World Journal of Laparoscopic Surgery

An Official Publication of the World Association of Laparoscopic Surgeons, UK

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Editorial

10.5005/wjols-15-3-v

Rouviere's sulcus is an important anatomical landmark in laparoscopic cholecystectomy. It is a 2–5 cm fissure on the liver between the right lobe and caudate process. The benefit of finding the Rouviere's sulcus during laparoscopic cholecystectomy is supported by the fact that the cystic duct and artery lay anterosuperior to the sulcus, and the common bile duct lays below the level of the sulcus. In this issue of WJOLS an important article is about Anatomical Variations of Rouviere's Sulcus Observed during Laparoscopic Cholecystectomy. Role of Preoperative Ultrasonography Findings in Predicting Difficult Laparoscopic Cholecystectomy is another good article to help general surgeon to perform safe laparoscopic cholecystectomy.

Although multiple operations have been described for the surgical treatment of rectal prolapse over the past 150 years, there have been very few trials conducted to compare treatments and even fewer to compare the functional outcomes. There is an important article in this issue on Short-term Outcomes of Laparoscopic Ventral Approach of Rectopexy with Polypropylene Mesh for Rectal Prolapse.

The robotic system is designed to work better in confined places such as the pelvis. The transition to robotic pelvic dissection for rectal cancer after laparoscopic mobilization of the splenic flexure facilitates dissection and prevents any disruption at the flow of the operation. There is a good meta-analysis in this issue about Laparoscopic vs Robotic Approach for Rectal Cancer.

Evolution of Surgical Management for Ulcerative Colitis in the Last Decade and Prevalence of Malignant Tumors of the Appendix in Patients with a History of Appendectomy and its Association with Demographic and Laboratory Variables and many more important articles are there in this issue that you will definitely like.

On behalf of the World Association of Laparoscopic Surgeons, the Editorial Board and the Editorial Team of our journal, I would like to wish all the authors, patrons and readers a wonderful and prosperous year ahead!

RK Mishra
Editor-in-Chief
Chairman
World Laparoscopy Hospital
Gurugram, Haryana, India

ORIGINAL ARTICLE

First Port Access Using an Optical Trocar in Advanced Upper Gastrointestinal Tract Laparoscopic Surgeries

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Received on: 24 January 2022; *Accepted on*: 06 September 2022; *Published on*: 07 December 2022

Abstract

Background: Multiple techniques for creation of pneumoperitoneum and first port introduction in laparoscopic surgeries are being used with a variety of benefits and hazards. Our study was conducted to present the safety and simplicity of using an optical trocar for the establishment of pneumoperitoneum and first port access through Palmer's point for advanced upper gastrointestinal tract (GIT) surgeries.

Materials and methods: All patients listed for advanced upper GIT laparoscopic procedures were included in the study, whereas patients who had splenomegaly, hepatomegaly or the previous left upper quadrant surgery were excluded. A 12-mm optical trocar was introduced with a 0°-degree camera through Palmer's point in a fully controlled way under complete direct vision, followed by the introduction of the required working ports to perform the targeted operation. The time of first port introduction, creating pneumoperitoneum, as well as complications during or after the procedure were recorded.

Results: The study included 1,560 patients who had advanced laparoscopic upper GIT surgeries. Our technique was successful except in two patients (0.12%) due to massive adhesions of previous operations. The mean time to induce pneumoperitoneum and abdominal access was 120s. Port-site infection occurred in 0.19%, whereas enterotomy occurred in 0.12%. No port-site hematomas, hernias, or vascular injuries were noted.

Conclusion: Using an optical port at Palmer's point in a fully controlled way allows a fast, easy and safe method for first port access and creating pneumoperitoneum in laparoscopic surgeries. However, special care is still required for patients with the previous abdominal surgeries to decrease the risk of bowel injuries.

Keywords: Bowel injury, Open method, Optical port, Palmer's point, Veress needle.

World Journal of Laparoscopic Surgery (2022): 10.5005/jp-journals-10033-1521

Introduction

Laparoscopy is considered the gold standard technique used nowadays in all upper GIT surgeries. Despite the rise in the learning curve of laparoscopic use and the recent technical advances in minimally invasive surgical techniques, a safe first port access and creation of pneumoperitoneum continues to be a challenge for all surgeons. Complications related to the entry technique might hinder the operation performance or could be a cause of death.[1] Various methods had been used for years including Veress needle technique; however, because of its slow insufflation rates and potentially life-threatening complications, it becomes an undefendable mistake to use it in many countries.[2]

The open technique method for port insertion in laparoscopy was first introduced in 1971 by Hasson.[3] This technique allows direct vision and safe entry for the first port avoiding vascular and organ injury as well as immediate recognition and repair for the injury if happened.[4,5] There are also other methods of intra-abdominal entry including direct trocar insertion, radially expanding trocars and visual entry systems.[6]

The advantages and disadvantages of closed or open methods for creation of pneumoperitoneum and introduction of first port safely were evaluated by many clinical studies. However, the definite answer to know the ideal technique is still unclear.[7,8] Many studies using modified techniques of both open[9] and closed[10] basic approaches have been carried out, while others are underway. The older randomized controlled studies,[11,12] as well as the more recent studies,[13,14] in many countries proved that the open technique is as quick as closed methods and associated with fewer minor complications. However, using the open technique is considered a challenge in morbidly obese patients and consume much more time for introduction with a higher rate of postoperative port-site infections and hernias.[15]

Palmer's point was first described by Raoul Palmer in 1974, which is a point located in the left upper quadrant, 3 cm below the costal margin in the mid-clavicular line. This entry point is utilized when midline adhesions are suspected.[16] It should also be considered in both obese and thin patients.[17] Entry through Palmer's point using Veress needle insufflation has been reported by different studies.[18,19] It has been mentioned that the correct

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How to cite this article: Elbarbary MG, Elashry A, El-Abbassy IHED. First Port Access Using an Optical Trocar in Advanced Upper Gastrointestinal Tract Laparoscopic Surgeries. World J Lap Surg 2022;15(3):189–192.

Source of support: Nil

Conflict of interest: None

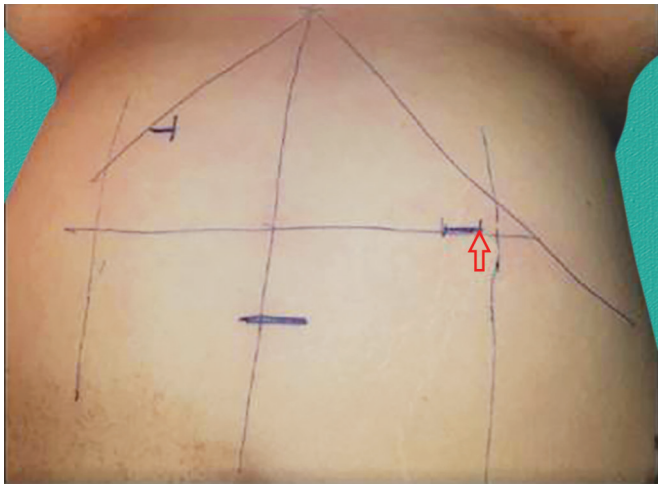

Fig. 1: Palmer's point shown by the arrow

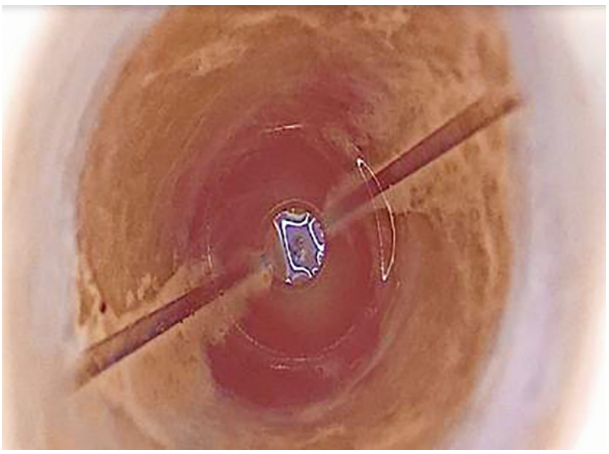

Fig. 2: Gradual introduction of the optical port through muscle layers of the anterior abdominal wall

placement of the Veress needle through that point would be more difficult compared to the infraumbilical entry because the abdominal wall layers do not come together at the left upper quadrant as they do at the midline.[20]

Many studies are reporting the use of optical ports through the midline,[21–23] whereas its use through Palmer's point has not been reported much in the literature. Our aim was to present the safety and simplicity of using an optical trocar for the establishment of pneumoperitoneum and first port access through Palmer's point for advanced upper GIT surgeries.

Materials and Methods

This prospective observational study was conducted during the period from December 2015 to January 2020 at Ain Shams University Hospitals and a few private hospitals in Cairo, Egypt. All patients listed for advanced upper GIT laparoscopic procedures were included in the study, whereas, the patients who had splenomegaly, hepatomegaly or the previous left upper quadrant surgery were excluded.

We conducted this study in compliance with the principles of the Declaration of Helsinki. The study's protocol was reviewed and approved by the institutional ethical committee (IRB No. 0006379). Written informed consent was obtained from all the participants.

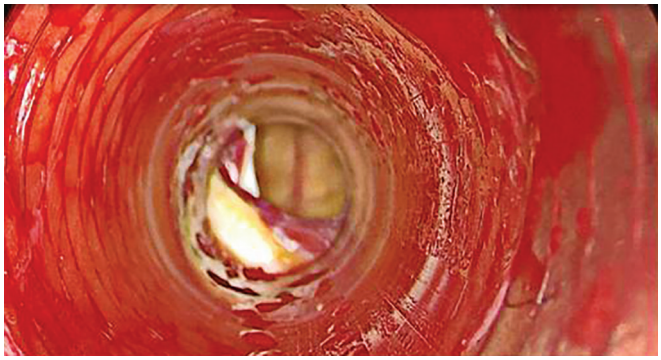

Fig. 3: The optical port was just at the level of the peritoneum with its tip creating a small hole to the abdomen through which insufflation was started

Fig. 4: The optical port was safely and easily introduced to the abdomen under complete vision after creating good pneumoperitoneum

A 12-mm incision was made over Palmer's point and a 12-mm optical trocar (ENDOPATH XCEL® trocar with OPTIVIEW® technology) was introduced with a 0°-degree camera (Fig. 1). A slow controlled rotating introduction of the optical trocar with the 0°-degree camera was done through the layers of the anterior abdominal wall (Fig. 2).

The introduction of the optical trocar was stopped once the peritoneum was reached and a small hole was created by the tip of the trocar. Then, pneumoperitoneum was created using low pressure less than 12 mm Hg. With the creation of good insufflation of the abdomen, the port was slowly introduced to the abdomen under complete safe vision (Figs 3 and 4).

Through-and-through inspection of the abdominal cavity was done to exclude any intra-abdominal injuries. Then, all other required ports for the targeted procedure were introduced under vision. This port used for creating the pneumoperitoneum was used as a working port during the procedures. At the end of the procedure, this port site was closed using subcuticular sutures. We do not routinely perform closure of the fascial defect because the muscle-splitting nature of these trocars does not require closure.

This technique was standardized among all cases and all operations were performed by two surgeons who are experienced in laparoscopic surgery.

Time of first port introduction, creating pneumoperitoneum, as well as complications during or after the procedure were recorded.

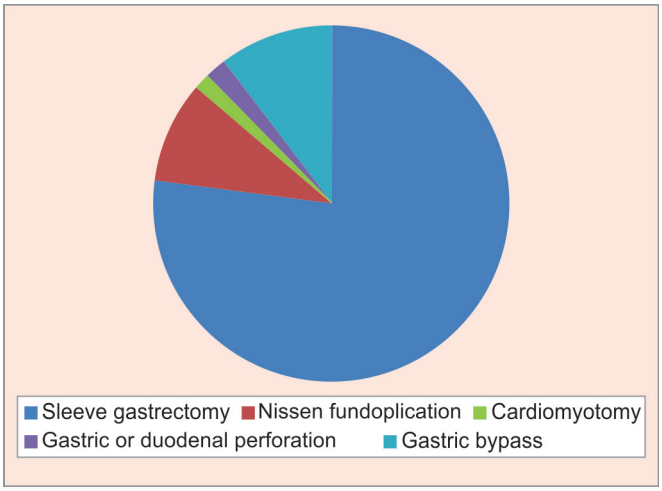

Fig. 5: Advanced laparoscopic upper GIT surgeries included in the study

Table 1: Complications of the technique

Complication	*Event (%), N = 1,560*
Enterotomy	2 (0.12)
Port-site infection	3 (0.19)
Port-site hernia	0 (0)
Vascular injury	0 (0)
Solid-organ injury	0 (0)
Conversion to open	1 (0.06)

Results

The study included 1,560 patients who had advanced laparoscopic upper GIT surgeries. Those cases included 1,200 sleeve gastrectomies (76.9%), 150 Nissen fundoplications (9.6%), 20 cardiomyotomies (1.3%), and 30 emergency laparoscopies for gastric or duodenal perforations (1.9%), 160 gastric bypasses (10.3%) (20 roux-en-y and 140 one anastomosis bypasses) (Fig. 5).

Intra-abdominal access using the given technique was successfully achieved in 1,558 patients, whereas it failed in only two cases (0.12%) who were scheduled for laparoscopic gastric bypass. The first patient had a previous midline laparotomy incision for postoperative leakage and wound infection with intensive care admission, while the other patient had marked adhesions after open complicated vertical band gastroplasty (VBG). The first patient was converted to open surgery, whereas the operation was abandoned for the other patient for fear of performing further vascular or organ injuries due to massive adhesions.

The mean time taken to induce pneumoperitoneum and abdominal access was about 2.3 minutes (range, 1–5 minutes). No postoperative mortality was recorded, and no vascular or solid organ injury was observed. Enterotomy was recorded in only two cases (0.12%) who had previous adhesions from previous surgeries. Both of these enterotomies were repaired laparoscopically during the same procedure with no postoperative complications. However, one of them was converted to open (after the laparoscopic repair of the enterotomy was done) due to massive adhesions and difficulty in handling the tissues.

Postoperative port-site infection was recorded in 3 (0.19%) cases and treated safely by daily dressing of the wound and antibiotics. There were no recorded postoperative port-site hernias (Table 1).

Discussion

Our study shows that the given technique for gaining access into the abdominal cavity using the optical trocar with 0°-degree camera adds advantages over the conventional blind method using Veress needle and also the open technique. It allows a completely safe and fast method for insufflation and first port access under complete direct vision. This technique may be used as well in re-do operations and patients having previous surgeries, but still great care during access is required to avoid complications. The point of entry described in our technique needed to be well recognized to allow to get the benefits of avoiding vascular or organ injury and easy manipulation of the instruments during carrying out the procedure required; otherwise, it might add more burden during the operation. The incidence of postoperative hernia in our technique was zero compared to other techniques especially the open one which had higher incidence rates because of introduction through the linea alba or close to it.[24]

In our study, the mean time taken to induce pneumoperitoneum and abdominal access using an optical trocar was about 2.3 minutes (range, 1–5 minutes). In a study done on 200 patients, Hallfeldt et al. reported a mean entry time of 4 minutes (range, 2.30–11.0 minutes,[22] whereas in another study, Bernante et al. reported a mean entry time of 20 seconds (range, 10–50 seconds).[25] Studies reported that the blind Veress technique requires around 214–300 seconds for abdominal cavity access,[11,26] whereas the open technique may require about 240–300 seconds.[27,28] Thus, using the optical trocar technique is quicker than using the Veress needle and the open technique.

Hasson reported complications using the open technique on 5,284 patients. Twenty-one of them had minor wound infection, four had a minor hematoma, one developed umbilical hernia, and one had an injury to the small bowel. Hence, if there are dense adhesions, bowel injury could still happen even if an open technique is used.[29] In our study, we reported two cases of bowel injury due to massive intra-abdominal adhesions that were repaired laparoscopically, and three cases of port site infection. String et al. reported one case of bowel injury and one case of gall bladder injury in a series of 650 patients using an optical trocar,[21] whereas Rabl et al. reported three cases of superficial mesenteric and greater omentum lacerations in their series of 196 morbidly obese patients.[22]

In a series of 821 patients using optical trocars, Wong WS reported no complications related to the induction of pneumoperitoneum or port insertion on gynecological patients.[23] Similarly, no complications were reported by Bernante et al. in their series of 200 morbidly obese patients who had bariatric procedures.[25] Similar results were reported by Bernante et al.[25] and Berch et al.[30] on a series of 200 morbidly obese patients who had bariatric procedures and 349 patients who had gastric bypass, respectively.

The use of optical access trocar through Palmer's point was reported by Berch et al.[30] in their case series on 349 patients who had gastric bypass, and no complications were documented. The same technique was adopted by Aust et al.[17] on their 15 patients who had gynecological procedures, and no complications were reported either.

Although using the optical trocar is not a new technique, to our knowledge, our study is considered to be the biggest in the literature documenting the outcomes from using this technique, emphasizing the idea of insertion of the first trocar under direct vision through Palmer's point to perform different types of laparoscopic upper GIT surgeries combining the benefits of shorter

time of introduction of the closed method and the complete visualization of the trocar during its access of the open method.

Therefore, we encourage using this technique routinely especially in advanced upper GIT laparoscopic surgeries due to its simplicity, safety, and low risk of complications guided by the excellent results of this study compared to other known techniques.

Conclusion

Using the aforementioned technique using the optical trocar at Palmer's point in a fully controlled way allows a fast, easy and safe method for first port access and creating pneumoperitoneum in upper GIT laparoscopic surgeries. However, a special care is still required for re-do operations and patients with previous abdominal surgeries to decrease the risk of bowel injuries.

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ORIGINAL ARTICLE

Clinical Outcomes of Laparoscopic vs Mini-incision Open Appendectomy: A Comparative Study

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Received on: 01 August 2022; *Accepted on*: 06 September 2022; *Published on*: 07 December 2022

Abstract

Introduction: Open appendectomy was first introduced by McBurney and has been considered as the treatment of choice for more than a century for acute appendicitis. However, recently, laparoscopic appendectomy (LA) has become the popular method of treatment for patients with acute appendicitis.

Aims and objectives: The aim of this study was to compare results of LA with mini-incision open appendectomy in terms of various parameters such as time taken to complete the procedure, postoperative pain, need for analgesia, hospital stay, days to return to normal activity cosmetic results, and complications.

Material and methods: This study was a prospective study conducted in the Department of Surgery, SKIMS Medical College, Bemina, Srinagar, Jammu and Kashmir, India, from July 2017 to June 2019. All patients more than 14 years in age admitted in the accident emergency department of the hospital with a clinical diagnosis of acute appendicitis were included in the study.

Results and observations: Total number of patients studied was 101 and were randomly taken either for mini-incision open appendectomy or laparoscopic surgery. The two groups were comparable with respect to age and sex distribution with no statistically significant difference. The average operative time in mini-incision appendectomy (MIA) group was 32.7 ± 2.52 (30–35 years of age) compared to 26.9 ± 2.46 (24–30 years of age) in laparoscopic group, which was statistically significant. The patients with laparoscopic surgery experienced less pain and had less postoperative wound infection as compared to MIA group with p <0.001, which was statistically significant.

Conclusion: Comparison done on the basis of statistical results between the two groups was suggestive of superiority of LA over MIA.

Keywords: Appendectomy, Appendicitis, Laparoscopy, Pneumoperitoneum, Visual analog scale.

World Journal of Laparoscopic Surgery (2022): 10.5005/jp-journals-10033-1479

Introduction

Claudius Amyand, a French surgeon performed first successful appendectomy in 1735, on an 11-year-old child. The appendix was found inside the inguinal hernia sac and had been perforated by the pin. The standard technique for removal of appendix by a muscle splitting incision was first described in 1894 by McBurney. Since then, open appendectomy has remained as a treatment of choice for acute appendicitis.[1] The overall mortality and morbidity rate for open appendectomy has been reported as 0.3 and 11%, respectively.

Laparoscopic appendectomy, first described by Kurt Semm in 1983, is now widely accepted as method of choice for management of acute appendicitis among surgeons using a three-port technique. Although laparoscopic cholecystectomy is presently considered as the treatment of choice for gallstone disease,[2] LA has yet not been accepted as a surgery of choice for appendicitis. In several randomized comparisons studies, LA has been proved to be safe and viable method for removal of appendix. Advantages of LA include improved diagnostic accuracy, lesser wound related complications, less pain, fast recovery, and early return to routine work. The disadvantages of laparoscopy include more operating time and increased hospital costs.[3,4] As reported by several comparative studies, laparoscopy is an ideal alternative to open appendectomy for patients with suspected appendicitis.[5] Although LA is associated with lesser postoperative wound infections, in patients with gangrenous and perforated appendicitis, higher incidence of postoperative intra-abdominal sepsis has been reported.[6] Several studies have concluded that although the cost of laparoscopy is high, the benefit is minimal.

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How to cite this article: Ul Bari S, Farooq A. Clinical Outcomes of Laparoscopic vs Mini-incision Open Appendectomy: A Comparative Study. World J Lap Surg 2022;15(3):193–198.

Source of support: Nil

Conflict of interest: None

While managing patients with suspected appendicitis, particularly in women of child bearing age, laparoscopy is an important diagnostic tool to rule out other causes of lower abdominal pain.[7] For assessment of benefits of laparoscopy, several prospective randomized trials, meta-analyses[7–9] and systematic reviews[10,11] have been conducted. However, there is no consensus in the literature about whether to take all patients with appendicitis for laparoscopy or to reserve it only for selected cases such as young females in a reproductive age-group, obese patients, and professional workers.[12]

Aims and Objectives

The aim of this study was to compare LA with mini-incision-open appendectomy in terms of operating time from the start of incision and the end of procedure, intraoperative complications if any, postoperative pain score on visual analog scale (VAS), postoperative

analgesic requirement, postoperative complications, number of days in the hospital, time taken to return routine work and cosmetic results.

Materials and Methods

This study was a prospective study conducted from July 2017 to June 2019 in the Department of General and Minimal Invasive Surgery, SKIMS Medical College, Bemina, Srinagar.

The study included all adult patients admitted in the department of surgery with a diagnosis of acute appendicitis. The patients were randomly taken either for LA or MIA. The total number of patients studied was 101. Laparoscopic appendectomy was done in 49 patients while MIA was done in 52 patients. The patients excluded from the study included those who were symptomatic for more than 5 days, those with a palpable right lower abdominal mass, those with features of peritonitis and shock at the time of presentation, patients with large abdominal hernia, patients with previous history of laparotomies, patients with a severe cardiopulmonary disease, patients with coagulation disorders and cirrhotic liver and all pregnant females. All those patients who had to be converted to open appendectomy were not included in the study.

Preoperative Assessment

All adult patients who reported to surgical emergency with features of appendicitis were subjected to detailed history and clinical examination. Baseline investigations, urine examination, and ultrasound examination of abdomen and pelvis was done in all cases. Computed tomography (CT) abdomen was done wherever there was doubt in diagnosis. Once impression of appendicitis was made, informed consent was taken and patients were subjected randomly to either LA or MIA. Consent for conversion from laparoscopic to an open appendectomy was taken from all patients.

Operative Technique

All procedures were performed under general anesthesia. In a laparoscopic group, Veress needle was introduced through a supraumbilical incision to create pneumoperitoneum. After the pneumoperitoneum was created, the same port was used for inserting a 10-mm trocar for telescope. Telescope was placed through this port and peritoneoscopy performed. Two additional 5-mm trocars were inserted, one in the suprapubic area in the midline and another in right hypochondrium in the mid-clavicular line. The appendix was identified and examined. After this the mesoappendix was divided using harmonic energy source, till the base of appendix was reached (Fig. 1). The base of the appendix was ligated with an endoloop constructed with a Roeder's knot on a No. 1 vicryl thread or No. 1 chromic catgut (Fig. 2). The appendectomy was completed using the harmonic energy source. The appendix was delivered through the 10-mm umbilical port without touching abdominal wall. The appendicular stump was not buried. In patients with peritoneal collection or perforated appendix, normal saline irrigation was carried out and suction drain was placed for 12–24 hours.

In the patients who were taken for MIA, preoperative abdominal examination was done and the tenderest point was marked. From that marked point, a 2.5–3-cm oblique incision was used instead of classical McBurney's incision (Fig. 3). Appendix was delivered through the incision using a finger. Mesoappendix was identified and ligated by 2/0 silk sutures and finally divided. The base of appendix was transfixed using 2/0 vicryl suture (Fig. 3). The knot at the base was further secured using 2/0 silk suture to prevent

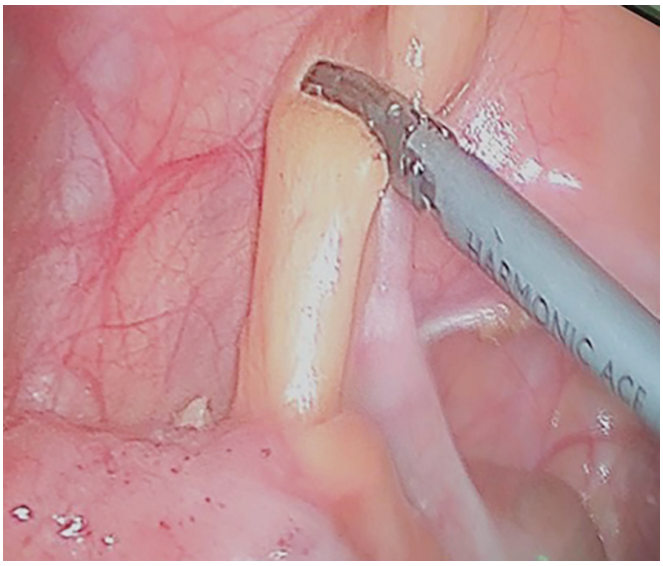

Fig. 1: Dividing mesoappendix with harmonic diathermy

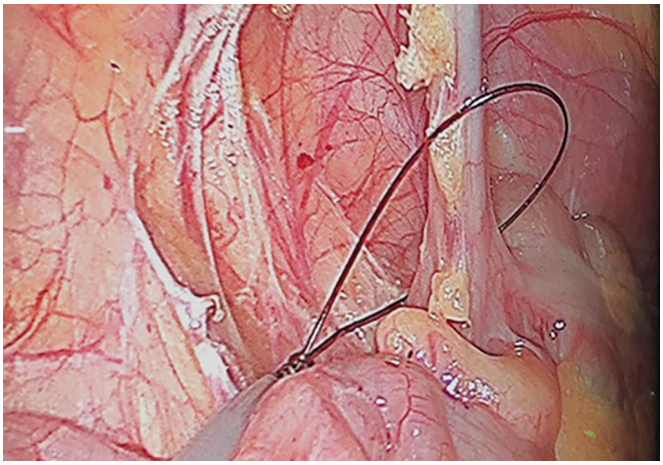

Fig. 2: Endoloop placement during LA

Fig. 3: Appendicular base and cecum as seen through mini-incision

stump leak. The peritoneum and fascia were approximated using 2/0 vicryl sutures. The incision in the skin was closed by using 1/0 non-absorbable suture.

Postoperative Course

In the postoperative period intravenous fluids were continued for 12 hours. All patients were given two doses of third-generation cephalosporin, one dose was given at the time of intubation and another was given 12 hours after surgery. Patients with complicated appendicitis received a combination of third-generation cephalosporin and metronidazole. For purpose of analgesia, all patients were put on paracetamol infusion during the procedure followed by 75-mg intramuscular diclofenac sodium as and when needed.

During the postoperative period, pulse rate, blood pressure, temperature, and respiratory rate were monitored in all patients. All patients were monitored for VAS at 6, 12, and 24 hours after surgery and same was recorded in the already prepared pro forma. The patients were allowed to take a clear liquid diet once the bowel sounds were present, followed by a regular diet. The patients were monitored for various clinical parameters which were recorded in already prepared pro forma. These parameters included total operative time, number of doses of analgesia received in the immediate postoperative period, time taken to resume oral intake, pain score, hospital stay, and complications if any. Pain score was assessed independently by the resident doctors using 10-cm unscaled VAS. The patients were advised to take tablet of aceclofenac 100 mg as an analgesia as and when needed. Total operative time was calculated from the time of incision in the skin till the placement of last suture.

The patients were discharged on oral antibiotics and were advised to take analgesic tablets as and when needed and to keep a record of it. The follow-up was done in the outpatient clinic at weekly intervals for a period of 1 month. During follow-up, a detailed history was taken and thorough examination was done as per the pro forma.

Statistical Analysis

All observed data was compiled and entered in a spreadsheet (Microsoft Excel) and then exported to data editor of Statistical Package for Social Sciences (SPSS), version 20.0 (SPSS Inc. Chicago, Illinois, USA). Continuous variables were expressed as mean (SD), while categorical variables were expressed as frequencies and percentages. Graphically, the data was presented by bar diagrams. Student's independent *t*-test was used for comparing continuous variables, while Chi-squared test or Fisher's exact test was used for comparing categorical variables. A $p < 0.05$ was considered statistically significant. All *p* values were two-tailed ones.

Results and Observations

The total number of patients studied was 101, out of which 52 were taken for MIA and 49 for LA. We did not convert any of the laparoscopic procedures to open surgery.

The patients who were taken for MIA had a mean age of 31.9 (13.06) years, while the patients who were taken for LA group had a mean age of 32.4 (14.34) years (Table 1). Thus, both groups were comparable as far as the age is concerned, with no statistically significant difference ($p > 0.05$). In MIA group, out of 52 patients, 31 (59.6%) were males and 21 (40.4%) were females, while in LA group, out of 49 patients, 24 (49%) were males and 25 (51%) were females with $p > 0.05$, which is statistically insignificant.

The patients who underwent MIA had an operating time ranging from 30–35 minutes, with a mean of 32.7 (2.52) while patients who were subjected to LA had the operative time ranging from 25–30 minutes, with a mean of 26.9 (2.46). The difference in operating time was statistically significant in favor of LA ($p < 0.001$) (Table 1).

Intraoperative bleeding was seen in 2 (3.84%) patients belonging to MIA group while another 2 (3.84%) patients had an iatrogenic injury to bowel. No such complication was seen in any of the patients taken for laparoscopy ($p > 0.05$) (Table 2).

The patients belonging to LA group experienced less pain in contrast to MIA group on a VAS. The overall pain score in MIA was 2.86 (1.184) in MIA and 2.30 (1.022) in case of LA. This difference in pain between the two groups was statistically significant with a $p < 0.001$ (Table 1).

The number of injectable analgesics needed during the first 24 hours after surgery was significantly higher in MIA group as compared to LA group with $p = 0.002$, which is statistically significant ($p < 0.05$). After discharge from the hospital, the number of analgesic tablets taken by patients who underwent LA was less as compared to patients who underwent MIA, which was again statistically significant (Table 1).

Table 1: Comparison of study variables between two groups

Parameter	*Mini-incision open appendectomy group, N = 52* *Mean (SD)*	*Laparoscopic appendectomy group, N = 49* *Mean (SD)*	*p-value*
Age (years)	31.9 (13.06)	32.4 (14.34)	0.876
Operating time (minutes)	32.7 (2.52) (30–35)	26.9 (2.46) (24–30)	0.001
Intraoperative complications	4	0	0.118
Postoperative pain score on VAS (1–10)	2.86 (1.184)	2.30 (1.022)	0.001
Analgesic injection requirement	2.05 (1.09)	1.41 (0.93)	0.002
Postoperative complication	11	1	<0.008
Hospital stay above 30 hours	52	5	<0.001
Analgesic tablet requirement	5.3 (1.31)	3.2 (1.17)	0.001
Return to routine activities in 1–2 weeks	2 (3.8%)	47 (96%)	<0.001*

*Significant when $p < 0.05$

Table 2: Comparison based on postoperative complications in two groups

	Group MIA		*Group LA*		
Postoperative complications	*Number of patients*	*%*	*Number of patients*	*%*	*p-value*
Wound infection	6	11.5	0	0.0	0.027*
Adhesion obstruction	3	5.8	0	0.0	0.243
Intra-abdominal abscess	2	3.8	1	2.0	1.000
Ileus	4	7.7	0	0	0.118

*Statistically significant difference (p <0.05)

Complications were seen in 11 patients who underwent MIA. It included wound infection in 6 (11.5%), intra-abdominal abscess in 2 (5.8%) and ileus in 3 (7%) patients (Table 2). On the other hand, only one patient with LA had a postoperative complication in the form of intraabdominal abscess. The difference between the two groups as far as the wound infections is concerned was statistically significant with $p = 0.027$ in favor of LA (Table 2).

A total of 36 (73.5%) patients from LA group resumed orals within 12 hours after surgery while more than 84% patients from MIA group resumed orals 24 hours after surgery. The difference was statistically significant with p <0.001 in favor of LA.

All 52 patients belonging to MIA group had hospital stay for more than 30 hours, while out of 49 patients belonging to LA group, 44 (89.8%) had a hospital stay of less than 30 hours, and remaining 5 (10.2%) patients had stay of more than 30 hours, which was statistically significant with p <000.1. The 5 patients from LA group who had hospital stay of more than 30 hours had delayed onset of bowel sounds with postoperative abdominal distension, which was managed conservatively.

In this study, 31 (63.3%) patients from LA group returned to routine work by 1 week while 2 (3.8%) patients from MIA group and 16 (32.7%) patients from LA group returned to routine work by 1–2 weeks. On the other hand, 50 (96.2%) patients from MIA group and 2 (4.1%) patients from LA group returned to routine work after 2 weeks. The p-value was statistically significant (<0.001) in favor of LA.

Discussion

Surgical intervention is the most common modality of management for acute appendicitis. Gridiron incision is the most common approach utilized when diagnosis of appendicitis is reasonably certain. In case the need arises, the gridiron incision may be converted to a muscle cutting Rutherford Morison incision for better exposure. Another popular incision employed widely is a transverse skin incision located approximately 2 cm below the umbilicus with its center on the mid-clavicular-mid-inguinal line. The exposure is better with this type of incision and the incision may be extended medially either by retraction or by division of the rectus abdominis muscle if need arises.[13] Mini-incision appendectomy is done either in general or spinal anesthesia. For the mini-incision approach, an abdominal examination is done and the most painful point is identified and marked preoperatively. From that marked point, a 2.5–3 cm oblique incision is made instead of classical McBurney's incision appendix is delivered through the incision by using an index finger. Mesoappendix is identified and ligated by 2/0 silk suture and finally divided. Base of appendix is transfixed using 2/0 vicryl suture (Fig. 3). The knot at the base is further secured using 2/0 silk suture to prevent stump leak. The peritoneum and fascia are approximated using 2/0 vicryl sutures. The incision in the skin is closed by using 1/0 non-absorbable suture.

Wound infection is the most common postoperative complication seen in 5–10% patients after open appendectomy. The other complications reported include intra-abdominal abscess (8%) and ileus mostly seen following removal of gangrenous appendix. Another rare complication reported is the leakage from appendicular stump, which may occur if the encircling stitch has been put too deeply resulting into a faucal fistula. Subacute intestinal obstruction due to postoperative adhesions is most common late complication of open appendectomy.[4] Laparoscopic appendectomy combines the advantages of diagnosis and treatment in one procedure. With the development of laparoscopic technique, it has been used for both diagnosis and treatment of acute appendicitis.[13] Advantages of LA include lower hospital stays, shorter recovery period, lower postoperative pain, lower postoperative infections, and early return to daily activities.[14–16] Several prospective randomized studies have been carried out to compare outcome of laparoscopic and open appendectomy, and the overall differences have been found to be insignificant. The percentage of appendectomies performed laparoscopically continues to increase.[17] In contrast to open appendectomy, patients with perforated appendicitis have been reported to have lower rates of wound infections following laparoscopic procedure.[18]

In this study, the mean operative time in MIA group was 32.7 (2.52) minutes while in LA group, the mean operative time was 26.9 (2.46) minutes. Laparoscopic appendectomy was less time consuming as compared to MIA with a significant p <0.001. The results of this study were similar and comparable to the results of the study conducted by Özsan et al.[19] with a mean operative time of 21.34 ± 8.39 in LA and a mean operative time of 28.32 ± 5.87 in MIA. This study was also comparable to Islam et al.[18] with an operating time of 33 (5.8) in LA and operating time of 37 (7.5) minutes in MIA. The results of this study were not comparable to the study of Naraintran et al.,[20] in which LA had taken a mean time of 68.5 (20.3) minutes and open appendectomy had taken a mean time of 48.2 (12.4) minutes (p <0.001). In a study by Kushwah et al.,[21] the mean operating time was 60.8 and 45.7 minutes for laparoscopic and open appendectomy, respectively.

In this study, total of four patients from MIA group had bleeding intraoperatively which was managed by electrocoagulation at the same time, while none of the patients from LA group had bleeding intraoperatively, with $p = 0.118$.

In this study, three patients from the MIA group had iatrogenic injury (two had injury to caecum and one to terminal ileum) while handling tissue which were repaired at the same time by primary suturing and putting a drain. None of the patients in LA group had any iatrogenic injury ($p = 0.243$).

In this study, the hospital stay was significantly less in those who underwent laparoscopy as compared to those who underwent MIA group with a statistically significant p <0.001 in favor of LA.

The results of this study were comparable with results of the study conducted by Naraintran et al.[20] and Kushwah et al.[21] In this study, the assessment of the postoperative pain was done by using VAS on day 1 at 6, 12, and 24 hours after surgery followed by further assessment on day 2, 1 week, 2 weeks, 3 weeks, and then 4 weeks after surgery. The postoperative pain score was less in LA group as compared to MIA group and was statistically significant in favor of LA group. This study was comparable with the results of Naraintran et al.[20] Kushwah et al.,[21] and Shaikh et al.[22] In this study, total analgesia required in postoperative period was assessed and calculated as the average number of analgesic injections needed by each patient during the first 24 hours and the need for analgesic tablets after 24 hours. The difference was statistically significant in favor of LA as the average number of analgesic injections needed was 2.05 in MIA group as compared to 1.41 in LA group. The statistically significant difference was also seen in the number of oral analgesic tablets needed by the patients at home. It was 5.3 for the MIA group and 3.2 for the LA group.

Wound infection was not seen in any of the patients who underwent LA. On the other hand, wound infection was seen in six patients who had undergone MIA, which was again statistically significant (p <0.027). Our results are in agreement with the results of other studies conducted by Naraintran et al.[21] and Pedersen et al.[23] This higher rate of wound infection in MIA group was because these cases were operated in emergency theatre where chances of getting infection and developing wound infections are more. While all LAs were performed in main theatre as laparoscope is not available in emergency theatre of our hospital. Those who developed wound infection were managed conservatively with IV antibiotics and daily dressings. Two patients with wound infection had wound dehiscence and needed secondary suturing.

Two patients from MIA group developed intra-abdominal abscess and both patients were managed conservatively with intravenous fluids and intravenous antibiotics and were discharged after complete recovery without any intervention. On the other hand, one patient from LA group reported back to hospital, five days after discharge from hospital with sepsis. The patient was evaluated with ultrasonography and CT abdomen which revealed large intra-abdominal abscess. The patient was taken for diagnostic laparoscopy and about 1 L of pus was drained; normal saline washes were given and drain was placed and finally patient was discharged after five days. The p-value was statistically insignificant ($p = 1$). Our results were comparable with studies of Chung et al.[9] and Garbutt et al.[24] In this study, four patients from MIA group developed ileus, while none of the patients from LA group developed ileus ($p = 0.118$). Results of this study were in contrast to the results of the study done by Shaikh et al.[22]

In this study, 3 patients from MIA group developed intestinal obstruction during a follow-up period of 4 weeks and were managed conservatively. Our results were comparable with the results of the study done by Golub et al.[8] and Biondi et al.[25]

In MIA group, 8 patients resumed orals between 12–24 hours while 44 patients resumed orals 24 hours after surgery. On the other hand, in a LA group, 36 patients resumed orals by 12 hours, 10 patients resumed orals between 12–24 hours and 3 patients resumed orals 24 hours after surgery. This was statistically significant in favor of LA (p <0.001). Our results are in agreement with the results of study conducted by Shaikh et al.[22]

In MIA group, only 2 patients returned to routine work within 2 weeks, while 50 patients resumed normal work after 2 weeks. In LA group, 31 patients resumed their normal activity by 1 week while 16 patients returned to normal work between 1–2 weeks (p <0.001). Our results were in agreement with the results of the studies by Islam et al.,[18] Kushwa et al.,[21] and Shaikh et al.[22]

Conclusion

We conclude that LA is safe and minimally invasive procedure for the management of appendicitis. The main advantages of LA are less intraoperative time, less pain, less analgesic need, early recovery, quick resumption of routine activities, and better cosmetic results.

Acknowledgments

The authors acknowledge the immense help received from the scholars whose articles are cited and included in references of this manuscript. The authors are also grateful to authors/editors/publishers of all those articles, journals, and books from where the literature for this article has been reviewed and discussed.

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ORIGINAL ARTICLE

Laparoscopic Approach to Repair Hiatal Hernias: Our Experience in a Tertiary Care Hospital

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Received on: 09 September 2021; *Accepted on*: 06 September 2022; *Published on*: 07 December 2022

Abstract

Introduction: Hiatal hernia is commonly associated with the symptomatic gastroesophageal reflux disease (GERD). Protrusion of any abdominal structure other than the esophagus into the thoracic cavity through the hiatus of the diaphragm. The relationship between hiatal hernia and gastroesophageal reflux and proposed surgical options to correct the defect as established by the Allison, namely returning the stomach to the abdomen and repairing the diaphragmatic hiatus. Proton pump inhibitors are a preferred treatment option for symptomatic relief. Surgical treatment usually follows medical treatment. Depending on the severity of symptoms and type of hernia involved, surgical treatment is decided. Laparoscopic repair is a good approach nowadays. It offers various benefits to both the patient and the surgeon. It is generally performed by a general abdominal surgeon because it usually involves an abdominal approach. Laparoscopic repair significantly decreases postoperative complications and is the procedure of choice in most centers.

Materials and methods: The present study protocol was reviewed and approved by the Institutional Review Board of Hospital, which waived the requirement for informed patient consent based on the retrospective nature of the work. A single team of surgeon performed all the procedures. Eighteen patients with primary hiatal hernia who underwent laparoscopic surgery from 2016 to 2018 were examined.

Results: The follow-up period was between 12 months and 24 months. The average follow-up period was around 18 months.

- Thirty-nine patients underwent laparoscopic hernia repair with fundoplication, of which 26 were females and 13 males.
- Most of the patients present with symptoms of heartburn or epigastric pain. Some of the patients presented with dyspepsia. Few patients were diagnosed incidentally.
- The average age was 42 years (25–75).
- Operative time was 150–250 minutes with a mean time of 194 minutes. No patient needed conversion from laparoscopic procedure to open technique.
- The hospital stay was 4–7 days with an average stay of 4.5 days. These included one-day preoperative admission.
- There were no deaths during or after the procedure.
- *Pain*: A total of 15 patients complained of pain on post-op day 1 who needed round-the-clock analgesia. This number fell to 5 by day 3. At the time of discharge (maximum interval being 7 days and median being 5.5 days), none of the patients had complaints of pain.
- Two patients had symptoms of dysphagia at the outpatient follow-up. These patients showed no notable findings on imaging examination and no difficulties with feeding, the symptoms were well-controlled with medication.

Conclusion: We conclude that laparoscopic repair of hiatal hernia is a feasible technique with satisfactory surgical outcomes. Although it is a complex operation with a substantial learning curve, thoracic surgeons who have adequate experience with laparoscopy would be capable of performing the operation.

Keywords: Esophagogastroduodenoscopy, Gastroesophageal junction, Gastroesophageal reflux disease, Hiatus hernia, Laparoscopy.

World Journal of Laparoscopic Surgery (2022): 10.5005/jp-journals-10033-1533

Introduction

Hiatus hernia is the bulging of an abdominal structure other than the esophagus into the chest cavity through the hiatus of the diaphragm. Hiatal hernia is often associated with symptomatic GERD.[1] The relationship between hiatal hernia and gastroesophageal reflux and proposed surgical options for correcting the defect, as noted by Allison, namely, returning the stomach to the abdomen and repairing the diaphragmatic hiatus.[2] The GEJ to become intrathoracic consists of a combination of hiatus enlargement, lengthening of the phrenoesophageal ligament, and increased intra-abdominal pressure. There are four types of hiatal hernia. Type I, sliding hiatal hernias, make up almost 95% of all hiatal hernias. The other three types of hiatal hernias are broadly classified as paraesophageal. Compared to a type I hernia, which does not have a hernial sac, all PEHs are covered all around by a peritoneum layer, which forms a real hernial sac. Type II PEH is the rarest.[3,4]

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How to cite this article: Ahmad M, Thakral A, Prasad D, *et al*. Laparoscopic Approach to Repair Hiatal Hernias: Our Experience in a Tertiary Care Hospital. World J Lap Surg 2022;15(3):199–201.

Source of support: Nil

Conflict of interest: None

It is difficult to determine the actual incidence of a hiatal hernia because an asymptomatic hiatal hernia often goes undetected. However, the symptomatic hernia associated with GERD should be examined pathophysiologically, as the incidence of GERD is increasing worldwide.[5] Compared to the West, the East has the

lower incidence, but recently the incidence is increasing in our part of the world.[6]

Proton pump inhibitors are a preferred treatment option for symptom relief. Surgical treatment is usually followed by medical treatment. Depending on the severity of symptoms and the type of hernia affected, surgical treatment will be decided.[7,8] Surgical reconstruction of the paraesophageal hernia has two main goals: to restore normal anatomy by returning the GEJ and stomach to the abdomen and to correct the condition that contributed to the development of the anatomical problem, GERD. There are several approaches to the surgical treatment of paraesophageal hernias; a transthoracic, transabdominal, or laparoscopic approach.[9–11]

Laparoscopic repair is a good approach these days. It offers various advantages to both the patient and the surgeon. It is generally performed by a general abdominal surgeon as it usually involves abdominal access. Laparoscopic repair significantly reduces postoperative complications and is the procedure of choice in most centers.

Materials and Methods

The present study protocol was reviewed and approved by the Institutional Review Board of Hospital, which waived the requirement for informed patient consent due to the retrospective nature of the work. A single team of surgeons performed all of the interventions. Eighteen patients with primary hiatal hernia who underwent laparoscopic surgery from 2009 to 2017 were examined. Routine preoperative tests were performed (e.g., physical exam, standard laboratory tests, and pulmonary function tests). In addition, an esophagogastroduodenoscopy, computed tomography of the thorax and abdomen, and barium esophagography were performed preoperatively. However, esophageal manometry and 24-hour ambulatory pH monitoring were not performed routinely. The indications for surgery were the presence of symptoms (reflux or obstructive symptoms) and the patient's desire for surgical repair and consent. The latter was generally true of asymptomatic cases discovered by chance. Consent to the operation was obtained from the patients after they had been adequately educated about the natural course of an untreated hiatal hernia and informed about the operation, including details of the procedure and the associated risks. Based on the postoperative clinical stability of each patient, feeding was started after it was confirmed that no abnormalities occurred. Patients who showed no symptoms on the oral soft diet were discharged. All patients visited the outpatient department 2 weeks postoperatively for a general check of their condition and symptoms. Follow-up examinations were carried out every 3 months for the first year and every 6 months thereafter. In this study, clinical features, surgical factors, and postoperative outcomes were analyzed for all patients.

Operative Technique

All patients were treated laparoscopically. The details were described in previous MIES studies.[7,12] The operative procedure was similar to that of Schlottmann F, et al.[7] Five trocars with a 30° angled camera and a liver retractor were used.

The procedure was completed with the following steps: First, a hernial sac dissection was performed. Intra-abdominal esophagus was mobilized and a tension-free length of not less than 2 cm. Then the crura were approximated with simple single-button sutures. Most recently, Nissen (360°) fundoplication was performed. No gastropexy was performed.

Results

The follow-up period ranged from 12 months to 24 months. The mean follow-up time was about 12 months.

- In total, 39 patients underwent laparoscopic hernia surgery with fundoplication, including 26 women and 13 men (Table 1).
- Most patients present with symptoms of heartburn or epigastric pain. Some of the patients presented with dyspepsia. Few patients were diagnosed by chance.
- The mean age was 42 years (25–75) (Table 2).
- The operating time was 150–250 minutes with an average time of 194 minutes. No patient required a switch from the laparoscopic procedure to the open technique (Table 3).
- The hospital stay was 4–7 days with an average stay of 4.5 days. This included a one-day preoperative admission.
- There were no deaths during or after the procedure.
- *Pain*: A total of 15 patients complained of pain on the 1st postoperative day that required analgesia around the clock. This number decreased to 5 by day 3. At the time of discharge (maximum interval of 7 days and median 5.5 days), none of the patients was in pain.
- Two patients had symptoms of dysphagia at the outpatient follow-up visit. These patients showed no significant imaging findings and no difficulty in eating, and the symptoms were well controlled with medication.

Discussion

The presentation of the hiatal hernia can be very different, it can be asymptomatic, or it can appear with different symptoms such as reflux or obstructive symptoms. Diagnosing hiatal hernia is difficult, but with the advent of new diagnostic tools, the rate of diagnosis has recently increased.[12,13] Because of the morbidity and effectiveness associated with open surgery, medical treatment is the preferred approach to control symptoms of GERD.[14] But since the introduction of laparoscopic surgery, the morbidity

Table 1: Sex ratio of the patient

S. no.	*Sex*	*No. of patients*	*Percentage (%)*
1	Male	13	33.33
2	Female	26	60.66
	Total	39	100

Table 2: Age distribution of patients

S. no.	*Age-group*	*No. of patients*	*Percentage*
1	25–35	5	12
2	36–45	11	27.5
3	46–55	9	22.5
4	56–65	5	12.5
5	66–75	4	10

Table 3: Duration of surgery

Time in mins	*No. of cases*
150–200	24
201–250	15

associated with the procedure has decreased dramatically. Various studies have concluded that the laparoscopic approach is just as effective as open surgery, but with reduced postoperative complications, recovery time, and almost the same recurrence rates.[15] In addition, several studies have shown that laparoscopic surgery is the medical treatment in terms of long-term symptomatic improvement and cost-effectiveness.[16–18] Regarding asymptomatic patients, some suggest waiting and observing. However, experts believe that asymptomatic hiatal hernias are rare and studies have shown a progression from asymptomatic to symptomatic about 14% per year.[19] The minimally invasive approach to repairing paraesophageal hernias is now the preferred approach because of the lower incidence of morbidities, less pain, and longer hospital stay compared to the open approach.[15,20] The recurrence rate of the laparoscopic approach is similar to that of the open approach and has decreased over time with increasing experience and better learning of the technique.[21]

The SAGES set out the technical considerations for surgery in their 2013 guidelines for the management of hiatal hernias.[22] The infra diaphragmatic position of the gastroesophageal junction is one of the most important aspects of hernia repair. Collis gastroplasty is the answer to the short esophagus as suggested by O'Rourke et al. in their study.[23] None of the patients in our study required Collis gastroplasty. The complexity of hiatal hernia surgery requires a significant learning curve. Okrainec et al. reported that surgeons need at least 20 cases of experience to achieve a reasonably low recurrence rate.[24] We have been able to successfully carry out this operation to date without complications and without recurrences. The limitations of our retrospective study were the small sample size and the relatively short follow-up.[25]

Conclusion

We conclude that laparoscopic repair of hiatal hernias is a viable technique with satisfactory surgical results. Although it is a complex operation with a significant learning curve, thoracic surgeons with sufficient experience in laparoscopy would be able to perform the operation.

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ORIGINAL ARTICLE

The Anatomical Variations of Rouviere's Sulcus Observed during Laparoscopic Cholecystectomy in Egyptian Patients

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Received on: 04 January 2022; *Accepted on*: 06 September 2022; *Published on*: 07 December 2022

Abstract

Background: Laparoscopic cholecystectomy (LC) became one of the most common operations worldwide. Bile duct injury usually occurs due to a failure to recognize the critical structures in Calot's triangle. A proper knowledge about biliary structures, its anatomicl variations, and identification of various anatomical landmarks is essential to make LC easy and safe. Although Rouviere's sulcus (RS) was initially described by Henri Rouviere in 1924, it is not widely known and not often incorporated in LC. In cirrhotic patients, the incidence of gallstones is higher than in general population.

Aim: To determine the frequency and types of RS as seen during LC and to assess the benefits of identifying *Rouvier's sulcus* as an anatomical landmark in avoidance of bile ducts injury during LC in Egyptian patients.

Materials and methods: A prospective study was conducted on 290 patients with gallbladder diseases, 250 non-cirrhotic (group A) and 40 cirrhotic patients (group B) who scheduled for LC at National Hepatology and Tropical Medicine Research Institute (NHTMRI), Cairo, Egypt, in a period of 30 months.

Results: Among group A, *RS* was clearly identified as a deep sulcus in 190 patients (76%), in 40 patients (16%), *RS* was identified as a scar, while it was absent in the remaining 20 patients (8%). Among group B, *RS* was clearly identified as a deep sulcus in 9 patients (22.5%), in 11 patients (27.5%), *RS* was identified as a scar, while it was absent in the remaining 20 patients (50%).

Conclusion: Identification of RS provides an easy landmark for starting dissection of Calot's triangle for safe LC as it facilitates the identification of the biliary and vascular structures and minimizes iatrogenic biliary injuries. Identification of RS may not be easy in liver cirrhosis and need careful dissection of vascular and biliary structures.

Keywords: Laparoscopic cholecystectomy, Liver cirrhosis, Rouviere's sulcus.

World Journal of Laparoscopic Surgery (2022): 10.5005/jp-journals-10033-1527

Introduction

In 1420, cholelithiasis was first described by Antonio Benivenius, and since 1882, cholecystectomy is performed initially by a German surgeon named Johann August, the first surgeon who performed open cholecystectomy. In 1987, Phillip Mourett was the first surgeon performing LC. Cholecystectomy becomes a commonly performed surgical operations worldwide, whereas more than 750,000 cholecystectomies are performed yearly in the USA alone. With the era of LC, there was an increasingly number of bile duct injuries with the incidence of 0.3–0.5% of LCs, which is considered a serious complication of this procedure. So, there is an increasing need for identification of various anatomical landmarks which makes LC safer. A proper knowledge about anatomical variations within the Calot's triangle is the milestone to perform safe cholecystectomy, together with meticulous identification of cystic biliary and vascular structures is considered the gold standard to minimize the incidence of biliary tree injuries.[1]

As LC now represents the vast majority of cholecystectomies all over the world due to better cosmetic outcome, less hospital stays, and minimal rest from work compared to open cholecystectomies. There is still incidence of complications of LCs including bile duct injuries, bile leakage, and massive bleeding.[2] The strategy for safe LC without surgical complications in addition to the proper knowledge about biliary structures and biliary congenital anomalies, focused on identification of various anatomical landmarks that makes LCs easy and safe.[3]

In 1924, Henry Rouviere identified an important fissure in the liver between the right lobe and the caudate process which was easily seen during the posterior dissection for LC in the majority of patients. RS, which is a cleft in the liver, could be identified in approximately 90% of patients and clearly seen by grasping the gall bladder and retracting it medially. The length and depth of RS vary in different individuals, and with the increasing number of LCs. This sulcus got more importance as a landmark for safe cholecystectomy because of its relation to the right portal pedicle which made it a gold extrabiliary landmark for safe cholecystectomy.[4–6]

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How to cite this article: El Wakeel BM, Abdellatif WM, Zytoon AA, *et al.* The Anatomical Variations of Rouviere's Sulcus Observed during Laparoscopic Cholecystectomy in Egyptian Patients. World J Lap Surg 2022;15(3):202–206.

Source of support: Nil

Conflict of interest: None

In cirrhotic patients, the incidence of gallstones is higher than in general population. In cirrhotic patients, symptomatic gallstones are associated with higher morbidity compared to the rest of the population. The risk for developing complicated gallstone disease must be strictly weighed against the risk of surgery.[7,8]

Aim of the Work

The aim of this study is to determine the frequency and types of RS as seen during LC and to assess the benefits of identifying RS as an anatomical landmark in avoidance of bile ducts injury during LC in Egyptian patients.

Materials and Methods

This is a prospective study which was conducted on 290 patients with gallbladder diseases, 250 non-cirrhotic patients (group A) and 40 cirrhotic patients (group B) who scheduled for LC at NHTMRI, Cairo, Egypt, in 30 months after approval from ethical committee and informing the patients and getting written consent.

All patients were investigated using preoperative ultrasound, laboratory investigations including liver functions, complete blood count (CBC), blood sugar, renal functions, coagulation profile, electrocardiogram (ECG), and echocardiography when indicated.

In this study, we used the (EPIQ 7 Machine – Philips ultrasound and Doppler) for the preoperative ultrasound assessment. Cirrhosis was confirmed in group B by preoperative ultrasound. Ultrasound findings of cirrhotic liver is the characteristic nodular surface, coarse heterogeneous echo-pattern, hypertrophy of left lobe, increase width of the caudate lobe, and reduction of the diameter of the medial aspect of the left hepatic lobe (segment IV), some cases showing attenuation of calibre of hepatic veins with monophasic flow (portalization of hepatic venous flow). Postoperative ultrasound was performed to confirm patency of biliary system and clearance of operative bed , also for the early detection of any postoperative complication like operative bed collection, biliary leak infection, and abscess or hematomas formation.[9]

Routine anesthetic check-up was performed for all the patients including ECG and chest X-ray.

All patients were subjected to LC by the same surgeons, using the four-port technique with introduction of the first 10-mm port blindly at the umbilicus, after carbon dioxide insufflation, using it as a camera, the second 10-mm port was introduced under vision at the epigastrium just lateral and to the right of the falciform ligament, the remaining two ports were introduced under vision of the camera, both were 5-mm, one below the costal margin in the mid clavicular line, the other was under the costal margin in the anterior axillary line for retracting the fundus.

After the exploration of the whole abdomen, the gall bladder is identified and grasped from its fundus cephalic toward the diaphragm, and the Hartmann pouch is grasped and retracted inferiorly and toward the right to explore the Calot's triangle for starting dissection.

Starting from a fixed point to the right of the Calot's triangle, RS is checked for its presence and observed whether the sulcus is clearly seen, hardly seen, or not identified as shown in Figure 1. The type of the sulcus, if present, is examined for, is it of open type (Fig. 2), closed type (Fig. 3), or scar type, and if it is of the open type, then the length, width, and depth of the sulcus is assessed, and the relation between the sulcus and the right hepatic pedicle is checked for.

Fig. 1: Absent RS

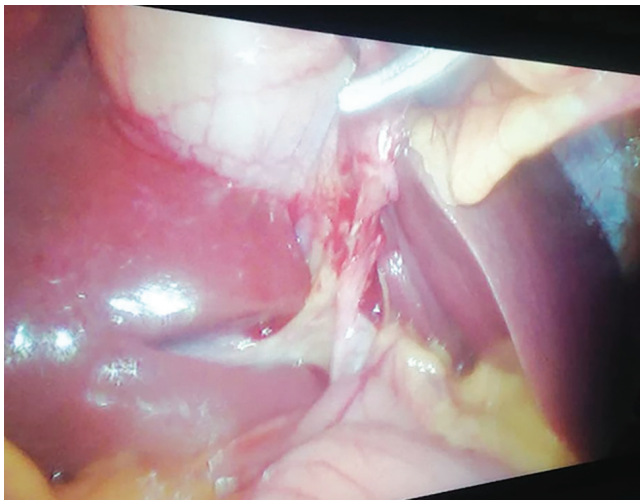

Fig. 2: RS open type

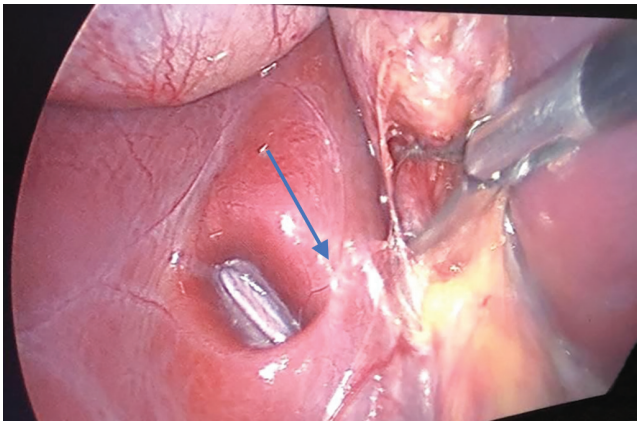

Fig. 3: RS closed type

After a good exposure of the Calot's triangle starting carful dissection of the structures within the pedicle of the gallbladder, in a plan anterior to the RS after proper de-peritonealization using bipolar electrocautery with maximal attempt to achieve proper hemostasis.

After identifying the cystic duct and cystic artery, both of them are clipped proximally with two clips, and one distally and both of them were cut, then dissection of the gall bladder from its bed is

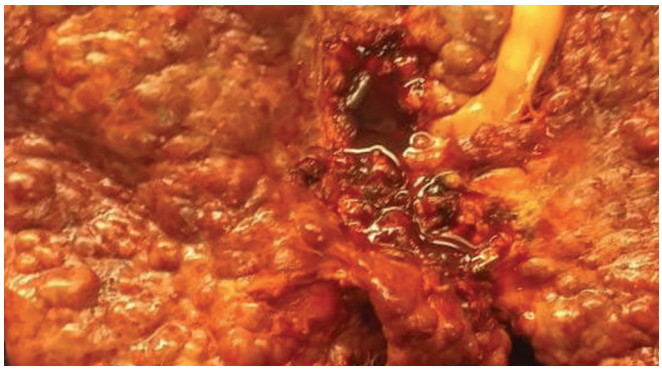

Fig. 4: Absent RS in cirrhotic liver

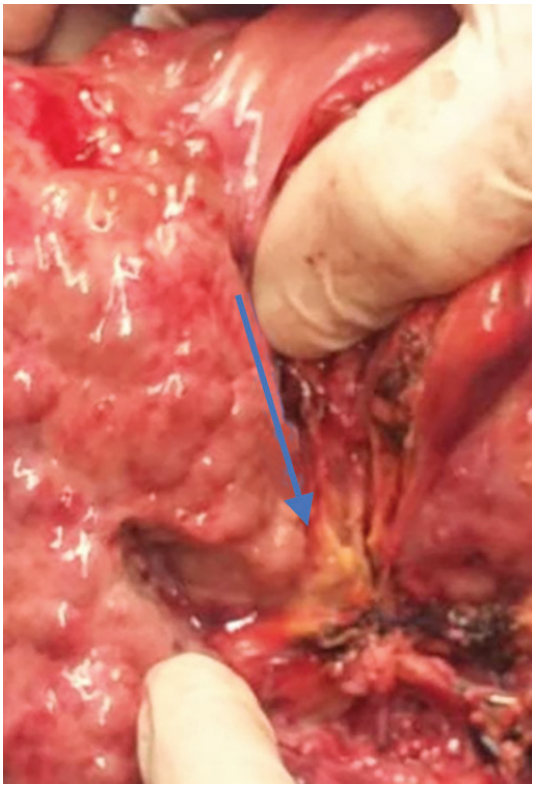

Fig. 5: RS open type. *Note:* Figures 4 and 5 were taken from recipient during liver transplantation for demonstration

done using electrocautery, and drain is put in the Morisson pouch, and the four wounds were closed.

Figure 4 shows absent sulcus and Figure 5 shows closed sulcus in cirrhotic patients obtained during liver transplantation just for demonstration.

Results

We divided the patients into two groups: group A: Non-cirrhotic (250 patients) and group B: cirrhotic (40 patients).

In group A, a total of 250 surgically fit patients subjected to elective LC in 30 months, 185 (74%) were females and 65 (26%) were males with a mean age of 45.2 ± 6.1 years, (range, 22–55 years). In group B, 40 surgically fit patients, child A 29 (72.5%) were females and 11 (27.5%) were males with a mean age 53.7 ± 7.1 years (range, 38–61 years).

Table 1: Data collected about the RS in group A

RS	*Number of patients*	*Percentage*
(A) Sulcus	190	76
Open	136	
Closed	54	
(B) Scar	40	16
(C) Absent	20	8

There were 220 patients (88%) complaining from chronic calcular cholecystitis, 10 patients (4%) were suffering from obstructive jaundice and performed endoscopic retrograde colangiopancreatography (ERCP) 1–3 months before cholecystectomy, and the remaining 20 patients (8%) complaining from acute cholecystitis.

Among group A (250 patients), RS was clearly identified as a deep sulcus in 190 patients (76%) (136 with open sulcus and 54 with closed sulcus), in 40 patients (16%), RS was identified as a scar, while it was absent in the remaining 20 patients (8%). Among group B (40 patients), RS was clearly identified as a deep sulcus in 9 patients (22.5%) (3 with open sulcus and 6 with closed sulcus), in 11 patients (27.5%) RS was identified as a scar, while it was absent in the remaining 20 patients (50%).

Among the 190 patients with clearly identified RS, 130 patients (68.4%) underwent an easy and straight forward LC, while in the 60 patients (31.6%), 10 of them (4%) had accessory artery arising from the gall bladder bed, 40 of them (16%) took more time for delineation of the biliary anatomy due to either very short cystic duct or sessile gall bladder, the remaining 10 patients (4%) five of them were converted to open cholecystectomy due to failure to identify the bile ducts safely due to frozen Calot's triangle, and the other 5 had empyema of the gall bladder and necessitate aspiration prior to clamping of the gall bladder.

Among the 250 patients' cholecystectomies, no injury to the bile ducts was suspected or reported in all patients, 10 patients (4%) developed hematoma at the site of the gall bladder bed which was small and resolved spontaneously with no intervention, while 5 patients (2%) developed bile leak through the drain by the second day which continued for 1 week and gradually stopped with no residual abdominal collection. Also, 130 patients (52%) were discharged from the hospital in the same day of the operation, 100 patients (40%) were discharged on the next day, 15 patients (6%) stayed in hospital for 2 days, while the remaining patient (2%) left the hospital after one week. No mortality was recorded during this study. The data collected about the RS in group A are described in Table 1 and Figure 6.

With regard to group B (cirrhotic patients), total of 40 child A patients subjected to LC in 30 months.

Among the 40 patients, RS was absent in 20 patients (50%), while in 9 patients (22.5%), RS was identified as a scar, and it was identified as a sulcus in the remaining 11 patients (27.5%).

Twelve patients underwent a relatively easy and straight forward LC (8 patients with identified sulcus and 4 of the 11 patients with the sulcus identified as a scar), while in 28 patients (one with sulcus, 7 with just scar and 20 with absent RS) the operations were relatively more time consuming and more technically difficult. Two cases of those 28 patients were aborted without cholecystectomy due to advanced cirrhosis than expected, so the expected hazard is

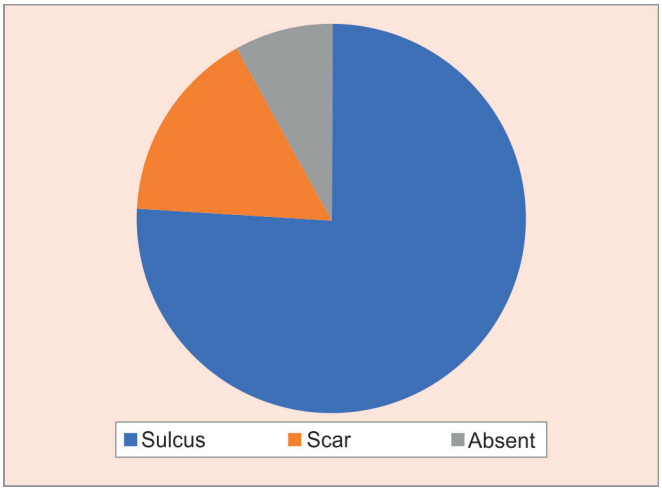

Fig. 6: RS in group A (non-cirrhotic)

Table 2: Data collected about the RS in group B

RS	*Number of patients*	*Percentage*
(A) Sulcus	9	22.5
Open	3	
Closed	6	
(B) Scar	11	27.5
(C) Absent	20	50

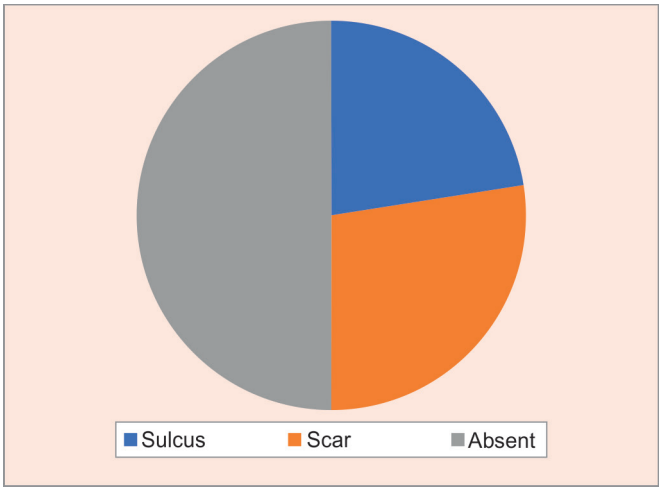

Fig. 7: RS in group B (cirrhotic)

more than the benefit and two patients were converted to open cholecystectomy due to extremely difficult anatomy.

Of these 28 patients, 3 cases developed gallbladder bed bleeding and was controlled by compression and surgical foam, 3 cases developed postoperative ascites with liver impairment and 1 case developed postoperative wound infection. No bile duct injury recorded in this group. Thirty patients (75%) were discharged from the hospital in the next day of operation, 10 patients (25%) stayed in hospital for more than 2 days to 1 week. No mortality was recorded during this study. The data collected about the RS in group B are described in Table 2 and Figure 7.

Discussion

With the increasing number of LCs all over the world, there is a risk of biliary tract injuries (0.4–1.5% of cases) inspite of marked improvement in the techniques and devices of laparoscopies.[10]

Anatomical variation of the biliary system, together with the lack of proper identification of the anomalies of the vascular and biliary structures, are the main causes of iatrogenic injuries of the biliary tree.[11]

Rouviere's sulcus, also known as incisura hepatica dextra or Gans incisura, was first described by Henri Rouviere in 1924, as a cleft 2–3 cm. Just anterior to segment I and running to the right of the liver hilum and is usually containing the right portal triad, and it marks the plane of common bile duct accurately. Although not all the classic anatomical literatures include data on RS, its importance is due to its location in a line where the cystic duct and cystic artery lay anterosuperior to the sulcus, and the common bile duct lays below the level of RS, so the minimal complications occur if the surgeon starts dissection during cholecystectomy in a plane anterior to it.[4]

Gans described RS in 80% of the livers, Reynaud et al. reported the incisura dextra of Gans in 73% of cases, Hugh et al. found it in 90% of livers.[12–14]

To the best of our knowledge, no research found discussing RS in patients with liver cirrhosis. In this study, we found RS in 92% of the patients having no cirrhosis while it was found in 50% of the patients having liver cirrhosis.

Identification of RS provides an easy landmark for starting dissection of Calot's triangle for safe LC. In this study, among the 250 patients RS was clearly identified in 92% of patients; as a deep sulcus in 76%, as a scar in 16%, while it was absent in the remaining 8% of patients. These results are comparable to results of Abhijeet Kumar study in 2020 as they found the sulcus present in 90.4%; as a sulcus in (77.1%) and scar in (22.9%) but differ from Stuart Lockhart in 2018 how mentioned that RS, occurs in over 80% and absent in 20% of normal livers during laparoscopic cholcystectomy.[15,16] This study also differs from the Lazarus, et al. study in 2018 as their study included the gross anatomical examination of 75 formalin-fixed, adult livers and not on living patients the sulcus was present in 82.67% and the study of Rohin Garg 2019, where the RS was present in 78.89% out of the 90 livers dissected cases.[17,18]

The aforementioned studies described the shape of sulcus (if present) as scar, slit, and deep sulcus. The deep type of sulcus may have a considerable length, breadth, and depth, and is divided into open and closed type according to the medial end of it whether open or closed. The scar type sulcus takes the shape of superficial white line which possibly represents the fused sulcus, while the slit type is shallow in depth and narrow in width. However, in this study, we presented the results as sulcus (open and closed), scar, or absent.

Although the RS varies in shape, depth, and width, but it constantly provides an anatomical landmark to the line of common bile duct, where Hugh et al. reported that fewer common bile duct injuries had been occurred in LC when the surgeons started dissection of the Calot's triangle in a plane ventral to the sulcus. Identification of RS may not be easy in certain conditions with unclear anatomy like liver cirrhosis, fatty liver, and contracted or intra hepatic gall bladder are present. So, the distorted anatomy may obscure the RS or confuse the anatomy of the porta hepatis with

misleading of the vascular and biliary structures. With obscured RS or with frozen Calot triangle, meticulous dissection of vascular and biliary structures, adequate exposure of the cystic duct and artery, remain the cornerstone for safe LC.[19–21]

In this study, RS was visualized in 92% of cases with healthy livers, while it was visualized in only 50% of cases with cirrhotic livers during LC. We believe that the current study is one of the first works discussing the RS in cirrhotic livers and we did not find studies discussing RS in cirrhotic livers to compare to our study.

Conclusion

Identification of RS provides an easy landmark for starting dissection of Calot's triangle for safe LC as it facilitates the identification of the biliary and vascular structures and minimizes iatrogenic biliary injuries. Identification of RS may not be easy in liver cirrhosis and need careful dissection of vascular and biliary structures.

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ORIGINAL ARTICLE

Extracorporeal Abdominal Transillumination in Laparoscopic Ventral Hernia Repair: A Tool to Achieve More Confidence and Safety

Maged Rihan

Received on: 10 February 2022; *Accepted on*: 14 September 2022; *Published on*: 07 December 2022

Abstract

Background: Two-port laparoscopic ventral hernia repair is currently practiced with preferable results. This study was conducted aiming to add to the general safety of trocar placement, and trying to solve the problems of the blind insertion of the primary trocar. This can be achieved by extracorporeal transillumination of the anterior abdominal wall before insertion of the primary trocar; thus, delineating whether the abdominal wall harbors any underlying tissues, and accordingly trying to visualize what is being performed rather than doing it blindly.

Materials and methods: This is a single-center study. Patients' enrollment was carried out between March 2018 and June 2019. They were randomized into two groups: Laparoscopic repair using transillumination before inserting the primary (camera) trocar (group I) and laparoscopic repair only (group II). The primary endpoint was the length of the direct distance between the primary port and the left midaxillary line. This distance is inversely proportional to the distance that will exist between the camera port and the hernial defect. Secondary outcomes involved the duration of the operation and adverse events.

Results: The analysis included 46 patients, of whom 23 were randomized to group I and 23 to group II. No significant differences were present regarding patient characteristics or operation times. The direct distances between the primary trocar and the left midaxillary line were significantly less in group I, a median of 35 mm (15–65 mm) than in group II, a median of 75 mm (45–85 mm) ($p = 0.013$).

Conclusion: Extracorporeal abdominal wall transillumination is a promising approach for achieving more safety and confidence in the two-port laparoscopic ventral hernia repair and represents an auxiliary tool for surgeons as a trial to visualize if there are structures adherent to the inner aspect of the anterior abdominal wall to improve abdominal entry safety.

Keywords: Laparoscopy, Parallel-design study, Transillumination, Two-port technique, Ventral hernia.

World Journal of Laparoscopic Surgery (2022): 10.5005/jp-journals-10033-1536

Introduction

Ventral hernia in adults is the second most common hernia after inguinal hernia, it includes primary and incisional hernias,[1,2] Laparoscopic approach for ventral hernia repair is associated with low postoperative complications, hospital stay, and recovery time.[3–5]

Although it is classically done by three or four ports in the abdominal wall,[6,7] the newly described "two-port technique" is considered to be the least invasive.[8,9]

Access to the abdominal cavity through small incisions is a challenge for the laparoscopic surgeon. At least 50% of associated gastrointestinal and major blood vessels injuries occur during entry to the abdominal cavity before the beginning of the intended surgery,[10,11] and there are many concerns related to bowel injury, especially in patients with intraabdominal adhesions like those who have incisional hernias,[12]

There is no certain consensus concerning the technique of port placement and laparoscopic entry, It is dictated by the surgeons' predilection based on personal experiences.[13] To facilitate convenient instrumental manipulations with appropriate visualization during laparoscopy, the operation target site should be 15–20 cm away from the optical port, and the remaining trocars are placed at 5–7 cm on either side of the optical trocar.[14]

It is important to keep the primary port as far away from the targeted operation site as possible. This point is of great importance in laparoscopic ventral hernia repair, because in some cases where the defect is large, a big mesh is required for repair, and therefore, the lateral border of the mesh will be too close to the optical port, which may cause some technical difficulties during fixation. Hence, the optical port should be as far away as possible from the hernia.

Transillumination has been used by pediatric surgeons as a fast and simple technique for diagnosing pneumoperitoneum and other abdominal diseases to obviates the necessity of frequent radiographs.[15] Here we document our experience in using transillumination of the abdomen prior to insertion of the first trocar in two-port laparoscopic ventral hernia repair.

This study was conducted aiming to improve the outcome, add to the general safety of trocars placement, and try to solve the problems of the blind insertion of the primary trocar and the

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How to cite this article: Rihan M. Extracorporeal Abdominal Transillumination in Laparoscopic Ventral Hernia Repair: A Tool to Achieve More Confidence and Safety. World J Lap Surg 2022;15(3): 207–210.

Source of support: Nil

Conflict of interest: None

surgeon's confusion between the desire to insert it as lateral as possible, and the fear from injuring the colon or other adherent tissues. This can be achieved by extracorporeal transillumination of the anterior abdominal wall before insertion of the primary trocar, thus exploring and delineating whether the abdominal wall harbors any underlying tissues, and accordingly trying to visualize what is being performed rather than doing it blindly. We recommend the implementation of extracorporeal abdominal transillumination before insertion of the primary trocar as a protective step aiming to eliminate the incidence of gastrointestinal or other tissue injuries.

Materials and Methods

This is a single-center, blinded outcome assessment, two-group parallel-design study conducted at the department of surgery, Al Jedaani hospital (private hospital in Jeddah, Saudi Arabia). The research and ethics review committee at the hospital gave approval to this study. Patients' enrollment was carried out between March 2018 and June 2019. Patients' ages ranged from 20 to 65 years, undergoing elective laparoscopic midline ventral hernia repair with a defect of 2–7 cm in diameter, were eligible for inclusion. Midline ventral hernia was defined as an abdominal wall hernia located between the xiphoid process and the *symphysis pubis*. Exclusion criteria were: complicated hernias for emergency surgery, severe comorbidities, pregnancy, and body mass index (BMI) exceeding 35 kg/m^2. Informed consent was obtained from all patients.

The patients were randomized into two arms as follows: Laparoscopic repair using transillumination step before inserting the primary trocar (group I) and laparoscopic repair only (group II). Randomization for eligible patients was done by using computerized simple sequence randomization. Blocking was not done in this study. Random allocation was hidden by using sealed envelopes with sequential numbers. Each envelope was opened later on sequentially just before the operation.

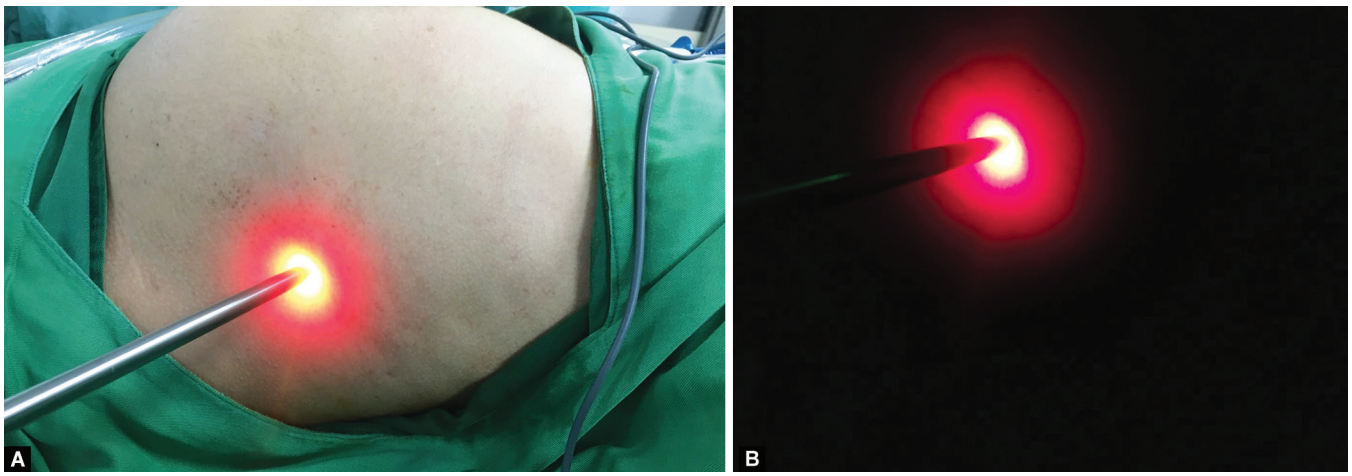
Operative Technique

The procedure is performed under general anesthesia, a prophylactic dose of antibiotic is administered upon induction. The patient is in supine position, with adducted left arm and a roll under the left loin. The dimension of the hernia defect is marked, and the four corner points that will be used for mesh fixation are marked on the skin with overlap at approximately 5 cm from the edge of the defect. Disinfection of the skin is done without erasing the markings.

The surgeon and the assistant are positioned on the left side, the assistant may change his position to the right or to the left side of the surgeon according to the stage. The laparoscopy tower is positioned on the right side of the patient. Pneumoperitoneum is induced with a Veress needle 3 cm under the left costal margin on the mid-clavicular line, initial pressure for insufflation is 15 mm Hg, after the insertion of the first trocar it will be reduced to 12 mm Hg, The first trocar (the visual trocar) is 10 mm in diameter, it is introduced at the defect level in the anterior axillary line in group II, and it is positioned according to the impression obtained from the transillumination in group I. The 5-mm working instrument trocar is introduced under vision below the left costal margin as laterally as possible. The peritoneal cavity is explored. The hernia sac content is then reduced, and the peritoneum around the hernia defect is cleared circumferentially for a distance of 5 cm to allow direct contact of the mesh to the parietal peritoneum.

We used Symbotex™ composite mesh, it is designed extracorporeally to cover the defect with a circumferential 5-cm overlay margin. The parietal surface of the mesh is stitched with 4 corners *absorbable* sutures with long threads. The mesh is placed on the skin, centered and marked over the defect, next to each knot a mini-incision of 2 mm is done on the skin, where the transfascial closure needle is passed to pull out the sutures. The mesh is damped in saline solution, the mesh is rolled with the polyester outer side the mesh is held with the atraumatic instrument, and it is introduced into the abdominal cavity through the 10-mm port, unfolded, and applied to the defect with the bioabsorbable collagen film to the visceral side, the transfascial closure needle is passed in the four skin incisions to pull out the threads with a distance of approximately 5 mm between the 2 threads at each corner, the abdomen is deflated to 8 mm Hg pressure. Threads are tied and buried in the subcutaneous plane. Helical absorbable fasteners are used by the tacker fixation device to attach the whole area of the mesh to the abdominal wall, and a compression bandage is applied to the defect. The patients were discharged 24–48 hours. Compression bandage could be changed but maintained for 7–10 days to prevent parietal seroma.

To achieve transillumination of the abdominal wall, the room light is turned off and the intensity of the light source is increased and the scope is rotated to contact the skin (Fig. 1). The light will be transmitted through the abdominal wall illuminating the abdominal cavity and backlighting the abdominal wall from inside to illustrate



Figs 1A and B: Abdominal wall transillumination before insertion of the primary trocar

that no intestinal, or other tissues is adherent to the back of the wall which will appear as a dark area in the shining field. Transillumination will also localize the course of the blood vessels traversing the abdominal wall a proactive step to avoid vascular injuries during trocar insertion. Once this procedure is completed, the scope's light source is returned back to the optimal intensity.

Patients' Assessment and Outcomes

Assessment of the patients was done at the operation, and a week; a month; and 3 and 6 months after the surgery. The primary endpoint was the length of the direct distance between the primary port and the left midaxillary line. As this distance is inversely proportional to the distance that will exist between the camera port and the hernial defect, the higher this last distance, the easier it will be to manipulate the instruments. Secondary outcomes involved the duration of the operation and adverse events.

Statistical Analysis

The power calculation was dependent on the measurement of the direct distance between the primary port and the left midaxillary line, by measuring a line starting from the center of the primary trocar wound toward and perpendicular to the midaxillary (Fig. 2). Statistical analysis was done using InStat, version 3.0 (GraphPad, New York, NY, USA). The independent *t*-test (age, BMI) and Mann–Whitney *U* test (distance measurements) were implemented to analyze the outcomes. The identified parameters were compared and the level of significance was set at the 0.05 alpha level. All the results are shown as median (interquartile range).

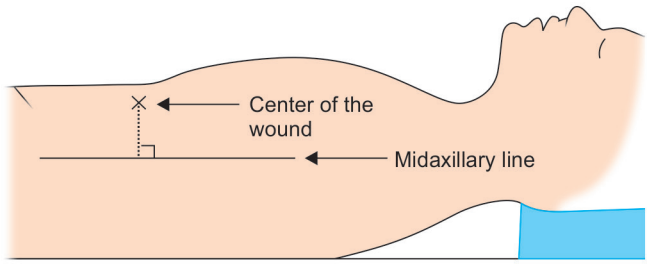


Fig. 2: Dotted line representing the distance between the wound and the midaxillary line

Results

Sixty-two patients were assessed for eligibility. The analysis included 46 patients for 6 months duration, of whom 23 were randomized to group I and 23 to group II. No significant differences were present between the two groups regarding patient characteristics or operation times (Table 1). The direct distances between the primary trocar and the left midaxillary line were significantly less in group I, median of 35 mm (15–65 mm) than in group II, median of 75 mm (45–85 mm) (p = 0.013). There were no significant differences between the two groups regarding postoperative complications. There were no complications or hernia recurrence within the 6 months follow-up in either group.

Discussion

Two-port technique for laparoscopic ventral hernia repair is currently practiced with safe and preferable results regarding cosmesis, pain, and patient satisfaction. Several techniques and special devices including suture-passing devices have been utilized to perform the procedure without using additional ports.[8,9]

With careful patient selection and precise manner and patience, this technique was described by some authors as an amazing reality in surgical practice.[16]

It is a safe technique but has some limitations. For example, it should not be used in patients with previous abdominal surgeries with expected or encountered technical difficulties such as in cases with dense intra-abdominal adhesions or incarcerated/strangulated ventral hernias. Therefore, adequate assessment for technique feasibility is highly recommended before doing the two-port technique, and suspected difficult cases should revert to the three- or four-port technique or even the traditional open technique from the start.[8,9,17,18]

In an attempt to overcome these limitations, we adopted the application of the transillumination step before proceeding with

Table 1: Demographic data and outcomes in both groups I and II

	Group I	*Group II*	
	n = 23	*n = 23*	
Demographic data	*Number*	*Number*	*p-value*
Male sex	12	15	
Age*	46 (26–65)	44 (25–62)	0.873
BMI* (kg/m^2)	28 (26–33)	30 (27–35)	0.965
Hernia defect size			
<4 cm	16	16	
≥4 cm	7	7	
Type of hernia			
Primary	15	17	
Incisional	8	6	
Outcomes			
Distances between the primary trocar and the left midaxillary line*	35 (15–65 mm)	75 (45– 85 mm)	0.013
Duration of procedure* (min)	59 (45–80)	61 (50–75)	0.758

*Values are median

the primary trocar insertion. It highlights the abdominal wall areas which are free of tissues attachments where safe trocar insertion could be achieved. Generally, our results are comparable with previous two-port laparoscopic hernia repair studies regarding operating time and defect sizes.[9,17]

Transillumination of the abdomen had been used by pediatric surgeons as a helpful part of the physical examination of infants. Several studies have been reported demonstrating its helpfulness in detection of pneumoperitoneum, ascitic fluid and in differentiation between cystic and solid masses.[19] To our knowledge, there are no previous reports in the English literature describing transillumination in laparoscopic ventral hernia repair.

Our technique does not significantly vary from other two-port described techniques but this study focuses attention on the benefits of using abdominal transillumination before insertion of the first trocar to obtain optimal results. Authors stated that the ports in laparoscopic ventral hernia repair should be placed as laterally as possible opposite the hernia, preferably in the left side.[18,20]

The farther away the camera port is from the hernial defect location, the wider the field of view and the easier it is to handle the mesh. And this is precisely the goal of transillumination as it guarantees to a big extent the identification of the farthest most secure point for placing the trocar without the possibility of inducing any intraabdominal injuries. It gives more confidence to the surgeon to insert the primary trocar as lateral as it could be.

The main limitations of this study were the small sample size with BMI limited cases, and the single-center design. In addition, there was a level of intersurgeon variability.

Conclusion

Extracorporeal abdominal wall transillumination is a promising approach for achieving more safety and confidence in the two-port laparoscopic ventral hernia repair and represents an auxiliary tool for surgeons as a trial to visualize if there are structures adherent to the inner aspect of the anterior abdominal wall to improve abdominal entry safety. However, it does not substitute the essential safety principles for laparoscopy in general. The potential benefits of this technique are its reproducibility and practicality; also, it could be tried with alternative tools rather than the scope as a light source. More studies in various centers are required to optimize and validate this technique.

No financial support was received from any organization for the submitted work.

Disclosure: The authors declare no conflict of interest.

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ORIGINAL ARTICLE

Bacterial Infection and Sensitivity Pattern of Cholecystitis among Cholecystectomy Patients

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Received on: 27 April 2022; *Accepted on*: 28 September 2022; *Published on*: 07 December 2022

Abstract

Aims and objectives: This retrospective type of study was done to know the bacterial cause of cholecystitis and to isolate different bacteria present in bile of cholecystectomy patients. Antibiotic sensitivity was also done to know the antibiotic-resistance pattern among the organism isolated.

Materials and methods: In this study, 126 patients' bile was sent to the Microbiology Department for culture and antibiotic-sensitivity testing during the period of October 2017–November 2018. Cultures were placed in blood agar and MacConkey agar. Organisms were isolated on the basis of growth characteristics and biochemical findings. Antibiotic sensitivity was done using the Kirby–Bauer disk-diffusion method.

Results: This study included 126 post-cholecystectomy patients, out of which the male-to-female ratio was 1:2.71. While the female was 92 (83%) and the male was 34 (17%). In this study, we have included all the age-groups of patients, but most of the patients were middle-aged, that is, between 41 and 60 years 78 (62%). In the microbiological analysis, only 68 (54%) samples were culture-positive. In our study, *Escherichia coli* 43 (63.2%) was isolated among maximum samples and the second most common was *Klebsiella* spp. 17 (25%).

Conclusion: Therefore, it is important to know about common bacteria causing gallbladder infection and their antibiotic-resistance pattern. This study may be helpful in designing the antibiotic prophylaxis among these patients.

Keywords: Analysis, Antibiotic sensitivity, Bile, Cholecystectomy.

World Journal of Laparoscopic Surgery (2022): 10.5005/jp-journals-10033-1540

Introduction

Gallbladder stones are one of the most common surgical conditions in North India, and out of all surgeries done for the gastrointestinal tract, cholecystectomy is the most common.[1] Bile is normally sterile, but may get infected in cholelithiasis. The incidence of bacterial presence in bile varies from 10 to 70%. Chances of Bactibilia are increasing in patients having obstruction and stasis of gallbladder due to gallstones.[2] The gallstone diseases are more prevalent in Western countries like United States, United Kingdom, and Australia, and incidence ranges between 15 and 25%. In India, gallstones are more common in the East and northern parts of India as compared with the South and West regions.[3,4] In 85–95% of cases, cholecystitis is associated with cholelithiasis.[5]

Among all the culture-positive samples of bile, the most common bacteria isolated were *Escherichia* and *Klebsiella*. The bacteriological profile of bile sampled from the gallbladder is more informative of the cause of cholecystitis because gallbladder is a closed sac, and direct sampling from the gallbladder is more relevant to know the causative organism.[6,7]

The study was done to know the most common bacteria associated with cholecystitis and their sensitivity pattern among cholecystectomy patients.

Materials and Methods

The retrospective type of study was done for one-year duration in tertiary care settings. In patients of open cholecystectomy, bile was collected in a sterile syringe, in the case of laparoscopic cholecystectomy, bile was collected in a sterile container. The syringe or container is sent to the Microbiology Department after proper labeling. In microbiology lab, bile samples were inoculated on blood agar and MacConkey agar, and incubated at 37°C for 24–48 hours. The bile was reported sterile if there was no growth even after 48 hours of incubation. All growth of cultures were identified on the basis of colony morphology, microscopic examination, and appropriate biochemical reactions. Antimicrobial-susceptibility testing was done by Kirby–Bauer method according to Clinical and Laboratory Standard Institute (CLSI) Guidelines.[8,9]

Results

This study included a total of 126 patients among which male-to-female ratio was 1:2.71. While female was 92 (83%) and male

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How to cite this article: Kaval S, Tewari S, Rani E. Bacterial Infection and Sensitivity Pattern of Cholecystitis among Cholecystectomy Patients. World J Lap Surg 2022;15(3):211–214.

Source of support: Nil

Conflict of interest: None

Ethical statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Figs 1A to C: (A) Gallbladder with multiple stones; (B) Intact gallbladder; and (C) Cholesterosis of gallbladder

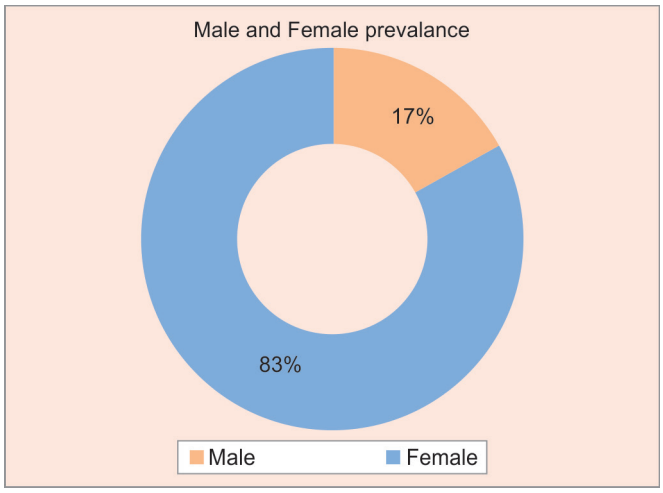

Fig. 2: Sex distribution

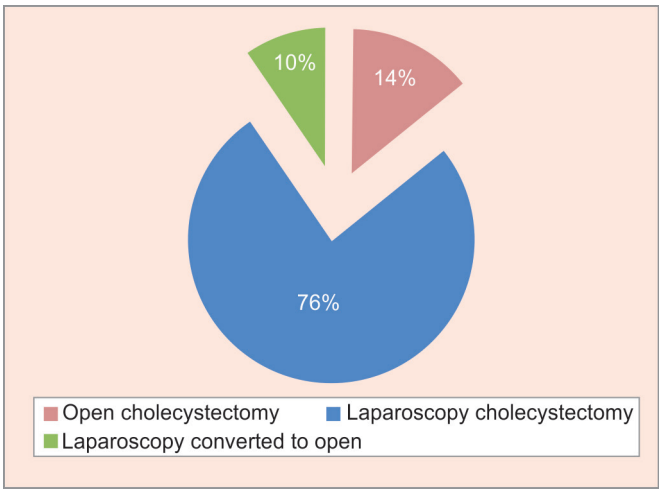

Fig. 3: Distribution of surgical treatment procedure

Table 1: Age-group-wise distribution

Sl. no.	*Age-group*	*Total %*
1.	01–20	01 (0.8%)
2.	21–40	22 (17.4%)
3.	41–60	78 (62%)
4.	>61	25 (19.8%)

was 34 (17%). We have included all ages of patients in our study, in which maximum patients were in 41–60 age-group, 78 (62%) followed by 25 (19.8%) in the age-group >61, 22 (17.4%) in 21–40 age-group, and 1 (0.8%) in 01–20 age-group (Figs 1 and 2, Table 1). Out of 126 patients, 96 (76.2%) patients underwent laparoscopy cholecystectomy, in 18 (14.3%) patients, open cholecystectomy was performed, and in 12 (9.5%), laparoscopy surgery was converted to open surgery (Fig. 3).

Out of 126 bile samples for culture and sensitivity, only 68 (54%) samples were culture-positive. *E. coli* 43 (63.2%) was the most common isolate followed by *Klebsiella* spp. 17 (25%). Other organisms isolated were 4 (6%) *Pseudomonas* spp., 2 (3%) *Salmonella* spp. and *Staphylococcus aureus*, and *Acinetobacter* 1 (1.4%) each. The remaining bile samples 58 (46%) were sterile (Fig. 4).

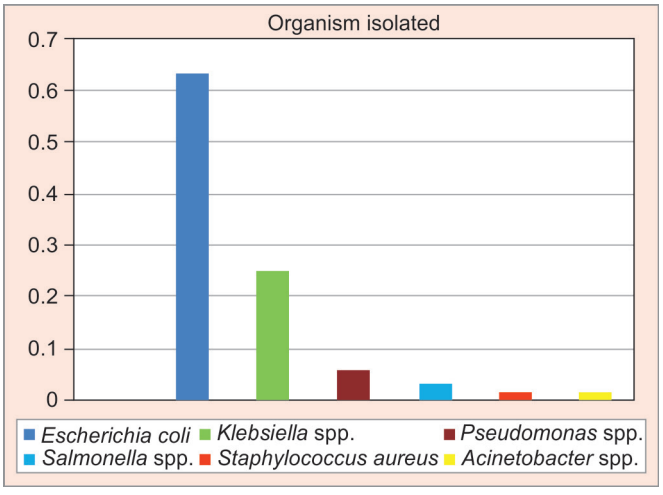

Fig. 4: Bacteriological profile of bile

All Gram-negative bacterial isolates showed maximum sensitivity toward imipenem, meropenem, piperacillin/tazobactam, cefepime, and ceftriaxone/sulbactam. No organism was found to be resistance to colistin and polymyxin B. Among gram-positive, bacterial isolates showed sensitivity to linezolid and teicoplanin (Table 2).

Table 2: Antibiogram of the bacteria isolated

	Resistance					
Antibiotic	*E. coli*	*Klebsiella spp.*	*Pseudomonas spp.*	*Salmonella spp.*	*Acinetobacter spp.*	*S. aureus*
Piperacillin	43 (100%)	17 (100%)	4 (100%)	2 (100%)	1 (100%)	–
Ceftazidime	22 (51.2%)	17 (100%)	4 (100%)	1 (50%)	1 (100%)	–
Ceftriaxone	22 (51.2%)	17 (100%)	4 (100%)	1 (50%)	1 (100%)	1 (100%)
Cefoperazone	22 (51.2%)	17 (100%)	4 (100%)	1 (50%)	1 (100%)	1 (100%)
Gentamicin	43 (100%)	10 (58.8%)	3 (75%)	2 (100%)	1 (100%)	–
Amikacin	43 (100%)	10 (58.8%)	3 (75%)	2 (100%)	1 (100%)	–
Ciprofloxacin	43 (100%)	14 (82.3%)	2 (50%)	2 (100%)	1 (100%)	1 (100%)
Levofloxacin	43 (100%)	14 (82.3%)	2 (50%)	2 (100%)	1 (100%)	1 (100%)
Imipenem	0	8 (47%)	1 (25%)	0	1 (100%)	0
Meropenem	0	8 (47%)	1 (25%)	0	1 (100%)	0
Chloramphenicol	0	–	–	0	–	–
Cefixime	–	–	–	–	–	1 (100%)
Colistin	0	0	0	0	0	–
Polymyxin B	0	0	0	0	0	–
Piperacillin/Tazobactam	0	10 (58.8%)	1 (25%)	0	0	–
Ceftriaxone/Sulbactam	0	10 (58.8%)	1 (25%)	0	0	–
Cefepime/Tazobactam	0	10 (58.8%)	1 (25%)	0	0	–
Doxycycline	–	–	4 (100%)	–	0	–
Aztreonam	–	–	0	–	–	–
Erythromycin	–	–	–	–	–	1 (100%)
Clindamycin	–	–	–	–	–	1 (100%)
Linezolid	–	–	–	–	–	0
Teicoplanin	–	–	–	–	–	0
Vancomycin	–	–	–	–	–	0
Rifampicin	–	–	–	–	–	0

Discussion

This study includes 126 patients admitted to our surgery unit over a period of 1 year. In this, 54% bile samples showed positive bile culture. The data showed high prevalence in western Uttar Pradesh. Our finding contrasts with other researchers. They reported very low prevalence.[10–12]

In this study, most of the cases were of middle-age-group that is between 41 and 60 years, that is similar to other studies. Chuttani et al. reported maximum incidence of cholelithiasis in-between 31 and 60 years.[3–6,13] In our study, 17% were males and 83% were females, and male-to-female ratio was 1:2.71. Similar female predominance has been reported by many researchers.[11–16] The most common organism isolated in bile culture was *E. coli* 63.2%, and the second most common was *Klebsiella* spp. in 25% of the patients. Our findings were similar to other studies published by Capoor et al., Bhansali et al., Cristina et al., Sharma et al., Pratik et al., and many more, the most common organism isolated was *E. coli* followed by *Klebsiella* spp. As *E. coli* and *Klebsiella* both are the most common bacteria isolated in the bile culture as they are the commonest bacteria found in GIT and infection to the biliary system comes from the GIT.[17–22]

Our study was similar to Gupta et al., Khalid Anjum et al., Kumar et al., Manan et al., Bhansali et al., Flores et al., Pratik et al., and Fuks et al.[2,11,13,16,19–23]

Conclusion

Normally, bile is sterile in the gallbladder in the absence of gallstone or any pathology of the biliary tract. There is high incidence of bacteribilia in cases of the inflamed gallbladder with gallstones or biliary tract obstruction. Gram-negative organisms are more common in bile infection as they are part of normal GI flora and may cause ascending infection in the gallbladder. Drug resistance is a growing health problem, nowadays, undue and inappropriate use of antibiotics are the main cause of growing drug resistance.

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ORIGINAL ARTICLE

Short-term Outcomes of Laparoscopic Ventral Approach of Rectopexy with Polypropylene Mesh for Rectal Prolapse

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Received on: 22 April 2022; *Accepted on*: 14 May 2022; *Published on*: 07 December 2022

Abstract

Background: Complete rectal prolapse (CRP) is a disease in which all layers of the rectum herniate through the anal sphincter. Patients with CRP may complain of constipation which precedes the prolapse.

Aim of the study: To evaluate the efficacy of laparoscopic ventral mesh rectopexy (LVMR) in the management of CRP.

Patients and methods: This trial was conducted on 20 patients with rectal prolapse (RP) who underwent LVMR admitted from the general surgery outpatient clinic in Fayoum University Hospital in the period from July 2015 to December 2017.

Results: We included 15 male patients (75%) and 5 female patients (25%), the average age of participants was 34.4 years. There was a significant improvement in constipation and inflammation and ulceration postoperatively. Recurrence occurred in one patient (5%).

Conclusion: The utilization of an anterior approach of laparoscopic technique is the approach of choice for patients with full-thickness RP. The LVMR has the advantage of avoiding unnecessary repeated operations with all its physical and psychological effects on patients, minimal recurrence, a high success rate, and a low complication rate for this procedure.

Keywords: Laparoscopy, Polypropylene mesh, Rectal prolapse, Rectopexy.

World Journal of Laparoscopic Surgery (2022): 10.5005/jp-journals-10033-1538

Introduction

Rectal prolapse is classified according to its severity into the following three major grades:[1] (i) Mucosal prolapse is a disease in which the mucosal lining of the rectum protrudes through the anus. (ii) Internal prolapse, rectal intussusception, in which part of the rectal wall invaginates into the lumen of another part of the rectum. (iii) The third grade is complete prolapse of the rectum through the anus.[2–4]

Complete rectal prolapse is disease in which all layers of the rectum herniate through the anal sphincter.[5,6] Complete rectal prolapse is a disabling disease affecting about 2.5 individuals per 100,000 population.[7] The exact etiology of rectal prolapse is unknown, however. Straight rectum, weakness of pelvic floor muscles and anal sphincter, and lack of ligamentous support of the rectum are considered anatomical predisposing factors for CRP.[8] A mass protruding from the anus is the main clinical feature of the CRP. At first, the prolapse occurs after defecation, but with time it may occur spontaneously upon standing or coughing. Incontinence is a frequent disabling symptom affecting about half of the patients with CRP.[5,9,10] The prolapsed rectum damages the rectal nerves and sphincters, which in turn, may lead to fecal incontinence not resolving after surgery.[10]

The long history of constipation is defined as the most reported complaint among patients with CRP.[11] Weakness of the pelvic muscles by chronic straining may contribute to rectal prolapse. Surgical intervention is the treatment of choice of CRP in adults.[12,13] The surgery aims to restore normal physiology and anatomy by correcting the prolapse.[14,15] It also improves bowel and sexual function. Many surgical procedures have been suggested to treat CRP. Available surgical treatment options include abdominal and perineal approaches.[16,17] Abdominal approaches either open or laparoscopic are better for young fit patients. On the other hand, the perineal approach is preferable for old patients who are unfit for abdominal procedures.[18] Laparoscopic correction of RP includes rectopexy and/or resection rectopexy. Laparoscopic ventral mesh rectopexy has been popularized in the past decade because of its benefits over alternative surgical options.[19] Laparoscopic ventral mesh rectopexy is associated with better anatomical results, fewer complications, less recurrence rate, and low mesh-related morbidity.[20,21] The ventral approach avoids the circumferential mobilization which decreases the complications of rectal denervation.[22]

Our aim in this study was to measure the success and suitability of the anterior approach of laparoscopic rectopexy for the treatment of CRP.

Patients and Methods

Study Design

The current clinical trial was conducted in general surgery outpatient clinic in Fayoum University Hospital in the period from

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How to cite this article: Essawy AM, Fares AE, Thabet AM, *et al*. Short-term Outcomes of Laparoscopic Ventral Approach of Rectopexy with Polypropylene Mesh for Rectal Prolapse. World J Lap Surg 2022;15(3):215–219.

Source of support: Nil

Conflict of interest: None

2015 to 2017 obtaining ethical approval from the local ethical committee and after taking fully informed consent from patients.

Patient Selection and Evaluation

This study included 20 patients with CRP who underwent LVMR with polypropylene mesh.

Inclusion Criteria

- All patients have CRP without any other pathology by colonoscopy. All these patients were between 6 and 70 years of age with no contraindication to laparoscopic surgery and those patients with physical status classification system of American Society of Anesthesiologists (ASA), categories I and II.
- Patients with failure of conservative management after at least 6 months.
- Patients with distressing symptoms such as rectal pain, bleeding, ulceration, and prolapse that require frequent manual reductions or show difficulty in reduction.
- Recurrent or persistent prolapse after previous trials of injection sclerotherapy or surgery.

Exclusion Criteria

- Patients who were younger than 6 years or older than 70 years.
- Cases of rectal polyps (till polyps are investigated and treated).
- Rectal prolapse following anorectal malformation procedures and Hirschsprung's disease repair.
- Patients with neurological causes for RP such as spina bifida and meningomyelocele.
- Patients suffering from cystic fibrosis.

Data on age, gender, and preoperative baseline symptoms including constipation, urine incontinence were obtained. Operation time, intraoperative complications, immediate and late postoperative complications were assessed.

Preoperative Assessment

All patients underwent a comprehensive evaluation including a detailed history, full physical examination, barium enema, colonoscopy, electromyography, imaging, and routine preoperative investigations, such as full blood count, liver function tests, kidney function tests, and ECG for patients older than 60 years to assess the eligibility criteria and fitness for surgery.

All patients underwent bowel preparation by daily enema for two days preoperatively. They received 50 mg/kg of ceftriaxone and 7.5 mg/kg of metronidazole before surgery (Fig. 1).

Operative Procedure

The procedure was performed under general anesthesia and the patients were in the supine position. Four ports were inserted, the first in the umbilicus for the camera, the second in the right midclavicular line for a grasper, the third was placed at the same position on the left side and the fourth was placed at the left anterior axillary line above the level of the umbilicus for grasping the rectum and keeping it in place throughout the procedure with the table in Trendelenburg position. Patients positioned in Trendelenburg position to expose the pelvic organs and the small intestine is retracted cephalad. Hysteropexy may be performed as needed for exposure. The rectosigmoid is retracted toward the spleen to expose the peritoneum. The right ureter is identified along the right pelvic sidewall. The right-side peritoneum is then incised at the level of the sacral promontory and the peritoneal dissection continues downward in the midpoint between the rectum and sidewall to the level of the pelvic floor. Dissection is performed in the anterior space through Denonvilliers' fascia to the rectovaginal space. In men, the dissection in the recto-vesical pouch is carried to the apex of the prostate but the lateral dissection around the seminal vesicles is avoided. In some cases, the hernia sac may be redundant and associated with enterocele which require resection of the peritoneal sac (Fig. 2).

Posterior and lateral dissection is avoided. Once the anterior space is mobilized, polypropylene mesh is secured to the anterior aspect of the rectum and the proximal end of the mesh is anchored to the sacral promontory with sutures or tacks using Ethibond Suture 0, taking care to avoid full-thickness rectal bites, two or three polypropylene sutures (3/0) were used to fix the seromuscular wall of the lowermost part of the rectum. This elevates the anterior wall without any traction on the rectum. The posterior vaginal fornix is lifted and sutured to the mesh (anteriorly), aiding in the repair of the rectocele, as well as prolapse. The proximal end of the mesh is anchored to the sacral promontory with sutures or tacks. The pelvic peritoneum is then approximated to extraperitonealize the mesh closed by absorbable sutures and the port site wounds were closed using subcuticular sutures.

Fig. 1: Patient with CRP

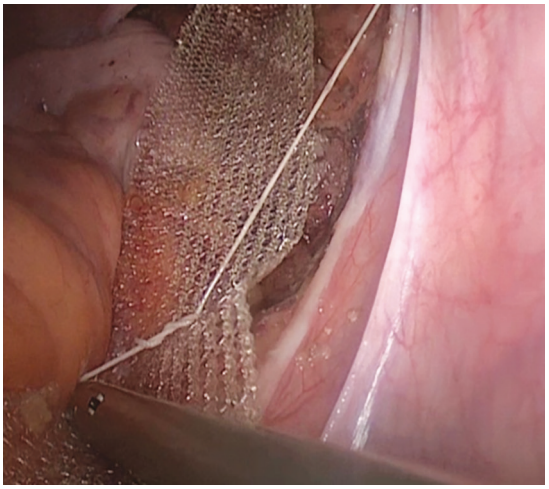

Fig. 2: Fixation of mesh to the rectum and sacral promontory

Follow-up

Stool softeners were used for one month after operation along with instructions to avoid constipation, lifting heavy objects, straining, doing heavy exercise for 6 weeks, having sexual intercourse for 4 weeks. Follow-up duration ranged from 6–12 months.

Statistical Analysis

Data were presented as mean ± standard deviation, number, and percentages. Statistical analysis was performed using MedCalc© version 12.5 (MedCalc© Software bvba, Ostend, Belgium) and Microsoft© Excel© 2010 (Microsoft© Corp., Redmond, Washington, USA).

Results

Demographic and Clinical Characteristics

We included 20 patients suffering from CRP who underwent LVMR. The patients were admitted from the outpatient clinic in Fayoum University Hospital in the period from 2015 to 2017. The average age of patients was 34.4 ± 19.8 (range: 8–70) years. There was male predominance. We included 15 male patients (75%) and 5 female patients (25%). The baseline preoperative symptoms were constipation in 35% of patients, urine incontinence in 5% of patients, inflammation and ulceration by colonoscopy in 30% of patients. Baseline demographic data are illustrated in detail in Table 1.

Primary Outcomes

- **Constipation**: Seven patients were constipated preoperatively (35%). There was a significant postoperative improvement of patients with constipation. All patients reported an absence of constipation (100%) after the operation.
- **Urine incontinence**: Only one patient complained of urinary incontinence before operation. There was no effect on the continence of patients. After the operation, there was one patient still complaining of urinary incontinence.
- **Inflammation and ulceration by colonoscopy**: There was a significant improvement of inflammation and ulceration after the operation. All patients showed complete healing of the colon after our approach.
- **Operative complications**: There was no bowel injury, nerve injury, major blood loss, or mesh erosion that occurred during the operation. Only one case (5%) was converted to open rectopexy as dissection was lateral and pelvic vessels were exposed. Another patient (5%) reported postoperative pain on defecation resulting from an acquired anal fissure during preoperative preparation and it was managed conservatively. Another patient (5%) complained of perianal maceration from severe diarrhea. The third patient had prolonged postoperative ileus and initiated feeding on the fourth postoperative day. This patient was discharged home on the fifth day and returned to the hospital with feeding intolerance.
- **Recurrence:** Recurrence of rectal prolapse after our procedure occurred in one patient (5%) that was managed with open rectopexy (Table 1).

Discussion

All patients presented with RP during the period of the study. Twenty patients who had complete persistent rectal prolapse or recurring after previous interventions were subjected to an anterior approach of laparoscopic rectopexy. Male predominance was noted in our study, which was also noted in Potter et al., Flum et al., Laituri et al., and Chan et al.[23–25] In pediatrics, rectal prolapse affects equally males and females. The disease is much more common in underdeveloped countries, with common causes including parasitic disease, malnutrition, and diarrheal illness.[13]

Twelve patients had no associated comorbidities. Patients tend to strain vigorously against closed sphincters, leading eventually to prolapse. Some authors considered that prolongation of the conservative treatment time is inappropriate because it is distressing for patients with unlikeliness of response. Therefore, early surgical intervention was considered more appropriate in such cases.[27,28] In the study by Potter et al., 47% of patients had no predisposing factors[23] Also, in Flum et al., 62% of patients had no predisposing factors.[24] However, meticulous history taking and thorough re-examination were done to pick up any predisposing factor that would have been missed. Other treatable predisposing factors such as constipation, diarrhea, and malnutrition were managed by stool softeners and diet modification (Fig. 3).

Laituri et al. in 2010[25] reported that extensive evaluation is not necessary in most uncomplicated cases as evaluation of patients with RP is relatively straightforward. However, we had baseline

Table 1: Baseline demographic data of 20 patients with CRP

Number (%)	*20 (100%)*
Age (mean ± SD)	34.4 ± 19.8
Sex (male:female)	15:5
Constipation *n* (%)	7 (35%)
Urine incontinence *n* (%)	1 (5%)
Inflammation and ulceration *n* (%)	6 (30%)
Previous surgery rectal prolapse *n* (%)	4 (20%)
Barium enema abnormalities *n* (%)	0 (0%)
Conversion to open surgery *n* (%)	1 (5%)
Average operating time (minute)	75 (60–90)
Follow-up duration range (month)	6:12
Average hospital stay (days)	3 (1–5)

n, number; SD, standard deviation

Fig. 3: Severe rectal prolapse with clinically significant edema and mucosal ulceration

investigations for all patients which were stool culture, plain X-ray abdomen, barium enema, and colonoscopy to assess the presence of any other pathologies and the fitness of patients. In 2010, Potter et al.[23] used colonoscopy or barium enema before operative intervention for evaluation of rectum.

Shalaby et al.[29] in their study used plain radiographs, barium enema, proctoscopy, colonoscopy, and pre and postoperative EMG. We reserved the use of colonoscopy for adult cases of significant bleeding per rectum or abnormalities detected on barium enemas. Similarly, EMG use was conserved for cases with the significantly diminished anal tone, as pelvic floor weakness, which is usually seen in adults and rarely seen in children.[30]

Our operative time ranged 60–90 minutes with a mean of 75 minutes. Potter et al.[23] had a range 28–117 minutes with a mean of 72 minutes. Shalaby et al.[29] had a range 50–70 minutes with a mean of 60 minutes. Abdominal procedure via the laparoscopic approach is now the recommended approach in all cases. There is a recurrence rate of 2–5% after laparoscopic sigmoid resection with or without rectopexy.[31] Generally, in mesh rectopexy, there is a mobilization of the rectum to the pelvic floor with a ventral or a posterior application of the mesh. The circumferential mobilization of the rectum usually damages the autonomic supply of the rectum, which in turn affect the motility of rectosigmoid yielding *de novo* constipation or worsening of existing constipation.[32] Other techniques that performed complete mobilization of the rectum, were found to be unnecessary as good results were obtained without the need for complete mobilization.[33]

In 2006, D'Hoore and Penninckx[20] reported "nerve–sparing ventral rectopexy" as a main procedure for the management of rectal prolapse. The primary advantage of laparoscopic ventral rectopexy is that it avoids any posterolateral dissection of the rectum keeping the autonomic innervation intact. Nowadays, this technique has gained widespread acceptance and is considered the standard method for treating pelvic organ prolapse.[34] The benefits of the laparoscopic approach and anterior approach of rectopexy have made the procedure effective and safe with minimal functional disturbance.

Many published studies reported a recurrence rate of 5% following LVMR. These recurrences usually occur within the first 2–3 years.[21,35] The risk of recurrence is similar to that reported for other abdominal procedures 2–9%.[36] The overall Recurrence, in our study, is one out of 20 patients 5% that is being managed with open rectopexy and improved on follow-up. Laparoscopic ventral mesh rectopexy is associated with a lower incidence of recent–onset constipation. Besides, it shows a great improvement in pre-existing constipation as compared with posterior rectal dissection.

Three randomized trials have shown an improvement in constipation by avoiding lateral and posterior dissection.[37–39]

Postoperative dyschezia and constipation were reported in many case series.[29,40] These postoperative symptoms were not encountered in our study, which is attributed to the avoidance of retro rectal dissection.

One can argue that the utilization of an anterior approach of laparoscopic technique is the approach of choice for patients with full-thickness RP. The LVMR has the advantage of avoiding the unnecessary repeated operations with all its physical and psychological effect on patients, minimal recurrence, the high success rate, and low complication rate for this procedure.

Study limitations were the relatively small number of patients, but this could be attributed to the characteristics of the disease in children and the fact that a big number of patients resolve spontaneously, which is the same limitation in most studies dealing with the RP.

The other limitation is the relatively short period of follow-up. Subsequent studies with a longer follow-up period would be useful in accessing the success rate of the LVMR.

From the obtained results, we found that the anterior approach of laparoscopic rectopexy is a simple, minimally invasive technique, with reasonable operative time and minimal immediate postoperative morbidities.

Data Availability Statement

Data will be available to any researcher who contact the corresponding author.

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ORIGINAL ARTICLE

A Prospective Study of Outcomes of Patients with Hemorrhoids after Minimal Invasive Procedure for Hemorrhoids

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Received on: 30 April 2022; *Accepted on:* 20 May 2022; *Published on:* 07 December 2022

Abstract

Introduction: Hemorrhoids are commonly reported anorectal diseases in which veins in the rectum and anal canal get swollen and inflamed, which causes discomfort and bleeding. Within the normal anal canal, there are specialized, highly vascularized cushion-forming discrete masses of thick submucosa containing blood vessels, smooth muscle, and elastic and connective tissue. They are located in the left-lateral, right-anterior, and right-posterior quadrants of the canal to aid in anal continence. The term *hemorrhoids* should be restricted to clinical situations in which these cushions are abnormal and cause symptoms. Hemorrhoids are a result of sliding downward of these cushions. Hemorrhoids result from disruption of the anchoring and flatting action of musculus submucosa and (Tretiz's muscle) its richly intermingled elastic fibers. Conventional hemorrhoidectomy is the open surgical procedure in which the hemorrhoid pedicle is ligated by transfixing suture. Stapled hemorrhoidopexy (SH) was introduced by Longo that requires no external incision, instead, hemorrhoidal tissue is lifted into ring of tissue with suture and a stapler removes the hemorrhoids, effectively cutting off blood flow to the tissue.

Aims and objectives: The current study defines the efficacy of stapled hemorrhoidopexy and its consequences.

Materials and methods: It is an institutional prospective study, including patients on which stapled hemorrhoidopexy was done from 4th January, 2019 to 6th December, 2020, who consented to be a part of the study. These patients were followed up through regular visits to the OPD every week for the first month, every 15 days for the next 2 months, and later via telephonic conversations up to a period of 6 months post surgery. Stapled hemorrhoidopexy was performed as per the procedure. Patients were discharged after successful completion of the operation. All clinical variables were collected from a standardized questionnaire evaluation obtained through office follow-up.

Results: Total 166 patients: 142 males and 24 females underwent SH (male:female ratio was 5.92:1). The mean age being 44.75 ± 12.99 years. After operation, patients were discharged on postoperative days 1–4; the mean being 1.67 ± 0.66 days. None of the patients had bleeding in the immediate post or period up to 1 month. Nine patients (5.4%) complained of pain in the immediate postoperative period, 1 had grade III hemorrhoids, 2 had grade II hemorrhoids, 2 had bleeding per rectally with grade II internal hemorrhoids, 1 had interno-external piles, 1 had prolapsed piles, 2 had thrombosed piles. In total, 3 had edema in the early postoperative period, 1 had interno-external piles, 1 had prolapsed piles, and 1 had thrombosed piles.

After 1 month, 4 (2.40%) had complained of bleeding per rectally, and none of the patients developed incontinence at the 6-month follow-up. Two patients had a recurrence of reports that had interno-external piles. Two patients who had developed peri-purse-string hematoma developed partial stricture in the long run.

The mean blood loss during surgery was 44.39 ± 8.08 mL, the mean duration of surgery was 25.13 ± 3.24 min, and the mean duration of patients returning to work after surgery was 5.08 ± 1.17 days. The overall success rate was 98.2%.

Conclusion: Stapled hemorrhoidopexy represents a relatively simple and fast operation with less blood loss during surgery, especially when compared with other traditional procedures. The cost of minimal invasive procedure for hemorrhoids (MIPH) gun was the only major limitation.

Keywords: Hemorrhoid, Minimal invasive procedure for hemorrhoids, Stapled hemorrhoidopexy.

World Journal of Laparoscopic Surgery (2022): 10.5005/jp-journals-10033-1541

Introduction

Hemorrhoids are commonly reported anorectal diseases in which veins in the rectum and anal canal get swollen and inflamed, which causes discomfort and bleeding. Clinical presentation of the patient comes to hospital with grade III or IV hemorrhoids. The treatment modality of hemorrhoid may be medical or surgical. A surgical modality is used in patients with grade III and IV hemorrhoids and concomitant anorectal pathology as well as in patients not responding to medical management. The conventional surgical techniques such as Milligan–Morgan's open hemorrhoidectomy and Ferguson's closed hemorrhoidectomy were preferred choices for the surgery in these patients and were considered to be the "gold standard" till the evolvement of SH

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How to cite this article: Shah TA, Modi JP, Shah JD, *et al.* A Prospective Study of Outcomes of Patients with Hemorrhoids after Minimal Invasive Procedure for Hemorrhoids. World J Lap Surg 2022;15(3):220–223.

Source of support: Nil

Conflict of interest: None

using a transonic circular stapling instrument, introduced by Dr Antonio Longo in the 1990s.[1–4]

Stapled hemorrhoidopexy is a technique that is globally accepted and widely used. Even though there is chance of recurrence and it is also a costly procedure as compared with open methods. The minimally invasive procedure for hemorrhoids or MIPH has made significant strides in the field of proctology.[5] The principle of this operation is to remove and cut off anal hemorrhoidal vascular cushion from an area above the dentate line and reposit the anal columns in such a way that the staple line is above the dentate line.[5,6]

Materials and Methods

It represents an institutional prospective study and included patients who underwent MIPH operated on 4th January, 2019–6th December, 2020. Written informed consent was taken from patients prior to study enrollment. The patients undergoing SH were followed up through regular visits to the outpatient department every week for 1 month, every 15 days for the next 2 months, and up to a period of 6 months post surgery.

Eligibility Criteria

Patients who had undergone MIPH surgery.

Exclusion Criteria

Age less than 18 years, hemorrhoids were associated with any other anal pathology during surgery.

All clinical data were collected from a standardized questionnaire evaluation obtained through follow-up. The following variables were recorded in all cases: age, gender, grade of hemorrhoid disease, previous treatment, complications like pain, edema, per-rectal bleeding, urinary retention in the early postoperative period (up to 1 month post surgery), and complications like perianal pain, edema, per-rectal bleeding, and stricture formation of the late postoperative period (from 2nd month up to 6th month post surgery). Operative time was recorded in minutes on indoor case paper. Intraoperative blood loss was calculated by wetting 10 × 10 cm gauze with blood. If the gauze piece was 25%, 50%, 75%, and 100% soaked with blood, it was considered as 3 mL, 6 mL, 9 mL, and 12 mL of blood loss, respectively.[7–9]

Bowel preparation was done 24 hours before surgery by proctoclysis enema and diet restriction. Antibiotic was given after giving spinal anesthesia before giving the lithotomy position.

The MIPH procedure was done by placing of purse-string suture with 2/0 polypropylene in the submucosa 2–3 cm proximal dentate line. The purse string was tightened as the specially designed circular stapler was inserted into the rectum. After the anvil passes proximal to purse string, the suture ends were pulled through a channel in the stapler to use as stay suture and manipulate the redundant rectal mucosa. The stapler was closed and fired, and pressure was held to aid in hemostasis. After stapler withdrawal, additional sutures were required for hemostasis. Patients were routinely discharged after the operation.

Results and Observations

Total 166 patients: 142 male patients and 24 female patients (male:female ratio was 5.92:1) underwent SH. The mean age was 44.75 ± 12.99 years (Table 1) (Figs 1 to 3).

After operation, patients were discharged on postoperative days 1–4 with mean being 1.67 ± 0.66 days. About 70 patients were discharged on postoperative day 1. About 82 patients were discharged on day 2. About 12 patients were discharged on postoperative day 3 (8 prolapsed piles, 2 thrombosed piles, and 2 bleeding per rectally with grade II piles). About 2 patients were discharged on postoperative day 4 (grade III hemorrhoids, procedure converted to open due to poor exposure).

Table 1: Distribution of patients undergoing MIPH

Diagnosis	*No. of patients*	*%*
Bleeding PR with grade II internal hemorrhoids	40	24.1%
Grade III hemorrhoids	52	31.3%
Grade III hemorrhoids	28	16.9%
Interno-external piles	14	8.4%
Prolapsed piles	22	13.3%
Thrombosed piles	10	6.0%

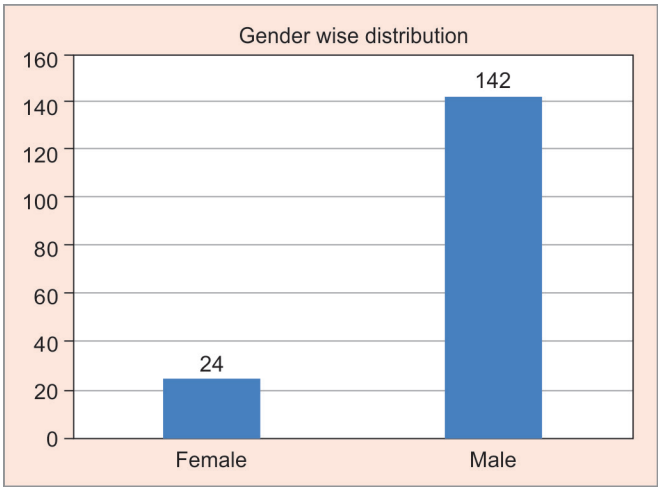

Fig. 1: Gender-wise distribution

Postoperative Complications

In total, 9 patients (5.4%) complained of pain in immediate postoperative period, 1 had grade III hemorrhoids, 2 had grade II hemorrhoids, 2 had bleeding per rectally with grade II internal hemorrhoids, 1 had interno-external piles, 1 had prolapsed piles, and 2 had thrombosed piles. The immediate pain was relieved with multiple analgesic doses (Table 2).

In total, 3 had edema in the early postoperative period, 1 had interno-external piles, 1 had prolapsed piles, and 1 had thrombosed piles. The edema was resolved with hot-sit bath with local ointment application.

None of the patients had bleeding in the immediate post or period up to 1 month. None of the patients had complained of urinary retention in the immediate postoperative period.

After 1 month, 4 (2.40%) had complained of bleeding per rectally in the follow-up visit, which was controlled with medication and 3 (1.80%) had perianal pain in the long run.

None of the patients developed incontinence at the 6-month follow-up. Two patients who had developed peri-purse-string hematoma developed partial stricture in the long run. About 2 patients had recurrence with interno-external piles in follow-up visits between 4 and 6 months (Tables 3 and 4).

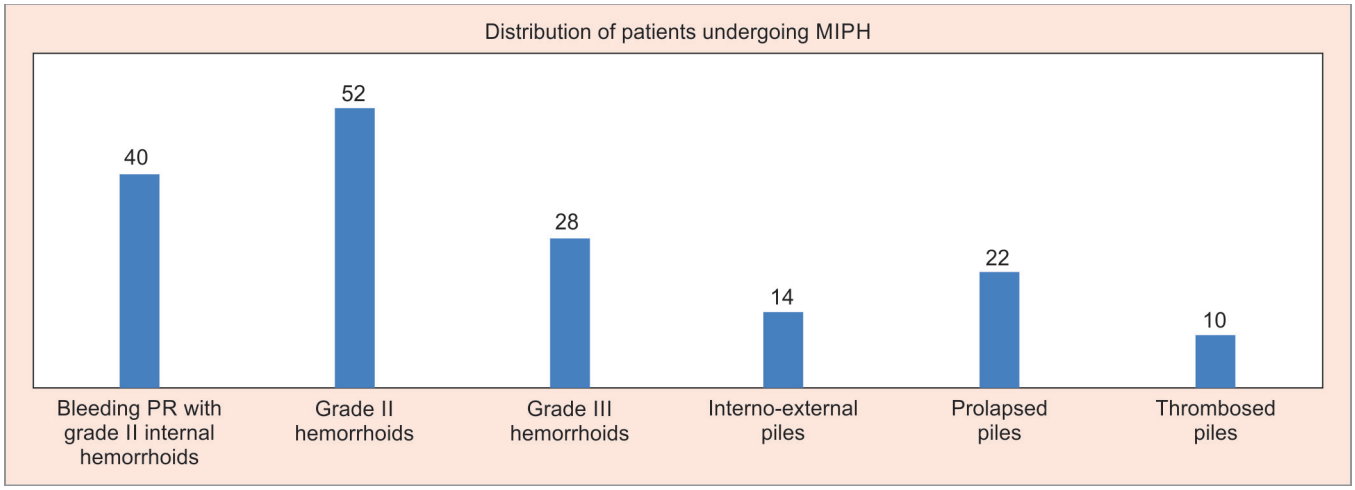

Fig. 2: Distribution of patients undergoing MIPH

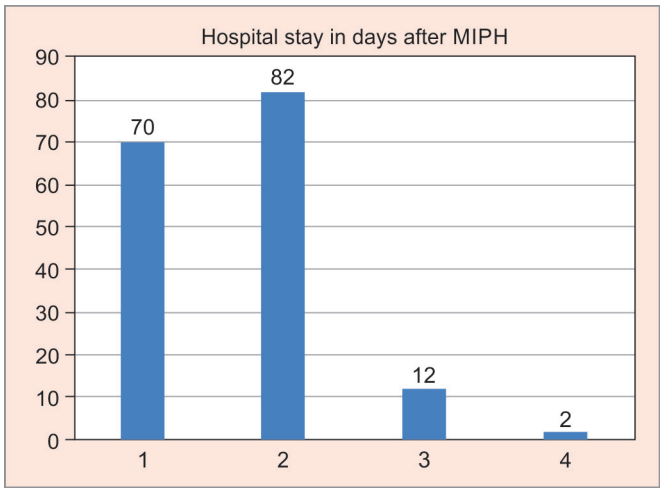

Fig. 3: Hospital stay in days after MIPH

About 3 patients had failure of surgery within 6 months. Among 3 patients, 1 patient had recurrence of interno-external piles, 1 patient had particle stricture, and 1 patient had particle stricture followed by interno-external piles. All 3 patients needed revised surgery.

Discussion

Conventional hemorrhoidectomy surgeries like the Milligan–Morgan operation and the Ferguson's closed hemorrhoidectomy have been very effective for long-lasting symptomatic control. But a major drawback of these surgeries is significant postoperative pain that is the prime cause of detention and hesitation of treatment. The ideal treatment for hemorrhoids should be free of uneventful consequences like pain and bleeding.

Stapled hemorrhoidopexy was introduced in 1998 as an alternative to conventional hemorrhoidectomy techniques, which

Table 2: Requirement of analgesic dose

Requirement of analgesic doses in postoperative period	*No. of patients*	*%*
Required single dose of analgesic	9	5.5%
Required multiple doses of analgesic	157	94.5%

Table 4: Various factors in MIPH surgery

Mean blood loss during surgery	44.39 ± 8.08 mL
Mean duration of surgery	25.13 ± 3.24 min
Mean duration of patients returning to work after surgery	5.08 ± 1.17 days
Overall success rate of MIPH	98.2%
Overall failure rate of MIPH	1.8%

Table 3: Postoperative complications

Presentation	*Immediate pain*	*Immediate edema*	*Recurrence*	*Bleeding PR*	*Stricture*	*Perianal pain*
Grade II hemorrhoids	2	0	0	0	0	0
Grade III hemorrhoids	1	0	0	0	0	0
Bleeding PR with grade II hemorrhoids	2	0	0	0	0	0
Interno-external piles	1	1	2	2	1	2
Thrombosed piles	2	1	0	1	0	0
Prolapsed piles	1	1	0	1	1	1
Total	**9**	**36**	**2**	**4**	**2**	**3**

is significant innovation in the treatment of hemorrhoids. Instead of removing columns of hemorrhoidal tissue, this operation removes a sleeve of distal-most rectal mucosa and submucosa, elevating the anal canal and fixing it in place (hence anopexy) and radically reducing the redundancy of mucosa.[10,11]

Several randomized controlled trials described the safety and effectiveness of MIPH. Systematic reviews of randomized controlled trials followed by meta-analyses have demonstrated that the short-term outcomes result in favor of MIPH when compared with traditional excisional techniques.[12] Chiefly, MIPH has several advantages over conventional hemorrhoidectomy, such as minimal pain with minimal blood loss, minimal operative time, quick recovery, and reduced hospital stay. However, meta-analyses of randomized controlled trials have described that MIPH has a higher recurrence rate than conventional hemorrhoidectomy. Minimal invasive procedure for hemorrhoids appears to be an easy and rapid operation rather than other transanal dearterialization procedures. But during the procedure, technical errors have a vital role in the recurrence rate when compared with conventional hemorrhoidectomy. Estimating of removal of the amount of prolapsed mucosa is a major practical drawback of the procedure of MIPH. But, however, the simple logic is to resect a larger amount of rectal mucosa in a higher degree of hemorrhoid prolapse.

Conclusion

Stapled hemorrhoidopexy represents a relatively easy and rapid operation with less blood loss during surgery, especially when compared with other traditional procedures. The cost of MIPH gun was the only major limitation. However, due to existing evidence during the procedure, technical errors have a vital role in recurrence rate when compared with conventional hemorrhoidectomy. Inspite of this controversy, SH is being used successfully in the management of hemorrhoids.

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ORIGINAL ARTICLE

Laparoscopic vs Robotic Approach for Rectal Cancer: A Meta-analysis

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Received on: 12 April 2022; *Accepted on*: 14 September 2022; *Published on*: 07 December 2022

Abstract

Technology is evolving constantly today, and among the plethora of innovations, the one with the most potential to look forward to, in surgery, is the introduction and evolution of Robotics. Demand, as well as a pursuit of minimally invasive surgery, has increased exponentially particularly in the last decade, with Robotics being at the leading edge of this evolution. It has shown a potential to provide outcomes that were comparable to those achieved with the laparoscopic approach, with some evidence suggesting even better outcomes than laparoscopy in high-risk groups such as patients with obesity, those treated by extended procedures, and male patients. Despite all its benefits, there is still no sturdy evidence established yet about the overall superiority of robotic surgery over the laparoscopic approach. This lack of concrete evidence warranted the need for a meta-analysis that would help reveal any significant differences between the two approaches (robotics vs laparoscopic). Our study aimed to understand and establish the differences between the two approaches of rectal cancer resections, as well as to ascertain the positive efficacy and benefits of robotic surgery, if any, over the conventional laparoscopic approach. The results of this study found that the rates of sphincter preservation, intersphincteric resection (ISR), and conversion were lower with the robotic total mesorectal excision (TME) compared to laparoscopic TMEs, while no significant difference was found in the rate of major (grade ≥III) complications between the two groups.

Keywords: Minimal access surgery, Open and laparoscopic surgery, Rectal cancer, Robotic surgery.

World Journal of Laparoscopic Surgery (2022): 10.5005/jp-journals-10033-1537

Introduction

Technology is evolving constantly today, and among the plethora of innovations, the one with the most potential to look forward to, in surgery is the introduction and evolution of robotics. Demand, as well as a pursuit of minimally invasive surgery, has increased exponentially particularly in the last decade, with Robotics being at the leading edge of this evolution. It has shown a potential to provide outcomes that were comparable to those achieved with the laparoscopic approach, with some evidence suggesting even better outcomes than laparoscopy in high-risk groups such as patients with obesity, those treated by extended procedures, and male patients.

Robotic surgery, however, is not new. It has been around for over three decades, with the first documented robot-assisted surgical procedure done as early as 1985.[1] However, in the year 2000, the introduction of the da Vinci Robotic Surgical System, which became the first robotic surgery system to get the US Food and Drug Administration (FDA) approval, revolutionized the field of robotic surgery, and it has only found evermore wider applications in various surgical procedures ever since.[2]

Despite all these benefits, there is still no sturdy evidence established yet about the overall superiority of robotic surgery over the laparoscopic approach. This lack of concrete evidence warranted the need for a meta-analysis that would help reveal any significant differences between the two approaches (robotics vs laparoscopic).

Our study aimed to understand and establish the differences between the two approaches of rectal cancer resections, as well as to ascertain the positive efficacy and benefits of robotic surgery, if any, over the conventional laparoscopic approach.

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How to cite this article: Agrawal A, Sandlas G, Tiwari C, *et al*. Laparoscopic vs Robotic Approach for Rectal Cancer: A Meta-analysis. World J Lap Surg 2022;15(3):224–228.

Source of support: Nil

Conflict of interest: None

Materials and Methods

The study is a meta-analysis conducted by the first author by doing a preliminary search in the PubMed and Cochrane databases to identify the literature on this topic. A systematic search of the PubMed and Cochrane Library databases was conducted in August 2020. The keywords used were (laparoscopic surgery or

laparoscopy) vs (robotics or robotic, soft or remote operation). Only those articles published after the year 2010 were included. Filters for cancer and systematic reviews were applied while conducting the search, after which 737 articles were obtained. After identification, the duplicates were removed, and the remaining records were screened to select. After applying the inclusion and exclusion criteria, seven articles were selected for this study.

Inclusion Criteria: Population, Interventions, Controls, Outcomes (PICO)

The inclusion criteria consisted of the following:

- **Participants:** All patients were the age of 19 years and above, undergoing surgery for rectal cancer;
- **Intervention:** Robotic or laparoscopic rectal cancer resection;
- **Comparison:** Robotic surgery vs laparoscopic surgery for rectal cancer;
- **Outcome:** The primary outcome of this study was the rate of sphincter preservation (RSP). The secondary outcomes looked into were rates of ISR, and surgical site infections (SSI) which were graded as per the Clavien–Dindo criteria and divided into two groups, namely, minor (grades I–II) and major (≥III).

Results

Primary Outcome

Rate of Sphincter Preservation

The meta-analysis evaluated the RSP using six studies that provided sufficient data regarding RSP.

As depicted in the forest plot in Figure 1, considering data from various studies plotted against the risk ratio of RSP, gave a pooled estimate of 0.049 (0.28, 0.85), with a statistically significant difference favoring the robotic approach ($p = 0.01$).

Secondary Outcomes

Surgical Site Infections (Major)

The meta-analysis evaluated the rate of SSI, which was graded as per the Clavien–Dindo criteria and divided into two groups, namely, minor (grades I–II) and major (≥III).

The forest plot shown in Figure 2 depicts results for the SSI (major) using 10 studies that published data regarding SSI as per the Clavien–Dindo criteria.

As depicted in the forest plot in Figure 3, considering data from various studies plotted against the risk ratio of SSI (major), gave us a pooled estimate of 1.14 (0.80, 1.62), which was not statistically significant ($p = 0.48$).

Surgical Site Infections (Minor)

The meta-analysis evaluated the rate of SSI, which was graded as per the Clavien–Dindo criteria and divided into two groups, namely, minor (grades I–II) and major (≥III).

The forest plot shown in Figure 3 depicts results for the SSI (minor) using 10 studies that provided data for SSI graded as per the Clavien–Dindo criteria.

As depicted in the forest plot shown in Figure 3, considering data from various studies plotted against the risk ratio of SSI (minor), gave us a pooled estimate of 0.84 (0.83, 0.97), and there was a

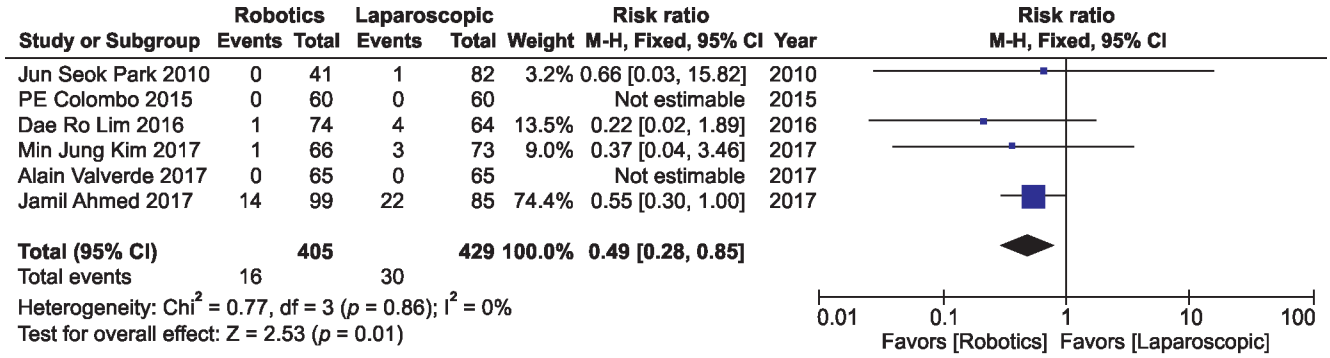

Fig. 1: Forest plot – RSP

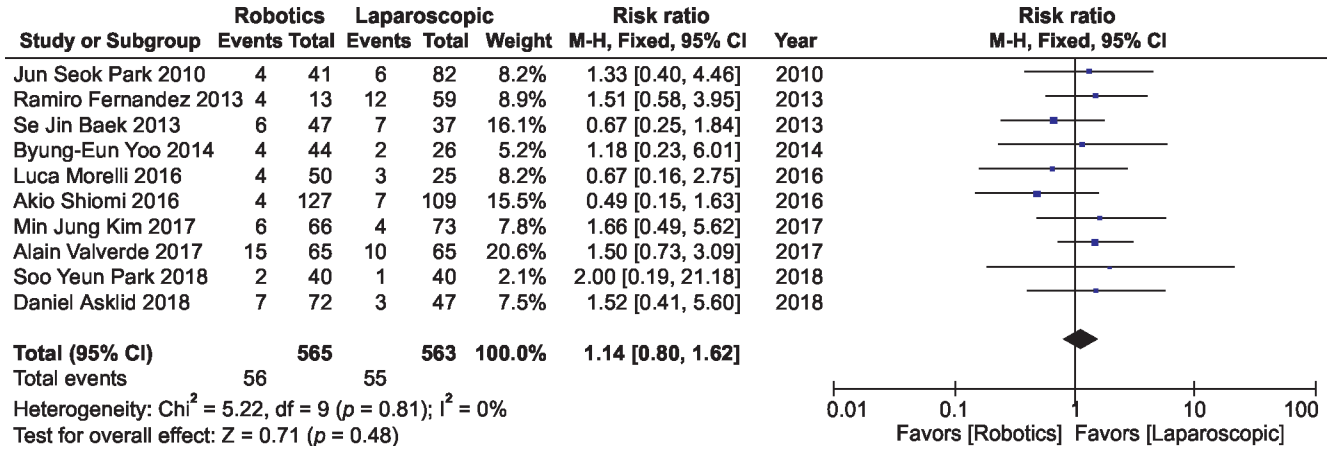

Fig. 2: Forest plot – SSI (major)

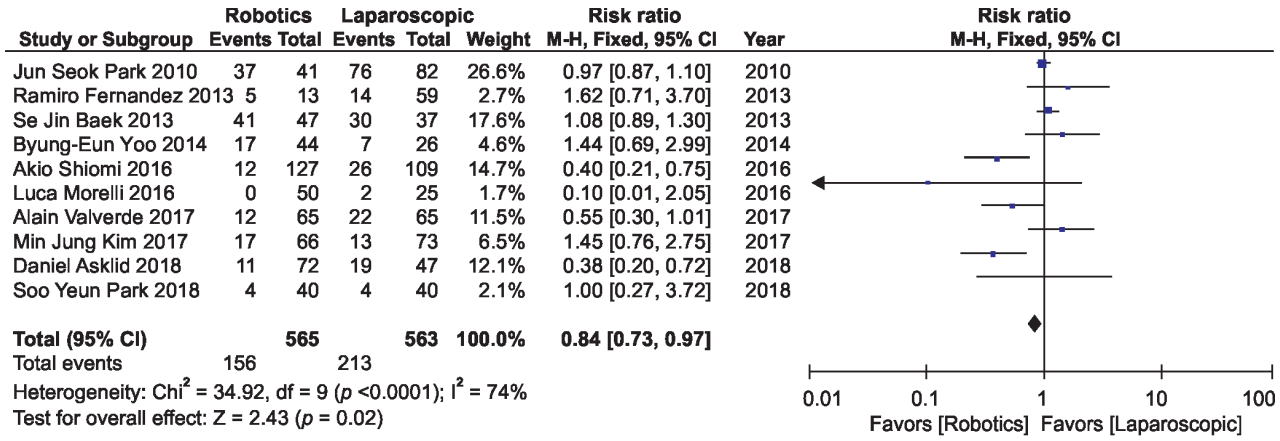

Fig. 3: Forest plot – SSI (minor)

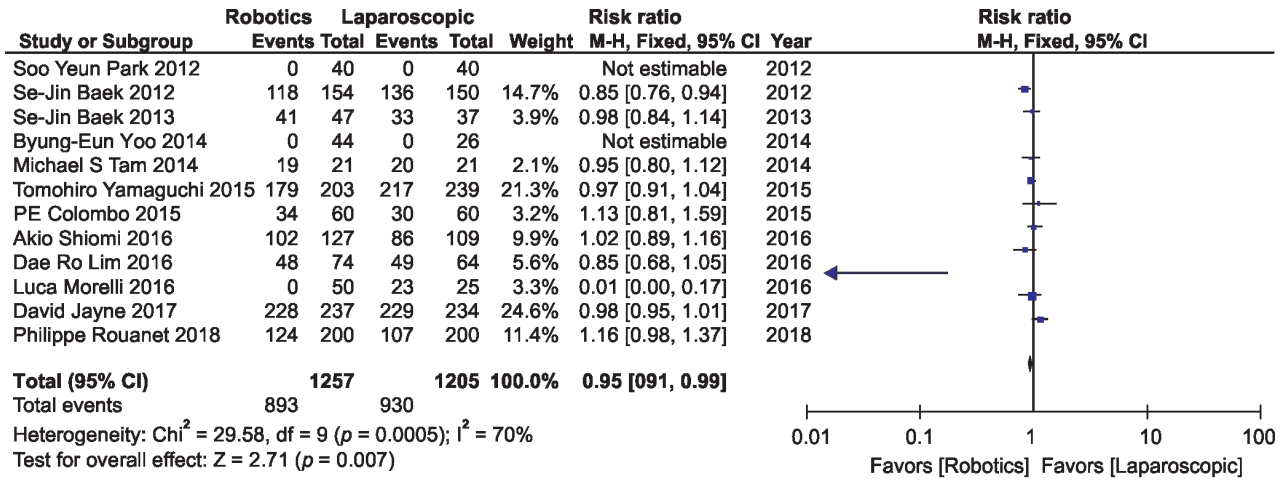

Fig. 4: Forest plot – Rate of intersphincteric resection

statistically significant difference between the two approaches ($p = 0.02$) favoring the robotic approach.

Rate of Intersphincteric Resection (RIR)

The meta-analysis evaluated the RIR, using 12 studies that have published data regarding RIR. As depicted in the forest plot shown in Figure 4, considering data from various studies plotted against the risk ratio of RIR, gave us a pooled estimate of 0.95 (0.91, 0.99), and there was a statistically significant difference between the two groups ($p = 0.007$) favoring the robotic approach.

Discussion

The treatment of cancer over the years has gone through a gradual process of development, particularly from the technical standpoint. Before the development of imaging modalities in the 1970s, an "exploratory laparotomy" would be required just to diagnose cancer. However, thanks to the advancements in modern technology, surgeons are now able to use tools equipped with optical fiber technology and pocket-sized video cameras to look inside the body as well as special surgical instruments such as the laparoscope, to operate via narrow tubes put into small cuts in the skin.[1] The most recent advancement in surgical techniques is the introduction of robotics surgery systems which has also shown the most potential, by allowing small surgical incisions and high precision demanding surgeries in a minimally invasive manner.[2] This has not only revolutionized general surgery but also cancer surgery, where surgeons can now excise tumors with precise and accurate margins, allowing for better outcomes overall. Minimally invasive approaches such as laparoscopic and robotic surgeries have especially played a major role in decreasing the morbidity and mortality in patients with rectal cancer, while also improving their quality of life, by helping avoid colostomies for most patients with rectal cancer.[3,4] After the first robotic colectomy was done in 2002, multiple case series and prospective studies have evidenced the viability and safety of this approach.[5] However, concrete evidence is missing to establish the superiority of one approach over the other.

In this discussion, we shall be comparing the robotic approach vs the laparoscopic approach for rectal cancer surgeries. Both surgical techniques were compared under various parameters. In our study, we mainly focused on three different parameters, namely, RSP, RIR, and the postoperative complications (PoC). The demographics of the patient have been presented in (Table 1). The PoC was graded as per the Clavein–Dindo criteria and divided into two groups, that is, minor complications (grades I–II) and major complications (grade ≥III).

The RSP and RIR have been observed to influence the postoperative quality of life of patients whereas the PoC has been known to influence the postoperative outcomes, length of hospital stays as well as the rate of readmissions.

Table 1: Demographics

Study	Age-group (years)	Male	Female	Country of origin
Kim (2017)[14]	48–71	52	21	South Korea
Ahmed et al. (2017)[6]	62–74	58	27	Portugal
Colombo (2015)[15]	35–85	42	18	France
Valverde et al. (2017)[9]	55–75	45	20	France
Park (2010)[16]	54–72	39	33	Korea
Lim (2016)[8]	33–86	36	18	Korea

In our study, we found that the RSP for the robotic approach was higher compared to the laparoscopic approach, and the difference was found to be statistically significant [0.49 (0.28, 0.84)] ($p = 0.01$). Similarly, the RIR with the robotic approach was found to be significantly higher than the laparoscopic group [0.95 (0.91, 0.99)] ($p = 0.007$). This could be attributed to various factors such as (1) robotics offers 3D views, which allows for precise dissections in a narrow surgical field such as the pelvis, (2) better freedom of movement due to the EndoWrist instruments which increase dexterity, and (3) Avoidance of physiological tremors and decreased fatigue for the operator compared to the laparoscopic approach.[6]

Baek et al. in their study to determine the advantages of Robotic surgery found albeit no significant difference between the robotic and laparoscopic groups with respect to operative time, operative outcome, and pathological outcome, they did conclude that the robotic surgical approach may help overcome some of the limitations of laparoscopy such as better surgical access to anatomically difficult areas such as the pelvis.[7]

Ahmed et al. also compared the RSP between the two approaches and found that the robotic approach yielded a higher RSP than the laparoscopic approach and the difference was statistically significant ($p = 0.045$) independent of the tumor level. They also reported a significantly lower conversion rate ($p = 0.043$), shorter operating time ($p = 0.013$) and shorter length of hospital stay ($p = 0.001$) favoring the robotic approach. However, there was no significant difference in the short-term (<30 days) PoC between the two groups. Lim et al. found that the RSP with the robotic approach was higher than with the laparoscopy, but the difference was not significant ($p = 0.444$) and although the RIR was also found to be higher with the robotic approach, there was no statistically significant difference between the two.[8]

Valverde et al. in their study of 130 patients found that the robotic proctectomy for sphincter-saving surgeries offered similar quality of TMEs as the laparoscopic counterpart, but with a statistically significant lower conversion rate in the former.[9]

Postoperative complications in our study were assessed as per the Clavein–Dindo criteria[10,11] and were divided into two groups, namely, minor (Clavein–Dindo grades I–II) and major (Clavein–Dindo grade ≥III). We found a significant difference between the rate of minor complications (grades I–II) favoring the robotic approach ($p = 0.02$). No significant difference was found in the rate of major complications ($p = 0.48$) between the two surgical approaches in our study. Asklid et al. supported these results as they reported no significant difference in the more major (grade ≥III) complications ($p = 0.54$); however, a significant difference in the overall complication rate was reported ($p < 0.001$). A significantly lower conversion rate favoring robotics ($p = 0.002$) was also reported in their study.[12]

Shiomi et al. reported similar findings with a difference in the overall complication rate favoring the robotic approach ($p = 0.003$), but no significant difference was found in the major complication rate (grade ≥III) between the two groups ($p = 0.19$).[13]

A systematic review of the other parameters, namely, intraoperative blood loss, readmissions, postoperative 30-day mortality, previous history of abdominal surgery, etc., showed no significant difference.

To sum up everything that has been stated so far, the results of this study suggest that the rates of sphincter preservation, ISR, and conversion were lower with the Robotic TMEs compared to laparoscopic TMEs, while no significant difference was found in the rate of major (grade ≥III) complications between the two groups.

Conclusion

Due to the limited availability of data, a statistical analysis could not be done for the overall survival rate and further investigation in multicenter studies is proposed to gain a better insight into it. Furthermore, we would also like to suggest studies to look into other parameters such as the surgeon's physical and mental stress, tumor spillage, R0 resection rate, and overall patient satisfaction rate between the two groups which could potentially influence the overall outcome of rectal cancer surgeries.

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ORIGINAL ARTICLE

Role of Preoperative Ultrasonography Findings in Predicting Difficult Laparoscopic Cholecystectomy

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Received on: 09 February 2022; *Accepted on*: 16 September 2022; *Published on*: 07 December 2022

Abstract

Aim: Most of the complications in a laparoscopic cholecystectomy are due to the difficulties faced during the surgery. In this research, the attempt was made to determine the factors that can predict a difficult laparoscopic cholecystectomy preoperatively based on ultrasound findings.

Materials and methods: One hundred patients who are satisfied with our inclusion criteria were included in our study. Preoperative ultrasonography (USG) findings like thickness and size of the gallbladder (GB) wall, the diameter of the common bile duct (CBD), GB stone size and numbers, and the existence of fluid collection around the GB were given a grade of 1 or 0 based on findings being affirmative or dissent. The sums of the grade were taken and were interrelated with the difficult laparoscopic cholecystectomy. Intraoperative findings, namely, injury and damages made to the bile duct, CBD or artery, the existence of thick adhesions on the GB sides, region of the Calot's being frozen, ripped up GB and spillage of bile and stones, unusual and atypical anatomy, bleeding that hampers and obstructs the visual field, and time taken of 60–120 minutes were considered as difficult laparoscopic cholecystectomy.

Results: Four preoperative findings, namely, the thickness of GB, GB stone impacted at the neck, GB stone size, and the existence of fluid collection around the GB had statistical significance in anticipating a difficult laparoscopic cholecystectomy. An elevated preoperative ultrasonography score had shown higher chances of a difficult laparoscopic cholecystectomy.

Conclusion: Preoperative ultrasonography findings have a role in predicting a difficult laparoscopic cholecystectomy.

Clinical significance: Laparoscopic cholecystectomy will be useful to have some authentic factors (USG findings) to prognosticate difficulty, conversion, or complications in laparoscopic cholecystectomy.

Keywords: Difficult laparoscopy, Gallbladder, Laparoscopic cholecystectomy, Prospective observational study, Ultrasonography.

World Journal of Laparoscopic Surgery (2022): 10.5005/jp-journals-10033-1539

Introduction

Cholecystectomy is one of the most frequently performed surgical procedures and in many developed countries they are performed laparoscopically.[1] The rapid acceptance of this new technique by the medical profession and the public was related to the obvious advantages of reduced cost, decreased hospital length of stay, reduced morbidity, better cosmetic scar, and increased patient satisfaction.[2] For these reasons, laparoscopic cholecystectomy is now considered the gold standard surgical treatment of choice for cholelithiasis.[3] For cholecystitis and cholelithiasis, ultrasonography screening is proven to be highly accurate, safe, and non-invasive.

Those patients who had a well-established disease and previous events of cholecystitis or pancreatitis are at increased risk of experiencing a difficult laparoscopic cholecystectomy. The overall conversion rate, as reported in numerous series on laparoscopic cholecystectomy, varies from 3.2% to 5.3%. Laparoscopic cholecystectomy conversion rate increases from 15% to 20% in patients having acute cholecystitis. Presently, GB cancer and uncorrectable coagulopathy are the absolute contraindications for laparoscopic cholecystectomy.[4]

It will be useful to have some authentic factors to prognosticate difficulty, conversion, or complications in laparoscopic cholecystectomy. Patients who are anticipated to have difficulty, conversion, or complications can then be counseled about open surgery, complication, and prolonged hospital stay. In this way, the patients and their attendees will be prepared for the adverse consequences.

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How to cite this article: Arone S, Raghunath KJ, Venkatasubramanian R, *et al*. Role of Preoperative Ultrasonography Findings in Predicting Difficult Laparoscopic Cholecystectomy. World J Lap Surg 2022;15(3): 229–234.

Source of support: Nil

Conflict of interest: None

A difficult laparoscopic cholecystectomy[5] is defined as when we address a difficult GB during the surgery. When a cholecystectomy causes an increased risk and complication when compared to the standard cholecystectomy then it is known as a difficult GB. It can be due to GB inflammation due to infection and other reasons or due to difficult exposure. Inflammation includes severe chronic cholecystitis and acute cholecystitis. Acute cholecystitis is the most common cause of a difficult GB. It includes gangrenous cholecystitis, emphysematous cholecystitis, and perforated GB. Difficulty in exposure includes previous upper abdominal surgery and obesity. Other conditions are liver cirrhosis and Mirizzi's syndrome.

In this study, we determine the factors which can predict a difficult laparoscopic cholecystectomy preoperatively based on ultrasound findings. This is done by validating the cut-off score from ultrasonography formulated scoring and finding the most

commonly associated factor in the USG findings that correlates with a difficult laparoscopic cholecystectomy.

Materials and Methods

The prospective observational study was conducted at the Department of General Surgery at Apollo Hospitals, Chennai, Tamil Nadu, India, from November 2019 to April 2021. Male and female patients above 18 of age who are ready to participate were included after explaining potential advantages, and risks. Patients were also informed about the possibility of on-table conversion to open cholecystectomy. Written informed consent for laparoscopy and if required open cholecystectomy was taken for surgery from the patient. Permission was obtained from the ethics committee and scientific advisory committee of the institution.

Inclusion Criteria

- Cholelithiasis
- Acute cholecystitis
- Empyema GB
- Symptomatic polyps
- Non-functioning GB
- Gallstone pancreatitis with or without previous upper abdomen surgery

Exclusion Criteria

- Gallbladder cancer
- Cardiac failure
- Portal hypertension
- Coagulopathies, uncorrectable coagulopathy
- Chronic obstructive pulmonary disease
- Biliary enteric fistula
- Pregnancy
- Hepatic and renal diseases

Methodology

All patients who presented to the outpatient department with symptoms suggestive of GB disease were evaluated on the following factors:

- Detailed history collection
- Systemic examinations
- Investigations with particular reference to biliary pathology
- Detailed ultrasound findings[6]

Preoperative USG findings such as thickness and size of the GB wall, the diameter of the CBD, GB stone size and numbers, and the existence of fluid collection around the GB were given a grade of 1 or 0 based on findings being affirmative or dissent.

After explaining the diagnosis to the patients and their attendees, they consented to surgery. Preanesthetic assessment and relevant investigation will be done. After relevant investigations and preanesthetic evaluation, the patients will be subjected to laparoscopic cholecystectomy, under general anesthesia. All relevant intraoperative findings will be noted.[7] Intraoperative findings, namely, injury and damages made to the bile duct, CBD or artery, the existence of thick adhesions on the GB sides, region of the Calot's being frozen, ripped up GB and spillage of bile and stones, unusual and atypical anatomy, bleeding that hamper and obstruct the visual field and time taken of 60–120 minutes were considered as difficult laparoscopic cholecystectomy.

Statistical Methods[8–10]

All the continuous variables will be represented by mean ± standard deviation if they are normally distributed. All categorical variables will be represented by percentages. Comparison of categorical variables will be done by either the Chi-squared test or Fisher's exact test. Comparison of normally distributed continuous variables if any will be done by independent sample *t*-test. Comparison of non-normally distributed continuous variables if any will be done by Mann–Whitney *U* test. A receiver operating characteristic (ROC) curve is drawn to see if there is a cut-off that distinguishes between simple and difficult laparoscopic cholecystectomy instances. Data analysis will be carried out by SPSS, v.25.0; $p < 0.05$ will be considered statistically significant.

Observation and Results

Among the 100 patients who were enrolled in the study, the mean age (standard deviation) is 48.04 (±14.23) and the median is 49. The highest number of patients lies in the 51–60 years age-group. Out of the 100 cases studied, the number of male and female patients was 48 and 52, respectively.

In these 100 patients, 26 patients had diabetes mellitus, 28 patients had hypertension, 10 patients had coronary artery disease, 6 patients had pulmonary disorder, 3 patients had renal disorder, and 1 patient had liver problem.

Pain was presented as a complaint in 90 patients on admission. A total of 73 patients had complaint of nausea and vomiting. Only two patients had complaints of a change of color of urine and stools.

Among the 100 patients 10 patients were asymptomatic and based on duration 38 patients were having acute disease and 52 patients were having chronic pathology. On examination, pallor, cyanosis, clubbing, and edema were found to be absent. Only two patients had icterus. Murphy's sign was positive in 41 patients and among these 100 patients, 18 of them had a previous history of abdominal surgery.

The ultrasonography findings of the 100 patients are as listed below. Among the 100 patients, 36 of them were found to have a GB wall thickness of more than 4 mm, 90 of them were found to have a distended GB and 15 of them had a CBD caliber size of more than or equal to 6 mm.

A total of 35 patients out of 100 had their stone size more than or equal to 1 cm and 20 of them had their stone impacted at the neck. Among these 100 patients, 39 patients had a pericholecystic fluid collection.

As depicted in Table 1, preoperative ultrasonography findings such as the thickness of the GB wall of more than 4 mm, stone at the neck of the GB, with the company of pericholecystic fluid and GB stone size of more than or 1 cm were significant in predicting a difficult laparoscopic cholecystectomy.

As seen in Table 2, the existence of wall thickness of the GB greater than 4 mm was the most precise vaticinator for a difficult laparoscopic cholecystectomy followed by gallstone impacted at the neck of the GB, the existence of pericholecystic fluid and GB stone size of more than or equal to 1 cm.

The preoperative ultrasonography score showed statistical significance in predicting a difficult laparoscopy cholecystectomy. As in Tables 3 and 4, it has been validated that when we observe

Table 1: Preoperative ultrasonographic findings with their incidence of easy and difficult laparoscopic cholecystectomy

		Level			
Ultrasonography findings	*Findings*	*Easy*	*Difficult*	*Total*	*p-value*
GB wall thickness	≤4 mm	51 (79.7%)	13 (20.3%)	64	0.000
	>4 mm	9 (25.0%)	27 (75.0%)	36	
GB size	<5 cm	8 (80.0%)	2 (20.0%)	10	0.308
	≥5 cm	52 (57.8%)	38 (42.2%)	90	
CBD size	<6 mm	53 (62.4%)	32 (37.6%)	85	0.253
	≥6 mm	7 (46.7%)	8 (53.3%)	15	
Size of calculus	<1 cm	46 (70.8%)	19 (29.2%)	65	0.003
	≥1 cm	14 (40.0%)	21 (60.0%)	35	
GB stone motility	Mobile	55 (68.8%)	25 (31.3%)	80	0.000
	Impacted	5 (25.0%)	15 (75.0%)	20	
Pericholecystic fluid collection	No	44 (72.1%)	17 (27.9%)	61	0.002
	Yes	16 (41.0%)	23 (59.0%)	39	

GB, gallbladder

Table 2: Diagnostic accuracy of preoperative ultrasonographic findings for predicting the difficult laparoscopic cholecystectomy.

	Diagnostic accuracy				
Ultrasonography findings	*Sensitivity (%)*	*Specificity (%)*	*PPV (%)*	*NPV (%)*	*Accuracy (%)*
GB wall thickness (>4 mm)	67.5	85.0	75.0	79.7	78
GB size (≥5 cm)	95.0	13.3	42.2	80.0	70
CBD size (≥6 mm)	20.0	88.3	53.3	62.4	46
Size of calculus (≥1 cm)	52.5	76.7	60.0	70.8	61
GB stone motility (impacted)	37.5	91.7	75.0	68.8	67
Pericholecystic fluid collection (yes)	57.5	73.3	59.0	72.1	67

GB, gallbladder; PPV, positive predictive value; NPV, negative predictive value

a rise in preoperative USG score, the percentage of difficult laparoscopic cholecystectomies done is higher.

Among the 100 patients, 60 patients had an easy laparoscopic cholecystectomy and 40 patients had a difficult cholecystectomy.

Discussion

Determining the factors that can predict a difficult laparoscopic cholecystectomy preoperatively based on ultrasound findings was the aim of our study. Our primary objective was to validate a cut-off score from the score formulated by preoperative ultrasonography findings that are specific to the GB and thereby predicting a difficult laparoscopic cholecystectomy. In our study, we also tried to find the most commonly associated finding that is specific to the GB that correlates with a difficult laparoscopic cholecystectomy.

There are many Western works of literature available that studied the relationship between preoperative ultrasonography findings and intraoperative surgical outcomes. In India, there are not that many studies available to correlate preoperative ultrasonography findings and intraoperative surgical outcomes.

In this study, we took a total of six parameters that are significant in predicting GB pathology. They were of the thickness of more than 4 mm of the wall of the GB, size of distension of the GB of more than or equal to 5 cm, the CBD caliber size of more than or equal to 6 mm, GB stone impacted at the neck, GB stone size more than or equal to 1 cm, and the existence of fluid collection around the GB. The surgical outcomes were divided into easy difficult and very difficult based on the intraoperative findings

Table 3: Preoperative ultrasonography score with their incidence of easy and difficult laparoscopic cholecystectomy

Preoperative USG score	*Laparoscopic cholecystectomy*			
	Easy	*Difficult*	*Total*	*p-value*
0–1	20 (87.0%)	3 (13.0%)	23	0.000
2–3	40 (65.6%)	21 (34.4%)	61	0.000
≥4	0	16 (100.0%)	16	0.000

Table 4: Diagnostic accuracy of preoperative ultrasonography score for predicting the difficult laparoscopic cholecystectomy

	Diagnostic accuracy				
Preoperative USG score	*Sensitivity (%)*	*Specificity (%)*	*PPV (%)*	*NPV (%)*	*Accuracy (%)*
0–1	13.0	51.95	7.5	66.67	43.0
2–3	34.4	51.28	52.5	33.33	41.0
≥4	100.0	71.43	40.0	100.0	76.0

PPV, positive predictive value; NPV, negative predictive value

which were discussed earlier. In our study, we had no conversions to open cholecystectomy. All 100 patients have had a standard laparoscopic cholecystectomy.

In this study, we had a remarkable association with the thickness of the GB wall. A total of 36 patients had an increased breadth. When we had a breadth of more than 4 mm, 27 (75%) of them had a difficult laparoscopic cholecystectomy and the rest 9 (25%) had an easy laparoscopic cholecystectomy. Daradkeh et al.,[11] Lal et al.,[12] Carmody et al.,[13] Kreimer et al.,[14] and Corr et al.[15] also reported in their respective studies that the GB wall thickness was the best ultrasonic parameter to predict a difficult laparoscopic cholecystectomy.

Chindarkar et al.[6] and Dinkel et al.[16] reported the sensitivity of 65 and 66.7%, specificity of 97 and 94.1%, positive predictive value (PPV) of 92.9 and 84.2%, negative predictive value (NPV) of 84.8, and 85.3% for escalating in the breadth of the wall of the GB of more than 4 mm as a criterion for operative difficulty. Whereas in this study, we had a sensitivity of 67.5%, specificity of 85.0%, PPV of 75.0%, NPV of 79.7%, and an accuracy of 78.0% for escalating in the breadth of the wall of the GB of greater than 4 mm as a criterion to anticipate a difficult laparoscopic cholecystectomy, respectively, with $p = 0.000$.

Next to increased thickness, the further notable statistically significant criterion was the GB stone impacted at the neck. Out of 20 cases that had stone impacted and adhered at the GB neck, 15 cases were found to be difficult. Daradkeh et al.,[11] Santambrogio et al.,[17] and Randhawa and Pujahari[7] have reported that when we had a case where the stone is firmly attached to the neck of the GB there are more chances that the case will be having a difficulty in dissection during surgery. Chindarkar et al.[6] and Akhter et al.[18] have reported that there is a firm association with the impaction of the stone at the neck of the GB to anticipate a difficult laparoscopic cholecystectomy. Chindarkar et al.[6] reported a sensitivity of 40%, specificity of 100%, PPV of 100%, NPV of 76.9%, and 80% accuracy for the stone impaction at the GB neck.

The chief difficulty observed during the surgery is when the calculi get adhered to the neck and making it difficult to hold and grasp with laparoscopic instruments. It slows down and restricts retraction and the dissection of the Calot's triangle. There is also mucocele formation due to mucus collection with in turn makes the GB to be distended and tense. In our study, we found a sensitivity of 37.5%, specificity of 91.7%, PPV of 75.0%, NPV of 68.8%, and 67% accuracy with $p = 0.000$.

Our study also discovered that there is an appreciable interconnection between the existence of pericholecystic collection in anticipating a difficult laparoscopic cholecystectomy. In our study, out of 100 patients, 39 of them had the presence of pericholecystic fluid collection in their preoperative ultrasound. Among those 39 of them, 23 patients had a difficult laparoscopic cholecystectomy. In the study done by Chindarkar et al.[6] and Nidoni et al.,[19] they have reported that presence of pericholecystic collection have a significant correlation with a difficult laparoscopic cholecystectomy. They also reported a sensitivity of 50.0 and 70%, specificity of 97.5 and 91.76%, PPV of 90.9 and 33.33%, NPV of 79.6 and 98.11%, and accuracy of 81.7 and 73.33%, respectively. In our study, we had a result of 57.5% of sensitivity, specificity of 73.3%, PPV of 59.0%, NPV of 72.1%, and accuracy of 67% with the $p = 0.002$.

Few studies have reported that there is a statistical significance between the sizes of the GB calculus with the difficult laparoscopy cholecystectomy. In this study, 35 patients had their calculus size more than or equal to 1 cm. Among those 35 patients, 21 patients (60%) had a difficult laparoscopic cholecystectomy. Chindarkar et al.,[6] Corr et al.,[15] Lein and Huang,[20] and Kama et al.[21] have reported in their studies that there is an appreciable interconnection in anticipating a difficult laparoscopic cholecystectomy if the stone in the GB measures more than or equal to 1 cm in diameter. Chindarkar et al.[6] reported 40.0% of sensitivity, specificity of 92.5%, 72.7% of PPV, NPV of 75.5%, and 75% accuracy with $p = 0.004$. Our study had a 52.5% of sensitivity, specificity of 76.7%, and PPV of 60.0%, NPV of 70.8%, and 61% accuracy with $p = 0.003$ for the criterion if GB calculus measurement in length is more than or equal to 1 cm.

Other two criterion in preoperative ultrasound, namely, the size of distension of the GB of more than or equal to 5 cm and the CBD caliber size of more than or equal to 6 mm was found to have no statistical significance in predicting a difficult laparoscopic cholecystectomy. This is a contrast discovery we found to the study made by Chindarkar et al., Lal et al., Corr et al., and Daradkeh et al. They have published that they noticed a moderate interrelation in anticipating a difficult laparoscopic cholecystectomy.

Several studies have attempted to form a scoring to predict a difficult laparoscopic cholecystectomy preoperatively. However, most of these studies are complex and use large number of determining factors. These studies are difficult to adapt and use in regular day-to-day practice.[22–25] In our studies, the scoring method was made in such a way that it is easy to follow and to use on regular day-to-day practice. In the study reported by Chindarkar et al., they had a 92.86% of sensitivity, 97.5% of specificity, PPV of 65.0%, NPV of 97.5%, and accuracy of 86.66% for the preoperative ultrasound score of more than or equal to 4. Whereas in this study, the sensitivity was 100.0%, specificity was 71.43%, PPV of 40.0%, NPV of 100.0%, and 76.0% accuracy for preoperative ultrasound scores more than or equal to 4 as a criterion to predict a difficult laparoscopic cholecystectomy with $p = 0.000$.

The difficulties we faced in our study intraoperatively are the presence of dense peri GB adhesions and frozen Calot's triangle. There was a minimal tear in the GB during dissection which accounted for bile and stone spillage. In our study, there was no injury made to the hepatic duct, CBD, and hepatic artery. We did not have bleeding that hindered the visual field, buried or intrahepatic GB. In this study, there were no conversions to open cholecystectomy. All 100 patients have had a standard laparoscopic cholecystectomy. Our observation made from the study agrees with other studies by Corr et al.,[15] Fried et al.,[26] Chindarkar et al.,[6] Santambrogio et al.,[17] and Daradkeh et al.,[11] that the preoperative ultrasonography finding can help in predicting a difficult laparoscopic cholecystectomy.

Conclusion

Overall critical complication rates seen in a standard laparoscopic cholecystectomy are more and seen frequently when compared to traditional open cholecystectomy. Most of these complications are made due to the difficulty faced during the surgery. Therefore, it would be helpful to have some tools to recognize a difficult laparoscopic cholecystectomy preoperatively. Determining the factors that can predict a difficult laparoscopic cholecystectomy preoperatively based on ultrasound findings was the aim of our study. The primary objective of our study is to validate a cut-off score from the ultrasonography formulated scoring method in identifying a difficult laparoscopic cholecystectomy. Finding the most notable and remarkable criterion in ultrasonography which is interrelated with a difficult laparoscopic cholecystectomy was our secondary objective.

A total of 100 patients who are satisfied to our inclusion criteria who were admitted for laparoscopic cholecystectomy were included

in our study. Preoperative ultrasound findings such as thickness of more than 4 mm of the wall of the GB, size of distension of the GB of more than or equal to 5 cm, the CBD caliber size of more than or equal to 6 mm, GB stone impacted at the neck, GB stone size more than or equal to 1 cm and the existence of fluid collection around the GB were given a grade of 1 or 0 based on findings being affirmative or dissent. The sums of the grade were taken and were interrelated with the difficult laparoscopic cholecystectomy. Intraoperative findings, namely, injury and damages made to the bile duct, CBD or artery, the existence of thick adhesions on the GB sides, region of the Calot's being frozen, ripped up GB and spillage of bile and stones, unusual and atypical anatomy, bleeding that hamper and obstruct the visual field and time taken of 60–120 minutes were considered as difficult laparoscopic cholecystectomy.

Four preoperative findings, namely, the thickness of more than 4 mm of the wall of the GB, GB stone impacted at the neck, GB stone size more than or equal to 1 cm, and the existence of fluid collection around the GB had statistical significance in anticipating a difficult laparoscopic cholecystectomy. An elevated preoperative ultrasonography score had shown higher chances of a difficult laparoscopic cholecystectomy. Our study also discovered that the preoperative grade of more than or equal to 4 had the highest statistical significance in anticipating a difficult laparoscopic cholecystectomy.

Preoperative ultrasound findings such as the thickness of greater than 4 mm of the wall of the GB, measurement in the length of distension of the GB of greater than or equal to 5 cm, the CBD caliber size greater than or equal to 6 mm, GB stone impacted at the neck, GB stone size more than or equal to 1 cm and the existence of fluid collection around the GB can predict a difficult laparoscopic cholecystectomy preoperatively. A cut-off score of more than or equal to 4 from the ultrasonography formulated grading method can prognosticate a difficult laparoscopic cholecystectomy. The thickness of more than 4 mm of the wall of the GB is the most statistically significant criterion in predicting a difficult laparoscopic cholecystectomy. From these observations, we conclude that preoperative ultrasonography findings have a role in predicting a difficult laparoscopic cholecystectomy.

Recommendation

Our study only compared the correlation of ultrasonography findings with the intraoperative prediction of difficult laparoscopic cholecystectomy. Our study was conducted on a limited patient population. Having a larger population will make our result more statistically significant. Also, there are very few literatures available that compared difficult laparoscopic cholecystectomy with other investigation modalities such as a contrast-enhanced computed tomography scan and magnetic resonance imaging. Hence, we would recommend a good larger population and use computed tomography scans, and magnetic resonance imaging scans to get more statistically significant results.

Limitations

The study was conducted on a limited patient population of 100. Even though the gold standard investigation of choice is ultrasound for diagnosing GB stones, it is purely an operated depended on one. A highly skilled and experienced sonologist with the latest ultrasound device can provide the best quality image and make a precise diagnosis. Hence, some degree of variation in the values of ultrasonography findings was anticipated. Laparoscopy surgery compared to open surgery needs extra time to become an expert in it and as the surgery itself a skill-based technique it differs from surgeon to surgeon. To make it to have some standard, all radiologists and surgeons with a minimum of more than 10 years of experience in their respective field were performing the investigation and the surgery.

Clinical Significance

Compared with open cholecystectomy, laparoscopic cholecystectomy has obvious advantages of reduced cost, decreased hospital length of stay, reduced morbidity, better cosmetic scar, and increased patient satisfaction. For these reasons, the laparoscopic cholecystectomy is now considered as the gold standard surgical treatment of choice for cholelithiasis. It will be useful to have some authentic factors (USG findings) to prognosticate difficulty, conversion, or complications in laparoscopic cholecystectomy.

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RESEARCH ARTICLE

The Prevalence of Malignant Tumors of the Appendix in Patients with a History of Appendectomy and its Association with Demographic and Laboratory Variables

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Received on: 01 August 2021; *Accepted on*: 06 September 2022; *Published on*: 07 December 2022

Abstract

Aim: Appendicitis is one of the major causes of acute abdominal pain and one of the most common reasons for emergency surgery. Studies have shown that those that have undergone appendectomy are more likely to develop malignant tumors of the appendix. The present study investigates the prevalence of the appendix's malignant tumors in patients with a history of appendectomy and its association with demographic and laboratory variables.

Materials and methods: This study is descriptive, in which 4940 patients with a history of appendectomy between 2011 and 2018 in Imam Reza Hospital, Kermanshah, Iran, have been studied. Initially, the patients' medical files were investigated, and the necessary demographic and laboratory information were extracted. Then, the data were analyzed by descriptive statistics, including mean and variance for quantitative variables and frequency/percentage plus two-dimensional contingency tables for qualitative variables by SPSS 21.

Results: The mean age of the patients with appendectomy was 25.50 years, and the prevalence of malignant tumors of the appendix in patients was 0.5%. Overall, 41 cases (0.8%) showed positive pathology regarding the existence of a tumor in the appendix; among them, 26 cases (0.5%) had malignant types, while 15 cases (0.3%) showed benign types. Out of the 26 cases with the appendix's malignant tumors, 14 were male (53.8%), and 12 were female (46.2%). The majority of malignant tumors of the appendix were observed in those above 50 years of age. Among the malignant tumors, 9 (34.61%) were adenocarcinoma mucinous, 6 (23.07%) were carcinoid, 5 (19.23%) were adenocarcinoma, 5 (19.23%) were malignant mucocele, and 1 (3.84%) was cystadenoma. The relationship between the number of white blood cells (WBC) and the appendix's malignant tumors was significant; the WBC count was significantly lower in those with malignant tumors compared to others. In addition, the relationship between age and the existence of malignant tumors was significant ($p = 0.025$); older individuals were significantly more likely to develop malignant tumors of the appendix compared with younger individuals. The study results did not show any significant relationship between gender and the presence of malignant tumors of the appendix ($p = 0.340$).

Conclusion: Concerning the local invasion and distant metastasis of some appendix tumors, follow-up of pathology reports by the patient (especially older ones) as well as the physician plus post-appendectomy checkup within short and regular time intervals and, if required, follow-up treatment is essential.

Keywords: Appendicitis, Appendectomy, Iran, Tumors.

World Journal of Laparoscopic Surgery (2022): 10.5005/jp-journals-10033-1530

Introduction

The appendix is an essential organ of the gut-associated lymphoid tissue system, whose physiological function is mostly unknown.[1] Some hypotheses suggest that the appendix plays a vital role in training, developing, and maturing the immune system.[2] When the appendix suffers infection and inflammation, appendicitis occurs, which is one of the most common acute abdominal diseases requiring surgery.[3] The risk of mortality in acute appendicitis has been reported 7–8%.[4] In the United States, around 77,000 people develop appendicitis every year, incurring 680 million dollars to the government.[5] The incidence of appendicitis throughout the lifetime is 8.6% and 6.7% for men and women, respectively.[6] The prevalence of appendicitis differs across various populations, regions, and ages.[7] Although lymphoid hyperplasia and fecalith are the most common factors underlying acute appendicitis, other factors have also been identified, including pinworms and tumors as the etiological factors.[8] Despite antibiotic treatment, laparoscopy appendectomy is established as a standard treatment for acute appendicitis.[9,10]

Appendix cancer is very rare,[11,12] yet less than 1% of those experiencing appendectomy have the chance of developing

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How to cite this article: Makhsosi BR, Darabi F, Mazaheri T, *et al*. The Prevalence of Malignant Tumors of the Appendix in Patients with a History of Appendectomy and its Association with Demographic and Laboratory Variables. World J Lap Surg 2022;15(3):235–238.

Source of support: Nil

Conflict of interest: None

appendix cancer on average.[13] Pathologically, appendix tumors are diverse, and it seems that the risk of developing various neoplasms of the appendix (except for malignant carcinoid, which involves women three times more than men) is the same for both males and females.[14] Carcinoid is the most common appendix tumor, while adenocarcinoma, lymphosarcoma, paraganglioma, and granular-cellular tumors account for only 10–20% of appendix tumors.[15] Most carcinoid tumors are asymptomatic, and on average, it usually takes 9 years to diagnose the tumor from the time of early symptoms.[16] When the tumor is located on the appendix base, it blocks the hole, whereby the patients manifest symptoms similar to those of appendicitis.[17] The present study aims to examine the prevalence of malignant tumors of the appendix and determine its association with demographic and laboratory variables in 4940 patients who have undergone appendectomy in Imam Reza Hospital in Kermanshah, Iran.

Materials and Methods

The present study is descriptive cross-sectional, with the study population consisting of all patients who had undergone appendectomy in 2011–2018 in Imam Reza Hospital in Kermanshah, Iran. The exclusion criteria included lack of pathology tests in the file, incomplete information, suffering cancers before appendectomy, metastasis to appendix before appendectomy, taking chemotherapeutic and corticosteroid drugs, radiotherapy, and use of other immunosuppressive drugs in patients with acquired immune deficiency syndrome (AIDS). From 6086 medical files of patients undergoing an appendectomy, 1146 were excluded, and eventually, 4940 files were examined. The required information, including age, gender, type of tumor, and laboratory information, was collected from these files.

Data Analysis

The Kolmogorov–Smirnov test was used to check the normality of data distribution. The data were analyzed using descriptive statistics, including mean and variance for quantitative variables and frequency/percentage plus two-dimensional contingency tables for qualitative variables by SPSS 21. The *p*-value was considered statistically significant if $p \leq 0.05$.

Results

The results indicated that most patients who had undergone appendectomy in the mentioned hospital were male (n = 3017, 61%), and the rest were female (n = 1923, 39%). The mean age of the studied patients was 25.50 ± 15.16 years. The youngest patient was a one-day-old neonate, while the oldest patient had 94 years of age. Out of all patients undergoing an appendectomy, 41 (0.8%) showed positive pathology regarding tumor in the appendix; out of them, 26 (0.5%) had malignant, while 15 (0.3%) showed benign types. Among the malignant tumors, 9 (34.61%) were adenocarcinoma mucinous, 6 (23.07%) were carcinoid, 5 (19.23%) were adenocarcinoma, 5 (19.23%) were malignant mucocele, and 1 (3.84%) was cystadenoma. Among the benign tumors, 9 (60%) were follicular hyperplasia, 3 (20%) were lymphoid hyperplasia, 1 (6.6%) was mucinous cystadenoma, 1 (6.6%) was sinus histiocytosis, and 1 (6.6%) was follicular lymphoid hyperplasia. The frequency distribution of different types of malignant and benign tumors of the appendix is presented in Table 1.

Out of the 26 cases with the appendix's malignant tumors, 14 (53.8%) were male, and 12 (46.2%) were female. The results found no significant relationship between gender and the presence of the appendix's malignant tumors (p = 0.340). The majority of cancerous cases were observed in those above 50 years of age. In addition, the relationship between age and the existence of malignant tumors was significant (p = 0.025); older individuals were significantly more likely to develop malignant tumors of the appendix compared to younger individuals (Fig. 1). The mean WBC count in those with appendectomy was 12.34 ± 4.184 Tho/μL. White blood cell count equal to and larger than 12 Tho/μL was considered positive (57.2% of cases), and below this value was regarded as negative (42.8% of cases). The relationship between the number of WBC and the appendix's malignant tumors was significant; the WBC count was significantly lower in those with malignant tumors compared to others (Fig. 2). The mean erythrocyte sedimentation rate (ESR) in

Ethics approval: Ethical approval (code: IR. KUMS. REC.1398.185) was granted from the Kermanshah University of Medical Sciences Ethics Committee.

Table 1: The frequency distribution of appendix tumors in patients undergoing appendectomy (n = 41)

Type of tumor	*Frequency*	*Percentage*
Malignant tumors		
Adenocarcinoma mucinous	9	34.61
Carcinoid	6	23.08
Adenocarcinoma	5	19.23
Mucocele	5	19.23
Cystadenoma	1	3.85
Total	26	100
Benign tumors		
Follicular hyperplasia	9	60
Lymphoid hyperplasia	3	20
Mucinous cystadenoma	1	6.7
Sinus histiocytosis	1	6.7
Follicular lymphoid hyperplasia	1	6.7
Total	15	100

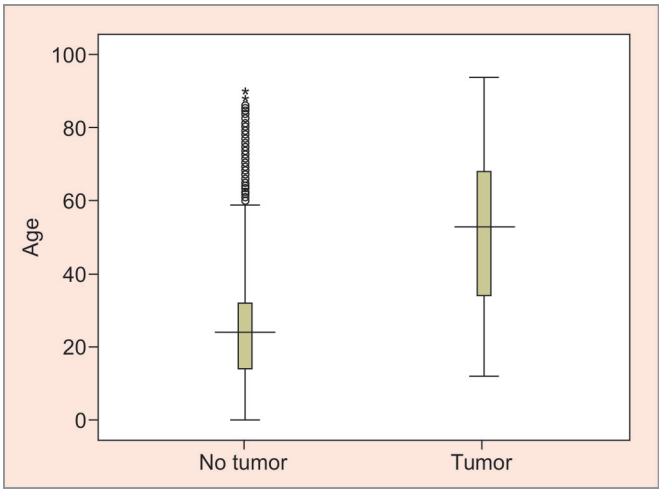

Fig. 1: Age comparison between the groups showing malignant tumors and no tumor (n = 4940)

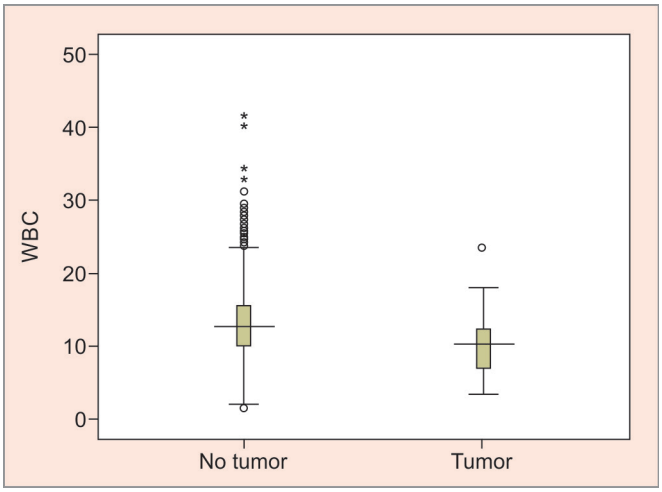

Fig. 2: Comparison of the WBC count in those with malignant tumors and no tumor ($n = 4940$)

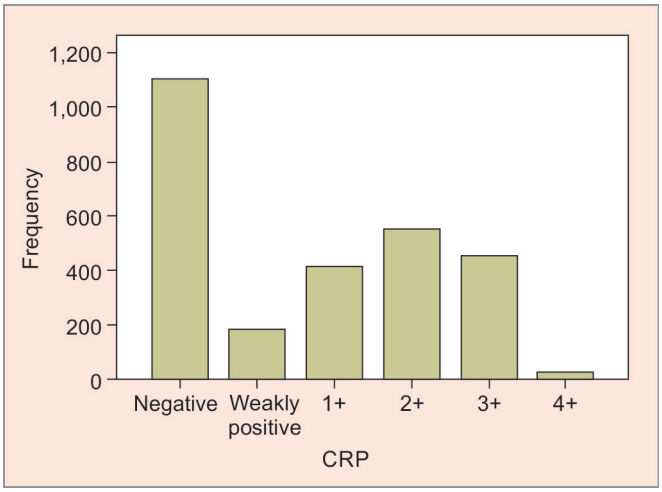

Fig. 3: CRP values in the studied population ($n = 4940$)

the studied population was 25.04 ± 23.98 mm/h. No significant relationship was observed between ESR and the presence of malignant tumors of the appendix. Moreover, the C-reactive protein (CRP) test results showed 40.4% negative and 59.6% positive cases. No significant relationship was observed between CRP level and the presence of the appendix's malignant tumors (Fig. 3).

Discussion

This study investigated the prevalence of the appendix's malignant tumors and determined the possible relationship between these tumors and demographic and laboratory variables in 4940 patients with a history of appendectomy in Imam Reza Hospital, Kermanshah. The results showed that the prevalence of the appendix's malignant tumors in those who had undergone appendectomy was 0.5%. Here, 61% of patients were male. In this regard, other studies have also shown a higher prevalence of appendectomy among men.[18] In the present research, the primary type of malignant tumor was mucinous adenocarcinoma (34.61%), followed by carcinoid tumor (23.07%). The prevalence of carcinoid tumors in this study across the entire population was 0.0012%. This value is slightly lower than the value obtained in the study by Chinifroush et al. in Iran (0.0019%),[19] Vessal et al. in Iran (0.0024%),[20] Guraya et al. in Saudi Arabia (0.0058%),[21] and Tchana-Sato et al. in Belgium (0.0040%).[13] In a study performed by Ahmadi Nejad et al. in Lorestan province, Iran, the prevalence of the appendix's carcinoid tumors in those with a history of an appendectomy was reported at 0.17%.[22] Although the prevalence of carcinoid tumors in the general population of the United States has been estimated to be 1–2 per 100,000 people,[23] it seems that the actual prevalence might be higher. Note that the incidence of carcinoid tumors is often asymptomatic and can often remain so for years.[24] Based on the obtained results, although no significant relationship was found between gender and the presence of malignant tumors of the appendix, the frequency of malignant tumors was higher in men. Unlike the results obtained from the present study, other investigations have shown a higher incidence of the appendix's malignant tumors in women.[19,23,25] In our study, a significant relationship was observed between presence of malignant tumors of the appendix and age, with older individuals showing larger numbers of malignant tumors. C-reactive protein assessment in the patients showed 40.4% negative and 59.6% positive cases. No significant relationship was found between CRP level and presence of malignant tumors of appendix. C-reactive protein is an acute phase reactant synthesized by the liver in response to infection. The serum levels of this protein begin to rise 6–12 h after initiation of tissue inflammation. C-reactive protein assessment is often done easily and rapidly in laboratories, with studies showing that CRP level can confirm appendicitis with high accuracy.[26,27]

Conclusion

Since the diagnosis of malignant tumors of the appendix may not be made easily, noting some variables, including advanced age and high WBC count in the laboratory test, can help diagnose malignant tumors. Moreover, given the malignancy as well as local invasion and distant metastasis of some appendix tumors, follow-up of the pathology report by the patient (especially older individuals) as well as physician and during checkup following appendectomy within short and regular intervals and if required follow-up treatment is essential.

Acknowledgments

The proposal of this research has been approved by the Research Deputy of Kermanshah University of Medical Sciences with the code of 980527. The authors highly appreciate those who cooperated with us in this research, as well as the general surgeons of Imam Reza Hospital in Kermanshah.

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RESEARCH ARTICLE

Comparison between Laparoscopic Ventral and Posterior Mesh Rectopexy for Rectal Prolapse

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Received on: 01 September 2021; *Accepted on*: 06 September 2022; *Published on*: 07 December 2022

Abstract

Aim: Recently, laparoscopic techniques are widely used for treatment of rectal prolapse. Therefore, the present work aims to compare the results between laparoscopic ventral mesh rectopexy (LVMR) and laparoscopic posterior mesh rectopexy (LPMR) for patients suffering from rectal prolapse.

Materials and methods: This prospective study included forty-four patients with rectal prolapse admitted and managed at the Assiut University Hospitals (Assiut, Egypt) in the period between November 2016 and 31 December 2020. They were divided into two groups (22 patients in each group). Operative parameters, complications, length of hospital stay, postoperative improvement of constipation and fecal incontinence, as well as recurrence were investigated. Clinical symptoms were followed up after surgery with the mean period of 23.73 ± 14.817 months.

Results: In the presented study, the mean patient age was 42.43 ± 14.05 years. There were 14 males (6 in the LPMR group vs 8 in the LVMR group) and 30 females (16 for LPMR vs 14 for LVMR) without a significant difference in-between. Operative time was shorter in LPMR (114.09 ± 12.690 minutes) compared with LVMR (181.82 ± 15.395 minutes). No postoperative complications were observed in 81.82% of patients who underwent LPMR and 90.91% of patients who underwent LVMR. Patients who underwent LVMR showed no impotence. Wexner's constipation score was postoperatively lower in LVMR than in LPMR (6.71 ± 3.29 vs 10.78 ± 2.80; respectively) indicating the significant improvement of constipation in LVMR compared with LPMR. A significant improvement of the symptoms of obstructed defecation syndrome was observed in both groups (*p*-value = 0.0001). Gastrointestinal quality-of-life score was highly increased from 66.09 ± 9.59 to 114.23 ± 8.64 after LVMR.

Conclusion: Our study proves that LVMR is superior to LPMR in prevention of impotence, improvement of constipation as well enhancement of the quality of life. Thus, LVMR offers a safer and more effective approach for patients of all ages.

Keywords: Laparoscopic posterior mesh rectopexy, Laparoscopic ventral mesh rectopexy, Rectal prolapse.

World Journal of Laparoscopic Surgery (2022): 10.5005/jp-journals-10033-1534

Introduction

Rectal prolapse is more common in females and increases with age.[1] Rectal prolapse is either external or internal. External rectal prolapse is a circumferential protrusion of all layers of the rectum over the anal sphincter.[2] Internal rectal prolapse, as well denoted to as rectal intussusception or occult rectal prolapse, appears to be a pioneer of external rectal prolapse.[1] Many patients with rectal prolapse suffer from symptoms of constipation and fecal incontinence, leading to a significant negative impact on quality of life.[3]

Two approaches are probable. The perineal approach is related to a high recurrence rate. So, it is preferred for patients who are not candidates for an abdominal operation. Currently, the abdominal procedures convey a lower recurrence rate and improved functional outcome and they are favored over the perineal procedures.[4]

The objectives of the surgical management are to correct the anatomical abnormality and to remedy the accompanying symptoms of incontinence, pain, and constipation, with the lowest rate of complications and a reasonable recurrence rate.[4]

Laparoscopic procedures for the management of rectal prolapse have been applied in patients of all ages. Laparoscopic rectopexy is safe and effective in patients of all ages and offers a lower rate of postoperative surgical site infection and length of hospital stay.[3]

Laparoscopic ventral mesh rectopexy is widely used, especially in Europe. In 2004, this procedure was first described by Lundby and Laurberg.[5] The technique relies on correcting the descent of the posterior and middle pelvic compartments coupled with reinforcement of the vaginal septum and elevation of the pelvic floor.[6]

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How to cite this article: Sayed MM, Reyad HA, Korany M, *et al.* Comparison between Laparoscopic Ventral and Posterior Mesh Rectopexy for Rectal Prolapse. World J Lap Surg 2022;15(3):239–245.

Source of support: This study was approved by Assiut University Protocol ID: AssiutU4988 and registered at ClinicalTrials.gov ClinicalTrials ID: NCT03026738

Conflict of interest: None

Hence, the objective of this study is to compare the results between LVMR and LPMR for patients admitted to Assiut University Hospital (Assiut, Egypt) with rectal prolapse, including recurrence, improvement of incontinence and constipation, operative time, and to assess the complications of both techniques.

Materials and Methods

This is a prospective study of forty-four cases of patients with rectal prolapse admitted and managed at the Assiut University Hospitals in the period between November 2016 and 31 December 2020.

Patients were divided into two groups (22 patients per group):

- Group A had LPMR.
- Group B had LVMR.

Inclusion Criteria

All patients with rectal prolapse, either external or internal prolapse.

Exclusion Criteria

Patients with comorbidities and patients with previous complicated abdominal surgery.

Preoperative Preparation

All patients listed for operation underwent bowel preparation for 3 days before surgery in the form of low-fiber diet, followed by clear fluid intake and 2–3 enemata at the day before surgery.

- Low-molecular-weight heparin (LMWH) 12 hours before surgery for prophylaxis against deep venous thrombosis (DVT). This was in addition to the elastic compression stockings worn by patients before induction of anesthesia,
- Written consents were taken from patients explaining the details of surgery, the merits of minimally invasive surgery, and illustrating the possible complications of surgery and the probability of change to open surgery.

Type of Anesthesia

- General anesthesia

Surgical Techniques

LVMR

The patients were placed in the Lloyd–Davies position. A 30° laparoscope was placed through an umbilical Hassan port. One 10-mm operating port was put in the right iliac fossa and other 5-mm port was inserted 5 cm lateral to the umbilical port to the right side. A third assisted port was implanted in the left iliac fossa. An additional port might be inserted in the suprapubic region (Fig. 1).

A superficial peritoneal window was performed over the right part of the sacral promontory and extended caudally over the right outer border of the mesorectum down to the right side of the pouch of Douglas. In females, the vagina was retracted anteriorly, and a careful dissection of the rectovaginal septum was made down to the pelvic floor (Fig. 2).

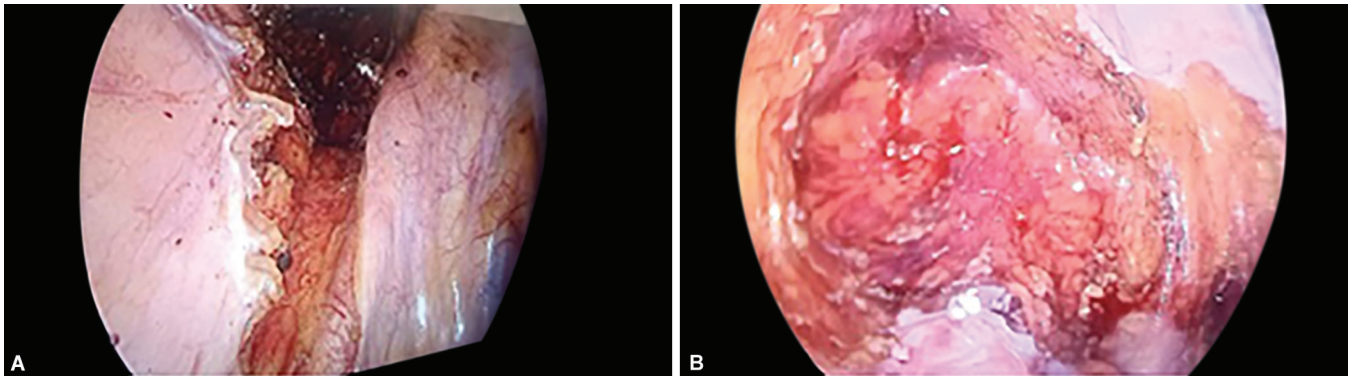
Its distal extent was confirmed by digital rectal and vaginal examination. In males, careful dissection of the rectovesical septum was done down to the perineal body. The performed dissection in this technique spared the hypogastric nerves and parasympathetic nerves from the lateral stalks and avoided the mesorectum mobilization. A strip of polypropylene (3 × 20-cm) mesh was inserted and sutured as distally as possible on the anterior rectal wall/perineal body with three, interrupted non-absorbable sutures (Fig. 3).

The posterior wall of the vagina was fixed to the mesh by nonabsorbable sutures. Then, the mesh was secured tension-free to the sacral promontory via three nonabsorbable sutures. The mesh was peritonealized by suturing the free edges of the previously divided peritoneum over the mesh to afford additional ventral elevation of the enterocele and evade small bowel adhesions to the mesh.[1]

LPMR

Laparoscopic posterior mesh rectopexy was done through mobilization of the mesorectum posteriorly from the sacral promontory to the pelvic floor. Lateral stalks were not divided. Bowel resection and circumferential division of the peritoneum were not performed in this study. A T-shaped polypropylene mesh was located with the vertical "leg" laying flush with the anterior surface of the sacrum and held to the promontory of sacrum with three nonabsorbable sutures. The mesh "wings" were closed to the lateral sides of the rectum with two absorbable sutures on each side.[2]

Fig. 1: The positions of the ports



Figs 2A and B: Dissection over the rectovaginal septum

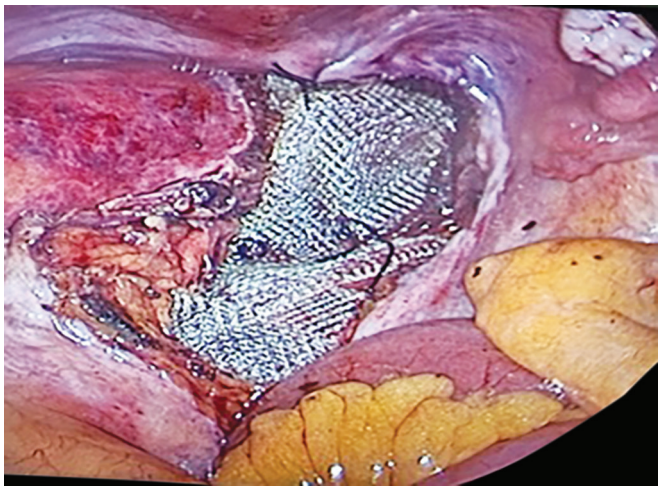


Fig. 3: Fixation of the mesh over the anterior rectal wound and sacral promontory

Postoperative Treatment

- Deep venous thrombosis prophylaxis via LMWH was continued during the hospital stay.
- Intravenous (I.V.) fluids and antibiotics (in the form of 3rd-generation cephalosporins plus metronidazole) were administered.
- Oral fluids were begun once intestinal peristalsis was recovered with progress to a normal diet as tolerated.
- The patients were discharged once they tolerate solid meals and passage of flatus or stool.

Follow-up

Intraoperative complications, early postoperative morbidity, operative time, blood loss, postoperative hospital stay, and hospital readmission were documented. All patients were reviewed in the outpatient clinic at 3-months intervals postoperatively within the first year and then annually, and evaluated for recurrence and morbidity.

Outcome Parameters

There were primary and secondary outcomes. Regarding primary outcome measures, disappearance of prolapse, recurrence, and its improvement were observed. Moreover, operative time, complications, length of hospital stay, functional outcome (constipation and continence), as well as quality of life were the secondary outcome parameters. The clinical changes after surgery were evaluated by Wexner constipation score (WCS), Browning and Parks' scale (BPS), obstructed defecation syndrome score (ODSS), as well gastrointestinal quality of life scale (GIQOL).

Statistical Analysis

Statistical Product and Service Solutions (SPSS) v26.0 Inc., Chicago, IL, USA. was utilized for data analysis. Medians, means, minimum, and maximum were the calculated quantitative data that were compared by Mann–Whitney *U* test. Qualitative data were denoted as numbers and percentages (%) and were compared by Chi-square test or Fisher's exact test when suitable. One-way ANOVA test was applied to investigate the differences in preoperative and postoperative scores within the same group. A significance level of *p*-value less than 0.05 was used in all statistical tests.

Results

Gender and Age

Of 22 patients who underwent LPMR, 6 (27.27%) were males and 16 (72.73%) were females. On the other hand, of 22 patients who underwent LVMR, there were 8 (36.36%) males and 14 (63.64%) females with no significant difference between both groups ($p = 0.747$). The patients' ages ranged from 11 to 63 years old with the mean age 42.43 ± 14.05 years and 40.5 years as a median. About 36.36% of patients were below 40-years old in group A, while about 40.91% of patients in group B with no significant difference between groups as shown in Table 1.

Clinical Presentation

Complete rectal prolapse, constipation, fecal incontinence, bleeding per rectum, obstructed defecation, and internal rectal prolapse were the common symptoms in both groups. Clinical presentation of rectal prolapse was distributed as presented in Table 2. It was noted that complete rectal prolapse (grade V) and constipation were the main clinical symptoms in group A. While, internal rectal prolapse (grades II and III), constipation, and obstructed defecation in addition to bleeding per rectum were the prominent symptoms in group B.

Operative Time

The mean operative time of both LPMR and LVMR groups was calculated. In group A, 114.09 ± 12.690 minutes were the mean operative time ± standard deviation. While 181.82 ± 15.395 minutes were that of group B. Laparoscopic posterior mesh rectopexy operation time was shorter than that of LVMR with a significant difference between operative times of both groups ($p = 0.001$).

Table 1: Age distribution in the groups

Variable	*Group A (LPMR)*	*Group B (LVMR)*	*Total*	*p-value*
Age distribution				
<40	8 (36.36%)	9 (40.91%)	17	
40–50	4 (18.18%)	6 (27.27%)	10	0.209
50–60	6 (27.27%)	7 (31.82%)	13	
>60	4 (18.18%)	0 (0%)	4	
Total	22	22	44	

Categorical data expressed by number (percentage) and compared by Chi-square test

Table 2: Clinical presentation of rectal prolapse

Clinical presentation	*Group A (LPMR)*	*Group B (LVMR)*	*Total*
Constipation	18	17	35
Fecal incontinence	4	5	9
Bleeding per rectum	9	11	20
Obstructed defecation	10	12	22
Complete rectal prolapse	14	10	24
Internal rectal prolapse	8	12	20

Categorical data expressed by number of patients

Estimated Blood Loss

The blood loss was measured for patients who underwent either LPMR or LVMR. No significant difference between the volume of the lost blood of both groups ($p = 0.598$) was observed. The results are summarized in Table 3 and represented as a bar chart in Figure 4.

Length of Hospital Stay

Regarding Table 4, there was no significant difference in hospital stay between both groups after surgery was found.

Postoperative Complications

Eighteen patients (81.82%) in group A and twenty patients (90.91%) in group B who underwent laparoscopic posterior and ventral mesh rectopexy, respectively, had no complications after surgery. However, recurrence, impotence, and discitis were recorded as postoperative complications in both groups.

Table 3: Estimated blood loss

Volume of blood lost (mL)	*Group A (LPMR)*	*Group B (LVMR)*	*Total*	*p-value*
50	6 (27.27%)	3 (13.64%)	9	
100	7 (31.82%)	6 (27.27%)	13	
150	5 (22.73%)	8 (36.36%)	13	0.598
200	4 (18.18%)	5 (22.73%)	9	
Total	22	22	44	

Categorical data expressed by number (percentage) and compared by Chi-square test

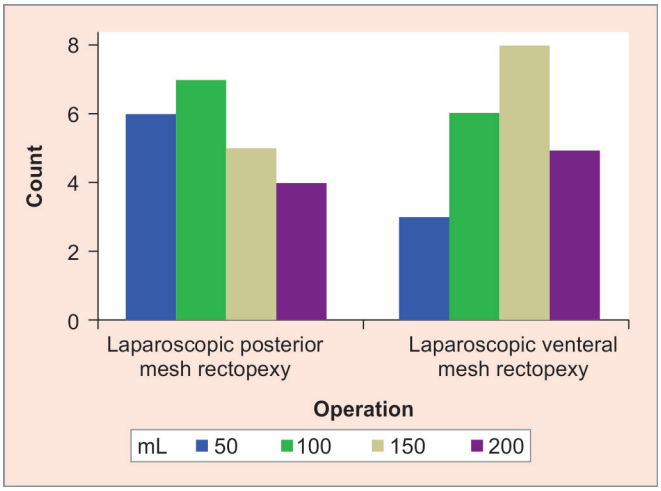


Fig. 4: Bar chart of the estimated blood loss

Table 4: Length of hospital stay

Hospital stay (days)	*Group A (LPMR)*	*Group B (LVMR)*	*Total*	*p-value*
Three	9 (40.91%)	9 (40.91%)	18	
Four	9 (40.91%)	11 (50%)	20	0.648
Five	4 (18.18%)	2 (9.09%)	6	
Total	22	22	44	

Categorical data expressed by number (percentage) and compared by Chi-square test

It was found that three patients (13.64%) in group A versus one patient (4.54%) in group B presented with recurrence. On the other hand, impotence was observed in one patient (4.54%) of group A. No impotence was recorded for group B in contrast with group A. Moreover, one patient (4.54%) in group B had discitis. Unlike group B, discitis was not reported as a postoperative complication in group A. As a result, there were no significant differences in postoperative complications between the two groups ($p = 0.142$). The results of postoperative complications are summarized in Table 5.

The four patients in both groups who suffered from recurrence were classified according to recurrence grade and recurrence-free time (Table 6). After applying the Oxford Rectal Prolapse Grading System, it was found that three patients in group A suffered from preoperative prolapse of grade V. While, the preoperative prolapse in the patient of group B was of grade IV. Three patients in group A had a recurrence-free time for 4 and 6 months, respectively. While, the patient in group B was free from rectal prolapse for 6 months.

We ordered MRI defecography once symptoms that suggest the possibility of rectal prolapse recurrence appeared. As shown in Table 6, the postoperative recurrence of one of the patients who underwent LPMR was of grade V after 4 months. The rest of patients in both groups who did not clinically improve, were followed up after 6 months by MRI defecography. It was found that the postoperative recurrence of the two patients underwent LPMR became grades III and IV. However, the patient who underwent LVMR suffered from grade III postoperative recurrence.

Clinical Changes after Surgery

Constipation, obstructed defecation syndrome, and incontinence were the main clinical symptoms that were followed up for 6–50 months after surgery with the mean period of 23.73 ± 14.817

Table 5: Postoperative complications

Postoperative complications	*Group A (LPMR)*	*Group B (LVMR)*	*Total*	*p-value*
No complication	18 (81.82%)	20 (90.91%)	38	
Recurrence	3 (13.64%)	1 (4.54%)	4	0.142
Impotence	1 (4.54%)	0 (0%)	1	
Discitis	0 (0%)	1 (4.54%)	1	
Total	22	22	44	

Categorical data expressed by number (percentage) and compared by Chi-square test

Table 6: Recurrence rate

	Group A (LPMR) n = 3			*Group B (LVMR) n = 1*
Variables	*Patient #1*	*Patient #2*	*Patient #3*	*Patient #1*
Recurrence grade* Preoperative	Grade V	Grade V	Grade V	Grade IV
Postoperative	Grade V	Grade III	Grade IV	Grade III
Recurrence-free time (months)	4	6	6	6

*Oxford rectal prolapse grading system was used

months. As shown in Table 7, improvement of constipation was higher in group B in comparison with group A.

Furthermore, one patient of group B did not improve from incontinence. Also, two patients in group B complained persistence of obstructed defecation even with correct dieting and training for proper defecation habits. Those two patients had no prolapse recurrence as shown by defecography done 3 months after presenting of symptoms. However, one patient in group A suffered from obstructed defecation syndrome that appeared 4 months after the operation. He had a prolapse recurrence on MRI defecography.

The clinical changes after surgery were evaluated by WCS, BPS, ODSS, as well as GIQOL. One-way ANOVA test was used for comparing the changes in the functional results within each group (Table 8).

Regarding WCS, it was postoperatively lower in LVMR than LPMR (6.71 ± 3.29 vs 10.78 ± 2.80, respectively). These results indicate the significant improvement of constipation in group B compared with group A. The postoperative decrease in BPS values proves the improvement of incontinence in both groups. The change was statistically significant (p-value = 0.003 and 0.004 for groups A and B, respectively). After applying ODSS, there was no difference between the results of both groups. They showed an improvement of the symptoms of obstructed defecation syndrome (p-value = 0.0001).

In group A, GIQOL score was increased from 61.00 ± 8.01 to 105.45 ± 7.54 after surgery. While the score increased from 66.09 ± 9.59 to 114.23 ± 8.64 after LVMR. The improvement is more in LVMR group and the difference is clinically significant.

Table 7: Changes in clinical symptoms after surgery

Clinical symptoms	*Group A (LPMR)*	*Group B (LVMR)*	*Total*
Constipation			
No improvement	14	3	17
Improvement	4	14	18
Total	18	17	35
Incontinence			
No improvement	0	1	1
Improvement	4	4	8
Total	4	5	9
Obstructed defecation syndrome			
No improvement	1	2	3
Improvement	9	10	19
Total	10	12	22

Categorical data expressed by number of patients

Discussion

Laparoscopic rectopexy has been verified to be as effective as open rectopexy in complete rectal prolapse treatment with a low recurrence rate. Significant reductions in postoperative pain, hospital length of stay, recovery time, and complications compared with open abdominal rectopexy were encountered. The present study compared two laparoscopic rectopexy procedures: LPMR and LVMR. The comparison involved operative parameters, complications, hospital length of stay, postoperative improvement in fecal incontinence and constipation, as well as recurrence. Between November 2016 and 31 December 2020, forty-four patients were eligible for this study with 22 patients undergoing LPMR and 22 patients undergoing LVMR.

In the present work, the mean patients' age was 42.43 ± 14.05 years. There were 14 males (6 in the LPMR group vs 8 in the LVMR group) and 30 females (16 for LPMR vs 14 for LVMR) with no significant difference in-between. In this study, the rectal prolapse incidence was higher in females. Our findings agree with those reported by Mik et al. and Madbouly and Youssef.[7,8]

It is well-known that rectal prolapse can occur as a result of many factors such as, chronic constipation or diarrhea long-term history of straining during bowel movements, the weakness of muscles, especially anal sphincter and ligaments in the rectum with age. Also, nerve damage that was caused by pregnancy, difficulty in childbirth, and anal sphincter paralysis leads to rectal prolapse.[7]

The duration of surgery is affected by numerous factors such as surgical technique, sex of the patient, intraoperative complications, surgeon's experience, and the operating team.

As regards to the operative time, it was shorter in LPMR (114.09 ± 12.690 minutes) compared with LVMR (181.82 ± 15.395 minutes) with a significant difference between the operative times of both groups (p = 0.001). These results can be explained by many reasons. In LVMR, dissection of rectovaginal septum to expose the whole anterior surface of the rectum in females and dissection in the rectovesical pouch that was held to the apex of the prostate in males spent long operative time. While mobilization of the rectum from the sacrum in LPMR was easy. Also, fixation of the mesh in LPMR was easier than that of LVMR.

Regarding postoperative complications, no complications have been observed in 81.82% of patients who underwent LPMR and 90.91% of patients who underwent LVMR. However, recurrence, impotence, and discitis were recorded as postoperative

Table 8: Functional results before and after surgery

	Group A (LPMR)			*Group B (LVMR)*		
Scoring test	*Preoperative (Mean ± SD)*	*Follow-up (Mean ± SD)*	*p-value*	*Preoperative (Mean ± SD)*	*Follow-up (Mean ± SD)*	*p-value*
WCS	14.28 ± 2.08	10.78 ± 2.80	0.0001	15.53 ± 2.24	6.71 ± 3.29	0.0001
BPS	3.50 ± 0.58	1.50 ± 0.58	0.003	3.60 ± 0.55	1.80 ± 0.84	0.004
ODSS	18.20 ± 1.99	6.00 ± 5.42	0.0001	18.92 ± 1.68	6.75 ± 5.06	0.0001
GIQOL	61.00 ± 8.01	105.45 ± 7.54	0.0001	66.09 ± 9.59	114.23 ± 8.64	0.0001

Categorical data expressed by mean ± standard deviation and compared by one-way ANOVA test
WCS, Wexner constipation score; BPS, Browning and Parks' scale; ODSS, obstructed defecation syndrome score; GIQOL, gastrointestinal quality of life scale

complications in both groups. Recurrence was found in 13.64% of patients who underwent LPMR vs 4.54% of patients who underwent LVMR. The previous studies recorded 0–21% of recurrent full-thickness rectal prolapse after LVMR.[3,9–15]

MRI defecography was done for the patients in both groups of our study who did not clinically improve. It was found that the postoperative recurrence of the three patients who underwent LPMR became grades III, IV, and V. However, the patient who underwent LVMR suffered from grade III postoperative recurrence. The recurrence might occur in elderly patients and multipara women due to weak pelvic floor muscle.

Moreover, one patient (4.54%) who underwent LVMR had discitis. Unlike LVMR, discitis was not reported as a postoperative complication in LPMR. As a result, there were no significant differences in postoperative complications between the two groups ($p = 0.142$). Our findings agree with those reported by Samaranayake et al. who observed discitis in two cases who underwent LVMR.[16]

Impotence occurred in one patient (4.54%) who underwent LPMR. No impotence was recorded for patients who underwent LVMR. Like our findings, no cases of impotence have been reported for LVMR according to Owais et al.[17] The risk of pelvic sympathetic and parasympathetic nerve damage after LPMR is considered the main cause of sexual dysfunction in men.[18,19] As reported, the risk of nerve injury should be less than 1–2% during the selection of repair procedures, especially in men.[18] Hence, our results assured that LVMR is better than LPMR in avoiding the pelvic nerve damage and impotence.

Mesh erosion into the rectum or vagina is a reported complication after laparoscopic rectopexy. The reported mesh-erosion rate ranged between 1 and 5%.[20] Infection, pervious pelvic irradiation, undiscovered vaginal injury, and large-size mesh that folds after fixation are the common causes of mesh erosion.[21] However, mesh erosion did not occur in the presented study, this may be due to the absence of long-term follow-up after surgery.

Concerning clinical changes after surgery, constipation, obstructed defecation syndrome, and incontinence were followed up for 6–50 months after surgery. In this study, improvement of constipation was higher in LVMR (82.35% improved) in comparison with LPMR (22.22% improved). Our results agreed with other reported studies stating that LVMR was superior to LPMR because of the lower risk of nerve damage and postoperative constipation.[16,22]

We found that 82.35% of patients were improved from constipation after LVMR near other reported percentages (86%, 97%, 81%, and 89%).[3,10–12]

Regarding WCS, it was postoperatively lower in LVMR than LPMR (6.71 ± 3.29 vs 10.78 ± 2.80, respectively). These results indicate the significant improvement of constipation in LVMR compared with LPMR. The postoperative constipation mechanisms might be due to: the leave of a redundant sigmoid colon that might link to yield a mechanical obstruction or due to interruption of the autonomic sympathetic innervation of the rectum, leading to a hindgut denervation inertia and distal slow transit or due to division of the lateral ligaments. Furthermore, the denervation inertia inconsistently dominates any mechanical improvement from fixation of the intussuscepting prolapse. This explained why LPMR sometimes improves and other times worsens constipation[9] Moreover, the basis of the postoperative constipation improvement in LVMR is the restriction of the mobilization to anterior rectum that leads to rectal intussusception and prevention of posterior and lateral rectal mobilization as well as denervation inertia. Our results are similar to a previous study that reported the improvement of constipation (WCS fallen from 9 to 6) after LVMR.[9]

Furthermore, one patient of group B was not improved from incontinence. The postoperative decrease in BPS values in LPMR and LVMR proved the improvement of incontinence. The change in both groups was statistically significant (p-value = 0.003 and 0.004 for groups A and B; respectively).

In a previous study, 27–90% of patients have shown an improvement of fecal incontinence that improved after LVMR.[23] Also, Dyrberg et al. have confirmed a complete improvement of incontinence in 74.4% of patients followed up 60 days after LVMR and in 86.3% improved after LPMR.[2] In conclusion, the restitution mechanism could be assisted by the improvement in rectal compliance and anorectal sensation. Also, restoration of internal anal sphincter function and postoperative constipation were important reasons for restitution.[24,25]

After applying ODSS, there was no difference between the results of both groups. A significant improvement of the symptoms of obstructed defecation syndrome was observed in both groups (p-value = 0.0001). These results agree with other reported studies[3,14,26] that stated that obstructed defecation syndrome deteriorated in 12 patients (75%) which was higher than our result (2 patients, 16.67% not improved). Defective rectal filling sensation, functional and mechanical outlet obstruction, the consumption of force at straining, and severe rectal intussusception in addition to rectocele can lead to obstructed defecation.

Additionally, GIQOL was applied. In LPMR, Gastrointestinal Quality of Life score was increased from 61.00 ± 8.01 to 105.45 ± 7.54 after surgery. While the score changed from 66.09 ± 9.59 to 114.23 ± 8.64 after LVMR. The improvement is more in the LVMR group, and the difference is clinically significant ($p = 0.0001$). About 77.78% of patients who underwent LPMR did not improve from constipation versus 17.65% of patients who underwent LVMR. This might be the reason for the worsened life quality in LPMR compared with LVMR.

Conclusion

To summarize, laparoscopic rectopexy has been proved to be as effective as open rectopexy in rectal prolapse treatment with a low recurrence rate. Laparoscopic rectopexy is preferable than open abdominal rectopexy in the reduction of postoperative pain, hospital length of stay, recovery time, and postoperative complications. Also, our study proves that LVMR is superior to LPMR in prevention of impotence, improvement of constipation, as well as enhancement of the quality of life. Thus, laparoscopic rectopexy especially LVMR, offers an effective and safe approach for patients of all ages. However, more studies with a large number of cases and long duration of follow-up are required to evaluate long-term consequences.

Acknowledgments

The authors would like to thank Dr Noha M Hosny (lecturer of pharmaceutical analytical chemistry at Faculty of Pharmacy, Assiut University, Assiut, Egypt) for her valuable contribution to performing the statistical analysis of this study and editing–reviewing this paper.

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REVIEW ARTICLE

Evolution of Surgical Management for Ulcerative Colitis in the Last Decade: A Comprehensive Literature Review

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Received on: 12 April 2022; *Accepted on*: 14 September 2022; *Published on*: 07 December 2022

Abstract

Introduction: Inflammatory bowel disease (IBD) is a term that canopies disorders which involve conditions causing chronic inflammation of the gastrointestinal tract (GIT). It mainly includes two conditions, viz.: Crohn's disease (Crohn's) and ulcerative colitis (UC). Ulcerative colitis had a high mortality rate of >50% until the mid-1950s corticosteroids were first introduced for its treatment. Since then, there have been many advances in the management of UC, with the current approach being initial treatment with pharmacological therapy and switching over to surgical management in refractory cases. Our review aimed to look at how the surgical management of UC has advanced over the last decade in various aspects.

Materials and methods: The authors searched the PubMed database in December 2021 using the search terms "IPAA for UC" and "Total Proctocolectomy for UC". After applying the inclusion and exclusion criteria, we found 57 articles that were numbered from 1 to 57 and entered in a randomizer (https://www.randomizer.org/) that gave us seven random numbers, and articles corresponding to those numbers were considered for this review.

Conclusion: Surgical management for UC has evolved toward a minimal access approach in the last decade; however, complications such as pouchitis and anastomotic leak are still some of the challenges faced in surgical management for UC. Further multicenter cohort studies comparing the rates of complications in different approaches can produce results that may further improve patient outcomes.

Keywords: Ileal pouch-anal anastomosis, Minimal access surgery, Open surgery, Surgical management of ulcerative colitis, Total proctocolectomy, Ulcerative colitis.

World Journal of Laparoscopic Surgery (2022): 10.5005/jp-journals-10033-1535

Introduction

Inflammatory bowel disease is a term that canopies disorders which involve conditions causing chronic inflammation of the GIT. It mainly includes two conditions, viz.: Crohn's disease (Crohn's) and UC. Both these conditions are associated with inflammation of the digestive tract, with two major differences between the two viz.: (1) The depth of the tissue layers involved (Crohn's involves transmural thickness of the bowel wall; UC involves only the mucosal and the submucosal layers) and (2) the extent of the GIT involved (Crohn's may involve any portion of the GIT from the mouth to the anus; UC is restricted to involving any segment from the colon distally).

First described in 1859, UC is defined by mucosal inflammation initiating in the rectum and extending proximally to involve the colon in a continuous fashion. The most common presenting symptom of this condition is bloody diarrhea; however, the diagnosis is usually a combination of clinical and histopathological evidence. For almost a century after it was first described, the condition had a withering prognosis (mortality >50%), until the mid-1950s, when corticosteroids were first used to treat UC. Today, with scientific advancements, the treatment options for UC (and IBD in general) have broadened, where the current trends include initial management with pharmacological therapies and switching over to surgical management in refractory cases.

The aim of our comprehensive review is to see how the surgical management of UC has evolved over the last decade (2010–2020) compared to the previous decade (2000–2010) in various aspects such as technique, approach, outcomes, etc.

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How to cite this article: Mehta A, Agrawal A, Sandlas G, *et al*. Evolution of Surgical Management for Ulcerative Colitis in the Last Decade: A Comprehensive Literature Review. World J Lap Surg 2022;15(3):246–248.

Source of support: Nil

Conflict of interest: None

Materials and Methods

The authors searched through the PubMed database in December 2021 using the search terms "IPAA for UC" and "Total Proctocolectomy for UC". Articles published only in the year 2010 and 2020 were considered for this review. There were 112 articles published in 2010 and 203 articles published in 2020, giving us a total of 315 articles. After applying the inclusion and exclusion criteria, we were left with 57 articles. We numbered these articles from 1 to 57, and we ran these numbers in a randomizer (https://www.randomizer.org/) which gave us a set of 7 random numbers viz.: 25, 20, 18, 30, 7, 23, and 39, and articles corresponding to these numbers were used.

The randomizer was used to avoid any selection bias in choosing the articles for review on the authors' part.

Inclusion Criteria

- Patients ≥18 years of age.
- Articles on surgical management of UC.
- Articles published in the last 6 months of 2010 and 2020.

Exclusion Criteria

- Surgical management of UC in the pediatric population.
- Articles regarding surgical management of any other gastrointestinal conditions except UC.

Discussion/Review

Ulcerative colitis is an autoimmune disease belonging to the group of IBD. First described in 1859, UC is defined by mucosal inflammation initiating in the rectum and extending proximally to involve the colon in a continuous fashion. The diagnosis is usually a combination of the clinical and histopathological evidence of the same.[1] It presents with a constellation of symptoms, the most common being bloody diarrhea. The long-standing disease can lead to dysplasia and colorectal cancer, which are some of its most serious complications, if left untreated.[2] Until the mid-1950s, when corticosteroids were first used to treat UC, the condition had a withering prognosis with >50% mortality rate among patients.[1] However, steroids are also associated with side effects like osteoporosis, osteonecrosis, weight gain, insulin resistance, increased risk of infections, etc. With the advancement of medical science, the treatment options for UC and IBD, in general, have broadened, where the current trends include initial management with medical therapies and switching over to surgical management in refractory cases. The review aimed to understand how surgery has evolved in the last decade compared to the previous decade in terms of surgical procedures, patient outcomes, quality of life, and complications. In our review, we found that the surgical procedure used for the management of UC has largely remained the same in the last decade, with the procedure of choice being restorative proctocolectomy with ileal pouch-anal anastomosis (RP-IPAA).[1] Restorative proctocolectomy with ileal pouch-anal anastomosis involves removal of the colon and rectum and establishing continuity, most commonly using a J-pouch, which is created using a loop of the small intestine. It is usually performed as a staged procedure over two or three operative occasions.[3] It best helps eliminate the need for a permanent stoma in these patients, which is associated with a better overall quality of life.[4] Since Parks and Nicholls described it for the first time in 1978, the technique has undergone several technical modifications.[4] In a study by Ikeuchi et al., where 1000 patients undergoing IPAA were followed over a period of 24 years for short-term and long-term outcomes, they demonstrated that ileal pouch-anal anastomosis (IPAA) had low rates of mortality and morbidity with pouch success rates to be 97% and 92% after 10 and 20 years, respectively.[5] With increased availability and accessibility to laparoscopic and robotic equipment, we have seen a shift in trend from open RP-IPAA to minimal access RP-IPAA.[4] This change in approach from open to minimal access has shown improved overall outcomes in patients, along with fewer associated complications, while using the same, although technically more challenging surgical procedure. There is some literature suggesting a laparoscopic approach being used to perform RP-IPAA in the previous decade as well.[4] In a study following 95 patients undergoing IPAA, McKevitt et al. reported a shift in the trend for IPAA, from an open surgical approach toward a minimal access approach over a period of 20 years (1998–2017).[6] This they attributed to potentially fewer complications as well as improved cosmesis and functional results with the latter.[6]

A retrospective review by Fajardo et al. which compared the outcomes of 55 patients undergoing laparoscopic IPAA and 69 undergoing open IPAA between April 1999 and July 2008, showed that the laparoscopic approach of IPAA was comparable to the open approach in terms of postoperative mortality and morbidity.[7] One of their significant findings was the duration of the closure of ileostomy which occurred on an average of 24.1 days sooner in the laparoscopic group compared to the open group, irrespective of patient characteristics and occurrence of postoperative complications.[7] This resulted in shorter discharge time and also helps explain the shorter length of stay (LOS) as reported by multiple trials in the past.[7] Laparoscopic IPAA was also associated with longer average operating times of 79.2 minutes compared to a conventional open procedure (266.7 minutes vs 187.5 minutes).[7] However, the study showed no significant difference between the two groups in terms of estimated blood loss, return to bowel function, readmission rates, and total complications.[7] Some of its limitations are its retrospective nature which could contribute to selection bias in patients.[7] The last decade has also seen the development of newer techniques such as Robot-assisted and hybrid IPAA, which seem very promising. As reported by Hota et al., based on a survey conducted on 2129 UC patients who underwent robotic, laparoscopic, or open IPAA, 30-day postoperative outcomes were better for minimally invasive techniques in terms of postoperative ileus, wound infections, and anastomotic leaks, but the multivariate analysis of their data shows no statistically significant difference in LOS among the three groups.[8] The minimal access approach also provided advantages in other aspects of 30-day postoperative surgical outcomes and shorter postoperative LOS, respectively.[8] Lim et al., in their institutional experience study, where they reported outcomes and impact of surgical evolution over a period of 26 years (1990–2016), also reported a shift toward minimal access technique (laparoscopic) in the last decade, with an increase in stapled IPAA (vs Hand-sewn IPAA) and modified 2-stage procedure (vs a 3 stage procedure) compared to the previous decade.[9] Their findings also show a decline in the defunctioning ileostomy rate in the last decade compared to the previous decade.[9] Over time, the use of J-pouch configuration (vs a W-pouch configuration) gained more importance, which was supported by their randomized trial findings comparing functional outcomes between the 2 configurations showing better outcomes with J-pouch compared to W-pouch.[9] They found their results to be consistent with a surgical evolution study conducted by the Leuven group, who in their study also reported decreased rates of anastomotic leak and small bowel obstruction with surgical evolution.[9,10] Lim et al., however, also reported an increase in the number of patients undergoing acute surgery, despite an increase in the use of immunomodulatory therapies over time, the reason behind this was not clear.[9] A multivariate analysis of their complications revealed that a BMI of 18.1 or more before surgery was associated with a decreased rate of anastomotic leak, while steroid use before colectomy was a risk factor that was not further elaborated on.[9] In terms of complications, Lim et al., also reported an increase in pouchitis rates which was seen in patients with a more aggressive preoperative disease, evidenced by the increased

number of surgeries being performed for acute indications, lower albumin levels before colectomy, and more patients with the extensive disease which is a known risk factor for pouchitis.[9] Limitations of the study are its unicenter, retrospective design, and a small sample size of 212 patients relative to the duration of the study (26 years).[9] Over the last decade, minimal access IPAA has evolved from a laparoscopic approach giving way to newer techniques like single incision laparoscopy surgery (SILS), natural orifice transluminal endoscopic surgery (NOTES), and robotic surgery.[11] However, there is scope for further improvement, especially in terms of minimizing complications and improving educational training, access, and feasibility of minimally invasive techniques for treating UC. Complications from IPAA such as pouch failure, small intestinal obstruction, and Crohn's disease of pouch still are some of the challenges in care provision for UC.[3,12] Perhaps, further cohort studies comparing outcomes between the open and the minimal access approach could help delineate finer differences between the two approaches which were not previously seen due to paucity of data.

Conclusion

Restorative proctocolectomy with ileal pouch-anal anastomosis has emerged as the gold standard procedure for surgical management of UC. In our review, we observed the evolution of the surgical approach from open to minimally access surgery in the last decade. It has also paved the way for recent advances such as SILS, NOTES, and robotic surgery which have shown immense potential. Although minimal access surgery is associated with better postoperative outcomes, especially in terms of return to function and cosmesis, it also requires longer operating times and specialized training. Complications such as pouchitis, anastomotic leak, and small intestinal obstruction are still some of the challenges faced in surgical treatment for UC. Further, multicenter cohort studies comparing the rates of complications in different approaches can help delineate finer differences that may help improve the overall quality of life in UC patients as we move on to the next decade.

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CASE SERIES

Laparoscopic Management of Cesarean Scar Pregnancy: A Case Series

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Received on: 25 January 2022; *Accepted on*: 06 September 2022; *Published on*: 07 December 2022

Abstract

Cesarean scar pregnancy (CSP) stands as a unique variety of ectopic gestation. The incidence is on rise ever since the steady rise with the number of cesarean (C-section) deliveries and improved technology. By means of sonography in the past few decades, there has been a rise in detection rates of CSP. Life-threatening complications, such as uterine rupture, hemorrhage, hypovolemia, and even death, are associated with CSP. Literature on scar ectopic is sparse, it is essential to report all cases of C-section scar ectopic so as to get a better understanding of its management as well as to create awareness on the possibility of this entity. In this regard, we are reporting three cases of C-section scar ectopic which were successfully managed by laparoscopy.

Keywords: Cesarean scar pregnancy, Laparoscopic excision of cesarean scar ectopic, Scar ectopic.

World Journal of Laparoscopic Surgery (2022): 10.5005/jp-journals-10033-1528

Background

Cesarean scar pregnancy stands as a unique variety of ectopic gestation where the implantation occurs within the muscle or fibrous tissue of the scar after a previous C-section. The condition was first described in 1978 by Larsen and Solomon.[1] The incidence ranges from 1 in 1800 to 1 in 2216 pregnancies.[2] Cesarean scar pregnancy accounts for 6.1% of all ectopic pregnancies, and 0.15% of pregnancies with previous scar.[3] Ever since the steady rise with the number of C-section deliveries and improved technology by means of sonography in the past few decades, there has been a rise in detection rates of CSP.

The ultrasound diagnostic criteria of scar ectopic gestation include the undermentioned:

- Anterior part of the lower uterine segment demonstrates a gestational sac within.
- An empty uterus and cervical canal.
- Absence of a layer of myometrium between the bladder wall and the sac, a crucial point in differentiating scar pregnancy from cervical pregnancy.[4]

Most of the CSPs are reported in the first trimester. Although rare, CSP can present at latter period of gestation with catastrophic complications. One case of CSP has been reported at 35 weeks of gestation during which hysterectomy had to be performed.[5]

Complications related to CSP can be serious and include uterine rupture, severe life-threatening hemorrhage, hypovolemia, and even death. If left undiagnosed, it may lead to abnormally invasive placenta and immense vascularity at the site of implantation and poor contractility of the lower segment resulting in tremendous hemorrhage which can become challenging to regulate.[1,6]

Since the literature on scar ectopic is sparse, it is essential to report all cases of C-section scar ectopic so as to get a better understanding of its management as well as to create awareness on the possibility of this entity when we are treating a pregnant woman with previous C-section with an aim to timely diagnose and treat before complications set in. In this regard, we are reporting three cases of C-section scar ectopic which were successfully managed by laparoscopy.

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How to cite this article: Virupaksha A, Patil SR, Jayashree S, *et al.* Laparoscopic Management of Cesarean Scar Pregnancy: A Case Series. World J Lap Surg 2022;15(3):249–254.

Source of support: Nil

Conflict of interest: None

Case Description

For writing these reports, oral consent was obtained from the patients.

Case 1:

- A 35-year-old $G_3P_1L_1A_1$ with a previous one C-section, presented to emergency department with complaints of intermittent bleeding per vagina and pain abdomen for one month. The previous C-section was done for fetal distress 10 years ago and an induced abortion at two months for which she underwent dilatation and curettage 2 years ago. The current pregnancy was detected by urine pregnancy test (UPT) at home after 2 months of amenorrhea.
- There was a history of over-the-counter medical termination of pregnancy (MTP) pills intake one month ago when UPT was positive and from then on, she had bleeding per vagina intermittently. She visited a local primary healthcare center (PHC) and was diagnosed as having incomplete abortion. Dilatation and curettage were attempted at the PHC, following which she bled profusely and was referred to higher center for further management.
- On examination, tachycardia and pallor were noted. Speculum examination revealed an open cervical opening in the cervix (OS) and minimal bleeding per vagina. On bimanual examination, cervix was bulky with an open OS, uterus anteverted and bilateral fornices were free and non-tender.

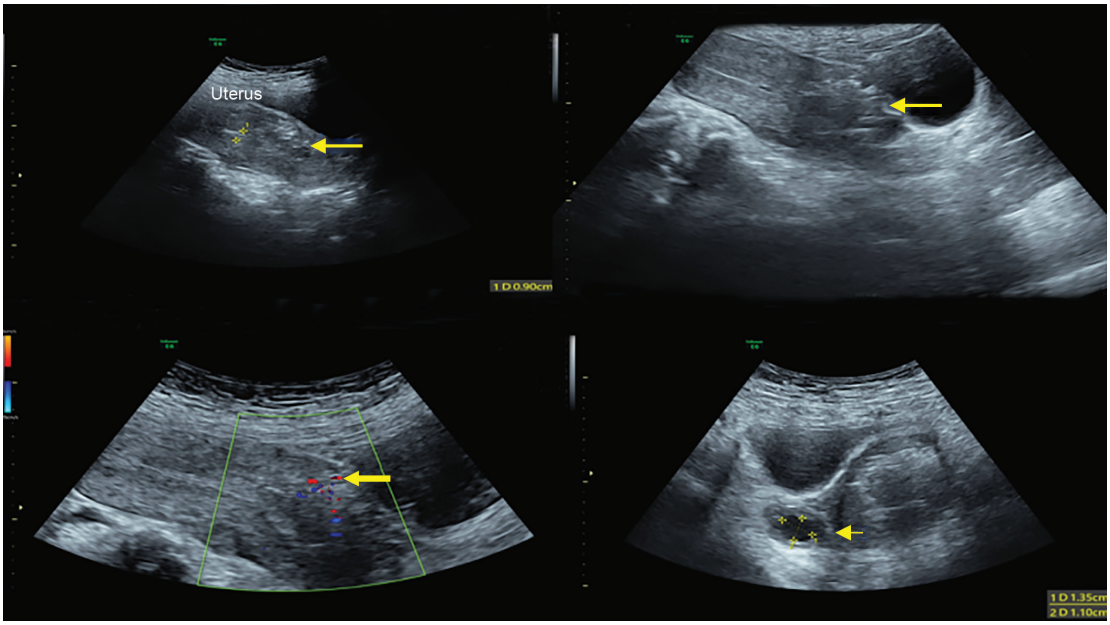


Fig. 1: TVS showing a hyperechoic lesion at the level of lower uterine segment

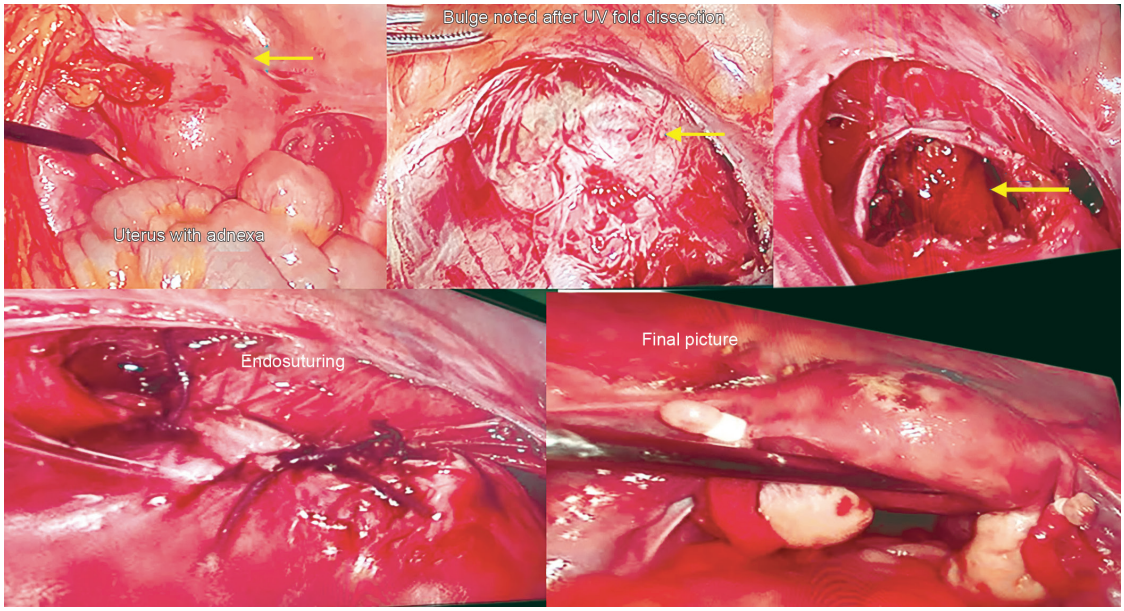
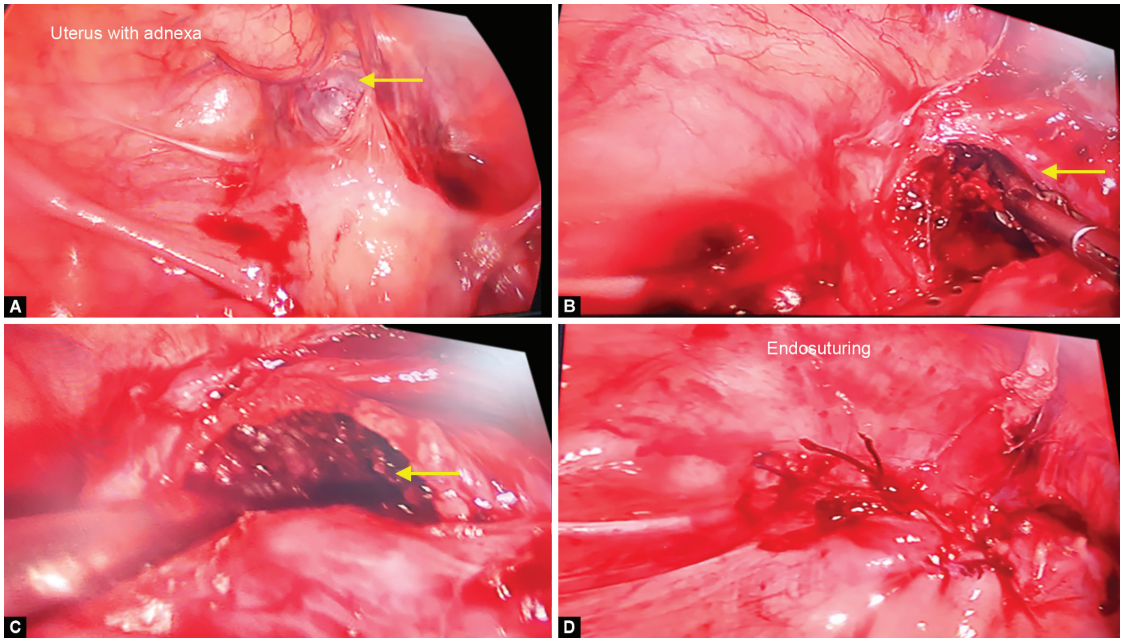


Fig. 2: Shows a bulge after dissecting UV fold of peritoneum

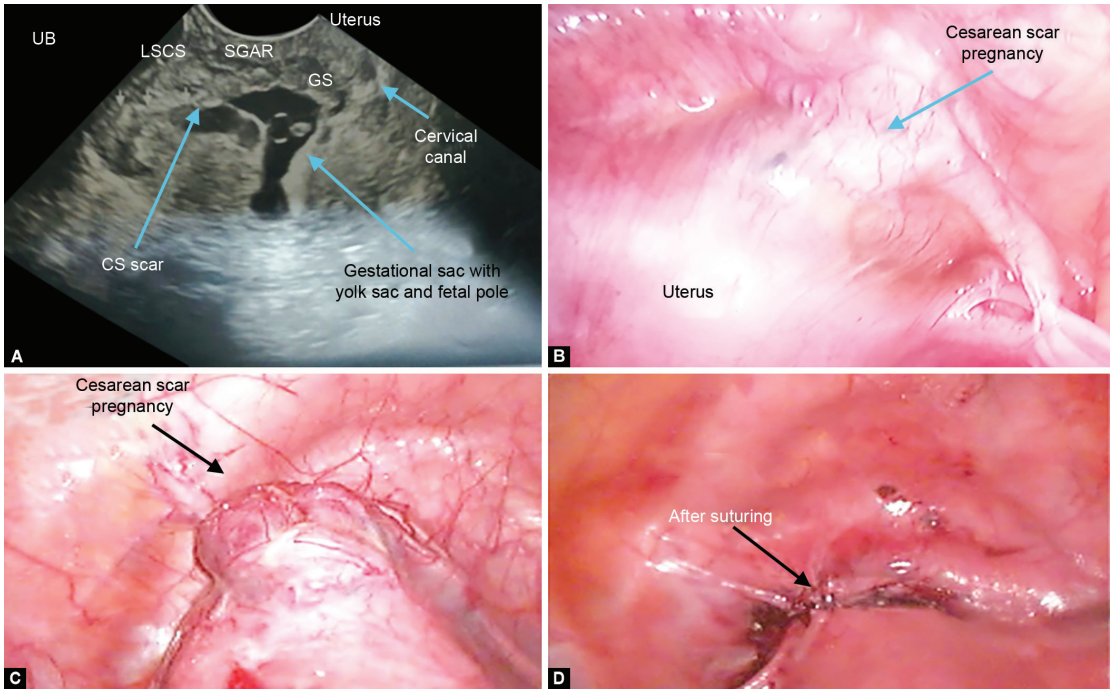
- Relevant investigations were done, beta human chorionic gonadothropin (β-hCG) level was 3112 IU/L. Ultrasound examination showed a heteroechoic, predominantly hyperechoic lesion measuring 27 mm × 13 mm in the anterior wall of lower uterine segment with posterior shadowing with increased internal vascularity and another hypoechoic cystic lesion measuring 15 mm × 12 mm adjacent to it with no intrinsic vascularity. Doppler examination showed increased internal vascularity scar ectopic (Fig. 1).
- Diagnostic laparoscopy was performed and UV fold was dissected and a soft and vascular mass was noted. Saccular structure was noted on anterior wall and lower uterine segment of 4 cm × 5 cm, incision was taken over the bulge, products of conception were gently scooped out, scar was excised and endosuturing was done. (Fig. 2) Products were sent for histopathological examination (HPE).
- Post-scar excision patient was followed up with repeat β-hCG on day 3 which was 224 IU/L, showing a declining trend. Histopathology revealed endometrial tissue with areas of hemorrhage and chorionic villi, thus confirming C-section scar ectopic pregnancy.

Case 2:

- A 35-year-old, $G_3P_2L_2$ with previous two C-sections came with history of 2.5 months of amenorrhea and a scan report of single



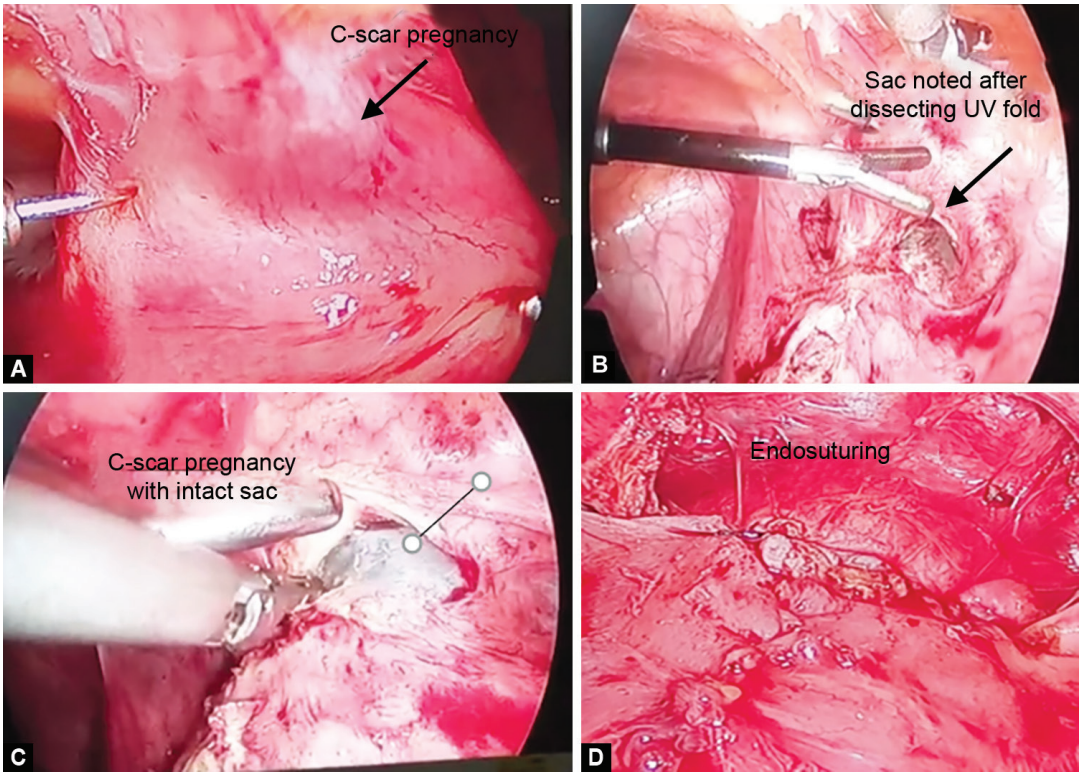
Figs 3A to D: Case 2: Intraoperative images illustrating scar ectopic and laparoscopic repair



Figs 4A to D: Case 3: Ultrasound and intraoperative images depicting scar ectopic and laparoscopic repair

live intrauterine gestation with gestational age corresponding to 10 weeks 1 day. She had taken MTP pills 2 weeks ago following which she had vaginal bleeding for 3 days. She had childbirth previously 7 and 4 years ago by full-term cesarean sections.

- On examination, the vitals were within normal limits. Abdomen was soft, non-tender. On speculum examination, closed cervical OS was noted. On bimanual examination, cervix was firm, uterus was anteverted and bilateral fornices were free and non-tender. Relevant investigations were done; hemoglobin was 9 gm/dLand β-hCG level was 15820 IU/L.
- Suction evacuation and laparoscopic tubal sterilization was planned. On suction, excessive vaginal bleeding around 250 mL was noted. Thus, uterine perforation or scar ectopic pregnancy was suspected and diagnostic laparoscopy was performed. A vascular mass of around 4 cm × 5 cm was found at the site of the previous C-section scar on left side suggestive of scar ectopic and adnexa were normal (Fig. 3). Laparoscopic scar excision and suturing and bilateral tubal sterilization was also performed. Tissue was subjected to HPE and diagnosis of C-section scar ectopic pregnancy was confirmed. Repeat β-hCG level on postoperative day 3 was 821 IU/L.



Figs 5A to D: Case 4: Intraoperative images illustrating scar ectopic and laparoscopic repair

Case 3:

- A 28-year-old $G_2P_1L_1$ presented with history of bleeding per vagina for 10 days following 2 months amenorrhea. She had taken MTP pills 15 days ago without prior ultrasound.
- On examination, she was pale with pulse rate of 98/min and BP 100/70 mm Hg. There was tenderness in suprapubic region.
- Ultrasound showed features suggestive of CSP.
- On laparoscopy, a scar ectopic of 3 cm × 5 cm was noted. Dilute vasopressin (10U in 100 mL) was injected into the myometrium near the site of the ectopic. Uterovesical fold of peritoneum was opened, bladder was pushed down and the contents of ectopic pregnancy were aspirated after incising the overlying myometrium (Fig. 4). The rent was sutured with barbed suture. The HPE revealed products of conception.

Case 4:

- A 32-year-old $G_2P_1L_1$ presented with history of 2 months amenorrhea and no other complaints. She had previous lower segment cesarean section (LSCS) done 1 year back and came for MTP.
- Ultrasound showed a low-placed gestational sac at the LSCS scar measuring 2.1 cm with fetal pole (CRL 3 mm corresponding to 5 weeks 6 days) and no cardiac activity. The myometrium over the serosal surface was thin and stretched out. The vitals were stable.

After discussing treatment options with her and taking informed consent for laparoscopic wedge excision of CSP, the procedure was carried out using intra-myometrial diluted vasopressin for minimizing blood loss (Fig. 5). The patient withstood the procedure well and HPE revealed products of conception.

Discussion

Cesarean scar ectopic pregnancy occurs when the blastocyst implants on the previous C-section scar and there is invasion of the myometrium through a microtubular tract between the C-section scar and the endometrial canal.

Types and Pathology

Cesarean scar pregnancy are classified into two different kinds based on the implantation of the blastocyst and further progression of pregnancy by Vial et al.[7] The first variety or type I CSPs also known as endogenic type, are the ones that may progress, leading to advanced gestation or even viable births as implantation in these pregnancies are occurring on the prior C-section scar with progression toward the cervico-isthmic space or even further to the uterine cavity. Life-threatening bleeding is a major complication associated with type I CSP. The second variety or the type II CSPs also known as exogenous type, are the alarming ones, as the implantation is deep into C-section scar defect and it develops deep invasion further progressing to the uterine serosa and the bladder with possible protrusion into the abdominal cavity. Type II CSPs are risky as they end up in uterine rupture, hemorrhage, shock and finally death.[1,7] It is generally becoming accepted that CSP is a precursor of abnormally adherent placenta in the second and third trimester of pregnancy. Some authors have proposed that the term CSP should be used in the first trimester, early placenta accreta in the second and morbidly adherent placenta in the third trimester of pregnancy.[8]

The prior C-section delivery is a chief factor influencing the occurrence of CSP and literature defines it as a prerequisite for CSP development. However, the effect of number of previous C-sections and placenta previa on CSP is unstated. Interestingly,

certain C-section indications in previous pregnancies are identified as risk factors for CSP, the most common one being prior C-section for breech presentation.[9]

Clinical Features

Cesarean scar pregnancy may present from as early as 5–6 weeks to as late as 16 weeks. 39% of women with CSP present with painless vaginal bleeding though CSP is an incidental finding in (37%) asymptomatic woman. About 16% of women complain of accompanying mild to moderate pain and 9% complain of only abdominal pain. Profuse vaginal bleeding with severe acute pain or tender uterus on examination hints at an impending rupture. Hemodynamic instability and/or collapse strongly implies a ruptured CSP. Clinical examination in stable women is usually unremarkable.[5]

Diagnosis

The ultrasound diagnosis of CSP should be made when the pregnancy invades myometrium in the vicinity of the internal OS. Cesarean scar pregnancies are implanted anteriorly at the visible or presumed site of transverse lower segment uterine scar. Internal OS is identified using Doppler and identifying the uterine vessels.[10]

Sensitivity of 86.4% has been estimated with combined TVUS and color Doppler. [11] The differential diagnoses include cervical ectopic pregnancy, cervico-isthmic pregnancy and inevitable abortion. MRI aids in diagnosis when ultrasound diagnosis is equivocal and patient is hemodynamically stable. Sagittal T2-weighted images may help in identifying placental implantation, bladder wall invasion and thickness of myometrium which may give us an idea of risk of rupture.[12] There are insufficient data to support a benefit of routine use of 3D ultrasound imaging for the diagnosis or management of CSP.[9]

Prognosis

Cesarean scar pregnancy is typically terminated upon confirmation of diagnosis to avoid life-threatening complications. However, a survey of 36 cases of CSP that continued under expectant management showed that, hysterectomy was performed in the second trimester in 10 cases due to genital bleeding, live offspring were delivered in 26 cases, at 26–39 weeks of gestation and hysterectomy was performed at delivery in 17 cases (only in type 1).[13]

Complications

The chorionic villi are either bound to or penetrate the myometrium in CSP unlike in case of placenta accreta where the villi invade the myometrium. This is said to be the reason for life-threatening complications associated with CSP.[5]

Treatment

The Royal College of Obstetricians and Gynecology London (RCOG)/ AEPU Green-top Guideline (No. 13) has highlighted that there is need for research on optimal treatment of CSP as there is no consensus on this. The three reported options include expectant, medical, and surgical management.[8] Duration of pregnancy, maternal vital parameters, desire to preserve fertility, skill and experience of the treating physician, and the resources available determine the treatment option to be chosen. The primary goal of treatment should be to preserve maternal health preserving fertility, the secondary goal.[9]

Expectant management is no more recommended as it may lead to severe maternal morbidity.[9,14] If the patient opts for expectant treatment, it may be considered if there is no cardiac activity. Also, the patient should be informed of the possibility of losing the pregnancy as well as hysterectomy in the event of excessive bleeding.[15]

The options for medical management of CSPs include the following:

(a) Systemic injection of methotrexate (MTX).
(b) Local injection of MTX and/or potassium chloride/ ethanol/ hyperosmolar glucose into the gestational sac.
(c) Oral mifepristone (not commonly practiced).

Hemodynamically stable patients may be offered medical management with success rates ranging between 56% and 77%. The combination of systemic and local therapy has been reported to be associated with highest success rate. The reported complications include hemorrhage (7%) and hysterectomy (3).[14,16] The risk of complications in subsequent pregnancies due to unrepaired C-section scar defect is considered as the disadvantage of medical treatment alone over surgical treatment.

Options for surgical treatment include the following:

(a) Dilatation and curettage (D&C) (success rate of 76%).
(b) Hysteroscopic/laparoscopic/vaginal/open excision of CSP (success rates: 88, 96, 97, and 99%, respectively).
(c) Hysterectomy.

The highest complication rate was noted with D&C; the risk of hemorrhage being 28%, and hysterectomy, 3%. With excision of CSP, the complication rate was much lower; risk of hemorrhage being 4% and the risk of hysterectomy, 2%.[16]

The combined medical and surgical treatment options have also been tried and have been found to be associated with higher success rates and lower complication rates. A systemic MTX may be given followed 7 days later by hysteroscopic resection or laparoscopic excision (success rate, 87%; risk of hemorrhage, 5%; and risk of hysterectomy, 0%). If there is no disappearance of blood flow around the scar on Doppler or insignificant decline in hCG, it may be prudent to give a repeat dose of MTX before surgical treatment. However, the combination of suction curettage with medical treatment does not seem to be of much benefit.[14,16]

In surgical excision of scar ectopic, wedge resection of the uterine wall is done followed by repair of the incision. This may be done with/without bilateral uterine artery occlusion. Laparoscopic approach seems to have the advantage of complete removal of the products of conception thereby reducing the follow up time. Another advantage with laparoscopic technique is excellent view of the pathology facilitating complete reconstruction and good prognosis for future pregnancies.[17] Hysteroscopy could be considered as a primary treatment modality for type I CSP.[14]

The uterine artery embolization (UAE) is another treatment option reported, being undertaken before D&C or surgical therapy and sometimes in combination with medical therapy.[16] Although reported to increase the success rate of the primary treatment, UAE has its disadvantages, namely, diminished ovarian reserve, fetal growth restriction, preterm delivery, abruption placentae, and placenta accreta.[14]

The high-intensity focused ultrasound ablation has also been reported either alone or combined with D&C in CSPs of less than 8–9 weeks in a few cases (success rate, 93%; risk of hemorrhage, 4; and risk of hysterectomy, 0%).[16] There is insufficient data comparing success rate with MTX vs UAE prior to surgical treatment in CSP. However, the blood loss was found to be lower with systemic MTX group.[18]

Future Pregnancy Prospects

Cesarean scar pregnancy is associated with long-term risks which include secondary infertility, recurrence of ectopic pregnancy, uterine rupture and placental attachment abnormalities resulting in maternal/fetal morbidity/mortality. These issues should be discussed while counselling patients who desire fertility.[4,9,12]

Cesarean scar pregnancy is an upshot of C-section, a primary cesarean scar invariably invites repeat scars and possibly more CSP. Therefore, as a preventive measure it would be prudent to monitor a primary labor well and perform a justified C-section.[6] As the rate of C-section scar ectopic pregnancies are increasing every obstetrician is very likely to come across this entity in their lifetime. Hence, in women with history of the previous C-section, early transvaginal ultrasound needs to be done to look for location of implantation and early diagnosis and early initiation of treatment.

The surgical and combination treatments are very effective, whereas medical therapy is associated with a higher risk of failure, with hemorrhage and persistence of trophoblast being the commonest issues that need to be considered in the post-treatment phase.

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CASE REPORT

Type VI Choledochal Cyst: A Rare Case Presenting with Acute Pancreatitis

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Received on: 29 June 2021; *Accepted on*: 06 September 2022; *Published on*: 07 December 2022

Abstract

Choledochal cyst (CDC) of cystic duct, i.e., choledochal cyst type VI is an extremely rare clinical entity, with few case reports only. Even the Todani classification of choledochal cyst does not include as a separate entity. Most of choledochal cyst VI is asymptomatic. For an accurate diagnosis, magnetic resonance cholangiopancreatography (MRCP) is required. There is no consensus regarding the management of the cystic duct cyst due to the rarity of the disease, but treatment alternatives extend from laparoscopic cholecystectomy to complete excision of the biliary duct with bilio-enteric reconstruction. We present a case of middle-aged woman who presented with biliary pancreatitis and managed with interval laparoscopic cholecystectomy. Choledochal cyst type VI had been identified intraoperatively.

Keywords: Acute pancreatitis, Intraoperative diagnosis, Type VI choledochal cyst.

World Journal of Laparoscopic Surgery (2022): 10.5005/jp-journals-10033-1512

Background

Choledochal cysts are focal or diffuse dilatations of a biliary tree that are believed to be congenital. They may occur as single or multiple cysts involving an extrahepatic or intrahepatic biliary tree. The incidence of 1 in 1000 persons is seen in Asia, with higher rates seen in Japan.[1] Cystic malformations of cystic ducts i.e. CDC type VI are uncommon with few cases reported in the literature. These are often misdiagnosed or undiagnosed preoperatively. Preoperative diagnosis and appropriate management require awareness of CDC type VI. In this case report, we report an instance of a 45-year-old lady presenting with acute gallstone-induced pancreatitis managed conservatively. No cystic malformation was identified preoperatively but the cystic duct cyst was identified intraoperatively and managed with laparoscopic cholecystectomy.

Case Description

A 45-year-old lady presented to the emergency department with acute onset severe pain abdomen in the epigastric region, radiating to back for the last 5 days, associated with recurrent bilious vomiting. No history of jaundice, fever, obstipation, and abdomen distension. On assessment, the patient had a pulse rate of 100 per minute, BP of 130/80 mm of Hg, respiratory rate of 20 per minute, and afebrile. Per-abdominal examination, the patient had tenderness in the epigastric region.

Investigation

Blood workup showed an elevated serum amylase level of 1265 U/L. Ultrasound of the abdomen reported cholelithiasis with multiple calculi and choledocholithiasis, but the pancreas appears normal. Contrast-enhanced CT reported grossly distended gallbladder with multiple calculi and no wall edema. Common bile duct (CBD) dilated, with a diameter of 14 mm and multiple stones in the lumen.

Treatment

She underwent ERCP and CBD clearance and stenting. The patient was treated with IV fluid and analgesics. After satisfactory clinical improvement, the patient was discharged.

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How to cite this article: Agarwal A, Jayant D, Kurdia KC, *et al*. Type VI Choledochal Cyst: A Rare Case Presenting with Acute Pancreatitis. World J Lap Surg 2022;15(3):255–257.

Source of support: Nil

Conflict of interest: None

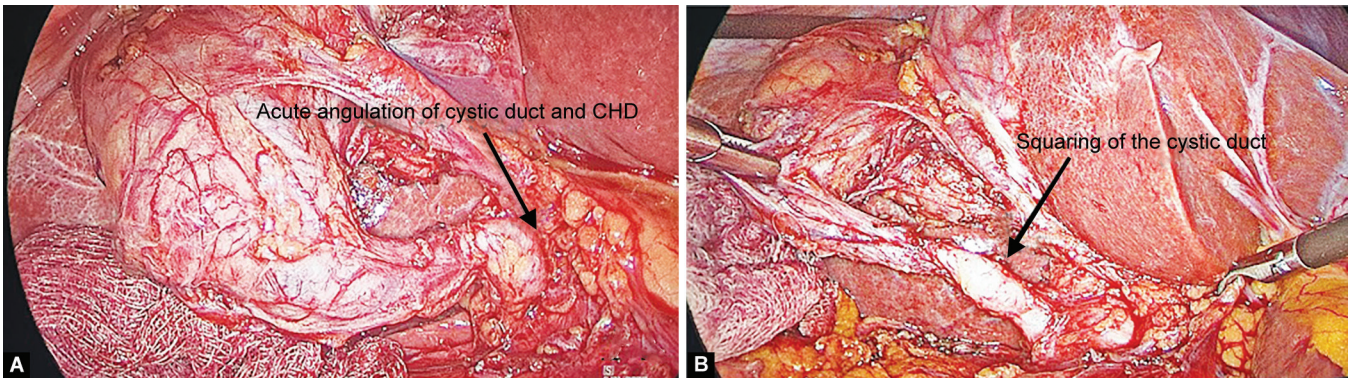
Four weeks later, she underwent laparoscopic cholecystectomy. On laparoscopy, the gallbladder was distended and mildly inflamed, Calot's triangle dissected, and critical view of safety was demonstrated. After dissection, we found that there was focal dilatation around a 10-mm cystic duct present, and proximal and distal to dilation, there was waisting present (Fig. 1). The cystic duct was completely dissected till junction to the common hepatic duct (CHD). Laparoscopic cholecystectomy was completed with an application of hemolock clip just adjacent to the junction of the cystic duct and CHD. On the cut section of the specimen, there was no evidence of any mucosal irregularities in the gall bladder and CDC.

Outcome and Follow-up

The postoperative course was uneventful. Magnetic resonance cholangiopancreatography done after 9 months of surgery showed no extrahepatic biliary cystic dilation. It showed normal intrahepatic and extrahepatic biliary systems (Fig. 2).

Discussion

Choledochal cyst is traditionally classified by Alonso-Lej and associates, which was later modified by Todani and colleagues in 1977 into five types to include intrahepatic cystic dilatation.[1] Choledochal cyst type VI was first identified by Bode and Aust in



Figs 1A and B: Laparoscopy showing choledochal cyst of the cystic duct with a narrow outlet of the cystic duct into CHD. (A) An acute angulation of the cystic duct with CHD; (B) The squaring of the cystic duct

Fig. 2: Postoperative MRCP showing normal biliary system

1983, where the patient presents with acute cholangitis.[2] It was Serradel et al. in 1991, who recommended the incorporation of cystic dilation of the cystic duct as a CDC type VI in the Todani classification.[3] In the review of literature, there are less than 50 cases reported to date. In most of the case reports, the cystic duct cyst presented as cholelithiasis and was identified intraoperatively.

A patient with a CDC VI can present to the hospital at any age. However, no sex predilection for cystic duct cyst was found in the literature of 10 cases over a period of 2 years, as reported by Maheshwari in 2012.[4]

Most of these were detected intraoperatively or occasionally on imaging for evaluation of biliary symptoms mostly epigastric and/or right hypochondrium pain. It is also reported as associated with complicated biliary disease, e.g., common hepatic duct obstruction due to the mass effect of cyst or inflammation from cholangitis, biliary pancreatitis, and rarely reported biliary cancer.[4–6]

Choledochal cyst is an established risk factor of biliary cancer and reported incidence varies and depend at age of diagnosis, the incidence of cancer is 0.7% in the patient under 10 years of age, 6–8% in the patient's second decade, and 14.3% after 20 years of age and as high as up to 50%.[7] Choledochal cyst, though rarely, is also associated with carcinoma gall bladder, periampullary carcinoma, and pancreatic carcinoma. These carcinomas should be excluded before attempting any surgical procedure. The basic principle of surgery of nonmalignant choledochal cyst requires complete excision of the cystic wall.

The diagnosis of CDC type VI requires high suspicion. Abdominal ultrasound is a good initial screening tool to identify any cystic lesion. The abnormality of the cystic duct can be localized with ultrasound by tracing its connection to the gallbladder. However, an operator-dependent property of ultrasound may fail to delineate the biliary origin of the cyst. The normal diameter of the cystic duct varies from 1 to 5 mm. A CDC of the cystic duct is defined as the diameter of the cystic duct of more than 5 mm without any evidence of biliary obstruction. Any nonvascular dilated cystic structure near the porta hepatis should be evaluated for its relationship with the CBD, cystic duct, and gallbladder and its connection with the biliary tract.[4]

CT scan helps in accessing hepatobiliary and pancreatic anatomy and evaluation of possible malignancy but failed to show pancreaticobiliary maljunction. Magnetic resonance cholangiopancreatography appears superior to CT scan for defining pancreaticobiliary maljunction. The gold standard investigation for the diagnosis of choledochal cyst is cholangiography. Cholangiography is effective in demonstrating the anatomy of the biliary tree, stone, obstruction, and pancreaticobiliary maljunction. The only disadvantage of cholangiography is that it is an invasive method.[7]

Typical radiological features of CDC type VI are acute angulation of cystic duct and common hepatic duct junction with a distinct plane, squaring and dilatation of the cystic duct, a normal or wide outlet of the cystic duct into CHD, and associated pancreaticobiliary maljunction.[4] In our patient intraoperative findings showed acute angulation of cystic duct and common hepatic duct junction with a distinct plane, squaring, and dilatation of the cystic duct, which were similar to radiological findings and confirmed the diagnosis of type VI CDC.

Treatment of cystic duct cyst includes complete excision of cystic duct cyst with cholecystectomy. For the cystic duct cyst with a narrow outlet of the cystic duct into the common hepatic duct, complete excision of the cystic duct cyst with cholecystectomy can suffice. It can be accomplished laparoscopically by clipping the cyst just adjacent to the opening in the CHD, as done in our case. Due to the presence of anatomical difficulty and associated biliary anomalies, which are seen in most reported cases in the literature, laparoscopic cholecystectomy can be done with a low threshold for conversion to open cholecystectomy.[5]

Cyst with the wide outlet of the cystic duct into the common hepatic duct, open cholecystectomy with excision of cystic duct cyst up to CHD and CBD with bilioenteric reconstruction, to remove the entire cystic epithelium. For bilioenteric reconstruction, Roux-en-Y hepaticojejunostomy is recommended. Although another method of bilioenteric reconstruction like choledochoduodenostomy can be performed.[5]

Clinical Significance

With advancements made at diagnostic tools and a better understanding of this type of pathology, more cystic lesions of cystic duct can be identified preoperatively. Preoperative diagnosis can help in better management of the patient.

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CASE REPORT

Left-sided Gallbladder: An Intraoperative Surprise during Laparoscopic Cholecystectomy

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Received on: 06 September 2021; *Accepted on*: 06 September 2022; *Published on*: 07 December 2022

Abstract

Aim: This article reports a case of the left-sided gallbladder (GB) which is more often than not an intraoperative surprise. The knowledge about the entity and associated anatomical variations is crucial to prevent complications.

Background: Cholecystectomy is a commonly performed surgical procedure. Left-sided GB is an intraoperative surprise. The reported incidence of left-sided GB is 0.04–1.1% of cases. There is an increased incidence of variant anatomy and a 7% incidence of bile duct injury in these patients.

Case description: A 29-year-old lady underwent laparoscopic cholecystectomy for symptomatic cholelithiasis. During laparoscopy, the falciform ligament was unusually stretched toward the right lobe of the liver, going to the region where one would normally see the fundus of GB. Hence, an additional 5-mm port was placed mid-way between the xiphoid process and umbilicus to the left of midline, apart from the standard ports. The fundus and the body of the GB were seen to the left of the falciform ligament. While the infundibulum of the GB was anterior and to the left of the hepatoduodenal ligament, distorting the Calot's triangle. We proceeded with the "fundus first" approach and could complete the procedure. Retraction of the fundus toward the right shoulder with a downward and a lateral traction at the infundibulum helped in Calot's dissection. The patient had an uneventful postoperative course.

Conclusion: Left-sided GB is a rare anomaly, most often detected intraoperatively. Use of an additional port and the fundus-first approach helped in successful laparoscopic completion of the procedure.

Clinical significance: This case report highlights an intraoperative surprise, a left-sided GB, encountered in laparoscopic cholecystectomy, one of the most commonly performed operations. The knowledge about the entity and the associated variations in critical structure anatomy would be crucial for the surgeons to safely complete the procedure by laparoscopic means.

Keywords: Aberrant gallbladder, Cholecystectomy, Laparoscopy, Left-sided gallbladder.

World Journal of Laparoscopic Surgery (2022): 10.5005/jp-journals-10033-1513

Background

Cholecystectomy is a commonly performed surgical procedure. Left-sided GB is an intraoperative surprise. The reported incidence of left-sided GB is 0.04–1.1% of cases. There is an increased incidence of variant anatomy and a 7% incidence of bile duct injury in these patients. Herein, we report a case of left-sided GB detected during surgery who underwent a successful completion of the procedure laparoscopically.

Case Description

A 29-year-old lady with no comorbidities presented with complaints of pain in the right hypochondrium for the last 3 months. Ultrasound evaluation suggested a single gallstone of size 1.8 cm. Her liver-function tests were normal. The patient was taken up for laparoscopic cholecystectomy after adequate pre-anesthetic evaluation. During laparoscopy, the falciform ligament was unusually stretched toward the right lobe of the liver, going to the region where one would normally see the fundus of GB. In addition, there were peri-cholecystic omental adhesions. Hence, an additional 5-mm port was placed mid-way between the xiphoid process and umbilicus to the left of the midline, apart from the standard ports. Then, the pericholecystic omental adhesions were lysed, after which the fundus and the body of the GB were seen to the left of the falciform ligament. While the infundibulum of the GB was anterior and to the left of the hepatoduodenal ligament, distorting the Calot's triangle. The Rouviere's sulcus was seen. We proceeded with the "fundus first" approach. The GB was dissected from the bed in the body region, and subsequently, the dissection was carried out toward the neck of the GB. As a next step, retraction of the fundus toward the right shoulder with a downward and a lateral traction at the infundibulum helped in Calot's dissection. The cystic artery and cystic duct were dissected and no other tubular structures were seen entering the GB. The cystic artery and the duct were clipped and divided in the usual manner. There was no bleeding encountered during the procedure. The patient had an uneventful postoperative course. She was discharged on the first postoperative day on a normal diet (Fig. 1).

Discussion

Cholecystectomy is a commonly performed procedure. The anatomical position of GB is along the Cantlie line, to the right of the falciform ligament attached to the undersurface of the liver. Gallbladder in other locations is termed aberrant GB.[1] Left-sided GB

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How to cite this article: Nachiappan M, Thota RK, Gadiyaram S. Left-sided Gallbladder: An Intraoperative Surprise during Laparoscopic Cholecystectomy. World J Lap Surg 2022;15(3):258–259.

Source of support: Nil

Conflict of interest: None

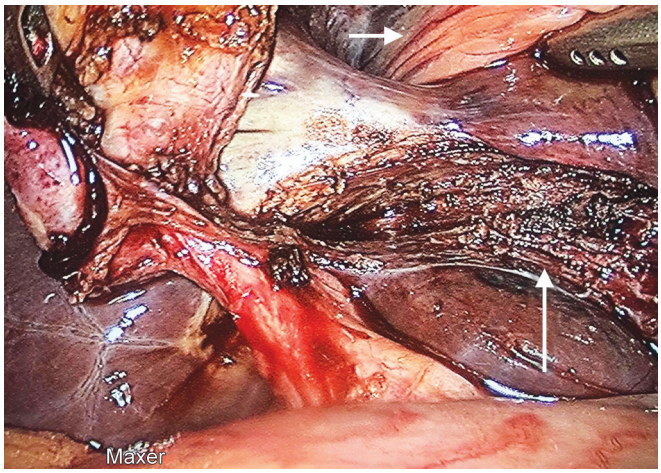

Fig. 1: Intraoperative photograph, GB dissected off the bed from the undersurface of the segment 3 of the liver (long arrow) by "fundus-first" technique. The falciform ligament (short arrow) is to the right of the GB

is a variant of aberrant GB. It can be associated with situs inversus. In the absence of situs inversus, left-sided GB could either be a true left-sided GB or an apparent left-sided GB.[1] True left-sided GB is one where the GB is in the undersurface of segment 3, and the falciform ligament is to the right of it. Whereas in an apparent left-sided GB, GB remains attached to the undersurface of segment 4, but because of the relative shift in the position of the round ligament to the right, it is identified as a left-sided GB. True left-sided GB is more commoner, constituting around 83% of 55 patients reviewed in a study by Abongwa et al.[2] The reported incidence of true left-sided GB is 0.04–1.1% of the cases undergoing cholecystectomy.[3]

Preoperative diagnosis of left-sided GB is more of a serendipity than a norm. Over 80% of the left-sided GBs are identified for the first time during surgery.[4] Lee et al. reported that, despite repeated investigation, eight out of ten patients were diagnosed with surgery.[5] In cases where a preoperative diagnosis is made, a thorough evaluation with contrast-enhanced triple-phase computed tomography of the abdomen and a magnetic resonance cholangiography is appropriate.[6] This helps in identifying any variation in the vascular and biliary anatomy of the liver.

Several variations in the anatomy are noticed in the patients with left-sided GB. These have implications whether the patient is undergoing a simple cholecystectomy or a complex liver resection.[1] Cystic-duct insertion could be into the common bile duct (CBD) or the left hepatic duct (LHD) based on the embryological pattern.[7] In a normal GB bud, which migrates and gets attached to the left liver, the cystic duct opens into the CBD. Whereas, failure of development of a right-sided GB along with a GB bud developing from the left side is associated with cystic duct opening into the LHD or the left side of the CBD. This variation is associated with atrophy of the right lobe of the liver. Apart from this, there are several variations reported in the portal venous, hepatic venous, and hepatic arterial anatomies. Lee et al. reported the aberrant anatomy that is commonly seen with the right branches of the portal vein and the hepatic veins in these patients.[5] Similarly, the biliary tree also is shown to have aberrant anatomy, including duplication and hypoplasia, in patients with left-sided GB. Bile duct injury is reported in 7% of patients with left-sided GB.[8] Therefore, a clear understanding of the arterial, venous anatomy, and the biliary tree is critical before any major biliary or hepatic surgery is contemplated in these patients.

Various technical modifications to laparoscopy have been reported for successful and safe completion of the procedure. They include placing the right-hand epigastric port to the left of the midline,[9] inserting the right-hand port after evaluation of the GB with the left-hand port for proper triangulation,[5] mirror image setup of the ports,[6] tilting the table so that the left side of the patient is up,[8] using additional ports, clipping the cystic duct as close to the infundibulum as possible,[10] fundus-first approach where the Calot's anatomy is not clear or dissection is unsafe, and finally, conversion to open surgery for safe completion of the procedure.[11] Thus, with some technical modifications, it is possible to complete the procedure by laparoscopic means. However, safety is paramount, and a low threshold for conversion should be maintained at all times.

Conclusion

Left-sided GB is a rare anomaly, most often detected intraoperatively. The use of an additional port and the fundus-first approach helped in successful laparoscopic completion of the procedure.

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CASE REPORT

Melena Post-laparoscopic Appendicectomy—One of a Kind: A Rare Case Report

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Received on: 25 October 2021; *Accepted on*: 06 September 2022; *Published on*: 07 December 2022

Abstract

Melena usually occurs as a result of an upper gastrointestinal bleed, rarely it can be due to bleeding in the small intestine and ascending colon. Appendicectomy is one of the safest procedures done with overall minimal complication rate of about 5%. In this article, we have discussed about melena post-laparoscopic appendicectomy, which is one of the rarest complications of the procedure.

Keywords: Appendicectomy, Laparoscopy, Melena.

World Journal of Laparoscopic Surgery (2022): 10.5005/jp-journals-10033-1514

Introduction

Appendicectomy can be done by open or laparoscopical approach, and is the commonest surgery performed with a very minimal complication rate.[1]

The postoperative complications are quite rare, with a mean rate of 4.6 and 3.3%, respectively, which are intra-abdominal abscesses, stump leakage, stump appendicitis, surgical site infections, seromas, wound rupture, intestinal damage, medical complications, small-bowel obstruction due to the formation of adhesions, and paralytic ileus.[2]

Though cases with rectal bleeding post appendicectomy had been reported in the literature, melena post appendicectomy is one kind of complication as melena as a cause of lower intestinal bleed is itself a rare complication.[3]

In this article, we had discussed about melena that occurred post laparoscopic appendicectomy in a young male patient and its management.

Case Description

A 28-year-old male with no known comorbidities or past surgical history, came to the surgical outpatient department with complaints of right lower abdominal pain, pricking type of pain, intermittent, and no aggravating or relieving factors. He also complained of 2 episodes of vomiting containing food particles, non-bilious, and non-blood-tinged. History of fever, 1 episode, low grade, not associated with chills or rigors, resolved spontaneously. On examination, the abdomen was soft, tenderness present over the right iliac fossa, with rebound tenderness, bowel sounds heard, and hernial orifices free. No significant findings in per-rectal examination following which ultrasound abdomen was suggestive of acute appendicitis. After routine investigations, the patient was taken up for laparoscopic appendicectomy under general anesthesia. Intraoperative inflamed appendix was found in the right iliac fossa. Histopathology of the specimen shows an appendix with mucosal ulceration. Lamina propria shows dense inflammatory composed predominantly of lymphocytes and eosinophils extending up to the muscularis propria. Serosa shows congested blood vessels (Fig. 1).

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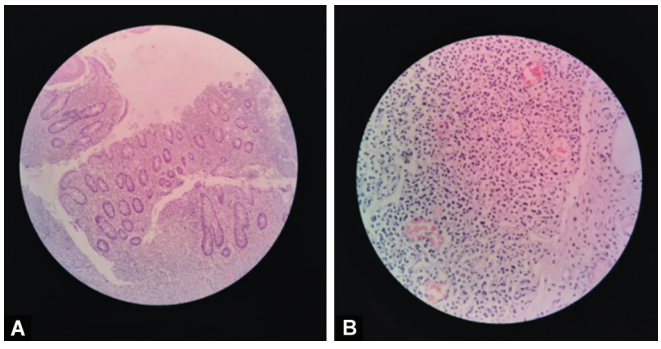
How to cite this article: Subramaniyan SG, Akshaya HB. Malena Post-laparoscopic Appendicectomy—One of a Kind: A Rare Case Report. World J Lap Surg 2022;15(3):260–261.

Source of support: Nil

Conflict of interest: None

The patient on postoperative second day complained of pain, black-colored stools suggestive of melena following which UGI scope showed normal study and CECT abdomen was taken, which showed postoperative inflammatory changes in the form of mild bowel-wall enhancement, mesenteric fat stranding, and minimal interbowel-free fluid at the ileocecal junction in the right iliac fossa. No obvious arterial bleed or pseudoaneurysms were noted. Mild post-op arterial phase blush near the post-op region was seen which might be suggestive of source of melena (Fig. 2).



Figs 1A and B: Histopathology of specimen: Lamina propria shows dense inflammatory composed predominantly of lymphocytes and eosinophils extending up to the muscularis propria. Serosa shows congested blood vessels

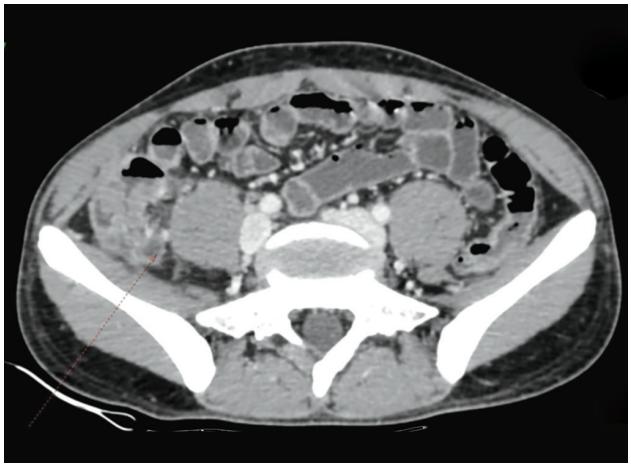


Fig. 2: CECT abdomen was taken which showed postoperative inflammatory changes in the form of mild bowel wall enhancement, mesenteric fat stranding, and minimal interbowel-free fluid at the ileocecal junction in the right iliac fossa. No obvious arterial bleed or pseudoaneurysms were noted. Mild post-op arterial phase blush near the post-op region was seen, which might be suggestive of the source of melena

Melena post appendicectomy is one of the rarest complications. Only a handful number of cases have been reported about lower GI bleed post appendicectomy as mentioned by Koimtzis et al.,[4] but melena post appendicectomy had never been reported in literature. In our case, upper gastrointestinal bleeding was ruled out as the cause of melena by upper GI endoscope. CECT abdomen ruled out any active bleed in the abdomen or peritoneal collection, which would have caused melena. As other causes are ruled out, the probable cause of melena in our case would be stump bleed where the patient was closely monitored, where the symptoms resolved spontaneously after 5 days. Colonoscopy can also be considered if the patient develops the complication at a later stage.

Conclusion

In summary, we have presented a very unusual case of melena post appendicectomy. Although this type of complication is rarest, but if it is left unattended, the patient might end up with serious complications, also, unnecessary intervention may result in serious morbidity for the patient.

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CASE REPORT

Laparoscopic Spleen-preserving Distal Pancreatectomy for Grade III Pancreatic Injury: A Case Report

Murugappan Nachiappan[1], Ravikiran Thota[2], Srikanth Gadiyaram[3]

Received on: 03 February 2022; *Accepted on:* 08 May 2022; *Published on:* 07 December 2022

Abstract

Aim: This article reports a case of grade III pancreatic injury managed by laparoscopic spleen-preserving distal pancreatectomy (SPDP). It also discusses the management options available, the timing of surgery, and the surgical options with the review of available literature.

Background: Pancreatic surgery represents one of the most challenging areas in gastrointestinal surgery. Isolated pancreatic injury is uncommon following abdominal trauma. Pancreatic transection with duct disruption following blunt abdominal trauma could be managed by both conservative and surgical approaches. Complete pancreatic transection with duct disruption carries high morbidity and mortality. Distal pancreatic resection along with splenectomy is the preferred surgical procedure. Laparoscopic distal pancreatectomy has gained worldwide acceptance in recent years for non-traumatic cases. We report a case of grade III pancreatic injury in a 15-year-old girl managed with laparoscopic SPDP.

Case description: A 15-year-old girl presented to us with around 24 hours of blunt trauma to the upper abdomen. She was hemodynamically stable. On examination abdomen was tender and there was voluntary guarding. Evaluation with contrast-enhanced computed tomography (CECT) showed grade III pancreatic injury. There was no pneumoperitoneum. The rest of the solid organs were normal. After resuscitation in line with advanced trauma life support (ATLS) protocols, she underwent a laparoscopic SPDP after written informed consent. She made an uneventful recovery and was discharged on the sixth postoperative day. At the last follow-up, eight years after the surgery, she had no symptoms of endocrine or exocrine insufficiency.

Conclusion: Laparoscopic SPDP for pancreatic trauma, though technically demanding and time-consuming, is a feasible undertaking in hemodynamically stable patients.

Clinical significance: This case highlights that SPDP for grade III pancreatic injury could be accomplished laparoscopically. A minimally invasive approach is feasible in patients with no associated injuries and hemodynamic stability. Early diagnosis and surgical management are crucial for optimal outcomes.

Keywords: Duct disruption, Laparoscopy, Pancreas, Trauma.

World Journal of Laparoscopic Surgery (2022): 10.5005/jp-journals-10033-1542

Background

Pancreatic surgery represents one of the most challenging areas in the field of gastrointestinal surgery. Isolated pancreatic injury is uncommon following abdominal trauma. Pancreatic transection with duct disruption following blunt abdominal trauma could be managed by both conservative and surgical approaches. Complete pancreatic transection with duct disruption carries high morbidity and mortality. Distal pancreatic resection along with splenectomy is the preferred surgical procedure. Laparoscopic distal pancreatectomy has gained worldwide acceptance in recent years for non-traumatic cases. We report a case of grade III pancreatic injury in a 15-year-old girl managed with laparoscopic SPDP.

Case Description

A 15-year-old girl presented to us around 24 hours of blunt trauma to the upper abdomen. She was hemodynamically stable. On examination, the abdomen was tender and there was voluntary guarding. Evaluation with a CECT showed a hematoma at the pancreatic neck and an enhancing pancreatic tissue in the distal body and tail of the pancreas suggestive of complete pancreatic transection and ductal disruption – grade III injury (Fig. 1A). There was no pneumoperitoneum. The rest of the solid organs were normal. After resuscitation in line with ATLS protocols, she was taken up for laparoscopic SPDP under general anesthesia in a leg-split position after written informed consent. The port placement was as shown in Figure 1B. Surgery was completed as discussed in the following steps:

- **Step 1.** *Exposure of the lesser sac:* Gastrocolic omentum was taken down, hematoma visualized (Fig. 1C), and gastric traction suture was used to tag the stomach to parieties (Fig. 1D).
- **Step 2.** Evacuation of the hematoma with gentle suctioning.
- **Step 3.** *Identification of the splenic vein:* Splenoportal confluence was identified after clearing the hematoma.

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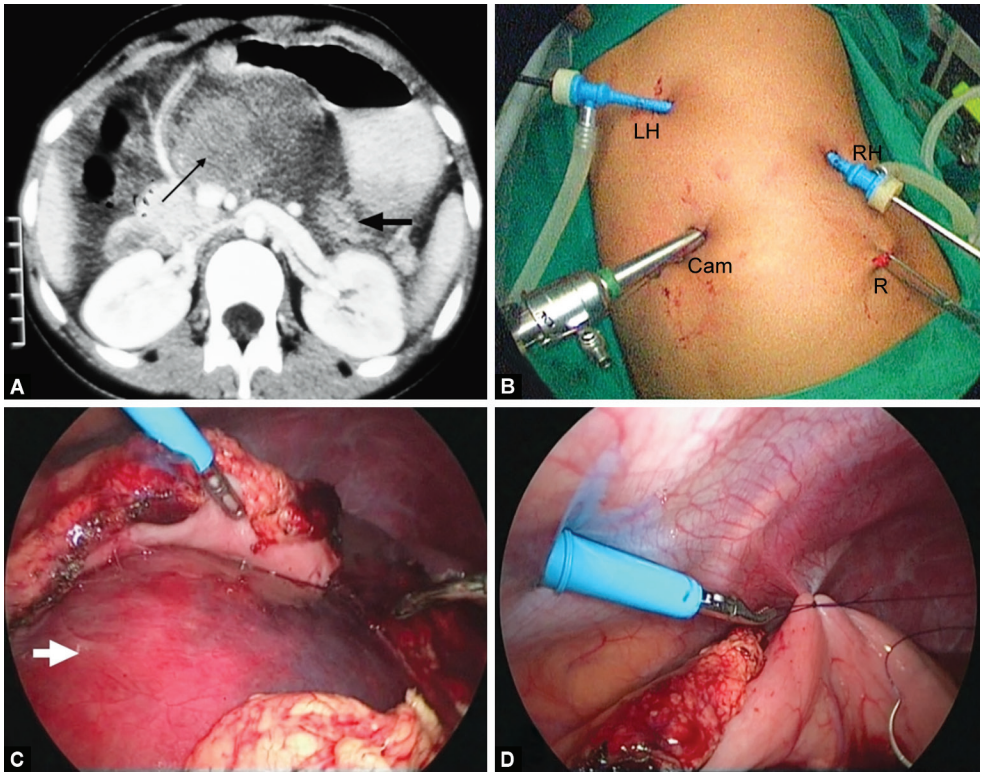
How to cite this article: Nachiappan M, Thota R, Gadiyaram S. Laparoscopic Spleen-preserving Distal Pancreatectomy for Grade III Pancreatic Injury: A Case Report. World J Lap Surg 2022;15(3): 262–265.

Source of support: Nil

Conflict of interest: None



Figs 1A to D: (A) The CECT image showing the hematoma (line arrow) at the region of the pancreatic neck and enhancing part of the pancreatic body and tail (block arrow); (B) Port placement 10 mm camera port in the supra umbilical region slightly to the left (Cam), 5 mm left-hand working port in the epigastric region (LH), 5 mm right-hand working port in the mid-axillary line (RH), and a 5 mm assistant port converted to 12 mm for stapler firing (R) and specimen extraction; (C) Hematoma (arrow) visualized on entering the lesser sac after taking down the gastrocolic omentum; (D) A gastric traction suture being placed to provide wide exposure of the lesser sac

- **Step 4.** *Dissection of the pancreatic body from the splenic artery and splenic vein:* Branches and tributaries of the splenic artery and splenic vein, respectively, were taken down with harmonic (Figs 2A to C).
- **Step 5.** A sliver of the pancreatic body attached at the cranial part near the neck of the pancreas was staple transected using 45 mm Endo GIA 3.5 mm thick cartridge.
- **Step 6.** The specimen was retrieved *via* a 12 mm port site using an endo bag (Fig. 2D).
- **Step 7.** Application of fibrin glue on the proximal transected surface of the pancreas.
- **Step 8.** A thorough peritoneal lavage was given, and an abdominal drain was placed through the right-hand working port.

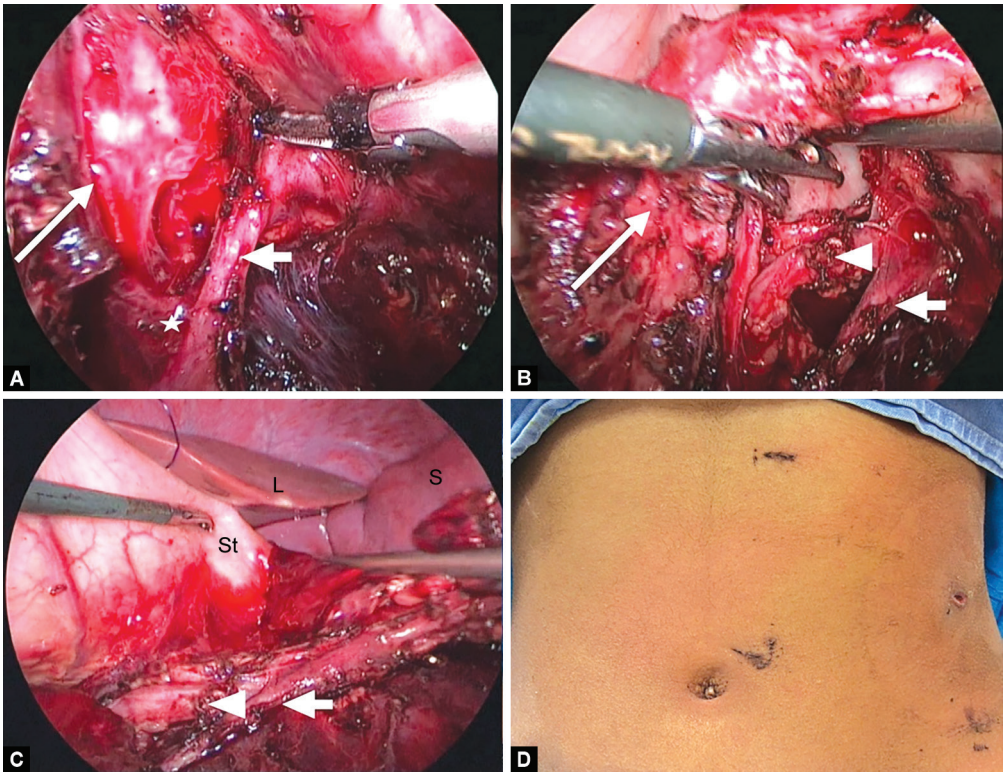
She made an uneventful recovery; the abdominal drain was removed after checking drain fluid amylase on the third postoperative day and she was discharged on the sixth postoperative day. At the last follow-up, eight years after the surgery, she had no symptoms of endocrine or exocrine insufficiency.

Discussion

Blunt abdominal trauma or penetrating trauma could lead to pancreatic injury. An isolated pancreatic injury is a rare event given the location of the pancreas in the retroperitoneum. Pancreatic injuries are classified by the American Association of the Surgery of Trauma (AAST) pancreatic organ injury scale classification into five grades based on the extent of the injury. Lesser grades (<grade II) of pancreatic trauma are not associated with a ductal injury. They are managed with conservative measures if there is no associated injury. Higher grades (≥grade III) are associated with disruption of the duct.[1] These injuries require a surgical procedure that is guided by the location, extent, associated injury to the duodenum, and the hemodynamics of the patient. Grade III AAST injury is one in which there is a hematoma with transection of the pancreas to the right of SMA along with ductal injury, like in the present case. Traditionally, surgery is the modality of choice when grade III or more AAST pancreatic organ injury scale is diagnosed.

The management of these injuries is challenging as they could have a delayed clinical presentation and there are no specific diagnostic modalities.[2] Ductal disruption could be missed on focussed assessment with sonography in trauma (FAST) evaluation. CECT is the investigation of choice in patients who are hemodynamically stable as it distinguishes between viable and non-viable pancreatic tissue.[3] The loss of ductal continuity, which, if not obvious on the CT (hematoma with viable pancreatic tissue on either side of it) could be evaluated either with magnetic resonance cholangiopancreatography (MRCP) or endoscopic retrograde cholangiopancreatography (ERCP). The ERCP could also help in the therapeutic stenting of ductal disruption. However, it may not be available at all centers emergently.

Few retrospective reviews have suggested conservative management of pancreatic trauma.[4,5] In a small retrospective analysis of a selected cohort of nine children managed with nonoperative treatment – there was no mortality but the median hospital stay was 24 days, the time to tolerate a full diet was two months, pseudocyst formation was seen in four, and



Figs 2A to D: (A) On evacuation of the hematoma, the splenic vein (block arrow) is identified and the pancreatic body (line arrow) is being dissected off the splenic vein, also seen is a tributary (star) from the pancreas to the splenic vein; (B) Body of the pancreas (line arrow) lifted off the splenic vein (block arrow) and the splenic artery (arrowhead); (C) Completed dissection of the splenic hilum demonstrating the artery (arrowhead) and the vein (block arrow); (D) Suture lines at discharge after drain removal. St: Stomach; L: Liver; S: Spleen

interventions as percutaneous drain placement was required in five patients. At follow-up, there were no insufficiencies but the scan showed an atrophic gland in 75%.[4] In another review of conservative management of 34 patients with pancreatic trauma, good clinical outcomes were demonstrated. However, the mean duration of hospital stay was 24 days, pseudocyst formation was seen in nearly half the patients, and half of these required drainage procedures. In addition, they do not delineate the grades of injury in all patients, and in graded patients, the majority fell under minor injuries.[5] Thus, there is no firm evidence to support nonoperative management in these patients and surgical management remains the treatment of choice.

Surgical management depends on the hemodynamic status of the patient and the amount of viable pancreatic tissue distal to the injury. The options include hemostasis and drainage in hemodynamically unstable to reconstructions/resections in stable patients. Reconstructions such as pancreaticojejunostomy and resections including distal pancreatosplenectomy and SPDP are based on the amount of viable tissue of the pancreas distal to the injury.[6]

Around 50% of acute pancreatitis in children is trauma induced.[7] Presentation of isolated pancreatic injury is usually delayed as the initial symptoms are vague. The timing of the intervention has a bearing on the outcomes. Surgical intervention undertaken prior to the setting-in of pancreatitis could lead to a better result. However, there is no clear definition of "early surgery."[8] In a retrospective review of 51 patients managed for pancreatic transections, Nadler et al. reported that surgery within 48 hours of the injury resulted in a significantly shorter hospital stay, whereas Meier et al. in their review found better results up to 72 hours.[2,9] Further, Lin et al. reported that all the mortality in their patients with grade III injuries was in whom the management was delayed by over 24 hours.[6] Thus, early aggressive management of pancreatic transections following pancreatic trauma reduces hospital stays, decreases complications, and expedites the return to good health.

Splenectomy is usually done along with distal pancreatic resection as it is technically less demanding and shortens the operative time. Spleen preservation can be done by two methods – the Warsaw technique and the Kimura technique. In the Warsaw technique, the splenic vessels are sacrificed like in the usual distal pancreatosplenectomy and the blood supply to the spleen is maintained by the short gastric vessels. Inherently, this method has the chance of splenic infarction and abscess formation and subsequently may require a splenectomy. In the more demanding Kimura technique, where the branches and tributaries of the splenic artery and vein, respectively, to the pancreas, are taken down, thus preserving the splenic vessels, the chances of postoperative splenic infarction are significantly less. These are well-defined for benign lesions of the body and tail of the pancreas.[10] In the setting of trauma, Eastern Association for the Surgery of Trauma (EAST) practice guidelines could not make a recommendation regarding routine splenectomy in adult patients with pancreatic trauma.[11] In the retrospective review of the trauma databank, SPDP on multivariate analysis was found to have a significantly lesser extent of hospital stays compared to those undergoing splenectomy. Complications, intensive care unit (ICU) stay and mortality were all non-significant. They recommended that in younger patients who are hemodynamically stable and those

with low injury burden, splenic preservation has to be considered if surgical expertise is available. In a review series, nine patients with grades III and IV injuries were managed with spleen preservation as compared to 22 who underwent splenectomy. There was one mortality in each group. There were fewer complications in the group undergoing splenic preservation.[6] The long-term benefits of splenic preservation have not been clearly reported in the literature. The incidence of OPSI, though lesser in cases of trauma splenectomy compared to pathological splenectomies, still remains.[12]

There have been few reports of SPDP done entirely laparoscopically or with hand-port assistance.[7,8,13–17] Improved vision during the laparoscopy may make the difficult dissection slightly easy. There is reduced postoperative pain, early recovery, and better cosmesis with laparoscopy.

Conclusion

Laparoscopic SPDP for pancreatic trauma, though technically demanding and time-consuming, is a feasible undertaking in patients who are hemodynamically stable. Early management of pancreatic transections with surgery provides good clinical outcomes.

Clinical Significance

This case highlights that SPDP for grade III pancreatic injury could be accomplished laparoscopically. Minimally invasive approach is feasible in patients with no associated injuries and hemodynamic stability. Early diagnosis and surgical management are crucial for optimal outcomes.

Orcid

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CLINICAL TECHNIQUE

Concomitant Obesity and GERD: Is Laparoscopic Sleeve Gastrectomy Still Considered the Best Option? A Clinical and Endoscopic Evaluation

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Received on: 26 January 2022; *Accepted on:* 06 September 2022; *Published on:* 07 December 2022

Abstract

Background: Obesity is a real worldwide problem. About one billion people are suffering from obesity all over the world. Two-thirds of the communities are adults, then the remaining one-third are children and adolescents. Obese patients especially those with central obesity are showing an incidence of 20–50% for preexisting gastroesophageal reflux disease (GERD).

Objectives: This article is trying to define the relationship between these items in obese patients in our community through clinical and endoscopic evaluation.

Patients and methods: This prospective study involved 61 patients who were scheduled for bariatric procedures. All patients were invited to answer a GERD questionnaire and to do upper GI endoscopy twice: once preoperative and second time 1 year postoperatively. Patients were divided into three groups regarding preexisting GERD and operative procedure.

Results: Group A patients showed significant worsening of GERD scores, endoscopic esophagitis grade, and proton pump inhibitor dependency (PPI). Group B patients showed significant improvement in GERD scores without improvement in esophagitis grade. Group C patients showed multifactorial significant improvement.

Conclusion: Laparoscopic sleeve gastrectomy (LSG) operation seems to be truly a refluxogenic procedure, while Roux-En-Y gastric bypass (RYGB) should be considered as better alternatives to avoid postoperative worsening of GERD and degree of esophagitis. These results need confirmation by studies with a bigger number of patients.

Keywords: Body mass index, Gastroesophageal reflux disease, Obesity, Sleeve gastrectomy.

World Journal of Laparoscopic Surgery (2022): 10.5005/jp-journals-10033-1517

Introduction

Obesity is a real worldwide problem. About one billion people are suffering from obesity all over the world. Two-thirds of this community are adults, and the remaining one-third are children and adolescents.[1–3]

Over the last years, a growing discussion was running around obesity as a disease. Approaching this disease with a surgical intervention was found to have a solid and reliable outcome.[4] Previously, more complicated interventions such as RYGB were planned for obesity control, while LSG was considered as only a preliminary step before a definitive procedure. Later, LSG was found to be an effective standalone simple procedure, and no need to add a further complex step.[5]

Obese patients especially those with central obesity, are showing an incidence of 20–50% of preexisting GERD.[1,2,5,6] This high association was attributed to high intra-abdominal pressure that may increase intragastric pressure, delayed gastric emptying, weak lower esophageal sphincter pressure, more frequent lower esophageal relaxations, and associated hiatus hernia (HH).[1] The presentation and endoscopic findings of GERD vary from a silent condition (10–25%), erosive esophagitis (4–34%), Barrette's esophagus (15%), and even esophageal adenocarcinoma in 0.5%.[3] In the same context, a preexisting HH in morbidly obese patients was found to reach 37–50%.[7]

On the other hand, LSG was found to be a Refluxogenic procedure. This finding was explained by the high pressure in the gastric tube, crural dissection, disturbed angle of His, and de novo HH due to migration of gastric tube toward chest cavity.[1,3] Many papers reported variable degrees of de novo GERD and de novo HH after LSG. Patients after LSG developed de novo GERD in 11–70%, de novo HH in 16–73%, and persistence of preexisting GERD in about 75–100% of cases.[1,2,6,8–10]

Evaluation of GERD is accomplished through many parameters such as clinical symptoms, pH monitoring, esophageal manometry, contrast-imaging studies, and upper GI endoscopy.[2]

The relationship between obesity, GERD, and bariatric operations was studied in many papers, but still, there is a strong debate with wide variations in its results that can be demonstrated in having no consensus around many items in this topic. This paper is trying to define the relationship between these items in obese patients in our community through clinical and endoscopic evaluation.

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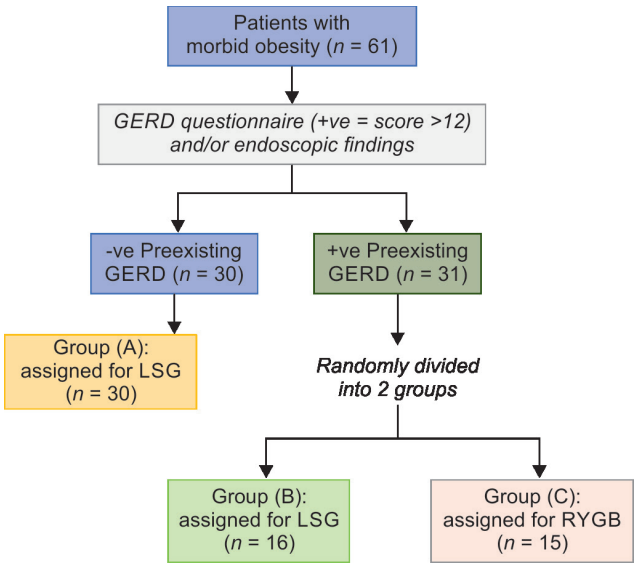
How to cite this article: Oraby EM, Harb OA, Bahbah MA. Concomitant Obesity and GERD: Is Laparoscopic Sleeve Gastrectomy Still Considered the Best Option? A Clinical and Endoscopic Evaluation. World J Lap Surg 2022;15(3):266–271.

Source of support: Nil

Conflict of interest: None

Flowchart 1: Study flowchart



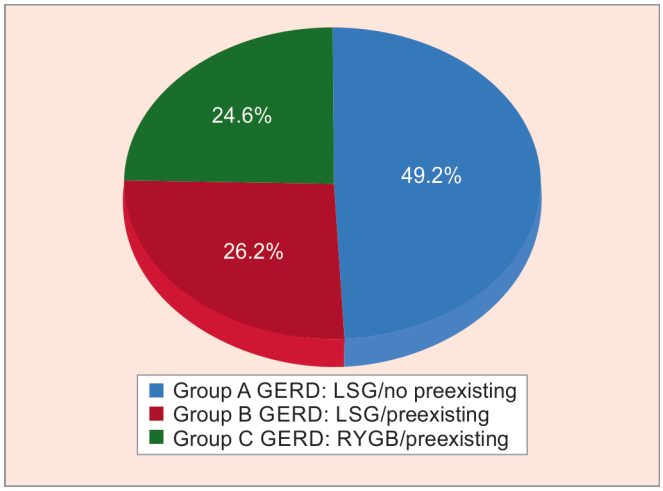


Fig. 1: Pie chart for groups

Patients and Methods

This prospective study was conducted at the Department of Surgery, Benha University Hospitals, after approval from the local Ethical Committee and after fully informed written consent signed by the patients.

This study involved patients who were scheduled for bariatric procedures from November 2017 to May 2020. All patients were invited to answer a GERD questionnaire and to do upper GI endoscopy twice: once preoperative and second time 1 year postoperatively. Sixty-one patients fulfilled these steps. Demographic data, BMI, GERD-Health Related Quality of Life (GERD-HRQL) questionnaire,[11] PPI dependency, and upper GI endoscopy findings were collected and analyzed.

After the preoperative questionnaire and intraoperative upper GI endoscopy, patients were divided into two categories. The first category included patients with no preexisting GERD (group A), and the other category included those with positive preexisting GERD. The second category was further subdivided randomly into two groups: groups B and C (Flowchart 1 and Fig. 1).

Table 1: Overall preoperative data (*n* = 61)

Age (years)	*Mean ± SD*	*36.6 ± 7.6*	*Remarks*
Gender			
Males	*n* (%)	11 (18.0)	
Females	*n* (%)	50 (82.0)	
Preoperative BMI	Mean ± SD	43.9 ± 3.6	
GERD score preop (?/30)	Mean ± SD	14.26 ± 6.7	Score ≤12 = negative
Endoscopic esophagitis			
No esophagitis	*n* (%)	30 (49.2)	No preexisting GERD in 49.2%
Grade A	*n* (%)	3 (4.9)	Preexisting GERD is 50.8% of cases
Grade B	*n* (%)	12 (19.7)	
Grade C	*n* (%)	9 (14.8)	
Grade D	*n* (%)	7 (11.5)	
Erosive esophagitis	*n* (%)	0	
PPI intake preop			
No PPI intake	*n* (%)	33 (54.1)	
Occasional intake	*n* (%)	16 (26.2)	
Daily intake	*n* (%)	12 (19.7)	

Proton pump inhibitor dependencies were defined to have regular PPI intake 5 times per week for more than 3 months.[8]

Data analyses were carried out in six subsequent steps:

(i) An overall analysis of whole-sample preoperative data.
(ii) Differential analysis of preoperative data for the three groups.
(iii) Individual analysis of each group comparing preoperative and postoperative data.
(iv) Comparing group B vs group A as they are sharing the same technique (LSG) for patients with preexisting GERD and those without preexisting GERD, respectively.
(v) Comparing group B and C patients. All of them were suffering from preexisting GERD, receiving different operations (LSG and RYGB, respectively).
(vi) Estimating the correlation between GERD score and endoscopic esophagitis in different groups.

Statistical Methods

Data management and statistical analysis were done using SPSS version 25 (IBM, Armonk, New York, United States). Quantitative data were assessed for normality using the Shapiro–Wilk test and direct data-visualization methods. According to normality testing, numerical data were summarized as means and standard deviations or medians and ranges. Categorical data were summarized as numbers and percentages. Quantitative data were compared between study groups using one-way ANOVA. Categorical data were compared using the Chi-square or Fisher's test, if appropriate. Post hoc analyses were done using Bonferroni's method. All statistical tests were two-sided. *P* values less than 0.05 were considered significant.

Results

In this study, (Table 1) 61 patients were involved, 11 males (18%) and 50 females (82%). No significant differences were noted between

Table 2: Differential preoperative data

		Groups			
		Group A (n = 30)	*Group B (n = 16)*	*Group C (n = 15)*	*p-value*
Gender					
Female	Count (%)	24 (48.0)	14 (28.0)	12 (24)	0.80
Male	Count (%)	6 (54.5)	2 (18.2)	3 (27.3)	
Age in years	Mean (SD)	35.3 (8.7)	36.6 (8.1)	39.2 (3.8)	0.28
BMI (preoperative)	Mean (SD)	44.0 (3.6)	43.5 (2.6)	44.2 (4.6)	0.85
GERD score preop	Mean (SD)	8.13 (2.6)	19.4 (3.3)	21.1 (2.8)	0.00
Preop PPI intake					
No PPI	Count (%)	30 (100)	3 (18.8)	0	
Occasional PPI	Count (%)	0	6 (37.5)	10 (66.7)	
Daily PPI	Count (%)	0	7 (43.8)	5 (33.3)	

Pearson Chi-square tests for gender, and one-way ANOVA test for age, BMI, GERD score, and esophagitis

Table 3: Group B preop–postop difference (*n* = 16)

	Preop data	*Postop data*	*Postop–preop difference*	*p-value*
	Mean (SD)	*Mean (SD)*	*Mean (SD)*	*(<0.05)*
BMI	43.5 (2.6)	32.0 (2.1)	−11.5 (1.5)	0.00
GERD score	19.4 (3.3)	16.4 (5.2)	−2.9 (4.2)	0.01
Endoscopic esophagitis	1.6 (1.4)	2.0 (1.4)	+0.4 (1.7)	0.40
PPI intake	1.1 (0.9)	0.9 (0.9)	−0.1 (1.1)	0.65

Table 4: Group C postop–preop difference

	Preop data	*Postop data*	*Postop–preop difference*	*p-value*
	Mean (SD)	*Mean (SD)*	*Mean (SD)*	*(<0.05)*
BMI	44.2 (4.6)	31.8 (3.1)	−12.4 (2.5)	0.00
GERD score	21.1 (2.8)	12.3 (1.9)	−8.7 (2.2)	0.00
Endoscopic esophagitis	3.1 (1.1)	0.8 (0.8)	−2.3 (1.1)	0.00
PPI intake	1.5 (0.5)	0.4 (0.5)	−1.1 (0.6)	0.00

the study groups (Table 2) regarding age ($p = 0.178$), gender ($p = 0.746$), and preoperative BMI (0.85). The three groups do not differ significantly from each other at the 0.05 level. On the other hand, no statistically significant difference between groups B and C regarding GERD score and endoscopic esophagitis (0.13 and 0.39, respectively) (Table 2).

Patients in a group A show a significant difference between preoperative and postoperative data, significant decrease in BMI (−11.8 ± 3.1), significant increase in GERD scores (+4.7 ± 4.8), significant increase in endoscopic esophagitis (+0.8 ± 0.8), and PPI intake (+0.3 ± 0.6). These results significantly imply that LSG is a refluxogenic operation.

Patients in group B (Table 3) show a significant decrease in BMI (−11.5 ± 1.5), significant decrease in GERD scores (−2.9 ± 4.2), statistically non-significant increase in endoscopic esophagitis (p value = 0.40), and statistically non-significant decrease in PPI intake (p value= 0.65). Patients with preexisting GERD who received LSG showed a little bit significant improvement in GERD score and also statistically non-significant worsening of endoscopic esophagitis.

Patients in group C (Table 4) show a significant decrease in BMI (−12.4 ± 2.5), statistically significant improvement in GERD scores (−8.7 ± 2.2), statistically significant improvement in endoscopic esophagitis (−2.3 ± 1.1), and statistically significant decrease in PPI intake (−1.1 ± 0.6).

Comparing group A vs group B (Table 5), both groups are matching in preoperative BMI, age, and gender. Both groups were exposed to the same operation LSG. Group A showed no preexisting GERD. Group B showed preexisting GERD. Decrease in BMI has no significant changes between both groups. So, preexisting GERD had no effect on weight loss in this study. GERD score difference showed a significantly wider gap. GERD score worsened in group A (+4.7 ± 4.8) while showed little improvement in group B (−2.9 ± 4.2). On the other hand, endoscopic esophagitis showed worsening in both groups with a narrower gap but still significant. Worsening in group A is more. Proton pump inhibitor intake also showed significant differences: worsening in group A while little improvement in group B.

Comparing between groups B and C (Table 6), both groups were matching in preoperative BMI, age, gender, and preexisting GERD. Each group was exposed to a different operation (LSG vs RYGB). Group C showed more loss in BMI but was still statistically non-significant. Both groups showed improvement in GERD score.

Table 5: Comparing group A vs group B*

	Postop–preop difference		*Postop–preop difference comparison*	*Sign.*
	Group A	*Group B*		
	Mean (SD)	*Mean (SD)*	*Mean (SE**)*	*(<0.05)*
BMI	−11.8 (3.1)	−11.5 (1.5)	0.3 (0.8)	1.00
GERD score	+4.7 (4.8)	−2.9 (4.2)	7.7 (1.3)	0.00
Endoscopic esophagitis	+0.8 (0.8)	+0.4 (1.7)	1.3 (0.37)	0.02
PPI intake	+0.3 (0.6)	−0.1 (1.1)	0.6 (0.2)	0.03

*One-way ANOVA and Post hoc test, Bonferroni method
**Standard error

Table 6: Comparing group B vs group C*

	Postop–preop difference		*Postop–preop difference comparison*	*Sign.*
	Group B	*Group C*		
	Mean (SD)	*Mean (SD)*	*Mean (SE**)*	*(<0.05)*
BMI	−11.5 (1.5)	−12.4 (2.5)	0.9 (0.9)	1.00
GERD score	−2.9 (4.2)	−8.7 (2.2)	5.8 (1.5)	0.001
Endoscopic esophagitis	+0.4 (1.7)	−2.3 (1.1)	1.5 (0.4)	0.002
PPI intake	−0.1 (1.1)	−1.1 (0.6)	0.6 (0.3)	0.06

*One-way ANOVA and Post hoc test, Bonferroni method
**Standard error

Table 7: Pearson correlation

	GERD score	*Esophagitis*	*PPI*
	Correlation (sign.)	*Correlation (sign.)*	*Correlation (sign.)*
Preop data (Groups B + C, +ve preexisting GERD, *n* = 31)			
GERD score	1.00 (–)	0.46 (0.01)	0.62 (0.00)
Esophagitis			0.28 (0.12)
Postoperative data (Groups A + B + C, *n* = 61):			
GERD score	1.00 (–)	0.48 (0.00)	0.60 (0.00)
Esophagitis			0.53 (0.00)

This improvement was more in group C (−8.7 ± 2.2). On the other hand, endoscopic esophagitis in group B showed little deterioration in endoscopic esophagitis. While group C showed improvement in endoscopic esophagitis with a statistically significant difference between the two groups. Proton pump inhibitor intake showed statistically non-significant differences (*p*-value = 0.06). Overall findings were little improvement in group B and a better improvement in group C.

Table 7 shows the significant positive intermediate correlation between GERD score and endoscopic esophagitis pre- and postoperatively (Pearson correlation 0.46 and 0.48, respectively).

The preoperative correlation between PPI and GERD score is stronger than that between PPI and endoscopic esophagitis (significant 0.62, non-significant 0.28). This reflects that PPI intake is related more to patients' symptoms. A weak correlation between PPI dependency and endoscopic esophagitis can be explained by the presence of asymptomatic cases. On the other hand, these two correlations become mostly equal of intermediate strength in postoperative data (significant 0.60, significant 0.53).

Distribution of endoscopic esophagitis among groups (Table 8): Group A patients with 100% had no preexisting esophagitis and 56.7% developed de novo esophagitis. Group B patients with 100% preexisting esophagitis, their response to LSG varied widely from the cure of esophagitis in 12.5% of patients to erosive esophagitis in 6.3%. Group C patients showed 40% clearance of esophagitis, other cases were included within low-grade esophagitis (only at grades A and B).

Discussion

Obesity is no more just a cosmetic problem. Obesity is a metabolic disease that responds well to surgical control. This area of research is rapidly growing with rapidly cumulating data that can act as a guide toward proper management.

This study was designed to evaluate the effect of LSG on patients with no preexisting GERD and those with positive preexisting GERD. A further step is to compare the effect of two bariatric procedures (LSG and RYGB) on patients with preexisting GERD, finally trying to find a correlation between patient symptoms and endoscopic findings. In other words, are preoperative and postoperative endoscopy considered routine steps with bariatric procedures?

Overall evaluation of the current sample (Table 1) found GERD incidence to be 50.8%. Most of them are in grade B and C

Table 8: Endoscopic esophagitis between groups

			Groups					
			A		B		C	
			Preop	Postop	Preop	Postop	Preop	Postop
			(N = 30)	(N = 30)	(N = 16)	(N = 16)	(N = 15)	(N = 15)
Endoscopic esophagitis	No	*n* (%)	30 (100)	13 (43.3)	0	2 (12.5%)	0	6 (40%)
	Grade A		0	11 (36.7)	2 (12.5)	4 (25.0)	1 (6.7)	6 (40.0)
	Grade B		0	5 (16.7)	8 (50.0)	5 (31.3)	4 (26.7)	3 (20.0)
	Grade C		0	1 (3.3)	2 (12.5)	3 (18.8)	7 (46.7)	0
	Grade D		0	0	4 (25.0)	1 (6.3)	3 (20.0)	0
	Erosive		0	0	0	1 (6.3)	0	0
Total			30	30	16	16	15	15

Table 9: Group A preop–postop difference

	Preop. data	*Postop. data*	*Postop–preop difference*	*p value*
	Mean (SD)	*Mean (SD)*	*Mean (SD)*	*(<0.05)*
BMI	44.0 (3.6)	32.2 (2.7)	−11.8 (3.1)	0.00
GERD score	8.1 (2.6)	12.9 (4.2)	+4.7 (4.8)	0.00
Endoscopic esophagitis	0.0	0.8 (0.8)	+0.8 (0.8)	0.00
PPI intake	0.0	0.3 (0.6)	+0.3 (0.6)	0.01

esophagitis. Intake of PPI medications was occasionally in 26.2% and daily in 19.7%. These results are matching with other reports.[1,2,5,6]

Group A patients showed significant worsening of GERD scores (+4.7 ± 4.8) and endoscopic esophagitis after LSG (postoperative de novo GERD) (Table 9).

The above results are matching with what was reported by Jorge et al.,[8] Halim,[1] and Ramon et al.[3] that patients after LSG have factors that enhance de novo GERD such as lost angle of His, crural dissection, disturbed sling fibers, the excised pad of fat, increased intragastric pressure, delayed gastric emptying, weak LES, and possible migration of gastric tube toward the negatively pressured thoracic cavity.

On the other hand, some patients after LSG with preexisting GERD (group B, Table 3) may show some benefits in GERD improvement. Those patients with preexisting GERD received LSG. The significant improvement in GERD scores is synchronous with statistically non-significant worsening of endoscopic esophagitis. One case in this group (6.3%) showed erosive esophagitis (Tables 3 and 8). Although it is still statistically non-significant but can be considered clinically significant, samples with a bigger number can be more beneficial in declaring the statistical significance. The above data in group B can be explained by decreased intra-abdominal pressure after weight loss, improved gastric emptying in some cases, and decreased ability of acid production.[3]

Group C patients (preexisting GERD patients received RYGB, Table 4), those patients showed improvement in GERD scores (−8.7 ± 2.2). Also, there was a significant improvement in esophagitis grade (−2.3 ± 1.1) and PPI intake (−1.1 ± 0.6).

These results agree with that reported by Zaina et al.[7] that RYGB is a feasible option used more frequently to treat bariatric cases with concomitant GERD.

A comparison between patients in groups A and B (Table 5) revealed that there was no effect of preexisting GERD on the weight loss after LSG.

Another comparison between patients in groups B and C (Table 6) revealed more improvement in GERD scores, PPI intake, and endoscopic esophagitis for group C patients, the above results declared that RYGB is more effective in multifactorial control against GERD persistence.

In this study, Table 7, we found a positive weak to an intermediate correlation between GERD score and endoscopic esophagitis. That may be interpreted as clinical symptoms alone cannot be considered enough for GERD evaluation especially with patients giving symptoms of preexisting GERD.

Conclusion

Treating obesity in patients with concomitant GERD should be taken carefully. Laparoscopic sleeve gastrectomy operation seems to be truly a refluxogenic procedure, while RYGB should be considered as better alternatives to avoid postoperative worsening of GERD and degree of esophagitis. Upper GI endoscopy should be considered as a routine preoperative and postoperative-assessment tool, especially for cases with clinically suspected GERD. Further studies with a bigger number of cases are recommended to stabilize this concept.

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CLINICAL TECHNIQUE

Scarless Appendectomy in Children. Is it Safe? Our Initial Single-center Experience

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Received on: 04 May 2021; *Accepted on:* 06 September 2022; *Published on:* 07 December 2022

Abstract

Purpose: Since the description of laparoscopic appendectomy, the surgeons are trying to develop techniques using less incisions. We describe our initial experience with the transumbilical laparoscopic-assisted appendectomy (TULAA) in children.

Materials and methods: A prospective, single surgeon, single-center study was conducted. The technique was described (Video). The rates of conversion of intraoperative complications and of postoperative complications were noted. Risk factors for conversion were analyzed.

Results: Forty patients were included. Conversion to a classical 3-port technique was done in 13 cases. The only intraoperative complication was an epiploic bleeding encountered in 1 patient. The only postoperative complication was an umbilical abscess in 2 patients. A scarless abdomen was noted 1 month postoperatively.

Conclusion: Transumbilical laparoscopic-assisted appendectomy had combined the exposure advantages of laparoscopy and the low cost of open surgery. Despite the small population number, it seems to be safe, reproducible, and effective, and it had superior esthetic advantages.

Clinical significance: Trans-umbilical laparoscopic-assisted appendectomy reduces the incisions needed to do an appendectomy with no increased risk in complications when compared to the traditional techniques.

Keywords: Appendectomy, Laparoscopy, Single trocar surgery.

World Journal of Laparoscopic Surgery (2022): 10.5005/jp-journals-10033-1518

Introduction

Open appendectomy, first described in the 19th century,[1] remained the treatment of choice of appendicitis till the introduction of laparoscopic appendectomy.[2] Many innovative minimal invasive techniques have been developed,[3,4] trying to decrease the number of ports used in the classical 3-port laparoscopic technique. The trans-umbilical single incision laparoscopic appendectomy uses the minimum of laparoscopic instruments for the exposure, and appendectomy is done extracorporeally like in the open technique.[5,6] Transumbilical laparoscopic-assisted appendectomy thus combines the advantageous exposure of laparoscopy and the low cost of open surgery.[7] Once a new surgical technique is adopted, assuring the safety of the technique during the learning phase might be challenging.[8] In this paper, we described the initial experience of one surgeon started adopting the TULAA. The aim was to highlight a simple and reproducible technique, that was forgotten. We described the technique, its advantages, and its limitations. We analyzed the children operated using this technique and their complications.

Materials and Methods

All pediatric patients (age ≤18 years) operated for appendicitis by a single surgeon in a single center between November 2018 and October 2019 were prospectively studied. Upon patient presentation, all patients had a basic blood work out and abdominal echography. CT scanner was not done. Patients with a preoperative suspicion of generalized peritonitis on the initial evaluation were directly operated by a classic 3-port approach, so TULAA was not attempted, and hence they were excluded. All patients with appendicular phlegmon or abscess on the initial evaluation were treated medically. After a 10 weeks interval, they were operated according to TULAA. All other patients were operated according to TULAA. Only patients operated primarily according to TULLA were included. The operative time (OT) was noted. The rate of conversion was calculated. Conversion was either to the classical 3-port approach or to laparotomy. Risk factors for conversion were identified. Intraoperative complications like intestinal perforation and bleeding were reported. Length of stay (LOS) was studied. Patients were followed till March 2021. Follow-up was done clinically. Postoperative complications, like intra-abdominal abscess, skin infection, intestinal obstruction, and incisional hernia were reported. All parents were educated about the small but still existing risk of intestinal obstruction.

The technique of TULAA (Video 1).

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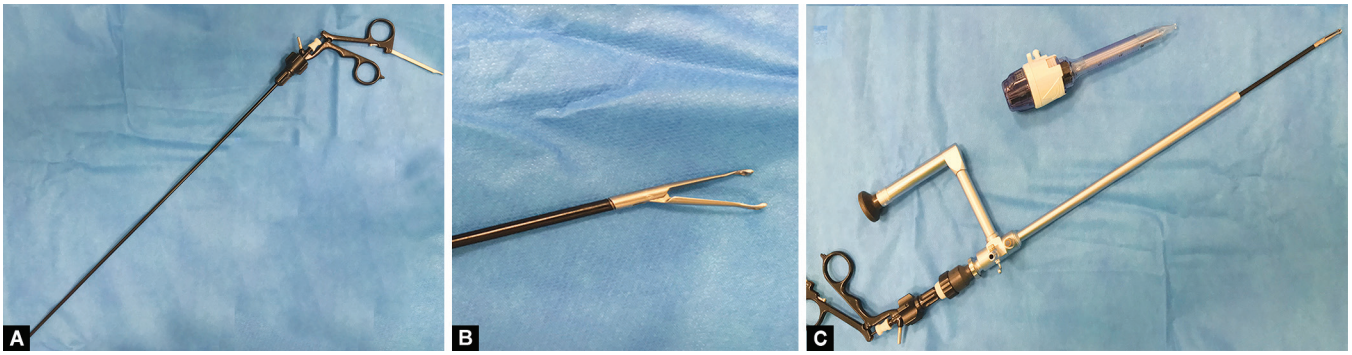
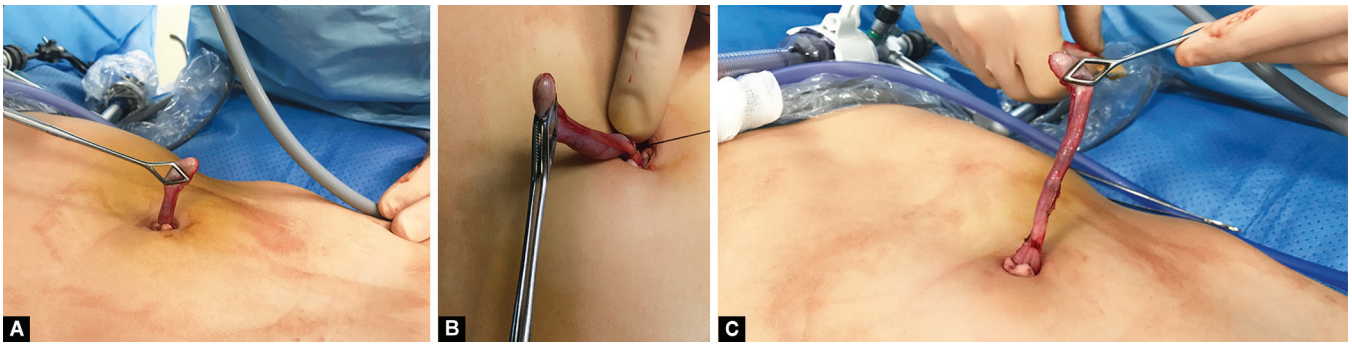
How to cite this article: Akkary R, Doumat JG, Jochault LH, *et al*. Scarless Appendectomy in Children. Is it Safe? Our Initial Single-center Experience. World J Lap Surg 2022;15(3):272–275.

Source of support: Nil

Conflict of interest: None



Figs 1A to C: All the needed instruments. (A) The grasper; (B) The tip of the grasper; and (C) The grasper in the telescope with the 10 mm port



Figs 2A to C: Extracorporeal steps. (A) Exteriorization of the appendix; (B) Ligation of the mesoappendix; (C) The cecum and the base of the appendix had reached skin level

All patients were asked to empty their bladders before the surgery. Patients were positioned supine with the left arm tucked. All surgeries were done under general anesthesia. After vigorously cleansing the umbilicus, the umbilicus was pulled out using two Allis forceps. A vertical trans-umbilical incision was made. Subcutaneous fat and fascia were cut to allow entry and direct vision into the peritoneal cavity. A sufficient incision allowed the introduction of the surgeon's little finger. A single 10 mm umbilical port was introduced. A 10 mm 0-degree operative telescope with a 6 mm working channel was used (Fig. 1). Patients were positioned in a Trendelenburg position with the table tilted toward the patient's left side. A tracheal aspiration tube connected to a feeding syringe was inserted in the working channel and used in order to aspirate the intra-abdominal liquid. A grasper was used in order to bluntly liberate the appendix and the cecum. The peritoneal attachments of the cecum and the appendix were bluntly divided. When those attachments were judged thick, they were coagulated using a monopolar power source connected to the grasper. Minimal liberation was needed. The extent of liberation was judged sufficient when, despite the presence of the pneumoperitoneum, the appendix's tip reached the umbilical port. The appendix was trapped by its tip and exteriorized along with the cecum through the umbilical incision after clearing the pneumoperitoneum. An extracare must be practiced while exteriorizing a perforated or gangrenous appendix. At skin level, the mesoappendix was ligated using a 3-0 multi-filament braided woven absorbable suture. The base was ligated using a 0 multi-filament braided woven absorbable suture. Extracorporeal appendectomy was done (Fig. 2). The stump was then coagulated. Vigorous incisional cleansing was always done before the closure. During every exploration according to TULAA, the operating room was prepared for a possible conversion to 3-port classical technique.

Results

Fifty-five patients were operated for appendicitis. Fifteen patients operated directly according the classical 3-port technique. Forty patients were initially operated according to TULAA. Median follow-up was 22 (17–27) months. Twenty-five patients were males (male to female ratio: 1.7). The mean age was 10 (3.9–17) years. The mean weight was 37 (9–115) kg. The mean duration of evolution before the presentation to emergency room was 43 (8–120) hours. Mean CRP was 58 (1–107) mg/L. Mean leukocytes count was measured at 15 (6–30) giga/L. Mean polynuclear neutrophils count was 11.8 (1.3–27) giga/L. On preoperative ultrasonography, intra-abdominal effusion was seen in 10 patients and appendicolith was seen in 10 patients. Intraoperative diagnosis was early appendicitis in 12 patients, preperforative appendicitis in 14 patients, localized peritonitis in 10 patients, and generalized peritonitis in 2 patients. Two patients had interval appendectomy according to TULAA. Conversion to a 3-port traditional technique was done in 13 patients. The diagnosis in those was, early appendicitis in 6 patients, preperforative appendicitis in 5 patients, and generalized peritonitis in the remaining 2 patients. The conversion was due to a retrocecal or a subserosal appendicitis with or without a non-mobile-fixed cecum in 7 patients. In 2 patients, it was due to generalized peritonitis. In 1 patient, it was due to short appendiceal vessels. In 1 patient, it was related to retroileal appendicitis. In 1 patient,

Fig. 3: The aspect of the abdomen at the 1-month postoperative visit

it was secondary to morbid obesity and hence difficulty of extracorporeal ligation of the appendiceal vessels. In 1 patient, it was due to accidental epiploic bleeding. No conversion to a laparotomy (or Mcburnery) was needed. Adhesions were encountered during interval appendectomy; however, conversion was not needed. Median OT was 50 (10–67) minutes with a mean of 40 minutes. Intraoperative complications were limited to 1 case of mild epiploic bleeding related to port insertion managed by bipolar cauterization. No intestinal perforation was encountered. Median postoperative LOS was 2 days. Two patients (5%) had short-term postoperative complications. Both of them had an infra-centimetric umbilical abscess, managed with antiseptic dressings. No long-term complications were noted. No incisional hernias were found, and no intestinal obstruction was diagnosed. Esthetic results were very good, with no evidence of a scar at the month follow of 1 month postoperatively (Fig. 3).

Discussion

Although the gold standard technique for appendectomy is highly debatable,[9,10] there is a growing evidence that laparoscopic approach is associated with less postoperative pain, shorter LOS, earlier postoperative recovery, less cutaneous infectious complications, and better cosmetics.[7,11] The main drawback of laparoscopic appendectomy was thought to be an increased risk of postoperative intra-abdominal abscess formation, which was reported in initial experiences,[9,12] however, large multi-centric studies had shown that this risk probably does not exist.[11] Since the introduction of minimal invasive appendectomy,[2] and after the increasing understanding of the advantages of minimal invasive approach, surgeons were trying to reduce the number of ports used in the classic 3-port techniques. The appendectomy techniques used today are: the classic 3-port technique, a 2-port technique,[13] the single-port laparoscopic appendectomy using either the SILSPort or the glove-port technique,[14] and the TULLA.

The advantages of TULLA were numerous. The installation was easy. There was no need to assemble a port; instead a classic 10 mm port was needed. Good patient positioning was an efficient maneuver to help a better exposure. TULAA was fast and easily reproducible. Using a simple classical non-articulated grasper, no particular technical skills were needed. Extracorporeal appendectomy decreased the need for additional potentially "costy" material, like additional ports, endo-loop, and an endo-bag. The most common reason for conversion in our series was retrocecal-subserosal appendix with/without a non-mobile cecum. In cases of generalized peritonitis, we opted directly for a 3-port technique. This attitude was adopted by other authors.[6] Our impression was that aspiration without a counter-traction was not sufficient in cases of generalized peritonitis. We could have used a 2-port technique instead of 3, however, that was not in our protocol. Localized peritonitis was not a reason for a conversion. The last advantage is the cosmetics. One month after surgery, the abdomen was scarless. From here, we felt the importance of family education about the small but existent risk of intestinal obstruction later in life. Though our fastest operative time was short (10 minutes) our mean operative time (40 minutes) was longer than other series.[6] We think that with further experience in this technique, the operative time might decrease. Regarding the complications, when generalized peritonitis cases were excluded, we don't think it's meaningful to compare the incidence of intra-abdominal infections and digestive complications (like intestinal perforation) with the conventional 3-port technique as patient's population differs. However, wound infection seemed to be the main drawback to this technique.[15] In accordance with larger multiple series,[7] we had 5% umbilical skin superficial infection. The reason was probably related to the contact of the infected appendix with the abdominal wall, although vigorous incisional cleansing was always done before the closure. The installation of a protector retractor of Alexis-type might be advantageous in those cases, however, this was not proven to decrease the risk of infections.[16]

Conclusion

We had a small population number, so definite conclusions could not be drawn. Despite this, we feel that the main advantages of this technique remain: the scarless, easily reproducible, safe, and low-cost surgery. We think it should be attempted every time a generalized peritonitis is not suspected.

Supplementary Material

A Supplementary Video to this article is available online on the website of www.wjols.com.

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