

Technical and social challenges of laparoscopic appendectomy performed in a rural setting



Ann. Ital. Chir., 2015 86: 344-348
pii: S0003469X15021089
www.annitalchir.com

Gultekin Ozan Kucuk

Assistant Professor, Giresun University Medical Faculty, Department of General Surgery, Giresun, Turkey

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AIM: The current study reports technical and social details aiming to evaluate difficulties faced while performing laparoscopic appendectomy (LA) in a rural hospital as well as providing solutions.

METHODS: Patients who underwent LA with a diagnosis of acute appendicitis between April 2009 and December 2010 were included in this study. Demographic details, operative findings and postoperative outcomes were analyzed.

RESULTS: Fifty-one consecutive patients (28 male and 23 female) underwent LA. The median age was 23 years (range, 13-74); the median operative time was 45 minutes (range, 20-75). Appendiceal base securing was performed either endoloops in 4 (7.8%), or via intracorporeal knot tying in 46 (90.2%) patients and 1 was sutured. Complicated/technically difficult appendicitis was faced in 20 (39.2%) patients. One patient underwent conversion to open procedure (2%). Mean postoperative hospital stay was 2.4 ± 0.8 days. Postoperative intra-abdominal abscess occurred in 1 (2%) patient.

CONCLUSION: LA can be performed safely in a rural hospital, even for complicated cases. In this study, we have discussed some technical and social difficulties encountered and the solution methods adopted when performing LA in rural settings.

KEY WORDS: Appendicitis, Laparoscopy, Rural hospital

Introduction

Rural areas and communities are an important aspect of the universal health care system. These areas differ from urban areas with respect to hospital size, the number of

practitioners per capita, disease outcomes, and demographics of the patients admitted to these hospitals^{1,2}. In addition, disparities in the rural and urban health care systems remain an important unsolved problem³. Practicing in a rural hospital poses some difficulties and differences when compared with urban hospitals⁴.

In Turkey, it is increasingly common for surgeons to work in rural areas after completing residency programs, and this has led to differences in surgical practices. Furthermore, as the technology and the ability of surgeons in performing laparoscopic procedures improved, the number of laparoscopic procedures performed by newly graduated surgical residents in rural hospitals has also increased.

The rural hospital settings differ from urban hospitals in terms of patient population, sociocultural structure of the community, technical support and expertise of the hospital, the absence of attending specialists such as pathologists, and variable support of personnel in the operating rooms in performing new procedures. Patients

Two cases from this study with video images were presented at the 12th European Congress of Trauma and Emergency Surgery (ESTES) in Milan, Italy, on April 28, 2011, and an abstract of this study was presented at the 13th National Turkish Colon and Rectal Surgery Congress in Antalya, Turkey, on May 21, 2011

Pervenuto in Redazione Febbraio 2013. Accettato per la pubblicazione Maggio 2013

Correspondence to: Gultekin Ozan Kucuk, M.D., Nizamiye Yerleskesi Orhan Yilmaz Caddesi, Mumcular Sokak No:1/1 PO Box 28100, Merkez, Giresun, Turkey (e-mail: gultekinozan@hotmail.com)

in rural areas have lower education status and lower incomes and need to travel long distances to access health care⁵. Additionally rural-dwelling patients may be influenced by local customs and beliefs originating from family, community, and culture. These social and geographic barriers may result in some differences in the manifestations of the diseases due to delays in the time interval between the onset of symptoms and the diagnosis⁶. Since Semm⁷ performed the first laparoscopic appendectomy (LA), the laparoscopic approach remains a viable and increasingly becoming the procedure of choice for appendicitis⁸. Perforated appendicitis and periappendicular abscess formation may present difficulties in performing LA, and for this reason demonstrating the results of laparoscopy in a time-sensitive condition such as acute appendicitis in a rural hospital setting with technical and social details can provide important insights.

In this population-based study, the results of a single surgeon who performed laparoscopic appendectomy in a rural hospital have been discussed.

Material and Method

Patients who underwent LA with a diagnosis of acute appendicitis at Vezirkopru Public Hospital between April 2009 and December 2010 were included in this study. There were no delays or cancellations of laparoscopic operations (even after-hours) and all surgeries were performed by the same attending surgeon.

Patient-related data were recorded by the attending surgeon on a pre-set data sheet. A written informed consent was taken from all patients prior to the procedure. The acute appendicitis was categorized as either "simple" or "complicated/technically difficult" appendicitis based on the intra-operative findings and the presence/absence of the following: perforation, periappendicular abscess, gangrenous appendix, inflammatory mass, or adhesions with other structures.

All the patients' records were analyzed retrospectively, regarding demographics, duration of symptoms prior to admission, initial white blood cell (WBC), imaging modalities used to confirm diagnosis, the first trocar placement region (subumbilical/transumbilical), method of dissection of the mesoappendix, appendiceal stump securing, operative time, conversion rate, hospital stay, postoperative complications, and final pathology.

LA was performed using three ports in a technique previously described⁹. An infraumbilical or transumbilical 10-mm port was inserted by open technique and it was used as the camera port. A second 10-mm port was inserted under direct laparoscopic vision from the left iliac fossa (for the LigaSureTM); the third port of 5-mm was placed above the pubis. A 0-degree laparoscope was used in all patients. The appendix was identified and gently freed from inflammatory adhesions. The mesoappendix was divided using either LigaSureTM (LigaSure

AtlasTM, Covidien-Valleylab, Boulder, CO) with ForceTriad Generator or secured with endoclip and then divided. Appendiceal base was secured using either the intracorporeal knot-tying method or endoloop ligatures. The appendix was then removed from the abdomen via the 10-mm left iliac fossa trocar with the usual wound protection. The affected area was irrigated and a drain was left in the pelvis at the end of operation in complicated cases. All patients received a single dose of perioperative intravenous antibiotic. Postoperative antibiotic usage was guided by the operative findings and clinical status of the patients.

The data acquired from the study were evaluated via "Statistical Package for Social Sciences for Windows 13.0" (SPSS, Inc., Chicago, IL). Descriptive statistics and data were presented as mean and (\pm standard deviation) or median and range.

Results

A total of 51 patients (28 male and 23 female) were taken up for LA. LA was successfully completed in 50 patients (with 1 conversion to "open"). The median age of patients undergoing appendectomy was 23 years (range, 13-74). The median duration of surgery was 45 minutes (range, 20-75). Median duration of symptoms prior to admission was 2 days (range, 8 hours-7 days). Median WBC count at admission was 13290/mm³ (range, 6000-25000). Ultrasonography (US) was used for diagnosis of appendicitis in 28 (54.8%) patients. In three (5.9%) patients sectional computed tomography (CT) of the appendix was used to confirm diagnosis.

Transumbilical entrance to the abdomen was performed in 26 (51%) of patients. LigasureTM was used in 46 (90.2%) patients for dissection of the mesoappendix. Securing the appendiceal base was performed either with endoloops in 4 patients (7.8%), or via intracorporeal knot tying in 46 patients (90.2%) and 1 was sutured. Complicated or technically difficult appendicitis was found in 20 patients (39.2%). In 6 patients (11.8%) periappendicular abscess drainage was performed intra-operatively. Mean postoperative hospital stay was 2.4 \pm 0.8 days. A major complication, postoperative intra-abdominal abscess, occurred only in 1 patient (2%). The patient diagnosed with an intra-abdominal abscess was the second patient of this series, who had perforated appendicitis with fecal contamination of the peritoneum. Open drainage with subumbilical incision was performed on postoperative day 10 and the patient was then referred to the university hospital, where more specialist care was available, if required. As a minor complication, superficial wound infection occurred in 2 patients (3.9%) and this was managed with simple dressing and oral antibiotics. All these three patients with infectious complications were managed successfully and sent home. Conversion to open appendectomy (OA) was performed

TABLE I - Patient demographics.

Median age, years (range)	23 (13-74)
Gender (M/F)	28/23
Median preoperative WBC (/mm ³) (range)	13,290 (6,000-25,000)
Median duration of symptoms, days (range)	2 days (8 hours-7 days)
Mean length of hospital stay, days \pm SD	2.4 \pm 0.8 days.
Preoperative US, n (%)	28 (54.8)
Preoperative CT, n (%)	3 (5.9)

TABLE II - Operative outcomes and postoperative complications.

Operative outcomes	
Median operative time, minutes (range)	45 (20-75)
First trocar (subumbilical/transumbilical)	25/26
Complicated/technically difficult appendicitis, n(%)	20 (39.2)
Appendiceal base securing (endoloop/intracorporeal/suture)	4/46/1
Conversion to open, n (%)	1 (2)
Postoperative complications	
Wound infections, n (%)	2 (3.9)
Intra-abdominal abscess, n (%)	1 (2)

in 1 patient (2%) due to difficulty in exposure of retrocecal appendix and the operation was completed via the standard McBurney incision. In 2 (3.9%) female patients, simultaneous gynecologic procedures (simple ovarian cystectomy) were performed. The examination of the specimens demonstrated acute appendicitis in 49 patients and appendiceal diverticulum perforation and appendiceal carcinoid tumor perforation in one patient each. All the above outcomes were summarized in Tables I and II.

Discussion

There are limited studies in the literature about surgeries performed in rural hospitals¹⁰. The paucity of data on safety, efficacy, and feasibility of rural surgical practices may result in some challenges for rural community patients in accessing modern surgical treatments. The current study assumes importance since it reports surgery performed on patients living in a rural area from Turkey, with technical and social details.

LA is considered to superior in terms of shorter hospital stay, lower rate of wound infection, more rapid return to normal activity, decreased postoperative analgesic use, lower rate of postoperative ileus, decreased risk of thromboembolic complications, and improved cosmesis¹¹⁻¹⁶. On the other hand, LA requires specialist technical support and costs more than OA^{17,18}. Delay in patient presentation to the hospital, as well as in-hospital delay has negative effects on the outcome of acute appendicitis. In this study, 2 patients had a delayed presentation to the hospital. Both of them had complicated appendicitis: periappendicular abscess. The delay was because these

patients, who worked in the city, were originally from the rural area where the hospital was situated. They came back to the rural area for family support during the surgery. This is a peculiar problem which may be faced in a rural practice.

One criticisms of LA is the higher cost of the procedure. Closure of the appendiceal stump is one of the most important steps in performing LA. In this study intracorporeal knot tying of the appendiceal stump was performed in 46 patients. In the initial cases, it seemed difficult and more time-consuming to use intracorporeal knot tying when compared with endoloops or linear staplers. But as more experience was gained in intracorporeal knot tying, it became less time consuming. We used Vicryl No. 1 (10 cms in length) to secure the base. This seems to be a cost-effective and safe alternative to the endoloops, hem-o-lok clips, and staplers. Linear staplers and clips should be reserved for cases with a highly edematous cecal base for decreasing cost of the operation.

Managing complicated appendicitis in a rural setting is challenging. If the tip of the appendix is excessively adherent to the cecum, appendectomy can be performed retrogradely, as in our case (Fig. 1). The ability of the surgeon in performing intracorporeal knot tying is important in these complicated cases, because it is difficult to secure the appendiceal stump with endoloop in laparoscopic retrograde appendectomy. Additional tools such as polymeric clips or large titanium clips may be necessary. The laparoscopic approach allows the identification of patients with dense phlegmon formation. This is an advantage of laparoscopy in preventing wider incisions and related complications. In this way, an individual patient can become a good candidate for an interval appendectomy with minimal scarring. Furthermore,



Fig. 1: Tip of appendix is densely adhered to the cecum.



Fig. 2: The use of LigaSure™ in fragmented appendix.

unless rural-dwelling patients feel pain again due to recurrent appendicitis, they may not be admitted to hospital again for a scheduled interval appendectomy because of difficulties in reaching hospital due to inappropriate conditions or geographic barriers. For those reasons in rural settings, laparoscopy can be used as a diagnostic tool for the patients with delayed presentation of appendicitis to avoid the complications of re-operative surgery. The dissection of the mesoappendix is one of the important steps in performing a LA in a rural setting. LigaSure™ was used in 46 patients for controlling the vessels in this study. Not only the stage of the appendicitis, but other conditions like coexisting pulmonary disease, also affected the dissection step of the mesoappendix. When the patient had pulmonary disease and the necessity for decreasing abdominal pressure occurred, the use of LigaSure™ was helpful in these patients with restricted working space. Since it both ligates and cuts, it reduced the number of devices entered into the abdomen. This way, the probability of undesirable injuries related to the entrance of different working devices was diminished.

The probability of fragmentation of the appendix is higher in complicated cases. In our cases, when the fragmented appendix was hanged, the mesoappendix became



Fig. 3: Perforated and doubled appendix with dense adhesions.

more prominent (Fig. 2). The use of LigaSure™ facilitated the dissection in these fragmented cases.

Fragmented cases have importance since a retained piece may cause intra-abdominal infection when it is left. The use of LigaSure™ in the dissection of a bulky mesoappendix was also helpful in complicated cases when the appendix was excessively adherent to other surrounding structures, like an ovary or the urinary bladder (Fig. 3). All technical difficulties mentioned above may be faced in patients with appendicitis who live in rural areas.

Another issue which is faced in rural hospitals is the absence of an attending pathologist. In surgical procedures all specimens excised are routinely sent to the pathology clinic for analysis. This situation is different in some rural hospitals. The appendix extracted is given to the patient and the patient takes it to the pathology clinic in the town/city. Sometimes, patients are unwilling to take the specimen due to cost and/or time constraints. In the event of a high suspicion of dealing with a neoplastic/serious pathology, the surgeon has to stress the importance of pathological analysis to the patient and family. It is for this reason that the appendix specimen was examined by the surgeon in all cases. Specially in those patients who present with complicated appendicitis, the surgeon should remember the possibility of other pathologies mimicking appendicitis, with rates up to 10 percent reported in some articles^{19,20}.

Conclusion

In this population-based study, we have attempted to share difficulties both technical and social which are

encountered in a rural hospital setting in Turkey. We hope this study will offer surgeons working in rural settings an effective method for laparoscopic appendectomy without jeopardizing the clinical outcome.

Acknowledgement

The author thanks Parul Shukla M.D., for supports in preparing the manuscript.

Riassunto

Lo studio illustra i dettagli tecnici e sociali delle difficoltà da affrontare nell'adozione dell'appendicectomia laparoscopica in un ospedale periferico in ambiente rurale, e suggerisce le soluzioni, includendo la casistica nell'intervallo tra aprile 2009 e dicembre 2010, di cui sono analizzati le caratteristiche demografiche, i reperti operatori ed i risultati.

La casistica si riferisce a 51 pazienti (28 uomini e 23 donne) sottoposti ad appendicectomia laparoscopica, di età media di 23 anni (tra 13 e 74 anni).

In media l'intervento ha richiesto 45 minuti (tra 20 e 75 minuti). La base appendicolare è stata trattata con endo-loop in 4 casi (7,8%) o per nodo intracorporeo in 46 casi (90,2%); in un caso la base è stata suturata. In 20 casi (39,2%) si sono dovute fronteggiare difficoltà tecniche, ed in un paziente (2%) si è fatto ricorso alla conversione al trattamento laparotomico.

La degenza postoperatoria è stata di 2.4 ± 0.8 giorni, ed in un paziente (2%) si è sviluppato un ascesso intra-addominale.

In conclusione la appendicectomia laparoscopica può essere adottata con sicurezza in ambiente rurale, anche se si tratta di casi complicati. Si discutono alcune difficoltà tecniche e sociali da affrontare, e le soluzioni adottate.

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