio Zaragoza” Regional Hospital, of the Institute of Social Security and Services for State Workers (ISSSTE), since July 2002, a new laparoscopic appendectomy technique has been performed by a surgical group.

Description of the technique: We placed a 10 mm trocar in the umbilical scar, another two 5 mm trocars in the suprapubic midline and the left lower quadrant, respectively (Fig. 1). The cecal appendix is identified, and a window is made at the base of the appendix between the meso and the wall of the appendix (Fig. 2), two 2-0 prolene or silk sutures are passed, one in the appendicular base and the other 1 cm distal to it, the sutures are tied in the appendix, either with an intra or extracorporeal knot (Figs. 3 and 4), the appendix is cut between the two sutures (Fig. 5) and finally the meso-appendix is divided with a harmonic scalpel or bipolar forceps (Fig. 6). We extract the surgical specimen through the umbilical port, always with an endobag. We individually assess in each case whether cavity washing and placement of drains is required. Procedure realized between a general surgeon with more than 20 years of experience and general surgery residents.

3. Results

In this way and over 17 years, from January 2002 to December 2018, a total of 1063 laparoscopic appendectomies have been performed and of them 148 (13.9%) with our technique. Of these, 76 (51.4%) were performed in men and 72 (48.6%) in women. The average age was 43.2, with an age range of 18–90 years, and the average duration of the procedure was 55 min, with a range of 35–150 min. Within our cohort, patients evolved favorably, with a lower complication range to that reported in the literature. 0% conversion rate, two cases of residual abscess (1.4%), of which one required laparoscopic reexamination and the other resolved with ultrasound-guided drainage, surgical wound infection (2 patients) 1.4%, post-operative ileus (3 patients) 2%, hospital stay 2.5 days.

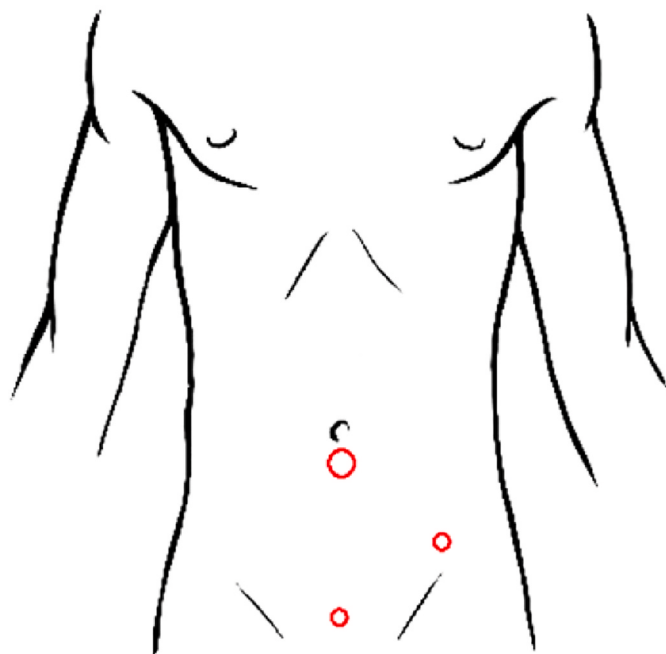


Fig. 1. Trocars Location.

4. Discussion

In recent years, the laparoscopic approach has experienced a notable increase, with a great variety of techniques described [13]. Many variants have been described in the laparoscopic technique, which involves the placement of a 10 mm umbilical trocar for the camera, another of 5 mm in the left iliac fossa and another more than 5 mm in the right upper quadrant [1]. The meso-appendix is divided with a stapler or harmonic scalpel and the appendicular base is tied with single or double endoloops, or endoscopic stapler, and the appendix is extracted in an endobag, which is considered the ideal extraction, through the umbilical port [3,7].

The single-incision laparoscopic appendectomy technique was described in 1992 by Pelosi, which consists of making a 2–3 cm transumbilical incision or at the MC Burney point, for a 10 mm trocar, adding acouscopic instruments percutaneously in the right iliac fossa to assist the procedure; the meso-appendix is cauterized and the appendix base is ligated with endoloop, the surgical piece is extracted through the 10 mm port, this technique has been reproduced with some variations by other surgeons [14]. The selection in number, caliber and the trocar placement site has many variants. For example, S. Adhikary uses two 10 mm trocars, one infra-umbilical and the other in the right iliac fossa; he performs the appendectomy once the appendix has been externalized from the abdomen through the port in the right iliac fossa; he reports a conversion rate to open surgery of 8% and infection of the surgical wound through which it has been externalized to the appendix of 10% and 2.7% with the use of endobags, which reveals the importance of the removal of the surgical piece in endobags [12].

R. Kumar reports his technique known as assisted transumbilical laparoscopic technique, to treat interval appendicitis in pediatric patients using a 5 mm infraumbilical trocar, slightly widens the incision for instrumentation, extracts the appendix via the transumbilical route, and the appendectomy is performed once the appendix was removed, with the disadvantage that the risk of infection of the surgical wound increased by not using endobags [10].

G. Kazemier reports his results using linear stapler for stump management, particularly for difficult cases, such as perforation in the appendicular base, thus reporting his results on 247 patients, with a surgical time of 9 min less, the rate of surgical wound infection and post-surgical ileus was lower guaranteeing a decrease in complications, however the routine use of staplers raises the cost too much [3].

Alan A. Saber, in his technique makes a 2.5 cm infraumbilical incision, deepens the incision in the fascia with a 1 cm incision, is inserted into a 12 mm trocar, with Hasson technique, a 5 mm trocar is placed through the same incision but in a different place in the aponeurosis, introduces a reticulated laparoscopic stapler through the 12 mm trocar, which staples and cuts the appendix and the meso-appendix in a single step; this procedure was performed in patients with appendages without perforation and was successful in 73.1%, an additional 5 mm extra-umbilical port was required in 15.3%, 11.5% of the cases were converted to a conventional procedure and none were converted to open surgery [1].

Alexander Rickert, places three trocars, one 10 mm transumbilical, 5 mm in the lower right quadrant and the other 12.5 mm in the lower left quadrant, dissects the meso-appendix with electrocoagulation, places two titanium clips (double shanked), one at the base and one distal, sectioned between the two clips and extracted the piece through the left trocar, and reported a significant reduction in cost compared to the use of staplers [9].

Fabrettin Yildiz reports an extremely reduced cost by constructing endoloops with 2-0 vicryl instead of prefabricated ones, it performs them using a single strand of vicryl (16). Other authors report the use of polymer clips (Hem-o-lok) for stump management as well as intra- or extracorporeal knots with various types of sutures [15].

Carlos Domene reports the use of three trocars, 5–10 mm umbilical, one of 5 mm in the right iliac fossa and another of 10 mm in the left iliac

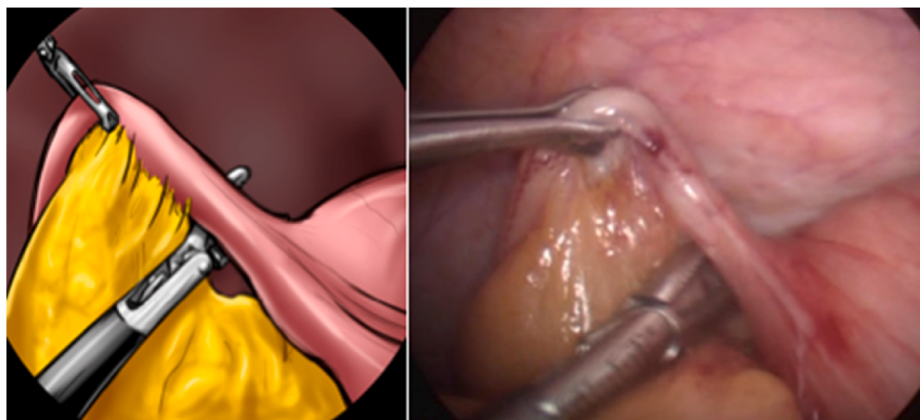


Fig. 2. Window at the base of the appendix between the meso and the wall of the appendix.

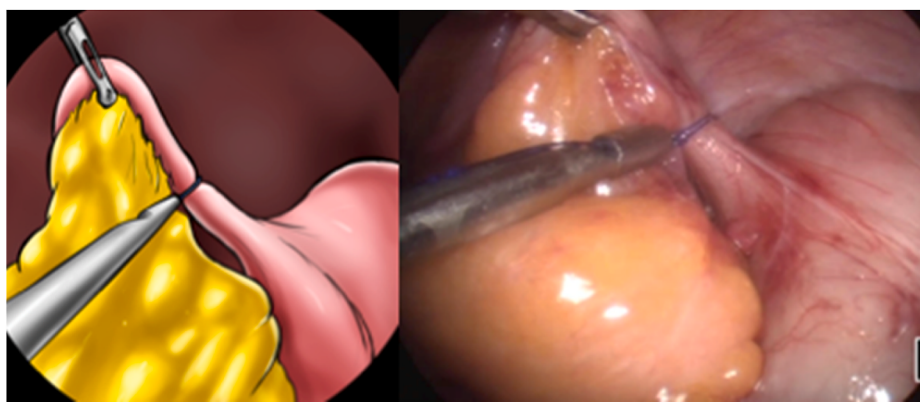


Fig. 3. Suture one centimeter distal to the appendicular base.

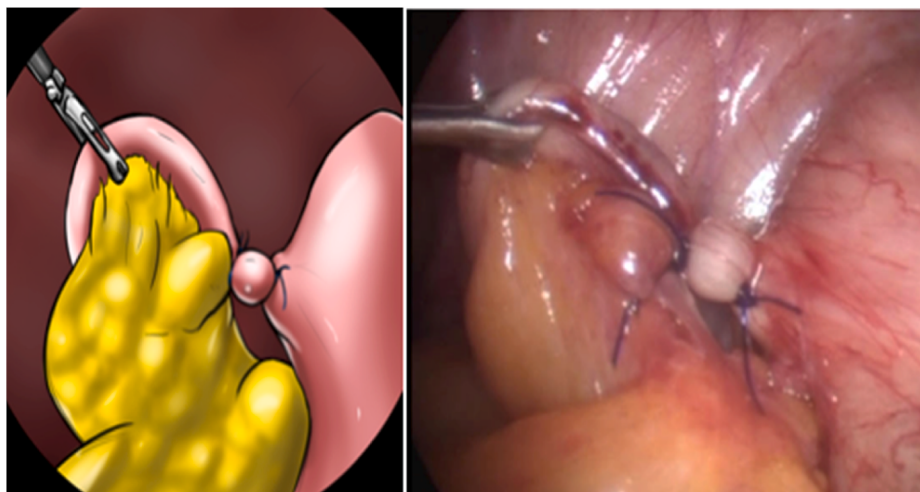


Fig. 4. Suture in the appendicular base.

fossa, the meso-appendix and the cecal appendix are ligated with 2-0 silk, sectioned with electric hook and the specimen is extracted without an endobag through the port of the left iliac fossa and invaginates the appendicular stump with the same 2-0 silk suture, with the possibility of increasing the incidence of infection in the extraction port [7].

Guiseppe Piccini has reported a technique similar to ours, with the exception that he uses a 10 mm trocar in the left flank and we use a 5 mm

trocars, he extracts the surgical specimen through the left flank port and ours was through the umbilical port, and once the window between the cecal appendix and the meso-appendix is made, the appendix is sectioned with a linear stapler, and the meso-appendix is sectioned with a second cartridge, in this way he performed 50 complicated and uncomplicated cases, with a zero conversion rate, no case presented an abdominal abscess or surgical wound infection, although due to the routine use of staplers, this increases the cost substantially [16].

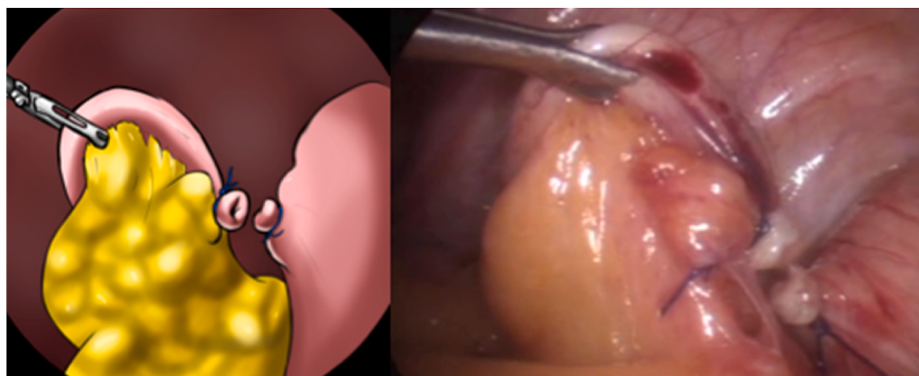


Fig. 5. Cut between the two sutures.

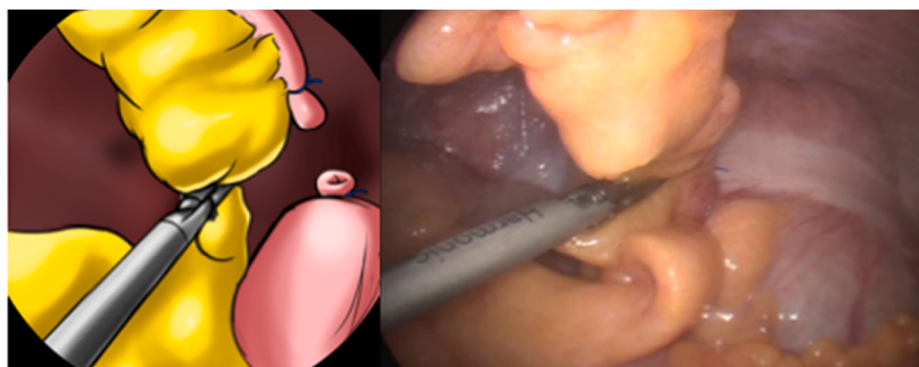


Fig. 6. Cut of the meso-appendix.

Motson reports her technique that begins with a window in the meso-appendix at the base of the appendix, cuts the appendix, and then places an endoloop in the appendix stump and another endoloop in the meso-appendix before cutting it [17].

Naguib makes a window in the meso-appendix at the level of the appendix base, places two clips between which he cuts the appendix, then places an endoloop proximal to the stump clip, and finally places another endoloop in the meso-appendix before cutting [13].

This is how multiple methods have been reported for laparoscopic appendectomy, from the placement of the trocars, the management of the appendicular stump, with endoloops, clips and staplers being the most used methods. Hemostasis is optimally achieved with harmonic scalpel, bipolar forceps or staplers; the preferred and safest extraction is with an endobag, thus decreasing the incidence of surgical wound infection. Our technique is a safe method, which prevents manipulation and therefore iatrogenic rupture of the cecal appendix in those cases where the area involved is the distal or middle third, even in cases where the proximal third is involved. Additionally, a seromuscular anchored point can be placed to prevent the knot from slipping and thus avoid major resective procedures such as cecectomy or even right hemicolectomy [18]. The results of a new surgical technique were presented for appendectomy, this technique showed remarkably better results relative to the usual technique.

5. Conclusions

The technique we are reporting is fast and safe, since we avoid transoperative bleeding, since the meso-appendix is not manipulated before sectioning it with the harmonic scalpel or bipolar forceps. It is a reproducible technique, because surgeons in training execute it easily, it is economical since it uses conventional sutures, and it is possible to opt for the use of bipolar forceps instead of the harmonic scalpel, for the

management of the meso-appendix. However, we consider that the study design could limit the conclusions, we suggest a prospective study with a control group to evaluate the efficacy of the technique. This study has been arranged in line with PROCESS guidelines [19].

Ethical approval

All procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

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No funding was secured for this study.

Author contribution

Dr. Arcenio Luis and Dr Julian: conceptualized and designed the study, drafted the initial manuscript, and reviewed and revised the manuscript.

Dr. Fernando, Dr Jesus and Dr Israel : Designed the data collection instruments, collected data, carried out the initial analyses, and reviewed and revised the manuscript.

Dr Stephany, Dr Javier and Dr Elizabet: Coordinated and supervised data collection, and critically reviewed the manuscript for important intellectual content.

Consent

Not applicable.

Registration of research studies

Name of the registry: ReserachRegistry

Researchregistry

6435.

Hyperlink to the registration (must be publicly accessible): N/A

https://www.researchregistry.com/browse-the-registry#home/?view_2_search=Researchregistry%206435&view_2_page=1.

Guarantor

Israel de Alba Cruz MD, MSc

Declaration of competing interest

The authors deny any conflict of interest in any terms or by any means during the study. The number NCT04751214 is registered in <https://www.clinicaltrials.gov/>.

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