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Editorial

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Irrespective of the availability of microprocessor-controlled high-frequency electrosurgical generators, it remains the responsibility of the surgeon to acquire knowledge on the range of tissue effects available with various laparoscopic energy sources. It is our responsibility to know, how these devices impart their tissue effects and the associated benefits and risks for each device. Depending on the type of laparoscopic surgery, surgeons have to make decisions about the energy sources they choose to use for operative laparoscopy. In this issue, we have an interesting article on the Efficacy and Safety of Electrothermal Bipolar Vessel Sealer vs ENSEAL in Total Laparoscopic Hysterectomy for Large Uterus.

Supracervical hysterectomy needs morcellation of uterus inside a good quality endo bag like Morsafe. On December 29, 2020, the FDA issued final guidance, Product Labeling for Laparoscopic Power Morcellators, providing recommendations concerning the content and format for certain labeling information to better inform patients and healthcare providers of the device's risks. In this issue, we have an interesting article on Comparative Evaluation of Total Laparoscopic Hysterectomy and Laparoscopic Supracervical Hysterectomy for Benign Uterine Diseases.

Ondansetron is a popular serotonin receptor antagonist which has been used frequently to reduce the incidence of postoperative nausea and vomiting in laparoscopic surgery. It has become a very popular drug for the prevention of postoperative nausea and vomiting due to its superiority in terms of efficacy as well as lack of side effects and drug interactions. There is another research article in this issue on comparison of the Effects of Aprepitant and Ondansetron Individually and Combining on Postoperative Nausea and Vomiting after Laparoscopic Cholecystectomy but a rare possibility of encountering bradycardia effect after intravenous administration of ondansetron should be born in mind.

Apart from these few interesting articles, there are many more interesting articles on this issue and we hope you love them! If you do, would you consider posting an online review? This helps us to continue providing great articles and helps reviewers to make confident decisions.

RK Mishra
Editor-in-Chief
Chairman
World Laparoscopy Hospital
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ORIGINAL ARTICLE

Laparoscopic or Open Appendectomy: Which Approach is the Best for Complicated Appendicitis?

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Abstract

Introduction: Appendicitis is more common in children and young adults. Treatment of appendicitis is either laparoscopic appendicectomy (LA) or open appendicectomy (OA) surgery.

Aim and objective: The 30-day postoperative morbidity, surgical site infection, and reoperation rate were compared between open and laparoscopic appendicectomies for complicated appendicitis. Secondary outcome measures were the length of hospital stay, duration of surgery, surgical waiting time, identification of other diseases, and patient satisfaction.

Materials and methods: This retrospective study was conducted in two institutions: Hospital Selayang, Selangor, Malaysia, and HUKM, Kuala Lumpur, Malaysia. Data were collected from January 2014 to December 2015 were reviewed.

Results: The mean age (±SD) for LA and OA were 32 (±15) and 30 (±14) years, respectively. The males showed predominance in LA and OA with 52 and 72%, respectively ($p < 0.001$). The majority of LA (73%) and OA (88%) were performed by the trainees ($p < 0.001$). There was a significant reduction in postoperative morbidity in LA compared to OA in terms of surgical site infection, LA vs OA [$n = 8$ (2.7) vs 26 (6.3), $p = 0.029$] and duration of surgery [LA vs OA 84 (±39) vs 68 (± 6) days ($p < 0.001$)]. However, for LA and OA, there were no significant differences in reoperation, 0.7 and 1.0%, respectively ($p = 1.000$), and length of stay in LA vs OA 3.55 (±2) vs 3.89 (±3) days, respectively ($p = 0.103$). Overall, patient satisfaction scores were not found statistically significant as the response rates were only 32% in LA and 30% in OA.

Conclusion: LA significantly reduced surgical site infection and offered an advantage in the detection of other pathologies. Hence, a laparoscopic approach should be offered to patients whose clinical diagnoses are challenging.

Keywords: Laparoscopic, Appendectomy, Complicated appendicitis.

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Introduction

Appendicitis is more common among children and young adults. It is uncommon in the elderly where the differential diagnoses are variable. In young patients, the perforation rate of acute appendicitis is less than 20%. However, among the elderly patients, perforation rate accounts for about 70% or even as high as 90%.[1]

The basic surgical approach involved in the management of perforated appendicitis has not undergone remarkable change over the past century. Laparoscopic appendectomy (LA) is minimally invasive and associated with less postoperative pain.[2] LA has been widely practiced for the treatment of uncomplicated appendicitis; various reports have demonstrated its merits in assisting diagnosis, reducing postoperative pain, and requiring an analgesic, thereby reducing the incidence of surgical site infection. However, the advantages of laparoscopic surgery in the management of complicated appendicitis, i.e., gangrenous, perforated appendicitis, and appendicular abscess remain unclear.

Park et al. suggested that a laparoscopic approach should be the treatment of choice for presumed perforated appendicitis. It has the benefit of simultaneously addressing alternative pathologies.[3] Currently, the choice of operative approach depends mostly at the surgeons' discretion.[4] A Cochrane study conducted by Koch et al. reported that LA increases the rate of intra-abdominal abscess (IAA) in adults and observed a similar trend in children. However, another Cochrane study published in 2010 performed on adults noted that laparoscopic appendectomy is advantageous in complicated appendicitis in terms of reducing surgical site infections (SSIs), causing no significant additional risk of IAA.[5]

We conducted a cross-sectional study in two institutions for reviewing the postoperative complications of laparoscopic appendectomy vs open appendectomy for complicated appendicitis. The primary objectives were detection of surgical site infection and reoperation within 30 days postoperatively. The secondary objectives were reducing the length of hospital stay, increasing patient satisfaction level, and identifying other diseases and postoperative complications like pneumonia, deep vein thrombosis, bedsores, and enterocutaneous fistulas.

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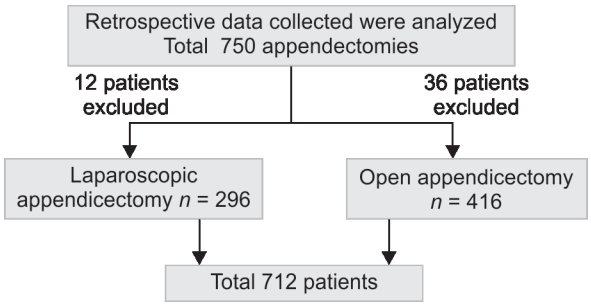
Table 1: Inclusion and exclusion criteria for patient selection for the study

Inclusion criteria	*Exclusion criteria*
Age 13 years and over	Age under 13-years
Patient with confirmed complicated appendicitis intraoperative or histologically	The patient presented with an appendicular mass
Patient with laparoscopic converted to open appendectomy	The patient who had developed complications like abscess collection, reoperation, etc. after 30 days postoperatively

Flowchart 1: Patients recruitment



Materials and Methods

Background and Study Design

The medical records of the patients who underwent LA from January 2014 to December 2015 were reviewed. Two clinical centers: Hospital Selayang in Selangor, and Hospital University Kebangsaan Malaysia (HUKM) in Kuala Lumpur were chosen for this study. These two hospitals are the tertiary hospitals that offer wide spectra of medical services including minimally invasive surgery (MIS) facilities. LA and OA were performed by different specialists or trainees in both hospitals. The patients were selected depending on the inclusion and exclusion criteria (Table 1).

Patients with earlier laparoscopic appendectomy and converted to open appendectomy were included in the study and grouped into the laparoscopic group (Flowchart 1).

Data on preoperative, intraoperative, and postoperative parameters were collected and properly maintained. The variable analyses included demographics data, comorbid factors, operative procedures and duration, and postoperative complications and outcomes, such as surgical site infection, reoperation, length of hospital stay, and patient satisfaction level. The 30-day postoperative morbidity data collected were: surgical site infection, reoperation, length of hospital stay, and enterocutaneous fistula rate.

Operative Method

A clinical diagnosis of perforated appendicitis was done by the on-call surgeon based on the signs and symptoms, i.e., right lower abdominal pain, particularly in the right iliac fossa, fever, and other associated symptoms. Antibiotics were started while waiting for the operation. The operation was done immediately after the operation theatre was available. Surgery was performed under general anesthesia and the patient was placed in a supine position. All patients underwent laparoscopic and open appendectomy depending upon the surgeon's preferences. A standard laparoscopic approach was employed for laparoscopic appendectomy using 3-port LC techniques with surgeons on the left side of the patient. The patient was catheterized preoperatively. A midline infraumbilical skin incision was made followed by the insertion of a 10-mm trocar for the camera-port. Carbon dioxide gas was insufflated at a pressure of 10–12 mm Hg. Another 5-mm trocar was inserted under camera vision, at the suprapubic area on the midline. At the last port, a 5-mm trocar was inserted on a left side abdomen under direct vision. For open appendectomy, Lanz incision was performed on almost all the patients; all appendectomies involved a muscle-splitting right lower quadrant incision. The appendix and any adherent omentum were removed. Irrigation was performed for both LA and OA.

Postoperatively, most of the patients were prescribed oral analgesics and allowed orally gradually. Intravenous antibiotics were continued for a few days postoperatively and the patients were subsequently discharged with oral antibiotics to complete one week course.

Definition of Terms

Perforated appendicitis: Intraoperative evidence of perforation or intra-abdominal fecalith.

Complicated appendicitis: Gangrenous, macerated, or grossly inflamed with pus collection or suppurative appendicitis and including perforated appendicitis.

Surgical site infection (SSI): Operative wound site that showed purulent discharge associated with surrounding cellulitis with other inflammatory signs and that needed to be opened. It can be superficial incisional, deep incisional, and organ or space infection. Superficial incisional SSI is infection up to subcutaneous tissue; deep incisional SSI is infection up to fascia and muscle; organ and space infection SSI is an abdominal infection.

Abscess collection: The intra-abdominal collection is confirmed by radiological imaging and needs to be drained by surgery, percutaneous drainage, or continuation of antibiotics.

Enterocutaneous fistula: Communications between bowel and skin causing discharging of bowel contents.

Reoperation: Reoperation is a second surgical procedure performed in the same site for the same indications.

Specialist: A person who has completed a Master's in surgery or any other specific fellowship training program.

Trainee: A person who performs the duty of a medical officer and/or is in the Master of the surgery training program.

Results

A total of 712 patients with acute appendicitis were admitted to and operated upon during the study period of two years from January 2014 to December 2015 at Hospital Selayang and Hospital Universiti Kebangsaan Malaysia (HUKM). A majority (58.4%) of the cases involved open appendectomy. The mean age of the patients for OA and LA were 30 (±14) and 32 (±15) years, respectively. The majority of cases were male in both procedures; 72.8% for open appendectomy and 52.4% for laparoscopic appendectomy (Table 2). Most of the

Table 2: Sociodemographic characteristics, procedure characteristics, intraoperative findings, and histopathological examination report of two procedures

Characteristics	*Open appendectomy n (%)*	*Laparoscopic appendectomy n (%)*	*p-value*
Age (years)[a], mean ± SD	30.12 ± 14.26	32.16 ± 14.87	0.065
Gender[b]			<0.001*
Male	303 (72.8)	155 (52.4)	
Female	113 (27.2)	141 (47.6)	
Surgeon[b]			<0.001*
Trainee	370 (88.9)	217 (73.3)	
Surgeon	46 (11.1)	79 (26.7)	
Intraoperative findings[b]			<0.001*
Perforated appendicitis	231 (55.5)	83 (28.0)	
Gangrenous appendicitis	18 (4.3)	3 (1.00)	
Macerated appendicitis	18 (4.3)	3 (1.0)	
Grossly inflamed appendicitis	127 (30.6)	111 (37.5)	
Appendicular mass	3 (0.7)	4 (1.4)	
Suppurative appendicitis	9 (2.2)	44 (14.9)	
Other pathologies	6 (1.4)	35 (11.8)	
Acute appendicitis	4 (1.0)	13 (4.4)	
HPE[b]			
Acute appendicitis with perforation	135 (32.5)	78 (26.4)	<0.001*
Gangrenous appendicitis with perforation	20 (4.8)	8 (2.7)	
Suppurative appendicitis with perforation	100 (24.0)	30 (10.1)	
Acute suppurative appendicitis	58 (13.9)	37 (12.5)	
Acute appendicitis	87 (20.9)	96 (32.4)	
Gangrenous appendicitis	1 (0.2)	0 (0.0)	
Other pathology	15 (3.6)	24 (8.1)	
Appendicular abscess	0 (0.0)	1 (0.3)	
Normal appendix	0 (0.0)	19 (6.4)	

*Significant if p-value < 0.05; [a]Independent t-test; [b]Chi-squared test

patients (>88.0%) for both the procedures reported no prior medical illness and some of the cases with premorbid reported more than one disease for both procedures (>3.0%); usually diabetes mellitus ($n = 18$) and hypertension ($n = 17$).

The majority of appendectomies were performed by the trainees as compared to the surgeons. The intraoperative findings showed variation. Intraoperative findings and histopathology reports that fulfilled the inclusion criteria were included in this study. Other pathologies that were identified in OA and LA group included gynecological pathologies, such as pelvic inflammatory disease, ovarian tumor, colonic tumor, diverticulitis, and colitis, and a bowel perforation. Most of the other pathologies were identified in LA group: 35 (11.8) vs 6 (1.4) in the OA group. Gender of the patients ($p < 0.001$), operating surgeon ($p < 0.001$), intraoperative findings, and histopathology examination results revealed a significant association with the method of appendectomy performed.

Outcomes and Complications

Overall, the rate of reoperation for open appendectomy was 1.0% and reoperation for laparoscopic appendectomy was 0.7%. The reoperation was performed mainly due to intra-abdominal sepsis. Surgical site infection was higher for open appendectomy compared to laparoscopic appendectomy, 26 (6.3%) vs 8 (2.7), respectively, with a statistically significant p-value of 0.029. In the LA group, there were two patients with abscess collection: one required open drainage, and the other required laparotomy drainage. In the OA group, 11 patients needed abscess collection, two patients required drainage percutaneous and one patient required laparotomy. The subsequent patients were treated conservatively. There were no patients with enterocutaneous fistulas and no postoperative deep vein thrombosis in both groups. Only one patient developed sacral sore postoperatively and two patients developed hospital-acquired pneumonia. One patient had intestinal obstruction which required laparotomy.

Length of stay for the LA group was 3.55 ± 2 days while for the OA group, 3.89 ± 3 days, with a p-value of 0.103 which was statistically insignificant. Duration of surgery was longer in the LA group with a mean of 84.38 ± 39.13 days compared to in the OA group, 68.36 ± 35.97 days, with a p-value of <0.001 which was statistically significant. Waiting time in the OA group, 427.34 ± 398.97 days, was longer compared to 320.30 ± 222.36 days in the LA group with a p-value < 0.001, which was statistically significant.

There was a significant association of postoperative complications between LA and OA groups in surgical site infection ($p = 0.029$), duration of surgery ($p < 0.001$), and waiting time of surgery ($p < 0.001$).

The subanalysis of the SSI and reoperation rate association between the trainees and the surgeon showed insignificant association (Table 3). However, there was a significant association between surgeon and SSI for OA and LA. Of total, 16/26 (61.5%) OA surgeries were done by the trainees and 10/26 (38.5%) OA surgeries were done by the surgeons developed SSI with a p-value of 0.001.

Table 3: Association between surgeon and trainee SSI

Surgeon	*Surgical site infection[a]*					
	Open appendectomy			*Lap appendectomy*		
	Yes	*No*	*p-value*	*Yes*	*No*	*p-value*
Trainee	16 (61.5)	354 (90.8)	<0.001*	4 (50.0)	213 (74.0)	0.216
Surgeon	10 (38.5)	36 (9.2)		4 (50.0)	75 (26.0)	
Surgeon	*Reoperation[a]*					
	Open appendectomy			*Lap appendectomy*		
	Yes	No	*p-value*	Yes	No	*p-value*
Trainee	2 (50.0)	368 (89.3)	0.062	1 (50.0)	216 (73.5)	0.463
Surgeon	2 (50.0)	44 (10.7)		1 (50.0)	78 (26.5)	

*Significant if p-value < 0.05; [a]Chi-squared test

Discussion

Acute appendicitis course of the disease may later progress to complicated appendicitis if not treated at an earlier stage. The late presentation may lead to disastrous morbidity and mortality.

In our study, appendicitis was more common in young male adults, as the mean age group for LA vs OA was 32 (±15) and 30 (±14) years, respectively. A study done by Yau et al. demonstrated similar demographic patient presentation.[6] However, different population studies conducted on pediatrics[4] and elderly patients' populations[7] found no significant difference in males and females in both OA and LA groups. Since the patients were young, no statistically significant comorbidities of patients with LA and OA groups could be observed.

In a tertiary center, surgeries were mostly done by a trainee rather than a surgeon, 88.9 vs 11.1% in the OA group and 73.3 vs 26.7% in the LA group. This is because appendicitis is among the most common acute surgical emergency and is one of the core competencies required for surgical trainees. Although most hospitals in developed countries are managing appendectomy laparoscopically, some hospitals are still practicing open appendectomy as the primary procedure for appendicitis.

The reoperation rate in LA (0.7%) and OA (1%) group was lower despite statistically insignificant data. This does not correspond to a study done by Vahdad et al. who stated that LA had reduced reoperation compared to OA.[4] Wound infection[8] remains the highest morbidity after appendectomy; however, the intra-abdominal collection is a major concern after performing operation for perforated appendicitis in the pediatric population.[8] In our study, surgical site infection was low in the LA group compared to the OA group which corroborates findings in previous studies.[4,9,10]

Duration of surgery was longer in the LA group compared to the OA group with a *p*-value of <0.001. Because most of the cases in both groups were done by trainees, the duration of surgery was probably longer as the trainee was still in the learning curve of the laparoscopic procedure.[10,11]

The average length of hospital stays in this study was 3.55 days in the LA group compared to 3.89 days in the OA group as most of the patients were young and they progressed well after surgery.[9] However, in a meta-analysis done among the elderly patients, LA reduced in-hospital stay compared to OA.[12]

Mean waiting time for surgery in our study was longer in the OA group compared to the LA group 427 vs 320 minutes. We cannot explain this because we were doing studies in two hospitals and the cases waiting for emergency surgery in each hospital were different. However, most cases were managed to be done within 24 hours. Hornby et al., in their study, concluded that appendicitis is not more likely to lead to perforation if a short delay before surgery is allowed.[13]

We observed other advantages in the LA group that can identify other pathologies, such as gynecological pathology, particularly in women patients, colonic tumor, and diverticular disease. Casarotto et al. in their study among women patients suggested that the laparoscopic approach should be used in case of unclear abdominal pain.[14]

Many studies were done to compare laparoscopic appendectomy and open appendectomy; however, there is still not enough evidence to support that the laparoscopic approach is the standard procedure for complicated appendicitis. The shortcoming of the study is the lack of defined selection criteria for an operative approach for each patient. The decision for the operative approach is based on the surgeon's preferences. Hence, selection bias for the decision for surgical approach in this study could not be excluded.

Conclusion

Laparoscopic appendectomy is becoming more popular nowadays. The decision for laparoscopic or open appendectomy depends on the surgeon's preferences and hospital facility. Laparoscopic appendectomy is better than open appendectomy as it reduces surgical site infection. The other advantage of doing LA is we might be able to identify other pathology while doing the laparoscopic operation.

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ORIGINAL ARTICLE

Efficacy and Safety of Electrothermal Bipolar Vessel Sealer vs ENSEAL in Total Laparoscopic Hysterectomy for Large Uterus: A Comparative Study in Mysuru, South India

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Abstract

Context: Hysterectomy is the most commonly performed gynecological procedure around the world. Hemostasis is of major concern in an enlarged uterus as chances of hemorrhage are more. New laparoscopic vessel sealing devices have been developed for laparoscopic tissue dissection and vessel sealing. In this study, an ALAN vessel sealer, an indigenous electrothermal bipolar vessel sealing device, is compared with ENSEAL device with respect to safety, efficacy, and perioperative outcomes in laparoscopic hysterectomy for a large uterus.

Aims and objectives: This study aimed to determine the efficacy and safety of electrothermal bipolar vessel sealer (ALAN vessel sealer) vs ENSEAL in total laparoscopic hysterectomy (TLH) for a large uterus.

Materials and methods: This prospective randomized case–control study included 100 women who underwent TLH for a large fibroid uterus. Of them, 50 women underwent TLH using ALAN vessel sealer, and the remaining 50 using ENSEAL. Efficacy, safety, and perioperative outcomes of both the groups were compared.

Statistical analysis: Statistical analysis was done using SPSS version 16.0 software. For evaluating continuous variables and discrete variables, independent T-tests, and Chi-square tests, respectively, were used.

Results: Duration of surgery in ALAN vessel sealer group was 56.90 ± 12.45 minutes and in ENSEAL group was 57.25 ± 13.54 minutes ($p = 0.9$) and mean blood loss in group A and group B was 111.40 ± 22.32 and 107.84 ± 20.33 mL, respectively ($p = 0.4$), both of the data were not statistically significant. No significant differences were noticed in the demographic characteristics, intraoperative, and postoperative complications between the two groups.

Conclusions: The ALAN vessel sealer is safe and as efficient as ENSEAL in decreasing blood loss and operative time when laparoscopic hysterectomy is performed for an enlarged uterus. It is cost-effective and a promising instrument for TLH in developing countries.

Keywords: Electrothermal vessel sealers, ENSEAL, Laparoscopic hysterectomy, Large uterus.

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Introduction

The study aimed to determine the efficacy and safety of electrothermal bipolar vessel sealer (ALAN vessel sealer) vs ENSEAL in total laparoscopic hysterectomy for large uterus.

Hysterectomy is the most commonly performed gynecological procedure around the world. Laparoscopic hysterectomy is a safe and efficient alternative to abdominal hysterectomy in managing benign gynecological conditions as it offers less blood loss, minimal postoperative discomfort, shorter duration of stay, faster convalescence, and fewer wound complications.[1]

Large uteri are always a technical challenge for laparoscopic surgery. Regardless of the surgical approach used, removal of an extremely large uterus is a challenge to surgeons. Most of the studies set the uterine weight of more than 500 gm as a large uterus. Giant myomas obstruct the pelvis and make the uterus extremely difficult to mobilize and manipulate. They also reduce the visibility of surrounding anatomy and impair the surgeon's ability to correctly develop spaces. Various studies have demonstrated increased intraoperative bleeding and postoperative complications when TLH is performed for a large uterus of more than 500 gm though few studies have also concluded that it is safe and feasible than laparotomy.[1,2]

Hemostasis is of major concern, especially in the enlarged uterus as chances of hemorrhage are more due to limited access to uterine vascular pedicles. In laparoscopic surgery, conventional mechanical hemostatic techniques like sutures or clips have almost completely been replaced by coagulation techniques using monopolar coagulation, bipolar coagulation, and ultrasonic instruments. These new electrosurgical devices have inbuilt tissue response generators, which provide computer-controlled feedback that senses tissue impedance, thereby allowing a consistently

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Fig. 1: ENSEAL generator

Fig. 3: ALAN generator

Fig. 2: ALAN vessel sealer hand instrument

defined bipolar sealing followed by dissection, thus giving better hemostasis even in a large uterus. They also have cost-saving properties as a result of decreased operative time, decreased use of postoperative analgesics, and shorter duration of stay. These devices have one major drawback that their instruments are disposable and are of economic concern.[3,4]

The ENSEAL device (NSEAL 535RE, Ethicon Endo-Surgery (Europe) GmbH) is used for laparoscopic tissue dissection and vessel sealing. It uses nanometer-sized particles embedded in a bipolar temperature coefficient matrix. The current flow is active only when the device jaws are closed. The nanoparticles embedded in them locally interrupt current flow to tissue when the temperature exceeds 100 °C, enabling sealing and transection to occur in a single step and also minimizing the thermal spread and tissue damage.

A new bipolar vessel sealing device (ALAN vessel sealer, Alan Electronic Systems Pvt. Ltd., Thane, Maharashtra, India), which is cost-effective as it is a reusable instrument, has been developed. This study aimed to compare the efficacy, safety, and perioperative outcomes of ALAN vessel sealer vs ENSEAL in laparoscopic hysterectomy for a large uterus of more than 12-week size (Figs 1 to 3).

Materials and Methods

This is a prospective randomized case–control study done at JSS Hospital, Mysuru, Karnataka including 100 women. Patients with fibroid uteri of size between 12 weeks and 28 weeks were included in the study. Patients with other indications for TLH were excluded.

Patients included in the study were subjected to detailed medical history check-ups and examination including abdominal, vaginal, and bimanual examination. Institutional Ethics Committee approval was obtained and after obtaining the informed consent from the participating patients, the data collected were included for statistical analysis.

All procedures were performed by a single surgeon. Out of 100 women, 50 women who underwent TLH using ALAN vessel sealer were considered in group A and the remaining 50 who underwent TLH using ENSEAL were considered in group B. Protocols for anesthesia, preoperative, and postoperative management were the same among all the patients. Patients were followed up once 2-, 4-, and 6-week after the surgery to look for any subsequent complications.

The ENSEAL device is designed for laparoscopic vessel sealing and tissue transection. The first electrode is integrated into the static lower jaw of the device and the second one in the movable upper jaw. The impedance of the nano-based material of the upper electrode depends on the temperature and is based on the tissue temperature; it regulates the energy output, thus not allowing the temperature to exceed 100°C. While moving the blade to the front position, the double T-shaped cutting blade located longitudinally in the instrument axis closes the jaws. The coagulation and cutting processes occur almost simultaneously, and the clamping force depends on the blade position in which the two jaws are substantially parallel in a closed position.

The ALAN vessel sealer uses a special type of bipolar current for tissue dissection. Lower tissue impedance is sensed by the machine following which it delivers a specially designed bipolar current for the dissection instrument, plasma bisector. The jaws of the plasma bisector are designed circularly, when the jaws are closed a very narrow portion of the plasma bisector comes in contact with the tissues. This enables the maximum concentration of current and rapid dissection of the tissues. The microplasma which is generated following the passage of dissection current rapidly vaporizes the tissue held between the jaws of the plasma bisector. Due to the

unique design and construction of the plasma bisector, the tissues close to the dissection area also get a small concentration of current, which helps provide better hemostasis and cut the tissues without causing any bleeding. Vessel sealing can be done with the same instrument by varying the pressure and applying a bipolar sealing current. But this sealing needs some expertise from the surgeon as this instrument is essentially designed for dissection.

As per the manufacturer's instructions, standard settings were maintained. Instruments were used for both vessel sealing and tissue transection.

All the subjects were administered required perioperative antibiotics and the standard approach for TLH was adopted. The patients were put in a lithotomy position. Foley's catheterization was done and then a uterine manipulator was inserted. Using one 10-mm and three 5-mm trocars and cannulas, abdominal access was obtained. The 10-mm port was introduced supraumbilical or 5 cm above the upper border of the uterus, whichever was higher. After creating pneumoperitoneum, both the pelvis and abdomen were inspected for any abnormalities interfering with the surgical approach. The site, size, and the number of myomas were assessed at the start of the procedure. Manipulation of a large uterus may be very difficult so a myoma screw was inserted through one of the 5-mm ports for uterus manipulation, wherever necessary.

Sequential bipolar sealing and transection of the round ligaments, bipolar sealing, and transection of the infundibulopelvic ligament in patients with risk-reducing salpingo-oophorectomy (RRSO) or utero-ovarian ligament and fallopian tube in patients without salpingo-oophorectomy, opening of the ureterovesical fold and mobilizing the bladder downwards, sealing and transection of bilateral uterine vessels were done using Alan vessel sealer in group A and ENSEAL in group B. Colpotomy was done using Alan vessel sealer in group A and monopolar hook in group B. Removal of the uterus was done by vaginal morcellation. Vaginal cuff closure was done by vaginal route. At the end of vault closure, the laparoscope was reintroduced to ensure adequate hemostasis.

Results

The patients with fibroid uterus of 12–28-week sizes were randomly allocated to undergo laparoscopic hysterectomy with either Alan vessel sealer or ENSEAL. All the procedures were done successfully by laparoscopy and no patient was converted to laparotomy in our study. The baseline patient characteristics including age, parity, BMI, and history of previous surgeries were found similar in both the groups and showed no statistical significance as depicted in Table 1.

The weight of the uterus was measured after the specimen retrieval following the surgery. The mean weight of the uterus in group A was 451.60 ± 150.39, and 447.80 + 154.87 g in group B, which was comparable between groups ($p = 0.9$) (Table 2).

Operative time was recorded from the transection of the first pedicle until the completion of colpotomy. It was noted that the duration of surgery in the ALAN vessel sealer group was 56.90 ± 12.45 minutes and in the ENSEAL group was 57.25 ± 13.54 minutes. Hence, there was an insignificant difference in the total time taken for surgery in both groups.

Blood loss in the intraoperative period was assessed by measuring the amount of blood in the suction apparatus minus the irrigation fluid. In group A, the mean blood loss was 111.40 ± 22.32 mL and in group B it was 107.84 ± 20.33 mL. There was no statistically significant blood loss between the groups ($p = 0.4$).

Table 1: Baseline and demographic characteristics

	Group-A (N = 50)	*Group-B (N = 50)*	*p-value*
Age, years (mean ± SD)	43.68 ± 5.35	45.06 ± 5.79	0.21
BMI* (mean ± SD)	25.37 ± 2.47	25.52 ± 2.25	0.21
Parity, *n*			
Nulli	3	3	0.7
Primi	5	3	
Multi	42	44	
History of previous surgeries, *n*			
None	43	45	0.73
Yes	7	5	

Group-A, ALAN vessel sealer; Group-B, ENSEAL; *BMI: body mass index

Table 2: Weight of the uterus in different groups

	Group-A	*Group-B*	*p-value*
Weight of uterus, *g* (mean ± SD)	451.60 ± 150.39	447.80 ± 154.87	0.9

Table 3: Intraoperative findings

	Group-A	*Group-B*	*p-value*
Blood loss, mL (mean ± SD)	111.40 ± 22.32	107.84 ± 20.33	0.4
Operative time, min (mean ± SD)	56.90 ± 12.45	57.25 ± 13.54	0.9
Complications			
Bowel injury	0	0	NA
Bladder injury	0	0	

Table 4: Postoperative findings

	Group-A	*Group-B*	*p-value*
Complications (*n*)			
Secondary hemorrhage	2	1	0.68
Leukorrhea/vault granulation	4	3	0.78
Vault dehiscence	0	0	NA
Bladder complications	1	1	NA
Bowel complications	0	0	NA

Intraoperative complications involving bladder or bowel were also noted in both groups (Table 3).

During the postoperative period, all the subjects were followed up with general, abdominal and vault examinations at 2-, 4-, and 6-week to look for complications. Two cases of secondary hemorrhage in the ALAN vessel sealer group and one case in ENSEAL group were noted. Leukorrhea or vault granulation was seen totally in seven cases, with 4 cases in group A, and 3 cases in group B. Bladder complications were one case in each group and were followed by an examination that reported them as vesicovaginal fistula. All the complications were similar in both the groups and were statistically insignificant as are depicted in Table 4.

Discussion

Laparoscopic hysterectomy has been the subject of controversy when it comes to the large uterus. Many studies have concluded

that TLH is a feasible and safe technique even in an enlarged uterus with various benefits and fewer intraoperative complications when compared to the open method. A seven-year-long study by Sinha et al. done in Mumbai, India concluded that TLH could be performed even in an enlarged uterus with no increase in complication rates and short-term recovery. Garry et al. did EVALUATE hysterectomy study in 2004, which noted that LH had a significantly higher risk of major complications and longer operative time but less postoperative pain, faster recovery when compared to open hysterectomy.[1,5]

Maintaining hemostasis is fundamental in all surgical procedures more so in minimally invasive surgery. The risk of hemorrhage is more especially in the enlarged uterus due to lack of exposure and distorted pelvic anatomy. Traditional methods of staples and clips have gradually been abandoned due to cost and technical difficulties. The evolution of laparoscopic hysterectomy is closely linked to continuous technological advancements in the visual and electrosurgical units. Various energy-based vessel sealing technologies have been introduced as these devices allow rapid sequential tissue and vessel sealing, coagulation and transection. These advanced bipolar vessel sealing devices have been widely used as they are easy to use, less time-consuming, and provide better hemostasis even in a large uterus where the risk of hemorrhage is greater.

The purpose of this randomized case–control study was to compare one such indigenous electrothermal bipolar vessel sealing device, ALAN vessel sealer with ENSEAL with respect to safety, efficacy, and perioperative outcomes in the enlarged uterus.

Before morcellation of an enlarged uterus, the blood supply to the uterus should preferably be controlled. Measures like pre-treatment with a gonadotropin-releasing hormone (GnRH) agonist may be necessary to induce uterine tissue shrinkage and decrease vascularity. Injection of dilute vasopressin solution around the largest myoma may also help control capillary bleeding. But none of these methods was used in our study.

In 1998, a multicenter randomized trial was done to compare LH vs TAH. Myoma being the most common indication in the trial, it was observed that blood loss was significantly less in the LH group compared to the TAH group.[6] The present study noted that mean blood loss in ALAN vessel sealer group and ENSEAL group was 111.40 ± 22.32 and 107.84 ± 20.33 mL, respectively. Both ENSEAL and ALAN vessel sealer devices have an inbuilt feedback system that determines the quantity of tissue being sealed and adjusts the strength of the current accordingly to provide a better hemostatic effect. Also in the ALAN vessel sealer group, tissues were held along the full length of the jaws during coagulation and only at the tip covering one-third of the jaw length while cutting, thereby ensuring precise cutting and minimizing blood loss.

A German study by Rothmund et al. compared ENSEAL with standard bipolar coagulation. It was noted that blood loss between both groups was not statistically significant. Another randomized prospective study by Aytan et al. compared LigaSure vs HALO PKS cutting forceps vs ENSEAL and noted more blood loss in the ENSEAL group compared to other groups.[3,7] Bicer et al. compared LigaSure vessel sealer both in small and large uterus subjects who underwent LH and noted that blood loss was more in the large uterus group but was not statistically significant.[8] In our study, the amount of blood loss was similar in both groups and was statistically insignificant ($p = 0.4$).

Mean operative time in group A was 56.90 ± 12.45 minutes and in group, B was 57.25 ± 13.54 minutes. Hence, there was no significant difference ($p = 0.9$) noted in the duration of surgery between the groups. A study by Aytan et al. also noted that operative time was the same in all three groups that used LigaSure, HALO PKS cutting forceps, and ENSEAL, respectively. Another prospective trial was done on 132 patients in Turkey by Yüksel et al. who compared the efficacy of LigaSure vs. ENSEAL and found that operative time was significantly more in ENSEAL group; however, no such differences were noted in the current study.[7,9]

The size of the uterus is an important factor in the occurrence of intraoperative hemorrhage and postoperative complications during a laparoscopic hysterectomy, especially with uterus weight >500 gm. Subjects with a history of prior gynecologic surgeries have an increased risk of complications due to adhesions. Kondu et al. did a retrospective evaluation of 38 patients with uterine weight >1000 g who underwent hysterectomies and reported no significant difference in both intra-op and post-op complications in the laparoscopic group compared to the open method group.[10]

Glaser et al. reported that the incidence of bowel and urinary tract injury during laparoscopic hysterectomy were 0.39 and 0.73–1.8%, respectively. Both the groups had no intraoperative complications in this study.[11] During the postoperative period, no cases were reported with bowel complications in our study but one case in each group reported developed bladder complications. Both the cases had a history of previous C-sections and were reported to have vesicovaginal fistulas, which were further managed by a urologist.

Secondary hemorrhage is a rare but life-threatening complication following TLH. Secondary hemorrhage was reported to occur more following TLH than other hysterectomy approaches in a retrospective observational study done at Paul's hospital, Kochi. Another study at the same center reported that cumulative incidence of secondary hemorrhage following TLH was 1.3%.[12,13] Large uterus size, excessive use of energy source, vaginal vault hematoma, or infection could be the possible factors. A total of three cases of secondary hemorrhage were detected in our study and were managed conservatively by vaginal packing and tranexamic acid.

Leukorrhea was seen in four cases in the Alan vessel sealer group and three cases in ENSEAL group as secondary to vault granulation, vaginal vault inflammation, or excessive tissue charring. All the cases were treated conservatively with a course of oral and local antibiotics. Vault dehiscence following TLH is an infrequent but devastating complication. Excessive use of thermal energy leading to tissue necrosis and devascularization was attributed to being a possible cause. Hur et al. reported that vault dehiscence was more following TLH and suggested the use of laparoscopic scissors over thermal energy.[14] No case was reported to have vault dehiscence in this study.

Postoperative complications were similar in both the groups and no statistical difference was observed in our study. Katherine et al. also observed no significant difference in the complication rate in subjects who underwent laparoscopic hysterectomy regardless of uterine weight.[15] The study by Bicer et al. who compared LigaSure in both small and large uteri also reported no significant difference in the minor and major complications between the groups and their finding was on par with the current study.[8]

The capital investment and running cost of these vessel sealer devices are of economic concern as they have disposable hand instruments but ALAN vessel sealer is less expensive due to its

reusable hand instruments. With adequate training and proper technique, these devices can also be used in TLH even in an enlarged uterus. Thus patients could benefit from all the advantages of minimally invasive surgery.

Conclusion

Laparoscopic hysterectomy is a safer alternative to open hysterectomy even in a large uterus. The ALAN vessel sealer is comparably safe and as efficient as ENSEAL. It is more cost-effective with its reusable hand instruments; hence, could be a promising instrument for patients undergoing laparoscopic hysterectomy in developing countries like India.

Ethical Approval

Institutional ethics committee approval has been taken.

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ORIGINAL ARTICLE

Do We Still Encounter Non-appendicitis Pathologies during Laparoscopic Appendectomy?

Yasser A Orban[1], Mohammed Algazar[2], Ahmed Farag[3], Tamer R Elalfy[4]

Abstract

Aims and objectives: Acute appendicitis is the most common surgical disease with a lifetime risk of 7–8%. Numerous studies have shown many benefits of laparoscopic appendectomy over open appendectomies, such as better visualization and identification of other abdominal pathologies that can mimic acute appendicitis. Herein, we illustrated the current incidence of non-appendicitis pathologies during laparoscopic appendectomies in our hospital.

Materials and methods: A retrospective study was carried out involving patients operated for acute appendicitis laparoscopically at the Surgical Emergency Unit, Zagazig University Hospitals, Egypt, during the period from March 2017 to December 2019. The diagnosis of acute appendicitis was based on clinical examination, laboratory findings, and ultrasonography. We drew out the patients' demographic data, duration of surgery, and surgical procedure reports.

Results: One hundred forty-five patients presented clinically, and confirmed by laboratory and ultrasonography with the diagnosis of acute appendicitis. Eighty-nine were males, 56 were females. The median operative time was 56.5 minutes. Eight cases (5.5%) showed a pathology other than acute appendicitis, including gynecological pathologies, Mickel's diverticulitis, inflamed sigmoid appendices epiploica, low-grade appendiceal mucinous neoplasm, and inflamed cecal diverticulum.

Conclusion: Diagnosis of acute appendicitis is challenging up to date. We faced many conditions mimicking acute appendicitis during surgical intervention.

Keywords: Appendectomy, Appendicitis, Diverticulitis.

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Introduction

Acute appendicitis is the most common surgical disease with a lifetime risk of 7–8%.[1] In 1977, Hans de Kok performed the first laparoscopic-assisted appendectomy, which was not popularized until Semm published the first laparoscopic appendectomy in 1983.[2] Numerous studies have shown many benefits of laparoscopic appendectomy over open appendectomies, such as better visualization and identification of other abdominal pathologies that can mimic acute appendicitis.[3]

The current incidence of incidental non-appendicitis histopathological findings during appendectomy is 3.9%, whether open or minimally invasive appendectomies.[4] Herein, we illustrated the incidence of non-appendicitis pathologies during a laparoscopic appendectomy in the Surgical Emergency Unit, Zagazig University Hospitals, Egypt.

Materials and Methods

A retrospective analysis of patients who underwent laparoscopic appendectomies from March 2017 to December 2019 at the Surgical Emergency Unit, Zagazig University Hospitals, Egypt. Pathologies other than acute inflammation of the appendix were recorded. We extracted the patients' demographic data, duration of surgery, and surgical procedure reports.

All patients had a preoperative diagnosis of acute appendicitis depending on the clinical picture, laboratory investigations (complete blood count for leukocytosis and neutrophilia), and ultrasonography.

At the laparoscopic appendectomy, the abdominal cavity was laparoscopically explored for other surgical pathologies. If any other pathology had been encountered, it was dealt with laparoscopically. Appendectomy was done on all patients, even if there was another intra-abdominal pathology.

A case of intraoperative suspected cecal diverticulitis was treated conservatively postoperatively without any further surgical intervention.

Histopathology of the resected biopsies (appendix and other pathologies) was done for all cases. A histopathological report of a removed appendix revealed low-grade mucinous neoplasm with free margins and no infiltration to the basement membrane (carcinoma in situ); the patient was referred to the medical oncology department that recommended only follow-up of the patient.

Results

One hundred and forty-five patients presented clinically. They were diagnosed with acute appendicitis after laboratory tests and ultrasonography. Eighty-nine patients (61.38%) were males,

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Conflict of interest: None

Table 1: Gender distribution of the patients

		Frequency	*Percent*
Valid	Male	89	61.4
	Female	56	38.6
	Total	145	100.0

Table 2: Age

	N	*Minimum*	*Maximum*	*Mean*	*Std. deviation*
Age	145	16.00	57.00	27.8069	8.34024

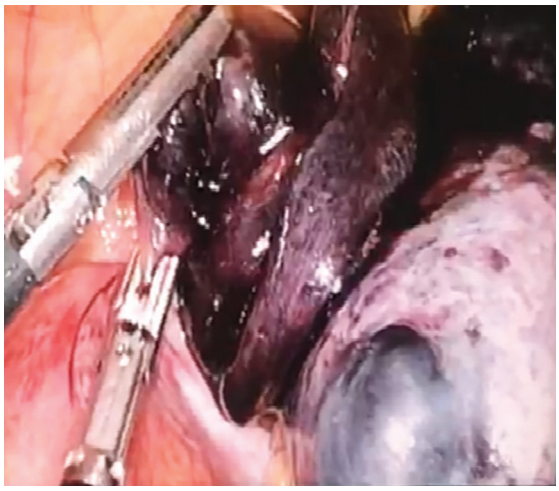

Fig. 1: Right ovarian torsion with gangrene

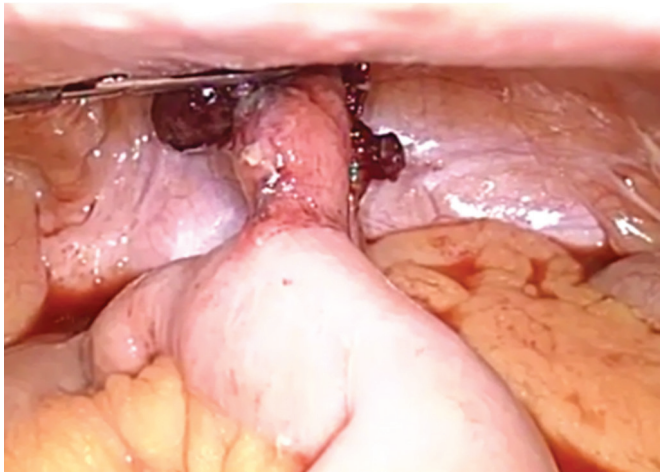

Fig. 2: Gangrenous Mickel's diverticulum

and 56 (38.6%) patients were females (Table 1). The mean age was 27.81 ± 8.34 years (Table 2). The minimum age was 16 years and younger patients were operated by pediatric surgery staff.

During laparoscopic exploration, the cause of acute abdomen was discovered not to be acute appendicitis in 7 (4.83%) patients; 3 cases had ruptured ovarian cyst, 1 case had torsion ovary (Fig. 1), 1 patient had acute Meckel's diverticulitis (Fig. 2), 1 patient had caecal diverticulitis (Fig. 3), and 1 patient had inflamed sigmoid appendices epiploica (Fig. 4) (Table 3).

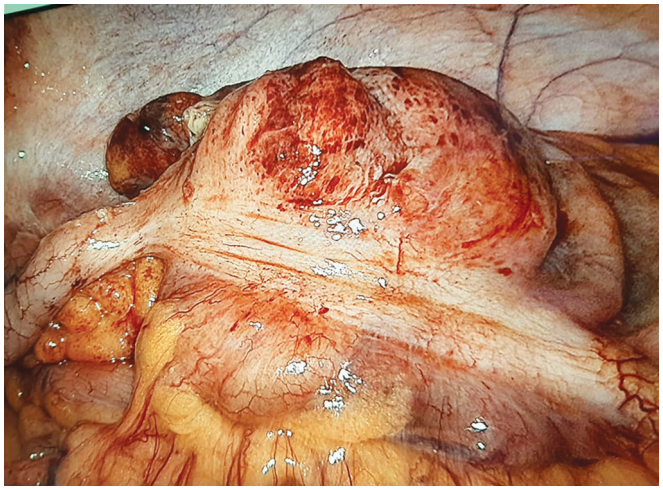

Fig. 3: Inflamed cecal diverticulum

Fig. 4: Resected inflamed sigmoid appendicitis epiploica

Table 3: Distribution of non-appendiceal pathology by gender and age

		Sex			
		Male	*Female*	*Age*	*Total*
	Ruptured ovarian cyst		1	20	1
	Ruptured ovarian cyst		1	24	1
	Ruptured ovarian cyst		1	28	1
	Torsion ovary		1	30	1
	Meckel's diverticulitis	1		31	1
	Inflamed sigmoid appendices epiploica	1		33	1
	Inflamed cecal diverticulum		1	44	1
Total	Ruptured ovarian cyst	0	3		3
	Torsion ovary	0	1		1
	Meckel's diverticulitis	1	0		1
	Inflamed cecal diverticulum	0	1		1
	Inflamed sigmoid appendices epiploica	1	0		1
	Total	**2**	**5**		**7**

Table 4: 0perative time

	Procedure	*N*	*Mean*	*Std. deviation*	*t*	*p-value*
Operative time	Appendectomy and other pathology	7	72.4286	10.37396	10.310	0.000
	Appendectomy only	138	43.6667	7.02896		

Table 5: Distribution of histopathological features of the removed appendix

			Sex		
Age group			*Male*	*Female*	*Total*
16–25	Histopathology of the removed appendix	Acute catarrhal inflammation	25	14	39
		Suppurative appendicitis	9	6	15
		Gangrenous appendicitis	7	2	9
		Normal appendix	5	4	9
	Total		**46**	**26**	**72**
26–35	Histopathology of the removed appendix	Acute catarrhal inflammation	10	7	17
		Suppurative appendicitis	11	9	20
		Gangrenous appendicitis	4	3	7
		Normal appendix	2	3	5
		Low-grade mucinous neoplasm	0	1	1
	Total		**27**	**23**	**50**
36–45	Histopathology of the removed appendix	Acute catarrhal inflammation	7	3	10
		Suppurative appendicitis	4	0	4
		Gangrenous appendicitis	0	3	3
		Normal appendix	1	0	1
	Total		**12**	**6**	**18**
46–55	Histopathology of the removed appendix	Acute catarrhal inflammation	0	1	1
		Suppurative appendicitis	2	0	2
	Total		**2**	**1**	**3**
56 or older	Histopathology of the removed appendix	Acute catarrhal inflammation	1		1
		Suppurative appendicitis	1		1
	Total		**2**		**2**
Total	Histopathology of the removed appendix	Acute catarrhal inflammation	43	25	68
		Suppurative appendicitis	27	15	42
		Gangrenous appendicitis	11	8	19
		Normal appendix	8	7	15
		Low-grade mucinous neoplasm	0	1	1
	Total		**89**	**56**	**145**

The mean operative time when appendectomy was the only procedure done was 43.6667 ± 7.02896 minutes while in the case of associated pathology, this time was longer (72.4286 ± 10.37 minutes) ($p = 0.000$) (Table 4).

Appendicular histopathology showed acute inflammation with different subtypes in 130 (89.66%) cases, low-grade appendiceal mucinous neoplasm in one case (0.69%), and 15 (10.34%) cases had normal appendix in histopathological examination (Table 5). Six patients with normal appendix had another surgical cause of acute abdominal pain, that was managed laparoscopically. Nine (6%) patients showed no apparent cause of their abdominal pain. The appendix of the patients with cecal diverticulitis showed acute catarrhal inflammation.

Eight cases (5.5%, 8/145) showed histopathologies other than acute appendicitis, seven non-appendiceal, and one appendiceal pathology.

Discussion

One of the most common causes of surgical emergencies is acute appendicitis.[5] Diagnosis of acute appendicitis is a challenge even to experienced surgeons and is usually a clinical one. Accurate medical history taking and clinical examination are essential to prevent unnecessary surgery, thereby avoiding operative complications.[6]

Approximately 80% of the clinically diagnosed acute appendicitis is accurate, with a false-negative appendicitis rate of 20%. The patient gender plays a vital role in the diagnostic accuracy of acute appendicitis, with a range of 78–92 and 58–85% in male and female patients, respectively presenting with right lower abdominal pain.[7]

The hazards of ionizing radiation make the routine use of computed tomography (CT) scans in diagnosing acute appendicitis highly controversial, especially in trenchant clinical presentations.

The dose of radiation delivered to the patients during CT scan of the abdomen is high, which may be comparable to 400 chest X-rays, and this certainly will increase the risk of occurrence of malignancies like leukemia.[8–10]

In our institution, a CT scan is not routinely used to diagnose acute appendicitis.

Acute appendicitis can mimic many gynecologic conditions, making the diagnosis uncertain. Although the imaging techniques have improved over the last three decades, it may still be challenging to differentiate between non-gynecologic and gynecologic causes of the acute abdomen before surgery.[11]

This retrospective study was done on 145 patients who were admitted to the Emergency Unit, Zagazig University Hospitals, Egypt with a diagnosis of acute appendicitis from March 2017 to December 2019.

In this study, the incidence of non-appendicitis acute abdomen among our patients was 7/145 (4.83%). The gynecological causes were 4/145 (2.76%): three ruptured ovarian cysts, and one ovarian torsion. The extra-appendiceal non-gynecological causes were 3/145 (2.07%): one Meckel's diverticulitis, one cecal diverticulitis, and one inflamed sigmoid appendices epiploica.

Seetahal et al. conducted a retrospective study that revealed that the gynecologic conditions involving the ovary are the commonest to be misdiagnosed as an appendiceal disease in females.[12] Literature depicted the risk of a wrong preoperative diagnosis (ovarian causes versus acute appendicitis) to be 5–8%, which was not high but still worthy of attention.[13]

The clinical presentation of Meckel's diverticulitis is typically nonspecific.[14] Radiologically, the diagnosis of Meckel's diverticulitis can be challenging, especially if it is initially not suspected.[15]

In this study, one case (0.69%) of complicated gangrenous Meckel's diverticulitis was detected in a 31-year-old male who presented with right iliac fossa pain and leukocytosis, and ultrasonography showed only free fluid in the right iliac fossa.

Epiploic appendagitis of the sigmoid colon is a rare cause of acute abdominal pain. The cause of this pathology may be torsion or thrombosis of the appendage's veins.[16] It is often misdiagnosed as either appendicitis or diverticulitis, according to its location.[17] Two studies found that the most common presentation of epiploic appendagitis was left lower quadrant pain (69–89%), right lower quadrant pain (8–16%), and pain at other locations, including in right and left upper quadrants (1.5–3%).[18,19]

In our study, one case (0.69%) was detected in a 33-year-old male who presented with right iliac fossa pain mimicking acute appendicitis that started a week before the presentation.

Inflammation of a colonic diverticulum in the caecum or ascending colon is called right-sided diverticulitis.[20] The presentation of cecal diverticulitis is usually acute abdominal pain, which may be misdiagnosed by most surgeons as acute appendicitis. The treatment of the cecal diverticulum in most studies ranges from conservative medical treatment to right hemicolectomy.[21]

In this study, we encountered a case of cecal diverticulitis in a 44-year-old female during laparoscopic appendectomy that was managed conservatively, and the patient improved and was discharged after three days postoperatively.

Oudenhoven et al. reported the success of the conservative medical treatment in most of the cases with cecal diverticulitis (41/44) and surgery in three patients. The symptoms recurred in five patients who received the medical treatment, two of them needed surgical treatment.[22]

In this study, histopathology of the removed appendix was done for all cases. 131 (90.34%) patients had appendiceal pathology, 130 (89.66%) patients had different types of acute inflammations, and one patient had a low-grade mucinous neoplasm non-infiltrative with free margins. Fifteen patients had negative appendectomies. The appendix of the patient with cecal diverticulitis showed acute catarrhal inflammation. Six patients with negative appendectomy had another pathology of their acute abdominal pain, which managed laparoscopically. Nine (6%) patients had no apparent cause of their abdominal pain.

Appendiceal mucinous neoplasms are rare tumors with an incidence of 0.4–1.0% among gastrointestinal cancers. In the early stage and due to distension of the appendix with mucin, it presents with acute appendicitis-like symptoms. About one-third of the patients with appendiceal mucinous neoplasms are diagnosed preoperatively as acute appendicitis.[23,24]

The incidence of non-appendicitis pathology in our study was 7/145 (4.83%), which was slightly higher than that reported by Yabanoglu et al. (3.9%).[4]

Conclusion

Diagnosis of acute appendicitis is challenging up to date; we faced many conditions mimicking acute appendicitis during surgical intervention.

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ORIGINAL ARTICLE

Intraoperative Cholangiography during Cholecystectomy Using a Biliary-nose Tube: Routinely Used in Patients with Main Bile Duct Stones

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Abstract

Background: Nowadays, the "gold standard" treatment for gallbladder stones is laparoscopic cholecystectomy but the risk of iatrogenic biliary duct injuries is increased compared to "open" surgery. Intraoperative cholangiography (IOC) can be useful to avoid biliary injuries but it can also be a no-safe procedure in center in which it is not routinely performed.

Aim and objective: The aim of our study is to trust the efficacy of IOC in a patient with common bile duct (CBD) and gallbladder stones using a biliary-nose tube.

Materials and methods: 135 patients with gallbladder and CBD stones were treated with sequential therapy and randomly divided into two groups. Laparoscopic cholecystectomy was performed within 24/48 h. During endoscopic retrograde cholangiopancreatography, a biliary-nose catheter was left to perform cholangiography during the following surgical procedure. Group A had also a cholangiography at the beginning of the surgical procedure in order to evidence biliary duct structure.

Results: Cholangiography avoided a lesion of the biliary ducts in nine patients. Only a patient had a residual stone in the CBD. The dissection at Calot's triangle was faster in group A patients without differences between the surgeons involved.

Conclusion: The biliary-nose tube can be useful in patients with gallbladder and CBD who underwent cholecystectomy for different reasons: it lets the surgeon performing IOC faster and without risk linked to the technique used; it reduces the risk of biliary injuries; and surgeons feel more safe and calm during the surgical procedure.

Keywords: Endoscopic sphincterotomy, endoscopic retrograde cholangiopancreatography, Gallbladder stones, Laparoscopy, Video laparoscopic cholecystectomy.

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Background

Today the "gold standard" treatment of gallbladder stones is laparoscopic cholecystectomy. Nevertheless, the risk of an iatrogenic injury of the biliary ducts has increased from two to four times compared to "open" surgery.[1,2] The incorrect visualization of the cystic duct, the common bile duct (CBD), and the cystic artery is often responsible for lots of injuries in both techniques.[3,4]

Anatomical changes can involve the hepato-cystic triangle, due to acute or chronic inflammatory phenomena, as well as frequent anatomical variations.[5,6] They have always been an important element of operative outcome and they can reduce long-term survival and patient's quality of life.[7,8]

In 1932, Mirizzi developed intraoperative cholangiography (IOC), an imaging technique to evidence biliary ducts intraoperatively.[9]

This method has been widely applied in North American clinical practice in association with open cholecystectomy since the early 1950s.[10]

At the beginning of the technique, surgeons explored the CBD biliary tract during the cholecystectomy in 30–65% of cases.[10] However, surgical exploration of CBD was associated with a significant increase in mortality and morbidity. Based on these observations, a routine use of the IOC associated with cholecystectomy has been proposed.[11,12] The IOC associated with open cholecystectomy decreased the incidence of misrecognition of asymptomatic lithiasis of the CBD that is 7%.[13] The routine use of IOC reduces the requirement of CBD surgical exploration from 66% to <5%.[14]

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The introduction in 1974 of endoscopic retrograde cholangiopancreatography (ERCP) with the endoscopic sphincterotomy, offered for the first time an alternative to reoperation for the treatment of residual CBD stones.[15]

Video laparoscopic cholecystectomy (VLC) in 1988, opened again the debate around the routine or selective use of IOC for the increased CBD iatrogenic lesions associated with VLC.[16,17] Different factors can be involved: the incorrect identification of the anatomical structures; a large number of anatomical biliary duct variations and vascular abnormalities; the anatomical changes due to prolonged and repeated inflammatory processes involving the gallbladder and the adjacent tissues; and surgeons learning curve.[18–20]

Nowadays, IOC has a marginal role in lots of surgical centers because few surgeons use it routinely, most of them use it occasionally or do not use it.[21,22]

Nowadays, ultrasound (US) technology, the ERCP, and MRI allow a higher diagnostic accuracy on the stones' presence.[23,24]

On the other hand, lots of studies showed that the IOC associated with the VLC decreases the incidence of misrecognition of asymptomatic CBD stones that is usually around 7%.[13,25] It can also avoid possible complications linked to the surgical procedure.[26–28] In addition, ERCP stones removal with the "inverse sequential" treatment may not be always successful and this situation requires to carry out a new surgical procedure.[29,30]

Moreover the surgical centers in which IOC is not routinely used, reported a higher risk of biliary injuries performing IOC than in centers in which IOC is routinely performed.[31–33]

For these reasons, we designed a prospective randomized study to verify the usefulness of routinely IOC during laparoscopic cholecystectomy, using a biliary-nose tube, inserted in a patient having main bile duct stones, previously treated by ERCP.

Aims and Objectives

This prospective randomized study aim is to verify the importance of IOC during laparoscopic cholecystectomy, testing its features in avoiding biliary injuries especially in difficult anatomical conditions. We also tried to propose a form taking into account patients' features to hypothesize the surgical complexity of the procedure.

Materials and Methods

We enrolled in our study patients with gallbladder and CBD stones diagnosed at US and MRI, undergoing endoscopic sphincterotomy before laparoscopic cholecystectomy. In all patients, a biliary-nose tube had been left inside the bile duct during ERCP and cholecystectomy had been performed in 24/48 hours after endoscopic sphincterotomy.

In the period from January 1, 2011 to December 31, 2015, 135 patients with inclusion criteria were recruited. Patients' age ranged from 41 to 84 years, 43 were male (31.8%) and 92 female (68.1%).

Anamnestic data were collected for each patient, as well as all the diagnostic data obtainable from the instrumental exams used to do the diagnosis.

Some features taken from clinical history and imaging data were taken into account to develop an evaluation form that could allow to preview surgical dissection difficulties. In the form, we attributed the number 1 with a negative sign (–) when the predictivity of difficulties was negative and with a positive sign (+) if it was positive (Table 1).

In patients with a positive-sum (risk group), we expected to find altered locoregional anatomical conditions, while in the negative-sum (no-risk group), these conditions were not expected. In cases of a sum equal to 0, the patient was attributed to the subgroup of those with probable alterations.

We divided all the patients randomly into two groups (Table 2) and we valued:

- The real correspondence with the prediction of anatomical findings;
- The time needed in surgical dissection;
- The biliary duct integrity;
- IOC time;
- The presence of residual stones in CBD.

Table 1: Form used to divide patients into two subgroups

Age	<40 years	–1
	>40 years	+1
Sex	Male	+1
	Female	–1
Murphy's sign	Negative	–1
	Positive	+1
Symptoms time-frame	Recent/accidental reporting/asymptomatic	–1
	<2 years	–1
	>2 years	+1
Previous episodes of jaundice or subitterus		+1
No previous episodes of jaundice or subitterus		–1
Jaundice at first diagnosis		+1
Previous episodes of cholangitis		+1
Previous episodes of cholecystitis		+1
Previous recurrent biliary pain		+1
Previous biliary pain sporadic and infrequent		–1
US abdominal findings	Non complicated	–1
	Complicated	+1
MRI valuation	Normal anatomy	–1
	Possible alterations	+1

If the sum was ≥0, the patient belonged in the risk group of complicated surgical dissection

Table 2: Study parameters considering the applied form of Table 1

Study parameters	*Group A*	*Group B*
Number of patients	68	67
Male	22	21
Female	46	46
Risk group expected (≥0)	45 (66.2%)	42 (62.7%)
No-risk group expected (<0)	23 (33.8%)	25 (37.3%)
IOC before dissection	Yes	No
IOC before cutting	Yes	Yes
Positioning time radiological equipment (minutes)	5′12″	4′40″

In group A, the ICO was performed through the biliary-nose tube at the beginning of the surgical procedure and once isolated the cystic duct and artery. In group B, the ICO was performed after dissection, before cystic duct and artery section.

According to the preoperative study form, we hypothesized 87 patients (64.4%) who have had unfavorable local anatomical conditions (risk group) and 48 (35.5%) in which unfavorable locoregional conditions were not expected (no-risk group).

In group A, after random division, 68 patients were included with 45 patients (66.1%) of risk group. In group B were enrolled 67 patients, including 25 (37.3%) of no-risk group and 42 (62.6%) of risk group.

All the procedures were performed by three different surgeons: two seniors, who had done 382 and 259 open cholecystectomies, respectively, with an IOC percentage of 83% and 87%, 150 and 167 VLC with an IOC percentage of 6 and 7.2%; a junior surgeon, younger and not expertise, who had done 29 open cholecystectomies performing an IOC in 12 cases (41.4%) and 47 VLC with an IOC in 6 cases (12.7%).

At the beginning of surgical procedures, surgeons had to declare their perception of the degree of safety owned, expressing it through a numerical score from 1 to 5 and giving the value of 5 to a mood of peaceful safety. Surgeons knew in which of risk or no-risk group the patient belonged.

Once the trocars were positioned and the surgeons evaluated the surgical field, they had to do a survey attributing the following values:

- 5 if he was sure of being able to complete the procedure laparoscopically;
- 4 if he was sure to complete the laparoscopic procedure with longer time;
- 3 if he thought he needed to perform an IOC;
- 2 if there was the possibility to convert the procedure to open surgery;
- 1 if he wanted to convert immediately.

At the end of the procedures, surgeons had to express their opinion on the usefulness of cholangiography, with also the subjective influence that it has had on the procedure.

In both groups, there were no significative differences in the positioning time of the radiological equipment that was about 5 minutes and cholangiography time that was between 3 minutes and 6 minutes.

Results

In group A, "difficult" anatomical conditions were found in 9 of the 23 patients (39.1%) of no-risk group and in 27 (60%) among the 45 of the risk group (Table 3). When locoregional anatomy was not significantly changed, the dissection time after cholangiography was between 10 minutes and 20 minutes. In those patients with locoregional alterations, the dissection time was between 10 minutes and 35 minutes. Transcatheter cholangiography allowed the safe recognition of anatomical structures in all patients without complications. Surgeons avoided injuries in the patients in which difficult conditions were not expected thanks to IOC. The second cholangiography avoided a lesion of the biliary duct in two patients of this group.

In group B, we performed cholangiography after the isolation of the anatomical structures at Calot's triangle. In the 42 patients of the risk group, we found 31 (73.8%) difficult surgical dissections and 9 among the 25 in which anatomical alterations were not hypothesized (26%) (Table 3).

Table 3: Results. There were no significant differences in IOC time. The form applied showed low sensitivity and specificity

Results	*Group A*	*Group B*
Patients without surgical complications	68	67
Risk group results	27 of 45 (39.7%)	31 of 42 (46.3%)
No-risk group results	14 of 23 (20.6%)	16 of 25 (23.9%)
Surgical dissection time (minutes)	24′17″	32′38″
No-biliary duct integrity before cutting	2 (2.9%)	7 (10.4%)
IOC time (minutes)	5 ± 1	4 ± 1
Residual stones in CBD	0	1
Bile duct injuries	0	0

In patients without altered locoregional anatomical conditions, dissection time was between 10 minutes and 35 minutes and between 20 minutes and 45 minutes when difficult anatomy had been found. IOC avoided a lesion of the biliary duct in 7 patients (10.4%) of which 2 (6.6%) with normal anatomical conditions.

Only 1 patient (0.7% of all) had a small stone in CBD. The surgeon eliminated it during the procedure, washing it through the catheter.

All surgeons evaluated their approach to surgery with a score of 5 before the surgical procedure, also in patients where difficult anatomical conditions were expected by the form applied. The rating given by the surgeons after the inspection of the operating field was 3 in 21 cases (13 by the junior surgeon).

Maybe, the IOC previously performed in group A patients provided a first picture of the biliary duct map and this had influenced the rapidity in the dissection that was shorted than group B without significant difference between senior and junior surgeons. It seems that a preventive view of the biliary ducts can contribute to a faster dissection but it is the IOC performed before the section that had a real meaning in avoiding biliary injuries. In fact, in nine cases surgeons avoid biliary damages thanks to IOC.

The form used to hypothesize the anatomical conditions, based on the elements we have taken into, has shown poor specificity (67%) and sensitivity (76%).

Discussion

Laparoscopic cholecystectomy is the gold standard for gallbladder cholelithiasis but is linked to an increased rate of biliary injuries.[34] The incorrect visualization of the cystic duct, the CBD, and the cystic artery is often responsible for surgical injuries.[11] The European Association for Endoscopic Surgery's guideline shows the importance of dissection and the relevance of the critical view of safety (CVS).[35] CVS is not only a dissection method but also the final picture that is obtained through a careful and prudent dissection of the Calot's triangle to highlight the duct and the cystic artery.[36,37]

Despite its adoption, however, the percentage of biliary injuries has not decreased even in centers where it is routinely adopted.

Laparoscopic surgeons lack three-dimensional (3D) view and tactile sensitivity causing iatrogenic bile duct injuries.[5] These problems are on the focus of scientific discussion. 3D laparoscopy helps surgeons, especially in difficult surgical procedures, but this technology is still not present in most of the surgical departments.[38]

Since 1932, IOC can help to avoid biliary injuries but its routine use is controversial: it is very useful to find anatomical biliary alterations or to find residual/unknown stones in the CBD;[39,40] however, it is expensive in terms of time and costs and it can also cause biliary damages by itself.[41,42]

The ERCP changed the choledocholithiasis therapy and it let to avoid complications linked to the surgical exploration of CBD. Lots of patients need ERCP because it immediately solves their choledocholithiasis pathology with a short time of hospitalization. Nowadays, ERCP is routinely performed and lots of centers follow the sequential treatment in gallbladder/choledocholithiasis. Leaving a biliary-nose tube during ERCP is a simple and safe procedure. It can be useful in sequential therapy in patients who should undergo cholecystectomy. In this way, we can avoid the problems linked to loss of time and biliary injury due to tube insertion procedure. It can also be avoided that a stone could pass throw the cystic duct to the CBD during intraoperative anterograde cholangiography.

Surgeons feel more comfortable knowing to have a biliary-nose catheter to perform an IOC and this is well expressed in our

study according to the surgeon's answers. It seems to reduce the open conversion rate but there will be further necessary studies to underline it. In our experience, a predictive form of anatomical alterations finding seems not to be useful before a surgical procedure because all the surgeons give an answer of five independently of the surgical difficulties hypothesized.[17] IOC costs are not excessive when compared to human and economic costs after iatrogenic biliary injuries.[16,43] The costs for a lesion that required a biliodigestive anastomosis over a lifetime are estimated at around €300,000 that is like the cost of 3000 VLC.[44]

As also shown by a study on over 300,000 laparoscopic cholecystectomies, the percentage of lesions was 0.21% when routinely IOC was performed, compared to 0.43% in cases of selective cholangiography. If the technique does not eliminate iatrogenic injuries, it certainly minimizes the incidence.[45,46]

Conclusion

A primitive evaluation of the possible difficult anatomy findings seems to have no influence on the surgeon's mood. Prior knowledge of the "biliary tree" map may help to speed up dissection time in difficult cases, but it is the cholangiography performed before cutting the cystic artery and duct that can avoid biliary injuries.

IOC should be used more frequently especially in patients with gallbladder and CBD stones. The use of a previously positioned biliary-nose tube lets surgeons doing IOC faster and without risks linked to the technique.

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ORIGINAL ARTICLE

Minimal Access Surgical Experience in Developing Economy: A Young Trainee Stimulant

Patrick O Igwe

Abstract

Background: The utilization of minimal access surgery (MAS) is rising in developing countries. Robotic surgery is rarer. The mirage surrounding operating with a telescope is completely changing the dimension of surgery. A young trainee finds it difficult to properly perform this surgery.

Aim and objective: This study aimed to elucidate an experience of minimal access surgeons practicing in a developing economy with the hope of stimulating a young trainee surgeon in the same field of study.

Materials and methods: This was a review of prospectively collected data of cases performed, stored electronically in an Excel spreadsheet and statistical software, Epi info, from December 2017 to March 2020. This review included laparoscopic procedures, colonoscopies, and esophagogastroduodenoscopies (OGD) performed by the author in a tertiary hospital and two private centers. It excluded all cases assisted by the author. The results were analyzed using statistical software, SPSS version 23.

Results: A total of 195 cases were performed. Esophagogastroduodenoscopies consisted of a maximum of 114 cases. This was followed by colonoscopies (52 cases), and laparoscopy (29 cases). The laparoscopic cases consisted of laparoscopic cholecystectomy (6), diagnostic laparoscopy (11), laparoscopic appendectomies (8), laparoscopic fundoplication (1), and foreign body retrieval (1). This study showed a gradual shift from mild to more complex minimal access procedures.

Conclusion: Performing minimal access procedures requires extensive training. Findings from this study will guide a young trainee in a developing economy to perform the easily available surgery procedures.

Keywords: Developing economy, Experience, Minimal access surgery, Young trainee.

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Introduction

The utilization of minimal access surgery (MAS) is rising in a developing economy.[1] The illusion of performing a surgical procedure with a telescope is currently moving surgical practice to a new level, especially for surgeons practicing in low- and medium-income countries. A beginner in minimal access surgical procedures needs to be abreast of this procedure. Taking steps to undergo training in minimal access procedures is indeed a very good option. Training is provided by good trainers who will give you the right ergonomics.[2] However, it may be worthwhile to peruse the experience of similar surgeons, especially those with recent experience on the trend of these procedures in the developing country. The use of modules, simulators, and trainers could be a plus.[3,4] Using a phone by a young trainee could help facilitate learning.[5]

Aim and Objective

This study aimed to elucidate an experience of minimal access surgeons practicing in the developing economy. This may be useful to a young trainee surgeon.

Materials and Methods

This study is a review of prospectively collected data of all minimal access procedures performed by the author and stored electronically in an Excel spreadsheet and Epi-info software from December 2017 to March 2020. The review included laparoscopic procedures, colonoscopies, and esophagogastroduodenoscopies (OGD) performed in a tertiary hospital and two private centers in Nigeria. It excluded all cases that were assisted or observed by the author. The results were analyzed using statistical software, SPSS, version 23.

Results

A total of 192 cases were performed. OGD consisted of the highest 114 cases. This was followed by colonoscopies in 52 cases, then laparoscopy with 26 cases (Fig. 1). The average cost for the endoscopies was 300 USD, while the average cost of laparoscopic procedures was 1500 USD. The laparoscopic cases (Fig. 2) consisted of laparoscopic cholecystectomy ($n = 6$), diagnostic laparoscopy

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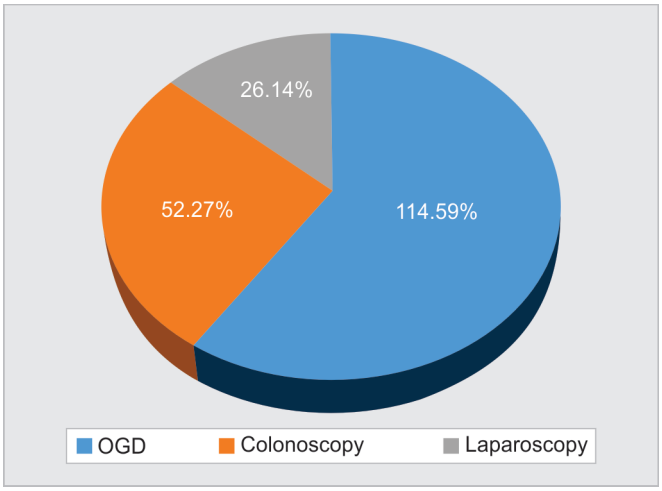

Fig. 1: Pie chart showing different MAS procedures. In the pie chart, the first numbers show the numbers of cases (*n*) and the second number percentage of procedures

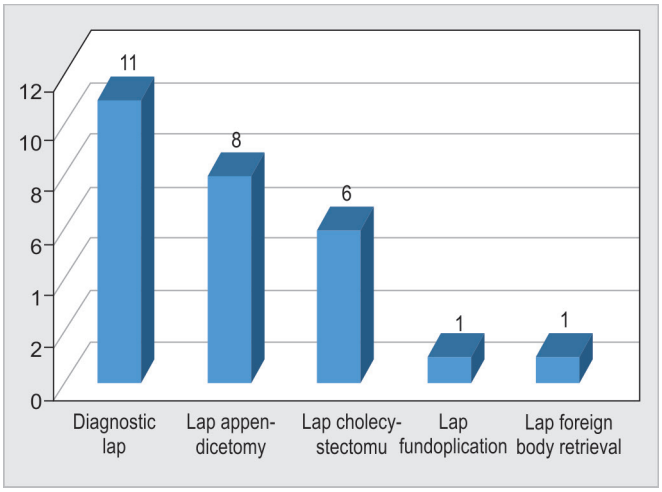

Fig. 2: The number of different types of laparoscopic cases

(*n* = 11), laparoscopic appendectomies (*n* = 8), laparoscopic fundoplication (*n* = 1), and foreign body retrieval (*n* = 1). The laparoscopic surgeries had a female to male ratio of 12:1. This result showed a gradual shift from mild to more complex minimal access procedures, with females being more beneficiaries. Most of the patients were young. The mean age was 29.3 ± 11.6 years. The oldest patient was a 65-year-old woman who had laparoscopic cholecystectomy while the youngest patient was an 8-year-old boy who had diagnostic laparoscopy with orchidectomy for undescended (intra-abdominal) right testes. The laparoscopic cases had an average procedure time of 60 minutes and both the conversion and case fatality rates were nil (0%). Only one patient had a port site infection that was managed conservatively.

The author could intubate the duodenums in all cases of OGS performed, except in three patients with gastric outlet obstruction where the risk of perforation was high and the endoscope could not enter the first part of the duodenum. The average intubation and procedure durations were 10 and 15 minutes, respectively.

The colonoscopy appears to follow the same pattern with 51 (98%) cases of cecal intubation. The average procedure duration was 45 minutes. All patients had a very good outcome.

Discussion

Minimal access surgery involves the use of camera-guided images to carry out procedures upon patients. Some authors prefer to use the term minimal invasive or incision surgery. It is also termed, in some instances, as key-hole surgery and also button-hole operation. These are for easy comprehension or clarity of terminology for trainees and clients or patients. The author preferred minimal access surgery to be a more comprehensive term just like his trainer.[6] However, endo-luminal, laparoscopy, and some other related procedures within the scope of this minimal access surgery were considered here. Hence, this review is expected to stimulate a young trainee surgeon to set up a career choice in minimal access surgery in a developing economy. The issue of the learning curve has been overemphasized and attention should be drawn to commonly performed procedures. Those who have high demanding practice, are easily available, and give a good outcome should be of prime importance in the scale of preference.

A glance at the results of the above procedures shows that endoscopic procedures were more than laparoscopies. This could be the result of high demand for upper and lower gastrointestinal endoscopies. This could also have been a result of associated lower costs. Most laparoscopic procedures appear to be more expensive than endo-luminal procedures as can be seen in the index report. More studies are required to elucidate MAS in developing countries. A young trainee should be aware of this fact, as acquiring skill in endo-luminal procedures could hasten experience in MAS. More data and studies will be required to compare activities of those with endo-luminal experience before laparoscopic procedures in low-income countries. Most hernia procedures are still done under regional or local anesthesia in low or medium-income countries, thereby, reducing the demand for laparoscopies that most often utilize general anesthesia.

Although the author recorded a nil conversion rate and nil case fatality rate, this may be due to a limited number of cases performed. It might also be due to adequate training that the author underwent at a good training center.[6] The act of conversion should always be borne in mind and discussed with the patient. The surgeon should be familiar with the anatomy of the area. He may not necessarily know how to repeat the open type of the operation but should have a colleague who can perform the open type around especially while operating in a developing economy. Also, a more senior minimal access surgeon, laparoscopist, or endoscopic surgeon is a good asset.

This result showed a gradual shift from mild to more complex minimal access procedures. Some cases, such as appendicectomy and laparoscopic cholecystectomy may be termed basic laparoscopic procedures. However, the author has encountered two instances where laparoscopic cholecystectomy was not the usual norm. He could remove giant calculi in the procedure via laparoscopy.[7] Laparoscopic fundoplication or retrieving a sharp foreign body is an advanced procedure. Some authors have reported retrieval of sharp foreign bodies.[8,9] The young trainee surgeon should have acquired the skill of intra-corporeal suturing technique. He should have mastered the act, especially during laparoscopic cholecystectomy, appendicectomy, and the likes.

The laparoscopic surgical cases had a female to male ratio of 12:1 with females being more beneficiaries. This may be a result of the diagnostic dilemma of young female patients presenting with abdominal pain. Cosmetic incisions may be another paramount reason as most females prefer these incisions. Furthermore, less pain, early return to work, and resumption of activity are all-inclusive in the avalanche of minimal access procedures.

A young trainer is therefore required to undergo extensive training at a good center, develop passion, exhibit yearn, and develop firm practicing habits to enhance necessary skills after taking a bold step.

Conclusion

Starting minimal access procedures requires a gradual curve of training. This experience will guide a young trainee in a developing economy on the easily available procedures to perform.

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ORIGINAL ARTICLE

Postoperative Seroma Collection in Operated Case of TAPP Hernioplasty in Unilateral Inguinoscrotal Hernia

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Abstract

Introduction: Repair of inguinal hernia is one of the commonest performed surgical procedures worldwide. Usually, a seroma develops in large inguinoscrotal hernias. Generally, a seroma is a cause of significant distress for the patient since it may recur. If the possibility of seroma formation is discussed with the patient before surgery, it may go a long way in alleviating the patient's distress. Seromas are common after large hernia repair and direct hernia repair.

Materials and methods: In this observational study, 50 patients were randomly selected from LG. Hospital (AMC MET Medical College, Ahmedabad, India) who went through TAPP hernioplasty for an inguinoscrotal hernia after a complete explanation of conversion to open as well as post-operative seroma formation. Since all cases were indoor patients, they were initially reviewed on the next day morning after the operation and the next examination time point was seven days later for seroma development. All the patients were followed up at 6 weeks and then every month for 6 months up to 1 year.

Results: Out of 50 patients, 44 (88%) patients had an indirect hernia and 6 (12%) patients had a direct hernia. The seroma developed in only three patients (6%) who were managed conservatively with only medicines. Within the follow-up period, no patients had pain, seroma, and recurrence.

Conclusion: In some cases of large scrotal hernia, the distal sac was difficult to be inversed or the hernia sac even adhered firmly to the ipsilateral testicle and other structures. In those cases, avoiding inverting the distal sac and leaving the distal sac in place means to avoid dissecting out the distal sac observed lesser occurrence of the seroma. That suggests that the laparoscopic method can help prevent or decrease the chance of the development of seroma in the unilateral inguinoscrotal hernia.

Keywords: Hernia, Hernioplasty, Inguinoscrotal hernia, Laparoscopy, Laparoscopic hernia repair, Laparoscopic inguinal hernia repair, Seroma, Transabdominal preperitoneal.

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Introduction

Repair of inguinal hernia is one of the commonest surgical procedures performed worldwide. The lifelong risk for males is 27% against 3% for females.[1] Since Bassini published his landmark paper about the manner of tissue repair in 1887, numerous modifications have been proposed. Shouldice four-layer inguinal hernia repair technique enjoyed extensive popularity before the idea of prosthetic material was introduced. Hence, tissue repair may be the commonest type of hernia repair in the developing world. But, with tissue repair comes the manipulation of the tissue, which can lead to the increased risk of seroma formation.

There has been a revolution in surgical procedures for groin hernia repairs after the introduction of laparoscopy. Ger documented the first laparoscopic hernia repair in 1982 by approximating the internal ring with stainless steel clips.[2] Since then, laparoscopic trans-abdominal preperitoneal repair (TAPP) is an increasingly innovative technique within hernia surgery and is now equally effective in preventing recurrence. The TAPP approach of laparoscopic hernia repair replicates the concept of Stoppa repair. The benefits of laparoscopic repair include the reduced incidence of recurrence similar to as noticed using the Stoppa technique that has the advantages of lesser pain, reduced discomfort, less tissue dissection, and manipulation, short hospital stay, and earlier resumption of normal daily activities.

Usually, seroma develops in the large inguinoscrotal hernias.[2] Seroma generally is a cause of significant distress for the patient, since it may recur frequently. If the possibility of seroma formation is discussed with the patient before surgery, it can significantly reduce patients' distress. The occurrence of seromas is common after large hernia and direct hernia repair.[2–4] Seroma formation is very common throughout the learning phase and decreases with increasing experience. TAPP techniques are the most widely adopted laparoscopic procedures for inguinal hernia repair with favorable clinical outcomes, such as shorter hospital study, minimal postoperative pain, and decreased surgical site infection (SSI). However, seroma formation is the most frequent complication after laparoscopic repair.[2,5] In this study, we aimed to study the occurrence of seroma formation in operated cases of unilateral inguinoscrotal hernia by laparoscopic methods.

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Aims and Objectives

To evaluate the incidence of postoperative seroma collection in TAPP hernioplasty in inguinoscrotal hernia in our surgical department at AMC MET Medical College and LG hospital, Ahmedabad.

Materials and Methods

In this prospective observational study, 50 patients were randomly selected from LG. General Hospital, AMC MET Medical College, Ahmedabad, India from May 2018 to May 2019.

Inclusion Criteria

- Unilateral inguinoscrotal hernia going beyond the root of the scrotum in patients admitted to the Department of Surgery.
- Patients who were willing to give informed consent for laparoscopic TAPP hernioplasty repair.

Exclusion Criteria

- Patient's age >65 years.
- Patient's age <18 years.
- Laparoscopic TAPP converted to open hernioplasty.
- Inguinal hernia.

All patients went through TAPP hernioplasty for an inguinoscrotal hernia after a complete explanation of conversion to open as well as postoperative seroma formation; which is usually 5–25%. Gentle careful dissection and perfect hemostasis were attempted. The pseudosac was tacked toward the pubic bone with two or three tacks in a large direct hernia to avoid seroma formation. In indirect hernia, meticulous dissection was done at the deep inguinal ring to skeletonize the sac from cord structures. Nontraumatic graspers were used to dissect the planes to keep the dissection field blood-free. We did not invert or dissect out the whole distal sac in the indirect inguinoscrotal hernia. Instead, the distal sac was left intact in place without closing the proximal end of the distal sac. The lower edge of the distal sac was lifted and fixed to the posterior abdominal wall in the site lateral and cranial to the internal ring. The scrotum was to be completely deflated before taking the ports out. Scrotal support was applied for the first 48 hours to prevent their formation. There is a need to reassure a patient regarding the time-bound self-resolution of the swelling. Though it may not resolve in 8 weeks, it might be aspirated under aseptic precautions.

Since all cases were indoor patients, they were initially reviewed the next day morning after the operation and the next examination time point was 7 days later for seroma development in OPD clinics. All patients were advised to return to the clinic in case of delayed complications or any unexpected problems, especially chronic pain and groin swelling. All the patients were followed up at 6 weeks for recurrence (any cough impulse) or any other complication. Then they are instructed to follow up every month for 6 months.

Results

A total of 50 operated cases of unilateral laparoscopic TAPP inguinoscrotal hernioplasty were included in the study.

Out of 50 patients, 44 (88%) patients were operated on for indirect inguinoscrotal and 6 (12%) patients were operated on for a direct inguinoscrotal hernia.

Only three (6%) patients developed clinically detectable seroma during the follow-up period (pod-2), as revealed by their physical examination. Among three patients, two were operated upon for an indirect hernia and the other one was treated for a direct hernia (Table 1).

All three patients were given chemotherapy (Seratopeptidase and Chymotrypsin tablets) and scrotal support was continued. In one of the patients with a direct hernia, seroma collection was resolved postoperatively on day 7. Another patient of indirect hernia, seroma collection was resolved on day 6 postoperatively, and the third patient after 30 days by postoperatively.

Moreover, 47 (94%) patients felt only slight pain the next morning after the operation, the pain became minimal 7 days later, and no chronic pain or neurological pain was recorded. All patients without complications were discharged. During the follow-up period (1–12 months), no pain, seroma, and recurrence were reported by the discharged patients (Fig. 1).

Table 1: Development of seroma in direct and indirect hernia repair by TAPP

	Direct inguinoscortal hernia	*Indirect inguinoscrotal hernia*	*Total (N = 50)*
No. of operated cases	6 (12%)	44 (88%)	50 (100%)
Seroma development	1 (2%)	2 (4%)	3 (6%)

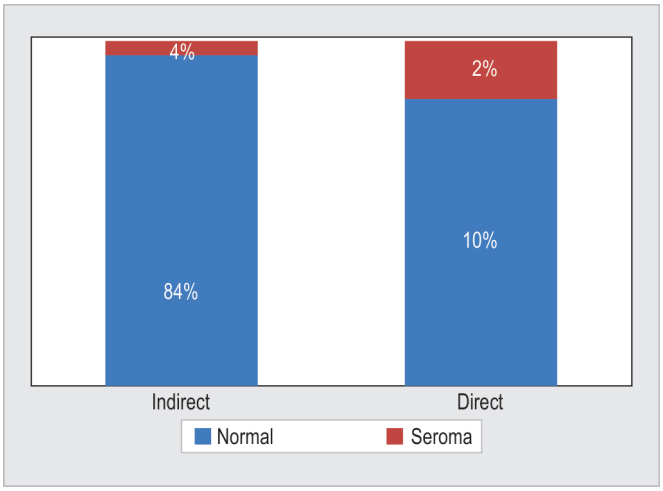

Fig. 1: Development of seroma in direct and indirect hernia repair by TAPP (*N* = 50)

Discussion

Several kinds of procedures have been described in the literature to address the problem of seroma formation, including the use of external compression, the application of fibrin sealant in the preperitoneal space,[6] and dwelling a closed-suction drain in the preperitoneal space.[7] Furthermore, the placement of drainage was with a potential risk of iatrogenic infection and could only be placed for a short period. The pressure dressing is usually difficult to apply over the groin region. Nevertheless, the optimal management of the distal sac is still debated, though some studies have supported

the complete dissection of the sac to avoid seroma formation;[8,9] however, this complete dissection may be difficult in certain cases and carry the risk of injury to adjacent vasculature.

Reddy et al.[10] reported a method of inversion and staple fixation of the lax transversalis fascia to Cooper's ligament, which reduced the incidence of seroma formation after laparoscopic repair of direct inguinal hernia. However, these approaches did not apply to the indirect hernia, since there is no lax transversalis fascia for management in the indirect hernia. Interestingly, Daes reported a method of pulling up the distal hernia sac out of the scrotum and fixing it to the posterior abdominal and reported a low incidence of clinically significant seroma in indirect inguinoscrotal hernia repair.[11]

Various incidences of seroma formation have been reported in the literature, and the increased frequency and volume of seroma formation were associated with large or inguinoscrotal hernias. Lau and Lee reported a seroma rate of 5.7% in nonscrotal hernias and the rate increased to 22.9% in scrotal hernias following laparoscopic hernioplasty.[8] This finding differs from our result where postoperative seroma collection was noted around six percentages.

Conclusion

In some cases of large scrotal hernia, the distal sac was difficult to be inversed or the hernia sac even adhered firmly to the ipsilateral testicle and other structures. Besides, the use of Protack™ in the Daes approach also significantly increases the whole cost of the hernia repair procedure. Thus, in this study, we did not invert the distal sac but left the distal sac in place. Our method has the advantage that we can avoid dissecting out the distal sac. Since the potential space localized behind the mesh extending into the scrotum is one of the main causes of the annoying seroma, our technique prevents the inflow of any exudation and fluid generated in the preperitoneal space during and after operation into the distal hernia sac in the scrotum. Furthermore, the distal hernia sac was not completely closed, since the upper edge of the sac was not sutured, thereby preventing the potential fluid collection from the secretion of the distal sac itself. Another advantage of this method is that leaving the distal sac undissected minimized the risks of damage to the cord structures.

In our study, we observed less occurrence of the seroma. That suggests that the laparoscopic method can help prevent or decrease the chance of the development of seroma in the unilateral inguinoscrotal hernia.

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ORIGINAL ARTICLE

A Comparative Study of Weight Loss and Reduction in BMI after Gastric Imbrication, Sleeve Gastrectomy, and Roux-en-Y Gastric Bypass

Pankaj Tejasvi[1], Arvind Ghanghoria[2], Ruchita Banseria[3]

Abstract

Background: Obesity is a worldwide epidemic and exercise supplemented with pharmacotherapy has poor long-term results; thus, bariatric surgery is the mainstay therapy for morbid obesity. But reduction in weight and BMI after bariatric surgery is not the same and mainly depends on the type of surgery performed.

Aim and objective: To study the comparative efficacy among three bariatric surgeries viz. Laparoscopic gastric imbrication (LGI), laparoscopic sleeve gastrectomy (LSG), and laparoscopic Roux-en-Y gastric bypass (LRYGB) in morbid obese patients in relation to weight loss and reduction in BMI.

Study design: Prospective study.

Materials and methods: Total of 40 morbid obese patients underwent different types of laparoscopic bariatric surgery and were followed for 1 year. Reduction in weight and BMI after 1 year was correlated with the type of bariatric surgery performed.

Statistical analysis: Paired t-test, analysis of variance (ANOVA), Bonferroni.

Results: Patients undergone LGI, LSG, and LRYGB had a preoperative mean weight/BMI of 105.33 kg/41.07 kg m^{-2}, 104.07 kg/42.76 kg m^{-2}, and 105.8 kg/43.27 kg m^{-2}, respectively; and postoperative mean weight/BMI after 1 year was 87.4 kg/34.08 kg m^{-2}, 81.07 kg/33.32 kg m^{-2}, and 81.2 kg/33.18 kg m^{-2}, respectively. On applying ANOVA and Bonferroni, LSG and LRYGB group had greater weight loss and reduction in BMI as compared to LGI group.

Conclusion: LSG and LRYGB are statistically better in weight and BMI reduction in obese as compared to LGI. Although weight and BMI reduction was more in LRYGB as compared to LSG, it was not statistically significant.

Keywords: BMI reduction, LGI, LRYGB, LSG, Weight loss.

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Introduction

Obesity is a medical condition in which excess body fat has accumulated to the extent that it may have a negative effect on health.[1] The main cause of obesity and overweight is an energy imbalance between calories consumed and calories expended.

A dietary therapy with exercise supplemented with pharmacotherapy, generally achieved only minimal and often transient effects with poor long-term results; however, the National Institutes of Health (NIH) Consensus Development Panel recommended that patients seeking therapy for severe obesity for the first time should be considered for treatment in a nonsurgical program that integrates a dietary regimen, appropriate exercise, behavior modification, and psychological support.[2] With long-term follow-up, bariatric surgeries sustainably decreased weight, HbA1c, and fasting blood sugar (FBS).[3]

But in spite of strict patient selection, the reduction in weight and BMI after bariatric surgery is not the same. Through this study, we wished to look for any significant correlation between the type of bariatric surgery and reduction in weight and BMI.

Aims and Objectives

To study the comparative efficacy among three bariatric surgeries viz. laparoscopic gastric imbrication (LGI), laparoscopic sleeve gastrectomy (LSG), and laparoscopic Roux-en-Y gastric bypass (LRYGB) in morbid obese patients in relation to weight loss and reduction in BMI.

Materials and Methods

A prospective study was conducted at MGMMC and Maharaja Yashwantrao Hospital, Indore in the Department of Surgery. A total of 40 morbid obese patients aged between 19 years to 50 years and

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Source of support: Nil

Conflict of interest: None

BMI ≥40 kg/m^2 or BMI >35 kg/m^2 with obesity-related comorbid conditions like diabetes mellitus, hypertension, and dyslipidemia were included in the study from July 2014 to April 2016. The same team of surgeons was involved in all the cases.

All patients fulfilled the NIH criteria[4] and were thoroughly evaluated preoperatively, and the type of bariatric surgery was explained to the patients and was selected by them, with written informed consent for the same. Patients were followed up at 2 weeks, 1 month, 6 months, and 1 year postoperatively. Weight, BMI, excess weight loss, random blood sugar, systolic and diastolic blood pressure, and any complication following surgery were documented at each visit.

Statistical Analysis

Paired t-test (two-tailed, dependent) has been used to find the significance of study parameters on a continuous scale within each group. Bonferroni and analysis of variance (ANOVA) have been used to find the significance of study parameters between different groups. For the analysis of the data, statistical software IBM SPSS Statistics version 20.0 was used.

P-value of less than 0.05 was considered statistically significant.

Results

Forty morbid obese patients were included in the study, of which 29 were females and 11 were males. Age varied from 19 to 50 years with a mean of 37.75 years. Patients undergone LGI, LSG, and LRYGB had a preoperative mean weight of 105.33 ± 8.87 kg, 104.07 ± 9.55 kg, and 105.8 ± 9.52 kg, respectively; and a preoperative mean BMI of 41.07 ± 2.51 kg m^{-2}, 42.76 ± 3.81 kg m^{-2}, and 43.27 ± 3.59 kg m^{-2}, respectively (Fig. 1).

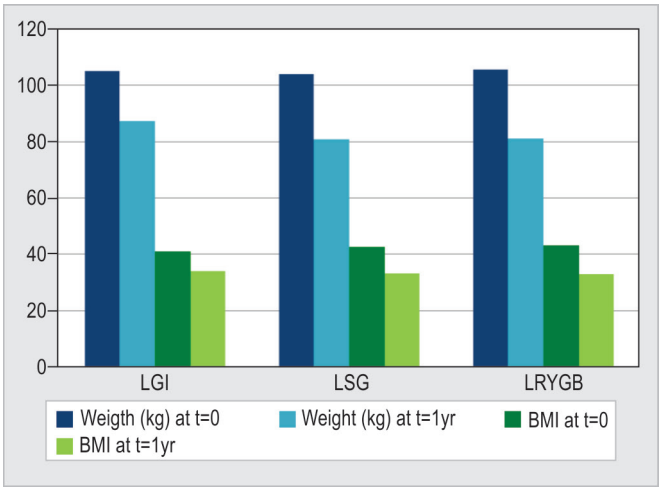

Fig. 1: Graph showing preoperative and postoperative weight and BMI

Postoperative mean weight after 1 year was 87.4 ± 6.58 kg, 81.07 ± 6.32 kg, and 81.2 ± 7.04 kg in patients undergone LGI, LSG, and LRYGB, respectively; and Postoperative mean BMI after 1 year was 34.08 ± 1.56 kg m^{-2}, 33.32 ± 2.65 kg m^{-2}, and 33.18 ± 2.24 kg m^{-2}, respectively (Fig. 1 and Table 1).

On comparison of preoperative weight and BMI to the corresponding variable 1 year after surgery, the weight loss and reduction in BMI were statistically significant in all the surgery groups.

On comparison of reduction in weight and BMI after 1 year of surgery between the different surgical groups, it was found that reduction in these parameters was more in LRYGB and LSG than in LGI, and the difference is statistically significant (Tables 2 and 3). Although the reduction in weight and BMI after 1 year of surgery was more in LRYGB than in LSG, the difference was not statistically significant (Table 3).

Discussion

The worldwide prevalence of obesity more than doubled between 1980 and 2014.[5] WHO estimated that in 2014, more than 1.9 billion adults aged 18 years and older were overweight. Of these over 600 million adults were obese. Overall, about 13% of the world's adult population (11% of men and 15% of women) were obese and 39% (38% of men and 40% of women) were overweight in 2014.[5]

Dietary therapy with exercise supplemented with pharmacotherapy, with or without organization supervision, generally achieved only minimal and often transient effects with poor long-term results. Once severely obese, the likelihood that a person will lose enough weight by dietary means alone and remain at a BMI below 35 kg/m^2 is estimated at 3% or less. The NIH consensus conference recognized that for this patient population, nonsurgical therapy has been uniformly unsuccessful in treating the problem.[4]

The rise in the prevalence of obesity led to increase interest in the surgical approach to treat obesity, and in 1991, the NIH established guidelines for surgical therapy of morbid obesity now known as bariatric surgery.[2]

A range of different bariatric procedures are available, working on principles of restriction or malabsorption or both. Along with reducing weight, some of them have been shown to reduce appetite and improve glucose homeostasis independently of weight loss. In view of its favorable metabolic effects, bariatric surgery is also referred to as "metabolic surgery."

Sleeve gastrectomy was initially described in 1988 by Hess[6] and Marceau[7] during the duodenal switch and 1993 by Johnston[8] in an isolated form.

The gastric imbrication procedure involves plicating the greater curvature of the stomach after the division of the short gastric vessels. It is a relatively new technique. It was initially proposed by Wilkinson and Paleso[9,10] and introduced in 2006 by Dr. Talebpour in

Table 1: Analysis of weight and BMI reduction 1 year after surgery within a surgical group

	LGI		*LSG*		*LRYGB*	
	Weight (kg)	BMI (kg m^{-2})	Weight (kg)	BMI (kg m^{-2})	Weight (kg)	BMI (kg m^{-2})
Preoperative; *t* = 0	105.33 ± 8.87	41.07 ± 2.51	104.07 ± 9.55	42.76 ± 3.81	105.8 ± 9.52	43.27 ± 3.59
Postoperative; *t*=1year	87.4 ± 6.58	34.08 ± 1.56	81.07 ± 6.32	33.32 ± 2.65	81.2 ± 7.04	33.18 ± 2.24
(Paired t-test) *P*-value	0.000	0.000	0.000	0.000	0.000	0.000

Table 2: Analysis of weight and BMI reduction 1 year after surgery between different surgical groups

	LGI		*LSG*		*LRYGB*		*(ANOVA) P-value*
	Preoperative; $t = 0$	Postoperative; $t = 1$ year	Preoperative; $t = 0$	Postoperative; $t = 1$ year	Preoperative; $t = 0$	Postoperative; $t = 1$ year	
Weight (kg)	105.33 ± 8.87	87.4 ± 6.58	104.07 ± 9.55	81.07 ± 6.32	105.8 ± 9.52	81.2 ± 7.04	0.001
BMI (kg m^{-2})	41.07 ± 2.51	34.08 ± 1.56	42.76 ± 3.81	33.32 ± 2.65	43.27 ± 3.59	33.18 ± 2.24	0.000

Table 3: Comparison of weight and BMI reduction 1 year after different bariatric surgeries

	LGI	*LSG*	*LRYGB*	*(Bonferroni) P-value*
Mean reduction in weight 1 year after surgery (kg)	17.93 ± 3.49	23.00 ± 4.72	24.60 ± 5.39	
Comparing				
• LGI and LSG				0.011
• LGI and LRYGB				0.002
• LSG and LRYGB				1.000
Mean reduction in BMI 1 year after surgery (kg m^{-2})	6.99 ± 1.33	9.43 ± 1.85	10.08 ± 2.41	
Comparing				
• LGI and LSG				0.003
• LGI and LRYGB				0.001
• LSG and LRYGB				1.000

Iran.[11] Since here resection of the stomach has not been performed, the decrement in the ghrelin levels is unlikely as they do in sleeve gastrectomy. The gastric imbrication procedure has a technical advantage when compared to LSG; that is, there are no resection and anastomosis of the stomach lines and thus no risk of leak from the staple line. The procedure is reversible and cost-effective.

Gastric bypass was initially developed by Dr. Mason and Ito in the 1960s.[12] Over several decades, the gastric bypass has been modified into its current form, using a RYGBP limb of the intestine. In 1994, Dr. Wittgrove and Clark reported the first case series of laparoscopic RYGBP.[13]

In our study, all the patients were preoperatively thoroughly evaluated for comorbidities and anesthetic risk. Preoperative ECG, lipid profile, thyroid function test, LFT, FBS, HbA1c, Hb level, hematocrit, platelet count, serum creatinine, and serum electrolyte were done. In women, Pap smears and pregnancy testing should be performed. Posteroanterior and lateral radiographs of the chest were also evaluated.

Fifteen morbid obese patients underwent LSG, in which greater curvature of the stomach was cut and stapled over a 34 Fr bougie, starting from 6 cm proximal to pylorus toward the angle of His, using Endo GIA™ stapler. In our study, the effective weight loss was 53.73% after 1 year, it was 66% after 36 months in a study conducted by Himpens et al.,[14] and 54% after 12 months reported by PP Cutolo et al.[15]

Fifteen morbid obese patients underwent LGI, in which greater curvature of the stomach was plicated over a 34 Fr bougie, the first row of extramucosal continuous suture, and a second layer of interrupted suture. The effective weight loss was 43.53% after 1 year, it was 61% after 12 months in a study conducted by Talebpour and Amoli,[11] and 67.1% after 12 months according to 2011 Skrekas et al.[16] publication.

Ten morbid obese patients underwent LRYGB, in which 30 ml gastric pouch and 50 cm of Roux-limb were created. The effective weight loss was 55.37% after 1 year, it was 60.5% after 12 months in a study conducted by Karamanakos et al.,[17] and 62% after 36 months according to Kehagias et al.[18]

There were no intraoperative complications. Postoperative on the first day, nausea was reported by most of the patients, which resolved gradually by antiemetics. There were no other significant postoperative complications. Deep vein thrombosis (DVT) prophylaxis was given to all. Patients were discharged when their vitals were stable able to accept liquid diet and could tolerate pain. Postoperatively patients were advised to have liquid diet for 10 days, proton pump inhibitors for 3 months, and multivitamins. Follow-up visits were scheduled at 2 weeks, 1 month, 6 months, and 1 year postoperatively.

On comparing the three surgery groups, LSG and LRYGB were statistically better in weight and BMI reduction in obese as compared to LGI. Although weight and BMI reduction was more in LRYGB as compared to LSG, it was not statistically significant.

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ORIGINAL ARTICLE

A Comparative Evaluation of Total Laparoscopic Hysterectomy and Laparoscopic Supracervical Hysterectomy for Benign Uterine Diseases

Kavita Khoiwal[1], Pradeep Garg[2], Alka Kriplani[3]

Abstract

Background: Laparoscopic supracervical hysterectomy (LSH) is a minimally invasive alternative to total laparoscopic hysterectomy (TLH), which is a common procedure in developed countries. The study aimed to evaluate the safety (risks vs benefits) of LSH in the Indian scenario when compared with TLH in terms of intraoperative and postoperative outcome measures. Furthermore, quality of life (bladder, bowel, and sexual functions) was also evaluated.

Materials and methods: A prospective randomized study among 30 patients with benign uterine pathology for hysterectomy was included in the study. Patients were divided randomly into LSH ($n = 15$) and TLH ($n = 15$) groups. Intraoperative outcome measures, such as operation time, blood loss, and visceral injuries were noted. Postoperative outcome measures included absolute change in hemoglobin (Hb), duration of hospital stay, pain, urinary complaints (retention, dysuria), and bladder, bowel and sexual functions for 6 months.

Results: Demographic data were comparable in both groups. The operating time and blood loss were more in LSH than TLH group, ($p = 0.29$ and 0.37). The absolute change in hemoglobin was more in LSH group than TLH group ($p = 0.001$). Postoperative pain was indifferent in both the groups on postoperative day 0 and day 7 but it was significantly less in LSH group on day 1 ($p = 0.03$). Duration of hospital stay was similar in both groups. No patient required readmission. Patients in TLH group took a lesser number of days to return to routine activity compared to LSH group. The postoperative bladder, bowel, and sexual functions were comparable. The incidence of post-LSH vaginal bleeding was 13.3%. No vault prolapse was noted at the end of 6 months follow-up.

Conclusion: Laparoscopic supracervical hysterectomy is safe and efficacious as TLH for benign uterine pathologies but has no extra benefits rather is associated with a persistent risk of developing cervical diseases and malignancy.

Keywords: Abnormal uterine bleeding, Fibroid uterus, Laparoscopic supracervical hysterectomy, Total laparoscopic hysterectomy.

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Background

Hysterectomy is a common gynecological surgery. The prevalence of hysterectomy in India ranges from 1.7 to 7.8%.[1] Vaginal route is always preferred as it obviates the need for abdominal incision but in cases where the vaginal route is not feasible laparoscopic hysterectomy is better than abdominal hysterectomy.[2] Laparoscopic hysterectomy is now being performed globally, primarily because of lower morbidity and faster recovery time.

The laparoscopic supracervical hysterectomy (LSH) provides yet another minimally invasive approach in which the body of the uterus is removed while the cervix is preserved. LSH is less invasive compared to other approaches of hysterectomy and has also been referred to as pain-less hysterectomy. The LSH procedure does not require the woman to lose her cervix which seems to be a major concern for many women who need to have a hysterectomy. With the development of screening techniques and minimally invasive methods to treat cervical intraepithelial lesions, the removal of the cervix at the time of hysterectomy in low-risk patients is more of a preference than a requirement. The advantages of LSH include minimal invasion, improved sexual function, fewer urinary complications, and preservation of the cervix with its ligamentous supports. Simultaneously, LSH is associated with persistent risk of cervical disease, persistent vaginal bleeding, pelvic pain, and complications with future surgery if required. Therefore, LSH should be recommended for benign uterine pathologies with no history of cervical dysplasia.[3]

Cooper et al.[4] found LSH more effective than endometrial ablation without increasing the risk of complications and proposed LSH as a potential mode of hysterectomy. Other studies suggested

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Conflict of interest: None

Ethical approval: The study has been approved by institutional ethical board. Research involved human participants. Informed consent was taken from all the participants.

that LSH is associated with a more rapid postoperative recovery in terms of resumption of normal activity than a total laparoscopic hysterectomy (TLH).[5,6] LSH is also been considered as the best surgical approach for abnormal uterine bleeding (AUB) by some authors as the overall patient satisfaction was quite high.[7]

Most of the literature regarding LSH is coming from developed countries. In India, TLH is a common surgery but we could not find any data on LSH, might be because it is not popular in developing countries due to high risk of cervical neoplasia, non-availability of regular cervical cancer screening and unawareness when available.

Therefore, we conducted this study to evaluate the safety (risks vs benefits) of LSH in the Indian scenario when compared with TLH in terms of intraoperative and postoperative outcome measures. Furthermore, quality of life (bladder, bowel, and sexual functions) was also evaluated.

Materials and Methods

It was a prospective randomized study conducted in the Department of Obstetrics and Gynaecology, All India Institute of Medical Sciences, New Delhi for 2 years. The study was reviewed and approved by the Institutional ethical board. All the patients presented to gynaecology OPD were invited to participate in the study. A total of 30 patients having a benign disease of the uterus with a surgical indication for hysterectomy who were willing to comply with the protocol and regular follow-up were included in the study. Patients with premalignant and malignant disease of uterus, cervix or ovaries/adnexa, complex adnexal mass, pregnancy, genital prolapse, coagulation disorders, and patients unfit for anesthesia were excluded from the study. Informed and written consent was obtained from all the patients. Women undergoing LSH were also counseled about the need for pap smear screening.

Patients were divided randomly into LSH ($n = 15$) and TLH ($n = 15$) groups by a computer-generated randomization list. All patients underwent detailed preoperative evaluation including a complete history, physical and pelvic examination, Papanicolaou (PAP) smear, endometrial aspiration (EA), transvaginal ultrasonography (using 6.5 MHz vaginal transducers, ultrasound machine- GEC LOGIQ 3 PRO), and routine laboratory tests. All surgeries were done by the same surgeon.

Apart from routine steps of TLH, the body of the uterus was amputated from the cervix after bilateral uterine arteries coagulation and the endocervical canal was cauterized with bipolar cautery in LSH. The uterus was then morcellated using an electronic uterine morcellater.

Intraoperative outcome measures, such as operation time, blood loss, visceral injuries (bladder, bowel, ureter), need for blood transfusion (BT), conversion to laparotomy, and weight of uterus were noted.

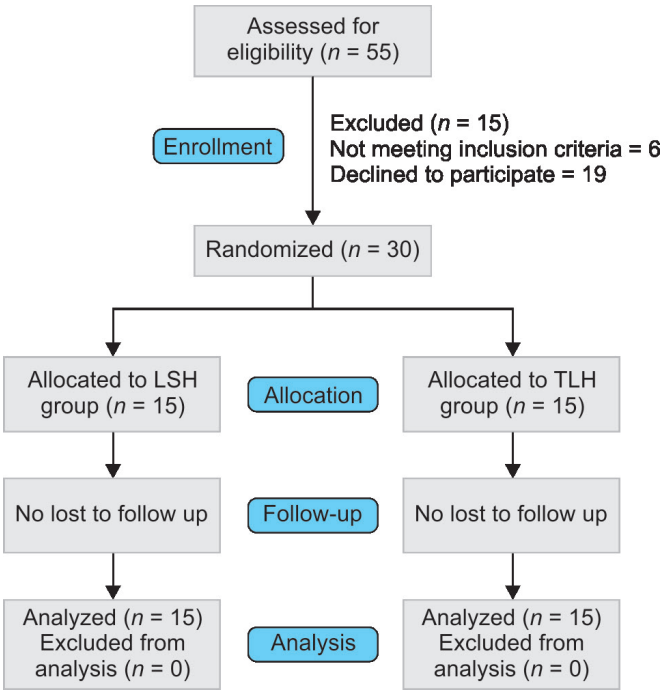
Postoperative outcome measures included absolute change in hemoglobin (Hb), fever, pain, BT, duration of hospital stay, urinary complaints (retention, dysuria), wound infection, duration and the number of doses of analgesic drugs given, and readmission. Operation time was calculated from the skin incision to skin closure. Postoperative pain was evaluated from the visual analog scale (VAS), ranges from 0 to 10 as no pain to worst pain possible. As a routine, injectable analgesic was discontinued on a postoperative day one in all patients and further doses were given only on demand. Oral analgesic was given in the form of a fixed dose combination of ibuprofen 400 mg and paracetamol 500 mg. The number of analgesic tablets and vials requested by the patients was also recorded. Hemoglobin was sent in all patients 24 hours after surgery. The absolute change in hemoglobin was obtained by subtracting the mean 24 hours postoperative hemoglobin from the mean preoperative hemoglobin. Follow-up was done at periodic intervals (1 week, 1 month, 2 months, 3 months, and 6 months after the surgery) and complaints, condition of wound, recuperation from surgery, bladder, bowel, and sexual function were noted on each follow-up visit.

Statistical analysis was done on software SPSS (SPSS Inc., Chicago, IL) using the Fisher's test, Student's t-test, and Mann–Whitney test. A value of $p < 0.05$ was accepted as significant.

Results

A total of 55 patients were assessed for eligibility, out of which 30 patients were included in the study based on eligibility criteria. Fifteen patients underwent LSH and another 15 patients underwent TLH after randomization. Flowchart 1 shows the flow diagram of the study.

Flowchart 1: Flow diagram of the study



Demographic characteristics were similar in both the groups (Table 1). Most common indication was fibroid uterus. Incidentally, five patients in LSH group had previous cesarean ($p = 0.042$) while the groups were divided by randomization, which might be because of the small sample size.

Table 2 demonstrates perioperative outcomes. Operative time and blood loss were higher in LSH group though, the difference was not significant. The absolute fall in Hb was significantly more in LSH group ($p = 0.001$). We did not find any significant difference in VAS score on day 0 and day 7 but VAS score on day 1 and mean duration of injectable analgesics was significantly less in LSH group.

Recuperation from the surgery was similar in both the groups except the number of days to return to routine activity was significantly less in patients who underwent TLH compared to LSH group ($p = 0.02$). Patients in both groups reported no significant change in their bladder, bowel, and sexual function. Resumption of sexual activity was earlier in the LSH group though, the difference was not statistically significant (Table 3).

Table 1: Demographic Characteristics

Variable	*LSH (n = 15)*	*TLH (n = 15)*	*p-value*
Age (year)	40.3 ± 4.8	44.3 ± 8.1	0.1
BMI (kg/m^2)	23.3 ± 3.4	23.5 ± 2.8	0.8
Diagnosis (%)			
Fibroid	9 (60)	10 (66.6)	
AUB	4 (26.6)	2 (13.3)	
Adenomyosis	2 (13.3)	1 (6.6)	0.8
Postmenopausal bleeding	0	1 (6.6)	
Submucous polyp	0	1 (6.6)	
Previous caesarean section (%)	5 (33.3)	0	0.042
Previous major abdominal surgery (%)	3 (20)	3 (20)	1

Data presented as *n* and mean ± SD; AUB, abnormal uterine bleeding; BMI, body mass index

Table 2: Perioperative outcome measures in both the groups

Variable	*LSH (n = 15)*	*TLH (n = 15)*	*p-value*
Operative time (mins)	88.6 ± 22.1	86 ± 27.2	0.29
Blood loss (mL)	256 ± 141.6	210 ± 107.5	0.37
Uterine weight (g)	254.4 ± 221.7	254.9 ± 265.2	0.7
Absolute change in Hb (g/dL)	1.73 ± 1.0	1.23 ± 0.5	0.001
Intraoperative complications	0/15	0/15	–
Blood transfusion	3/15	1/15	0.59
Hospital stay (days)	3 ± 1.4	3.1 ± 2.3	0.4
Postoperative complications	0/15	1/15	1
Readmission	0/15	0/15	–
VAS day 0	7.8 ± 0.8	8.2 ± 0.6	0.16
VAS day 1	3.6 ± 0.8	4.4 ± 1.6	0.03
VAS day 7	1.2 ± 0.4	1.3 ± 0.1	0.49
Injectable analgesics (no. of days)	1.8 ± 0.4	2.0 ± 0.2	0.04

Data presented as *n* and mean ± SD; Hb, hemoglobin; VAS, visual analog scale

Two (13.3%) out of fifteen patients in LSH group developed postoperative spotting per vaginum, managed by low dose oral contraceptive pills for 3 months.

On six month follow-up period, no patient was found to have vault prolapse.

Discussion

Hysterectomy by minimally invasive approach is now preferred as it obviates the need for a huge abdominal incision, longer hospital stay, longer convalescence time, and associated complications with added advantages of better visualization, faster recovery, less pain, and cosmetically better. We compared two types of laparoscopic hysterectomy.

One of the basic ideas behind performing supracervical hysterectomy was the total hysterectomy might lead to damage pelvic nerves or pelvic supports, which could increase the risk of urinary incontinence, bowel dysfunction, and reduces sexual pleasure. But in the present study, we did not find any significant difference in the postoperative bladder, bowel, and sexual functions in both groups. Cochrane review also suggested that supracervical hysterectomy does not improve outcomes for sexual, urinary, or bowel function as compared to total hysterectomy.[8]

Table 3: Recuperation from surgery

Variable	*LSH (n = 15)*	*TLH (n = 15)*	*p-value*
Ability to take care of self (days)	7.2 ± 1.2	6.4 ± 1.68	0.14
Routine activity (days)	15.87 ± 3.13	13.47 ± 2.30	0.02
Outdoor activity (days)	27.07 ± 4.6	26.07 ± 3.47	0.50
Urinary dysfunction	0/15	3/15	0.22
Bowel dysfunction	0/15	0/15	–
Resumption of sexual activity (days)	60.67	65.60	0.06

Data presented as *n* and mean ± SD

Cipullo et al.[9] did a retrospective cohort study for 7 years and reported shorter surgery time in the LSH group (100 min) than TLH group (110 min). Other studies also reported that the operating time and blood loss were less in LSH group when compared to TLH group.[10–12] In the present study, we found that LSH was associated with slightly longer operation time and more blood loss compared to TLH, statistically insignificant. It could be the effect of a learning curve and extra time required for morcellation in LSH group.

Cipullo et al.[9] reported a higher incidence of major complication rates (bladder, bowel, and ureteric injuries) in TLH group than LSH group (4.5 vs 1.3%). Minor complications, such as wound infection, urinary tract infection, vaginal cuff abscess, and hematoma were comparable in both the groups (TLH: 13.3% and LSH: 13.4%). Einarsson et al.[10] and Boosz et al.[11] also reported higher chances of intraoperative (visceral injuries), and postoperative complications in patients undergoing TLH. No intraoperative complications were noted in our study and only one patient in TLH group had a wound infection.

Postoperative pain and analgesic requirement were comparable in both the groups in previous studies.[10,13] While, we found significantly less pain on day 1 of surgery and less need for injectable analgesics in LSH group than TLH group.

Ozgur et al.[14] reported a 5.1% readmission rate in TLH group and 2.8% in LSH group. While no patient required readmission in our study.

Kafy et al.[15] described improvement in overall health, body and self-images, and sexual function in both LSH and TLH groups. Some studies reported mean time to return to normal activity is earlier after LSH (2 weeks) than TLH (3 weeks).[5,6]

Einarsson et al.[16] documented significantly better improvement in the short-term postoperative quality of life in terms of physical functioning, role physical, bodily pain, vitality, social functioning, and physical component summary in LSH group than TLH group. However, they did not find any difference in return to daily activities, perioperative pain, or use of pain medication. On the contrary, patients in our study took significantly longer time to return to normal activity with LSH group than TLH group and resumption of sexual activity was earlier in LSH group.

Berlit et al.[17] published in their article that preservation of the cervix does not have any impact in improving sexual functioning postoperatively. Both LSH and TLH have a similar improvement in long-term sexual functioning in women who had impaired sexuality preoperatively.

The incidence of postoperative vaginal bleeding was 13.3% in the LSH group in our study which is as per previous studies. Ghomi et al.[18] and Lieng et al.[3] reported the overall incidence of post-LSH vaginal bleeding as 19 and 0–25%, respectively.

Hellstrom et al.[19] described that the risk of development of carcinoma in the cervical stump is similar to the general population. In India, the incidence of carcinoma cervix is quite high and this was the probable reason behind the small sample size in our study. Routine cytological screening must be continued following a supracervical hysterectomy because of the persistent risk.

Prospective nature and randomization were strengths of the study. However, larger sample size and longer follow-up period would have produced more robust results and these are some limitations of the present study.

To the best of our knowledge, this is the first study from India comparing LSH with TLH. We postulate based on current data that supracervical hysterectomy has no added advantages over a total hysterectomy in terms of intraoperative and postoperative outcome measures as well as bladder, bowel, and sexual functions and in a country like India, where background incidence of carcinoma cervix is high, the decision should be individualized**.**

Conclusion

Laparoscopic supracervical hysterectomy is safe and efficacious as TLH for benign uterine pathologies but has no extra benefits rather associated with a persistent risk of developing cervical diseases and malignancy.

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ORIGINAL ARTICLE

Simple and Reliable Scoring System to Predict Difficult Laparoscopic Cholecystectomy Preoperatively

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Abstract

Aim and objective: To validate the efficacy of proposed scoring system compared to the Randhawa scoring system in prediction of difficult laparoscopic cholecystectomy (LC) preoperatively.

Materials and methods: A prospective study was conducted including 102 patients who underwent LC for symptomatic cholelithiasis. Preoperatively a score was given to the patient according to both scoring systems. Final outcome was decided on intraoperative findings of operative time, adhesions, and bile spillage. Univariate and multivariate analyses of preoperative factors were done. Receiver operating characteristic (ROC) curves of both the scoring system were compared, and the results were reported as a difference in proportion (95% CI). *p* value <0.05 was considered as statistically significant.

Results: The specificity and positive predictive value of the modified scoring system were 92 and 95.1% which was higher than Randhawa scoring system, i.e., 76 and 87.5%. Area under ROC curve was also more in modified scoring system. Also, univariate analysis found age >50 years, history of hospitalization, previous endoscopic retrograde cholangiopancreatography, diabetes mellitus, palpable gallbladder, gallbladder wall thickness, and contracted gallbladder on ultrasound to be statistically significant factors.

Conclusion: The proposed modified scoring system significantly increases the specificity and positive predictive value of the Randhawa scoring system. This scoring system is easy to perform, require no additional investigation and can effectively categorize patient where LC will be difficult.

Clinical significance: The proposed scoring system can effectively predict difficult preoperatively which would help in better preoperative preparation by the surgical team for a difficult laparoscopic cholecystectomy. Patients can be optimally counseled preoperatively so that they are well prepared for various outcomes of the procedure.

Keywords: Difficult cholecystectomy, Laparoscopic cholecystectomy, Prediction, Preoperative, Scoring system, Simple.

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Introduction

Laparoscopic cholecystectomy (LC) is the most common minimal invasive procedure performed by general surgeons around the globe. Early recovery, shorter hospital stay, and minimal postoperative discomfort after the surgery are among the few reasons which make this surgery a gold standard treatment for symptomatic cholelithiasis. Although the complication rate of LC ranges from 0.1 to 6%, which might look small, the actual number of complications is both large and is a cause of significant morbidity to the patient.[1] Most complications, which are avoidable, are caused due to the lack of adequate preparation for a difficult operation. Randhawa et al. proposed a scoring system for preoperative prediction of difficult LC, which has been validated by many studies with variable results.[2–4] To improve the predictive value of this scoring system, very few modifications have been proposed; these are complicated and too much elaborated.[5,6] Here we propose a simple modified scoring system that can be done bedside preoperatively and compare its efficacy to the original scoring system.

Materials and Methods

A prospective study was conducted between July 2019 and December 2019 enrolling a total 102 patients who underwent LC for symptomatic cholelithiasis. All patients were operated by a single surgeon, with experience of more than five years in laparoscopic surgery. Exclusion criteria had those patients who were unfit for anesthesia, had comorbidity (except diabetes and hypertension), bleeding diathesis, operation which were prolonged due to nontechnical reasons (light or instrument failure), and patient not giving consent for the study. Patients were admitted a day before surgery, and a detailed history and examination were done along with documentation of the investigations. A score was given to each patient preoperatively according to the modified scoring system as well as the Randhawa scoring system (Table 1) to label each patient as easy or difficult LC. In both scoring systems, a score of <5 was considered easy, 6 to 10 was considered difficult, and >11 as need for conversion to open (Table 2).

Standard four-port LC was performed with pneumoperitoneum of 12 mm Hg. A standard intraoperative protocol was followed in each patient starting with bile duct timeout to visualize the

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Table 1: Detailed layout of proposed and Randhawa *et al.* scoring systems

Sl. No.	*Preoperative factors*	*Findings*	*Proposed scoring system*	*Randhawa et al. scoring system*
History findings				
1.	Age	<50 years	0	0
		>50 years	1	1
2.	Gender	Female	0	0
		Male	1	1
3.	History of hospitalization	Absent	0	0
		Present	4	4
4.	History of ERCP	Absent	0	–
		Present	2	–
5.	History of diabetes mellitus	Absent	0	–
		Present	1	–
Clinical findings				
6.	BMI	<27.5	0	0
		>27.5	2	2
7.	Previous abdominal surgery	Absent	0	0
		Present	1	2
8.	Palpable gallbladder	Absent	0	0
		Present	1	1
Ultrasonographic findings				
9.	Gallbladder wall thickness	<4 mm	0	0
		>4 mm	2	2
10.	Pericholecystic fluid	Absent	0	0
		Present	1	1
11.	Impacted gallbladder calculus	Absent	0	0
		Present	1	1
12.	Contracted gallbladder	Absent	0	–
		Present	1	–
Maximum score			18	15

Table 2: Preoperative prediction according to scoring done by both the scoring system

Sl. No.	*Predictive outcome*	*Score*
1.	Easy	1–5
2.	Difficult	6–10
3.	Need for conversion	11–18

structures namely Hartmann's pouch, common bile duct, cystic duct, and cystic artery or lymph node to get familiar with the anatomy. Then posterior to anterior peritoneal reflection around Calot's triangle was done clearing all the fat and clipping was done after only two structures are seen entering the gallbladder. LC was labeled as difficult on the basis of three intraoperative parameters, i.e., operative time >1 hour, adhesions around the Calot's with omentum or adjacent structure including duodenum or transverse colon, and bile/stone spillage (Table 3). A master chart was prepared in the Microsoft Excel sheet including all preoperative and postoperative parameters for statistical analysis.

Table 3: Criteria of final outcome on the basis of intra operative findings

Sl. No.	*Criteria*	*Easy*	*Difficult*	*Conversion*
1.	Operative time	<1 hour	>1 hour	–
2.	Adhesions	Absent	Present	–
3.	Bile/stone spillage	Absent	Present	–
4.	Need for conversion to open	–	–	Present

Statistical Analysis

Statistical analyses were carried out using statistical software SPSS version 17. The data were presented as no. (%) for continuous variable and median (interquartile ranges) for categorical variable. The preoperative predictive parameters were compared with results for difficult and easy using the Chi-square test for categorical variable. Multivariate receiver operating characteristic (ROC) model was performed to predict the result for difficulty. To analyze the postoperative parameters prediction with the result, ROC analyses were performed. The results were reported as a difference in proportion (95% CI). *p* value <0.05 was considered statistically significant.

Results

Mean age of presentation was 46 years with 63 (62%) patients having age <50 years and 39 (38%) having age >50 years. Surgery was easy in patients with age <50 years (73.4%) compared to patients with age >50 where surgery was difficult (57.9%). This result was found to be statistically significant (*p* value: 0.002). Out of 15 male patients nine (60%) had easy and six (40%) had difficult surgery, which on univariate analysis was not statistically significant (*p* value: 0.812). Hospitalization for a history of acute cholecystitis was the most significant preoperative predictor (*p* value <0.0001). Similarly, history of diabetes mellitus was present in 13 patients (12%) and 11 (84.6%) patients had difficult LC. It was a unique finding of our study where history of diabetes mellitus came out to be a significant preoperative predictor (*p* value: <0.0001). History of hypertension and dyspepsia did not show any significant correlation to the predictability of difficult LC.

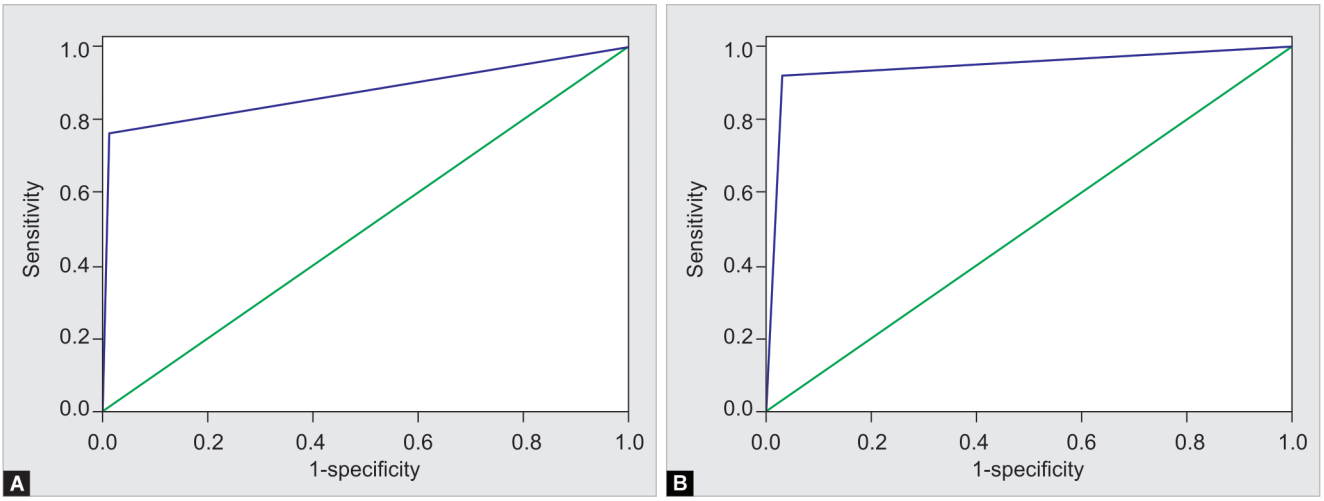
Palpable gallbladder was found in seven patients and all patients had difficult cholecystectomy. Patients who had a history of abdominal surgery were 20 (19%), out of which only three cases (15%) had difficult LC, showing the result as insignificant but it must be noted that most of these cases had infraumbilical scar for tubectomy or cesarean. There were five (4%) patients with a history of endoscopic retrograde cholangiopancreatography (ERCP) and four (80%) had difficult cholecystectomy with *p* value <0.05. Mean BMI was 23.86. BMI >27.5 was a significant preoperative factor with *p* value of 0.03. Murphy's sign was also found to be predictive with *p* value of 0.03.

All ultrasonographic findings included in the scoring system were significant namely gallbladder wall thickness (*p* value <0.0001), stone size >1 cm (0.002), pericholecystic fluid collection (0.023), and contracted gallbladder (0.06). Common bile duct diameter had no significant predictive value for difficult LC (Table 4).

The ROC curve of multivariate analysis of all significant preoperative predictors showed area under curve of 97%. Positive predictive value and accuracy of Randhawa scoring system was 87.5 and 90.2% whereas that of modified scoring was 94.38 and 95.10%. Sensitivity of both the scoring system was 95% with specificity of modified scoring greater (92%) than that of original scoring (76%) (Fig. 1).

Table 4: Univariate analysis of preoperative factors compared to the final outcome of the surgery

		Result			
Preoperative factors	*Findings*	*Easy*	*Difficult*	*p value*	*Odds ratio*
Age	Age <50 years	47 (46.1%)	16 (15.7%)	0.002	3.801 (1.625–8.89)
	Age >50 years	17 (16.7%)	22 (21.6%)		
Gender	Female	55 (53.9%)	32 (31.4%)	0.812	1.146 (0.373–3.516)
	Male	9 (8.8%)	6 (5.9%)		
H/o acute cholecystitis	Absent	60 (58.8%)	10 (9.8%)	<0.0001	42 (12.11–145.612)
	Present	4 (3.9%)	28 (27.5%)		
H/o dyspepsia	Absent	26 (25.5%)	11 (10.8%)	0.236	1.679 (0.710–3.97)
	Present	38 (37.3%)	27 (26.5%)		
Diabetes mellitus	Absent	62 (60.8%)	27 (26.5%)	<0.0001	12.630 (2.62–60.88)
	Present	2 (2.0%)	11 (10.8%)		
Hypertension	Absent	48 (47.1%)	30 (29.4%)	0.65	0.80 (0.305–2.09)
	Present	16 (15.7%)	8 (7.8%)		
Previous abdominal surgery	Absent	47 (46.1%)	35 (34.3%)	0.022	0.237 (0.064–0.872)
	Present	17 (16.7%)	3 (2.9%)		
Previous ERCP	Absent	63 (61.8%)	34 (33.3%)	0.043	7.41 (0.796–68.97)
	Present	1 (1.0%)	4 (3.9%)		
BMI	<27.5	46 (45.1%)	16 (15.7%)	0.003	3.51 (1.51–8.16)
	>27.5	18 (17.6%)	2 (1.6%)		
Murphy's sign	Absent	36 (35.3%)	10 (9.8%)	0.003	3.60 (1.50–8.63)
	Present	28 (27.5%)	28 (27.5%)		
Palpabale gallbladder	Absent	64 (62.7%)	31 (30.4%)	<0.0001	NA
	Present	0 (0%)	7 (6.9%)		
USG: gallbladder wall thickness	<4 mm	62 (60.8%)	23 (22.5%)	<0.0001	20.21 (4.28–95.35)
	>4 mm	2 (2.0%)	15 (14.7%)		
Pericholecystic fluid	Absent	64 (62.7%)	35 (34.3%)	0.023	NA
	Present	0 (0%)	3 (2.9%)		
USG: impacted stone	Absent	52 (51.0%)	20 (19.6%)	0.002	3.90 (1.59–9.53)
	Present	12 (11.8%)	18 (17.6%)		
USG: contracted	Absent	63 (61.8%)	32 (31.4%)	0.006	11.81 (1.36–102.36)
	Present	1 (1.0%)	6 (5.9%)		
	Count	23 (28.8%)	16 (20.0%)		



Figs 1A and B: ROC curves of Randhawa et al. scoring system (A) showing with the area under the curve of 87.4% whereas the area under curve of proposed scoring system (B) is 94.5%

Discussion

Cholelithiasis is a benign disease of the gallbladder where most cases are asymptomatic or have mild symptoms. LC is the gold standard procedure of choice for cholelithiasis and conducting a safe operation becomes the utmost priority for the operating surgeon. Much work has been done to improve intraoperative outcomes by following safe cholecystectomy protocol but not much literature is available on the safe preoperative protocol. Difficult LC requires preparation in form of operative skill, on floor senior support, logical surgical steps, bailout procedures, and most importantly a well-informed patient and attendants. Wrong selection of cases can result in devastating results both for the patient as well as for the operating surgeon. This justifies the importance of preoperative prediction of a difficult LC.

Lee et al. and Hussain et al. in their study found age >50 years as a risk factor for difficult LC.[7,8] Rothman et al. also concluded in a meta-analysis that there is association of higher rate of conversion in patients with age >60 years.[9] Similarly, age >50 years was a significant preoperative risk factor in our study(*p* value – 0.01). In studies done by Kanakala et al. and Rothman, male patients had higher rate of conversion to open but it was not found to be associated with difficult LC in our study.[9,10] Many studies which studied preoperative risk factors for difficult LC did not find male gender as an independent risk factor.[11] History of hospitalization for acute cholecystitis, palpable gallbladder, and BMI >27.5 is among the most significant clinical parameters for predicting difficult LC preoperatively.[2,3,12,13] In our study also these factors showed strong preoperative association in univariate analysis. Though Murphy sign was significant preoperative factor in univariate analysis, it did not show significant association in multivariate analysis. Therefore, it was not considered as a risk factor for preoperative prediction.

Among the ultrasonographic findings, gallbladder wall thickness showed significant relation in our study, similar to studies done by Nachnani et al. and Randhawa et al. where wall thickness of >4 mm had intraoperative difficulty in dissection of Calot's due to adhesions and difficulty in grasping gallbladder.[2,14] Pericholecystic fluid is found significant in our study with a higher incidence of adhesions intraoperative. This is probably due to the fact that pericholecystic fluid is found in cases of acute cholecystitis. Similarly impacted stones had a direct relation to difficult LC by creating difficulty in grasping the gallbladder which caused bile spillage. Finding of the contracted gallbladder in ultrasonography (USG) was independent significant variable for difficult LC in our study and was associated with adhesions intraoperatively. Rothman et al. also found contracted gallbladder to be associated with higher rate of conversions in their meta-analysis.[9] Therefore, this factor was added to the scoring system proposed by the authors.

Other two factors which were added are history of ERCP and history of diabetes. Reinders et al. found in their study that history of pervious ERCP is a significant risk factor for a difficult LC.[15] Fibrous adhesions around the Calot's triangle due to the stent placed after ERCP cause disruption in the plane of dissection posing risk of bile duct injury, even in the hands of an experienced surgeon. These patients also have a contracted gallbladder intraoperatively which further increases the complexity of an otherwise simple procedure. Timing of LC after ERCP has been found significant in a study by Aziret et al., showing early LC within 48 hours after ERCP leading to significant reduction in difficulty.[16] Diabetes mellitus was a strong predictor for difficult LC in a study done by Aldachal et al.[17] Most of these patients had delayed presentation due to neuropathy; therefore, more association with intraoperative adhesions was encountered. In our study, we also found diabetes to be a strong preoperative predictor of difficult LC.

Previous studies which have been done on the Randhawa et al. scoring system concluded that it was more sensitive, less specific, and had 85–90% positive predictive value for the difficult cases preoperatively.[3,13] Our study also found similar results however prediction done using a modified scoring system showed that the specificity increased and positive predictive value also increased to 95%. This shows that simple modification can significantly increase the accuracy of the original scoring system. We found this scoring system to be a simple bedside tool, which accurately predicted difficult LC preoperatively in our setting.

This study had its limitation as it was a single-center study and validation in different hospital settings and populations may be required for a further recommendation of this scoring system. A systemic review and meta-analysis of all the available scoring methods would be the best way to remove these limitations.

Conclusion

Preoperative prediction helps in better preparation of the challenges associated with difficult LC. An accurate and reliable scoring system, therefore, comes handy for a surgical team in this situation. The scoring system that is proposed by the authors significantly increases the specificity and positive predictive value of the Randhawa et al. scoring system which has been validated by many studies previously. The proposed scoring system is simple, easy to perform, requires no special investigation and can effectively categorize patients, so that the best expertise is available when required and the patient is adequately counseled so that they are also prepared for various outcomes of otherwise a simple procedure. Further evaluation in different clinical settings may be required to validate the findings of this study.

Clinical Significance

The most important goal of a surgeon while performing a procedure is to give the best and safest treatment to the patient. LC is the gold standard treatment for patients with gallbladder disease but the difficulties related to the procedure require both expertise in laparoscopic skills and the correct choice of bailout procedure to prevent any major complication. The proposed scoring system can effectively predict difficult LC preoperatively which would help in better preparation for a difficult scenario preoperatively. Patients can be optimally counseled preoperatively so that they are well prepared for various outcomes of the procedure.

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RESEARCH ARTICLE

Comparison of the Effects of Aprepitant and Ondansetron Individually and Combining on Postoperative Nausea and Vomiting after Laparoscopic Cholecystectomy

Farhang Safarnejad[1], Karim Nasseri[2], Reza Karami[3]

Abstract

Background: Nausea and vomiting are one of the most common postoperative complications that cause unpleasant feelings and delays in the discharge of patients. This study aimed to compare the effect of aprepitant, ondansetron, and their combination on the severity of nausea and vomiting after this procedure for finding a safe and less indisposition regimen.

Materials and methods: This study was performed on patients aged 18–50 who had been diagnosed with symptomatic cholelithiasis and who underwent laparoscopic cholecystectomy under general anesthesia. This study was done single-blinded. Patients were categorized into three groups (the recipient of aprepitant, the recipient of ondansetron, and the group receiving ondansetron and aprepitant simultaneously) and the rate of nausea and vomiting was measured at 6 and 24 hours after the operation.

Results: The results of one-way analysis of variance analysis and Kruskal–Wallis showed that there was a significant difference between the treatment groups regarding the severity of nausea and vomiting after surgery ($p < 0.001$). The severity of nausea and vomiting in the group receiving ondansetron plus aprepitant is less than the other two groups.

Conclusion: A combination of ondansetron plus aprepitant can reduce nausea and vomiting after surgery while the effect of aprepitant is much more than ondansetron.

Keywords: Aprepitant, Cholecystectomy, Ondansetron, Vomiting.

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Introduction

Nausea and vomiting are common serious postoperative complications that cause unpleasant feelings and hospital stay elongation.[1] The annual cost of postoperative nausea and vomiting has been reported in the United States for several hundred million dollars.[2] Postoperative nausea and vomiting in 20–30% of patients and are the second most common postoperative complications.[3] Its incidence is 37–90% without prophylaxis.[4] Nausea and vomiting may lead to serious but rare complications of aspiration and postoperative hypoxemia, fluid and electrolyte disorders, and dehiscence of the surgical site.[1] Some factors, such as age, sex, previous history of nausea and vomiting, motion sickness, type of surgery, duration of anesthesia and surgery, and anxiety of the patient and parents are the factors influencing nausea and vomiting, which cannot be controlled by the anesthesiologist.[5] Some studies demonstrated that type of operation may be associated with postoperative nausea and vomiting, but there are controversies in this regard.[1]

An increase in surgery and anesthesia duration leads to an increase in the risk of nausea and vomiting, which is probably due to the accumulation of anesthetizing agents. The incidence of nausea and vomiting rises from 2.8% in patients with a duration of less than 30 minutes to 27% in patients with an operation duration between 151 minutes and 180 minutes. The duration of anesthesia increases the risk of nausea and vomiting up to 59% per 30 minutes.[6] Of course, some of the factors affecting the development of postoperative vomiting and vomiting are under the control of anesthesiologists who need to pay attention to controlling this complication, including premedication, type of anesthesia, anesthetic drugs during surgery, postoperative management, and anti-anesthetic drugs. It has been reported that patients who receive general anesthesia are 11 times more likely to have nausea and vomiting after surgery than those who receive regional or block anesthesia for the treatment of chronic pain. The use of intubation due to stimulation of pharyngeal mechanoreceptors is believed to be associated with an increased risk of postoperative nausea and vomiting.[6] Choosing the right treatment and appropriate intervention in controlling nausea

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Conflict of interest: None

and vomiting can improve patient satisfaction with medical and anesthetic services and promote the level of activities and the patient's faster recovery.[6]

Different factors in the incidence of post-surgical nausea and vomiting play a role in spinal anesthesia, the most important factor being the increased stimulation of vagus due to sympathetic inhibition. Other factors, such as hypotension (systolic blood pressure less than 80 mm Hg), block-level higher than thoracic fifth space, adding substances such as vasoconstrictors, neostigmine, and opioids to the anesthetic, increase the chance of nausea and vomiting. Reduced blood pressure causes brain stem cell ischemia, which leads to stimulation of the vomiting center in the brain stem. Also, hypotension is associated with ischemia of the intestines and the release of nausea-like substances, such as serotonin.[2]

Several methods and drugs, including metoclopramide, droperidol, a specific 5-HT antagonist, propofol, and dexamethasone, are used to treat this condition. The most commonly used drug is metoclopramide, which is characterized by the risk of extrapyramidal symptoms and complications, such as drowsiness, dizziness, and headache.[7] Therefore, proper treatment achievement is one of the concerns in this regard, so that research in reducing postoperative nausea and vomiting focuses on low-price methods and drugs. The drug should have the greatest effect and duration and the least complication.[6]

The aprepitant is a long-acting agonist of neurokinin-1 (NK1), whose half-life is 9–12 hours.[8] The neurokinin receptor 1 is known to be nausea-like as a receptor with high effect in both acute and chronic forms.[9] This drug has been approved by FDA for nausea prophylaxis induced by chemotherapy. This oral medication is known as an effective drug for opioid nausea. On the other hand, it has no sedative effect and its use in obese and apnea patients is quite safe during surgery and anesthesia.[10]

The other drugs include serotonin antagonists, such as ondansetron and dolasetron, which have a good effect on nausea and vomiting.[10] Ondansetron complications are headache, stomach upset, dizziness, flushing of the injection site, and arrhythmia.[11]

Another risk factors for postoperative nausea and vomiting are laparoscopic.[12] Laparoscopy is used to diagnose and treat many diseases. Pneumoperitoneum, during laparoscopy, can stimulate the vagus nerve and increase the chance of nausea and vomiting. Postoperative nausea and vomiting cause, discharge delay, dehydration, wound dehiscence, pulmonary aspiration, patient dissatisfaction, and increased costs.[13] Regarding the high prevalence of laparoscopic cholecystectomy and postoperative nausea and vomiting, in our study, we compared the effect of aprepitant, ondansetron, and combination of ondansetron and aprepitant, on postoperative nausea and vomiting, to introduce a regimen that is safe and low cost.

Materials and Methods

After approving the plan and performing the necessary coordination, the study was performed as a double-blind clinical trial after receiving written consent from patients. A total of 90 patients which were candidate for laparoscopic cholecystectomy under general anesthesia were admitted to the hospital. Inclusion criteria for the study include all patients are women aged 18–50 years, and the American Association of Anesthesiologists has a health level of 1 and 2, and at least two APFEL criteria (including female gender, non-smoker, having a history of PONV, and use of 100 mcg fentanyl or equivalent). Exclusion criteria include a woman aged over 50 and under 18, patients with a health status of 3, 4, 5 the American Association of Anesthesiologists, patients with regional anesthesia cholecystectomy, patients with any systemic disease, such as diabetes, asthma, cardiovascular disease, gastroesophageal reflux, severe obesity, pregnancy, lactation, liver and kidney diseases, neuromuscular diseases, psychiatric disorders, alcohol addicts and drug and smoker, and acute cholecystitis.

This study is double-blind. For the blinding of drugs and placebo, they are packaged by a pharmacist in unnamed packages and encoded and packaged into the operating room. After completing the design and measuring the indicators before the patient data analysis, the codes are delivered from the pharmacist and the case and control groups are identified.

After insertion of the patient into the operating room, venous access of the patient had the fluid infusion, and crystalloid infusion (Ringer's serum) started at 500 cc and vital signs were monitored. General anesthesia was induced and patients were divided into three groups: at the same time as an anti-nausea drug, ondansetron 4 mg (Tehran Chemistry Company) was administered intravenously and placebo capsule an hour before the operation. In another group, an 80-mg aprepitant capsule from Tehran Chemistry Company received an hour before the operation with placebo ampulla during operation and in the third group, an 80-mg capsule of aprepitant 1 hour before the operation and 4 mg ondansetron was given during the operation.

The patient was monitored for at least 30 minutes in the recovery room and then was delivered to the surgical ward. The severity of nausea and vomiting of patients at 6 and 24 hours after the operation as early and late symptoms using visual analog scale (VAS) criteria[14] was recorded in the questionnaire. Nausea and vomiting were measured based on VAS criteria. A 100 mm graduated line, the first of which without nausea, and the end of it is unbearable nausea. The occurrence of nausea and vomiting is collected through a patient's inquiry. The need for antiemetic medication is questioned by the nurse. Patient information is categorized in separate tables and analyzed by SPSS software.

Results

The mean age of the patients was 39.14 with a standard deviation of 7.78 years (Fig. 1). The highest age in this study was 50 years and the lowest 21 years. The mean severity of nausea and vomiting at

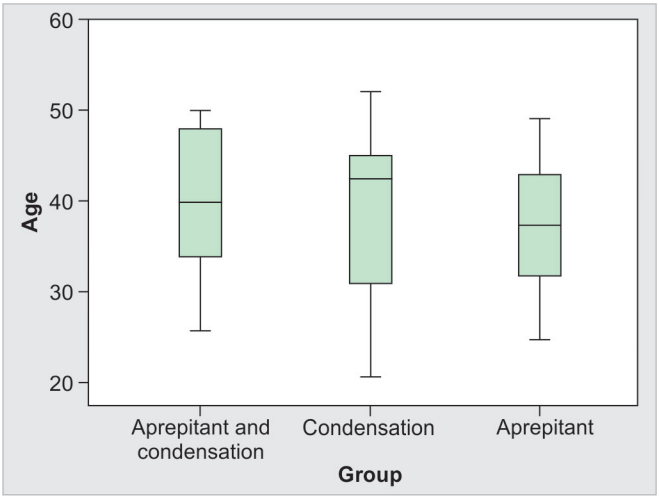

Fig. 1: Box plot of age distribution in groups

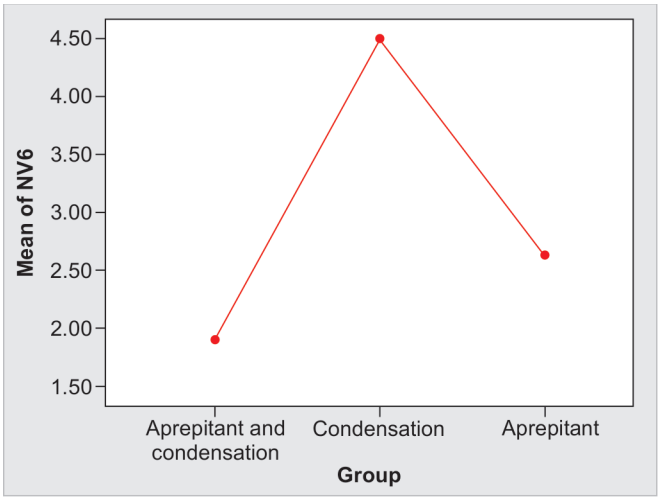

Fig. 2: Means plot of nausea and vomiting at 6 hours in groups

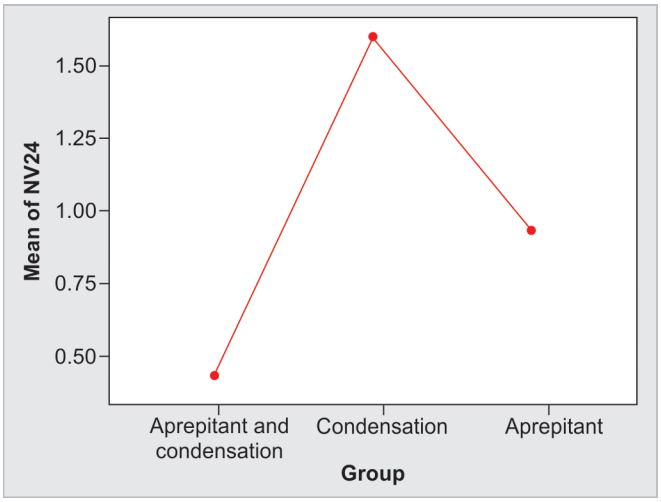

Fig. 3: Means plot of nausea and vomiting at 24 hours in groups

6 hours after the operation was 3.01 with a standard deviation of 1.71 (Fig. 2). The highest severity of nausea and vomiting was in subjects equal to 7 and lowest of zero. The mean severity of nausea and vomiting during the 24 hours after the operation was 0.99 with a standard deviation of 0.98 (Fig. 3). The highest severity of nausea and vomiting was in patients equal to 3 and the lowest was zero.

Considering that the *p*-value of the one-way analysis of variance is more than 0.05, it can be concluded that there is no significant difference between the studied groups in terms of the mean age, so the groups are conformed.

Considering that the amount of results from one-way analysis of variance is less than 0.05, it can be concluded that there is a significant difference between the groups in terms of severity of nausea and vomiting at 6 hours.

Considering the results of Tukey follow-up, it can be concluded that there is a significant difference between the treatment group receiving ondansetron and the two other groups, thus the severity of nausea and vomiting in the group receiving ondansetron is more than the other two groups.

Considering the result obtained from Kruskal–Wallis is less than 0.05, it can be concluded that there is a significant difference between the groups in terms of severity of nausea and vomiting in 24 hours. According to the calculated mean for nausea and vomiting severity in the groups, it is concluded that the highest severity of nausea and vomiting has occurred in the ondansetron group and the lowest in the group receiving the aprepitant plus ondansetron.

On the other hand, according to Pearson's correlation test, there was no significant difference between age and nausea and vomiting.

Discussion

Nausea and vomiting are common complications in the postoperative period, which causes bad and unpleasant feelings and delays in discharge of patients. Nausea and vomiting may lead to serious but rare complications, such as aspiration and postoperative hypoxemia, fluid and electrolyte imbalance, and the dehiscence of the surgical site. Postoperative nausea and vomiting in 20–30% of patients and are the second most common postoperative complication. Some factors, such as age, sex, previous history of nausea and vomiting, motion sickness, type of surgery, duration of anesthesia and surgery, and anxiety of the patient and parents are among the factors influencing nausea and vomiting that are not under the control of anesthesiologist.[14] Several methods and drugs, including metoclopramide, droperidol, a specific HT-5 antagonist, propofol, and dexamethasone, are used to treat this condition. The most commonly used drug is metoclopramide, which has the potential for extreme opiates and side effects, such as drowsiness, dizziness and headache, and low effect duration. Research in reducing postoperative nausea and vomiting focuses on effective low-dose medications and therapies. Medication should have the greatest effect and least complication.[15] This study aimed to compare the effects of aprepitant and ondansetron separately and their combination on postoperative nausea and vomiting after laparoscopic cholecystectomy. The mean age of patients in the study was 39.14 ± 7.78 years, which was 42.17 ± 14.03 in similar studies.[15] The patients were conformed in different age groups, which were similar in parallel studies.[14,15]

Comparisons between groups were performed using statistical tests. According to the results, the severity of postoperative nausea and vomiting at 6 and 24 hours after surgery showed that in the group which administered ondansetron and aprepitant simultaneously, the severity of nausea and vomiting is less than the other two groups. The existence of two different mechanisms of action for both ondansetron and aprepitant drugs can lead to the conclusion that co-administration of both drugs improves the outcome and reduces the incidence of vomiting in patients.

Comparing nausea and vomiting in other groups based on statistical tests, it was demonstrated that the level of nausea and vomiting at 6 and 24 hours after surgery was significantly different between the groups of aprepitant and ondansetron, this difference in mechanism leads to different effects of these two drugs, indicating that the blocking mechanism of the neurokinin receptor 1 has more effect on vomiting than the serotonin 5-HT3 receptor block pathway. On the other hand, there is not a significant difference in the rate of nausea and vomiting between the groups of aprepitant and the simultaneous aprepitant and ondansetron group, which indicates the potent antiemetic effect of the aprepitant.

As it was demonstrated, there is no significant relationship between age and severity of nausea and vomiting in different groups. Therefore, based on this study, it can be concluded that age does not have a clear effect on nausea and vomiting after surgery.

Other findings of the study indicate that there is a significant correlation between nausea and vomiting in 6 and 24 hours after surgery in the aprepitant group and the aprepitant and ondansetron group simultaneously. This result shows the ability to predict the severity of nausea and vomiting 24 hours after surgery based on the severity of nausea and vomiting 6 hours after surgery. In the event of severe symptoms at 6 hours, the symptoms may be more severe at 24 hours. But in general, the severity of symptoms at 24 hours is less than 6 hours.

In a study by Se-Jin Lee et al., they evaluated the effect of aprepitant in preventing postoperative nausea and vomiting in patients undergoing surgery. They demonstrated a significant difference between the aprepitant and the control group at 6 and 24 hours, while the incidence of nausea and vomiting in the aprepitant group was less than the control group. At 6–24 hours, the incidence was less than the first 6 hours,[14] which is consistent with our study.

Diemunsch et al., in their study, compared aprepitant with ondansetron for the prevention of postoperative nausea and vomiting in major abdominal surgery. They indicated that aprepitant is more effective than ondansetron in reducing nausea incidence on the first day following surgery, which is consistent with our study.[16]

Another study by Vallejo et al. assessed aprepitant in reducing postoperative nausea for 48 hours in patients undergoing plastic surgery. The results demonstrated the severity of nausea was significantly higher ondansetron group comparing with the ondansetron plus aprepitant group, which is in the same way with our study.[17]

Conclusion

In patients undergoing laparoscopic cholecystectomy with general anesthesia, ondansetron, and aprepitant can be used to reduce postoperative nausea and vomiting, while the effect of aprepitant on this complication is greater than ondansetron. If these two drugs are used concurrently, they will have a longer and much more efficacy than their separate injections.

Acknowledgments

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Disclosure

Ethical Approval Statement

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

Informed Consent Statement

Informed consent was obtained from the participants included in the study.

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RESEARCH ARTICLE

Laparoscopic Stapled Gastrojejunostomy in Non-operable Cases of Malignant Gastric Outlet Obstruction (GOO): A Retrospective Study

Hilal A Makhdoomi[1], Tajamul Rashid[2], Irfan N Mir[3], Suhail N Bhat[4], Asifa Azad[5]

Abstract

Background: Inability of gastric contents to go beyond the proximal duodenum is termed as gastric outlet obstruction (GOO). This may be partial or complete. A multitude of causes, benign/malignant, may lead to GOO of gastric and extra gastric origins. Malignant GOO is a common condition among locally advanced gastric cancer patients. One of the relative contraindications for surgery is the presence of advanced malignancy; in these cases, in which life expectancy may be limited to a few months, palliative surgical measures may improve the quality of life. The role of the laparoscopic approach in the treatment of GOO is under investigation and may represent a valid form of therapy with low morbidity.

Materials and methods: This was a retrospective study conducted in the Department of General Surgery, Government Medical College, Srinagar, from May 2018 to May 2019. A total of 35 patients who were diagnosed as cases of non-operable malignant GOO were included in the study. All patients underwent laparoscopic stapled gastrojejunostomy after diagnostic laparoscopy. This study was aimed at operative time, time for making anastomosis, hospital stay, return of bowel sounds, and postoperative complications.

Results: Mean age of patients in our study was 66.8 years with male predominance. Mean operative time was 94.35 minutes with a mean time of 20.4 minutes for making stapled anastomosis. Mean hospital stay, return of bowel sounds, and resumption of orals were 7.9, 2.28, and 3.85 days, respectively. Bleeding from the anastomotic site was noted in three patients and anastomotic leak was noted in one patient.

Conclusion: Laparoscopic stapled gastrojejunostomy is a viable option for palliation in advanced cases of non-operable malignancies leading to GOO. It is associated with less operative times and less immediate postoperative complications. However, further studies are needed before laparoscopic stapled gastrojejunostomy is taken up as a standard for non-operable cases of malignant GOO.

Keywords: Gastric outlet obstruction, Gastrojejunostomy, Palliation, Diagnostic Laparoscopy.

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Introduction

Inability of gastric contents to go beyond the proximal duodenum is termed as gastric outlet obstruction (GOO). It is a misnomer encompassing numerous cases of gastric or extra-gastric disease, rather than an isolated gastric disease. It may be partial or complete.[1–3] The incidence of GOO is not precisely known. The major cause of GOO was peptic ulcer disease (PUD) till the discovery of proton pump inhibitors and Helicobacter pylori, which has resulted in fewer cases of PUD presenting with GOO (<5%). In the modern era, the major cause is known to be malignancy, especially in the developed world.[4] The prevalence of peptic ulcer and gastric carcinoma are 8 and 3/lakh, respectively.[5] Malignant GOO is a clinical symptom of advanced malignancies in the upper gastrointestinal tract, most commonly gastric and pancreatic malignancies. Palliative treatment is required for patients with unresectable primary malignancies or metastatic lesions. Despite a decrease in the incidence of gastric cancer over previous decades, gastric cancer remains the fourth most common malignant disease and the second main cause of cancer-related death worldwide.[6] Even if the patient has unresectable disease, palliative surgical measures may improve the quality of life. In GOO, bypass (gastrojejunostomy) can be performed by both open and laparoscopic techniques. The role of the laparoscopic approach in the treatment of GOO is under investigation and may represent a valid form of therapy with low morbidity.

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Conflict of interest: None

Materials and Methods

This was a retrospective study conducted in the Department of General Surgery, Government Medical College, Srinagar, from May 2017 to May 2019. A total of 35 patients of both sexes in the

age group of 30 years and above, who were diagnosed as cases of malignant GOO, were included in the study. All patients underwent laparoscopic stapled gastrojejunostomy after diagnostic laparoscopy by a single surgical team. Patients who were found to have resectable growth after diagnostic laparoscopy were excluded from the study. Informed and written consent was taken prior to the performance of each procedure. Ceftriaxone injection of 1 gram was given to all patients at the time of induction of anesthesia.

With the patient in supine position, three ports were used. A 12 mm port was placed 2 cm below right costal margin in midclavicular line for staplers. Second, 10 mm port (camera port) in midclavicular line was placed 5 cm below the first port. Third, 5 mm port was placed 5 cm below the second port in the midclavicular line. Diagnostic laparoscopy with staging was done. If the staging favored unresectable growth, laparoscopic stapled gastrojejunostomy was done. The study was aimed at total operative time, time for making anastomosis, hospital stay, return of bowel sounds, and postoperative complications.

Results

Mean age of patients in our study was 66.8 years with male predominance (Tables 1 and 2). Mean operative time was 94.35 minutes with a mean time of 20.4 minutes for making stapled anastomosis (Tables 3 and 4). Mean hospital stay, return of bowel sounds, and resumption of orals were 7.9, 2.28, and 3.85 days, respectively (Tables 5 to 7). Bleeding from the anastomotic site was noted in three patients and anastomotic leak was noted in one patient (Table 8).

Table 1: Age distribution

Age (in years)	*Number of patients*	*Percentage*
50–59	20	57.14
60–69	13	37.14
≥70	02	5.72

Mean age: 66.81 years

Table 2: Sex distribution

Sex	*Number of patients*	*Percentage*
Male	27	77.14
Female	08	22.86

Table 3: Operative time

Time (minutes)	*Number of patients*	*Percentage*
80–95	19	54.28
95–110	16	45.72
≥110	0	0

Mean: 94.35 minutes

Table 4: Anastomosis time

Time (minutes)	*Number of patients*	*Percentage*
<20	30	85.72
20–24	05	14.28
≥25	0	0

Mean anastomosis time: 20.4 minutes

Discussion

For non-operable malignancies of the stomach, duodenum, or pancreatic head with GOO, gastrojejunostomy is indicated as palliative treatment.[7,8] Historically, open gastrojejunostomy used to be the only method available. Minimally invasive approaches are now more commonly preferred. In our study, we routinely followed laparoscopy as a modality for diagnosis and patients having GOO with stage 4 disease were taken up for laparoscopic stapled gastrojejunostomy. We used laparoscopic linear stapler with 60 mm mounted cartridge.

In our study, the mean age of patients was 66.81 years. Zhang et al. in their study of 28 patients reported an average age of 68 years (range, 25–99).[9] In a study by Seo et al., the mean age of patients in stapled group was 60.1 ± 11.7.[10] Males predominated females in our study. This finding was concurrent with studies that suggested males are more commonly affected with GOO.[11] Laparoscopic gastrojejunostomy is technically more difficult than open gastrojejunostomy in creating a bypass. The mean operative time and mean time for making anastomosis in our study were 94.35 and 20.4 minutes, respectively. A study by Zhang et al. found the average operative time for laparoscopic stapled gastrojejunostomy was 170 minutes.[9] Studies have also shown that operative time decreases as the individual surgeons become more experienced.[12]

Table 5: Hospital stay

Hospital stay (days)	*Number of patients*	*Percentage*
7	14	40
8	13	37.14
9	5	14.28
10	3	8.58

Mean hospital stay: 7.91 days

Table 6: Return of bowel sounds

Days	*Number of patients*	*Percentage*
2	25	71.42
3	10	28.58
4	0	0

Mean number of days for return of bowel sounds: 2.28 days

Table 7: Resumption of orals

Days	*Number of patients*	*Percentage*
3	11	31.42
4	18	51.44
5	06	17.14

Mean days for resumption of orals: 3.85 days

Table 8: Immediate postoperative complications

Complication	*Number of patients*	*Percentage*
Bleeding	02	5.71
Anastomotic leak	01	2.85
Intra-abdominal abscess	0	0
Fistula formation	0	0

In a study done by Seo et al., the time taken for creating stapled anastomosis was 5.7 ± 0.7.[10,13] The difference in time for making stapled anastomosis in our study may be attributed to the learning curve with stapled gastrojejunostomy. The hospital length of stay can be as low as 3 days and as high as 14 days in laparoscopic gastrojejunostomy.[10,14] In our study, the mean length of hospital stay was 7.91 days. The mean duration for return of bowel sounds in our study was 2.28 days. This was comparable with studies conducted by Linda et al. (3 days) and Seo et al. (2.4 ± 0.9 days).[9,10] Resumption of oral feeds is an important predictor of a successful gastrointestinal surgery. Mean duration for resumption of oral feeds in our study was 3.85 days. Alam et al. and Kazanjian et al., both reviewed patients with GOO secondary to non-operable cancer and found the median time to solid food after laparoscopic gastrojejunostomy to be 4 days.[15,16]

As we know, the complications are a part of any surgery. Among various complications of laparoscopic gastrojejunostomy, we found intraoperative anastomosis site bleeding in 0 patients (11.42%) and anastomotic leak in 01 patient (2.85%). Intra-abdominal abscess and fistula formation were noted in none of our patients. Gonzalez et al. in their study of found intraoperative bleeding from the anastomotic site in 01 patient.[17] Zhang et al. in his study mentioned a leak rate of 3.57% in his study.[9]

We, in our study, observed lesser complications of the procedure mentioned in the literature. This may be attributed to smaller sample size in particular. The lesser incidence of complications in our study may also be because of the fact that all the patients were properly optimized before surgery. However, further studies with a larger cohort are needed.

Conclusion

There have been several modifications and innovations in the instrumentation available for advanced laparoscopic procedures, which have enabled surgeons to perform several procedures that would otherwise not have been feasible. Laparoscopic stapled gastrojejunostomy is one of them and is a viable option for palliation in cases of advanced cases of non-operable malignancies leading to GOO. It is associated with less operative times and less immediate postoperative complications. However, further studies are needed before laparoscopic stapled gastrojejunostomy is taken up as a standard for non-operable cases of malignant GOO.

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CASE REPORT

Postoperative Acute Pancreatitis in a Patient Who Underwent Laparoscopic Cholecystectomy: A Case Report

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Abstract

Laparoscopic cholecystectomy (LC) is a widely performed procedure worldwide, and it is one of the safest surgical interventions, with few short- and long-term complications. The presentation of post-LC acute pancreatitis (AP) is quite rare and with few reports over time. This case report relates the case of a 34-year-old woman who, 12 days after surgery, presented with AP with no other apparent cause, in addition to which a right renal mass was found incidentally. This case presents us with a rare complication of a fairly safe surgical procedure; however, it should serve to carry out a good follow-up of postoperative patients in the first weeks above all in order to prevent complications.

Keywords: Abdominal pain, Acute pancreatitis, Cholecystectomy, Gallstones.

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Introduction

Laparoscopic cholecystectomy (LC) is a highly used surgical procedure around the world, showing a significant increase in the last decades.[1,2] South Africa showed a 28% increase in procedures performed between 2009 and 2013 compared to 2004 and 2008,[1] while New York had an annual increase of 1.3% between 1995 and 2013.[2] Among the reasons for carrying out the procedure, about 70% of LC is due to a case of calculous cholecystitis, followed by biliary colic, acalculous cholecystitis, among others.[2] The procedure is quite safe, and it presents less than 15% complications, between intraoperative and postoperative.[3,4] Among the most common complications, we have the conversion of LC to open cholecystectomy, which is the most frequent complication, followed by bile leak and bile duct injury;[4] at the postoperative level, complications are rare and at the level of this rarity, and the most common is surgical wound infections and hernias.[3]

Acute pancreatitis (AP) is one of the most frequent causes of hospitalization; there was an increase of 13% in cases from 2002 to 2005 to 2009 to 2012; and within its causes, it is more frequently related to gallstones and alcohol abuse.[5] Patients with smaller gallstones are those at higher risk of developing pancreatitis.[6] Post-LC AP is a rare entity, and it has been reported in a cohort in 1997, where it was seen that 40 patients out of a cohort of around 10,000 patients presented this condition, of which eight of them occurred after an LC conversion to open surgery, while only five patients presented AP before 10 days after the surgery.[7] The objective of this study is to report the case of a woman who underwent LC for calculous cholecystitis, who presented a picture of AP 12 days after surgery.

Case Description

This is a 34-year-old obese female patient who presented to our emergency department (ED) with severe abdominal pain in the right upper quadrant (RUQ) radiating to the back and epigastric region. The pain started a day ago and did not get better with Tylenol. The patient denies fever, chills, nausea, or vomiting but notifies mild diaphoresis. In the ED, the vitals and temperature of the patient are normal. The patient denies any use of alcohol, smoking, and illicit drugs. The initial lab workup of the patient showed Hb of 11.8 g/dL, WBC of 6.2×10^3/mm^3, platelets of 290×10^3 mcL, creatinine of 0.8 mg/dL, alanine transaminase (ALT)/aspartate transaminase (AST) of 1000/62 units, alkaline phosphatase (ALP) of 177 IU/L, Albumin of 2.9 g/dL, Ca of 7.9 mg/dL, and urine analysis is significant for 3+ blood and 1+ protein. The abnormal liver functions and RUQ pain are indicated for Ultrasound of the abdomen. Ultrasound showed diffusely enlarged liver parenchyma, gallstones (Fig. 1), and 2.5 mm thickened gallbladder. There are no findings of pericholecystic fluid. Murphy's sign is absent. The common bile duct measures 5 mm in the porta hepatis. The right kidney measures 10.7 cm with a $3.5 \times 2.5 \times 3.4$ cm complex lesion with areas of solid and cystic change and thick septation. The Ultrasound of the abdomen confirmed the diagnosis of cholelithiasis and the complex lesion of the kidney, and RBC in the urine indicated for MRI of the abdomen. MRI of the abdomen showed a heterogeneous slightly enhancing lesion in the superior pole of the right kidney measuring 28×31 mm (Fig. 2). The nature of the right kidney mass is indicated for biopsy

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Fig. 1: Ultrasound showing 2.5 mm thickened gallbladder

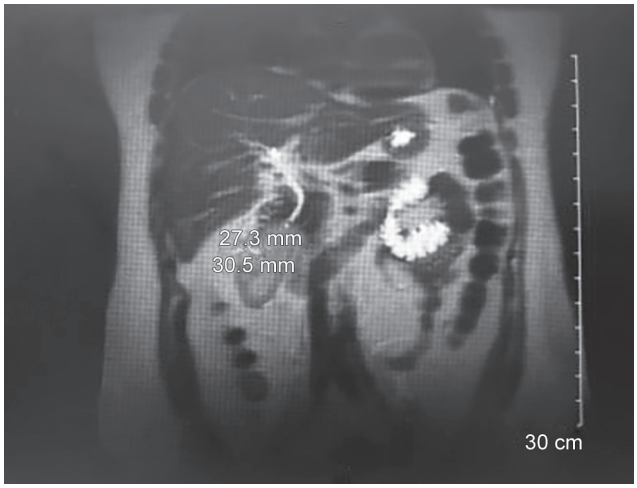

Fig. 2: MRI of the abdomen showing complex renal mass measuring 28 × 31 mm

Fig. 3: HIDA scan of the liver and biliary structures

of the kidney on an outpatient basis later to the cholecystectomy by the hematologist. The patient was given morphine sulfate 2 mg IV Q4H PRN, ondansetron 4 mg IV Q4H PRN for nausea, and Levofloxacin/Dextrose IV antibiotic and admitted to the medical floor for cholecystectomy scheduled for surgical consultation on the next day.

On the next day, the patient underwent LC. The gallbladder showed multiple gallstones and minimal inflammation of the gallbladder. There are no complications during the surgery. A total loss of 10 cc blood is noted during the procedure. Postoperative suboptimal elevation of liver enzymes with concern for postoperative biliary leak indicated for the Gastroenterology department consultation. They recommended for nuclear medicine—hepatobiliary scan. Hepatobiliary iminodiacetic acid (HIDA) scan showed minimal activity at the proximal aspect of the extrahepatic duct and paracolic gutter (Fig. 3), which is suspicious

Table 1: Blood workup of the patient during initial visits to ED

Labs	*Hg*	*WBC*	*Total bilirubin*	*AST*	*ALP*
During initial visit to ED—preoperative Cholecystectomy	11.8 g/dL	$6.2 \times 10^3/mm^3$	2.70 mg/dL	1000 units/L	177 IU/L
During postoperative day #12 visit to ED—acute pancreatitis bout.	13.6 g/dL	$17.7 \times 10^3/mm^3$	2.60 mg/dL	442 units/L	740 IU/L

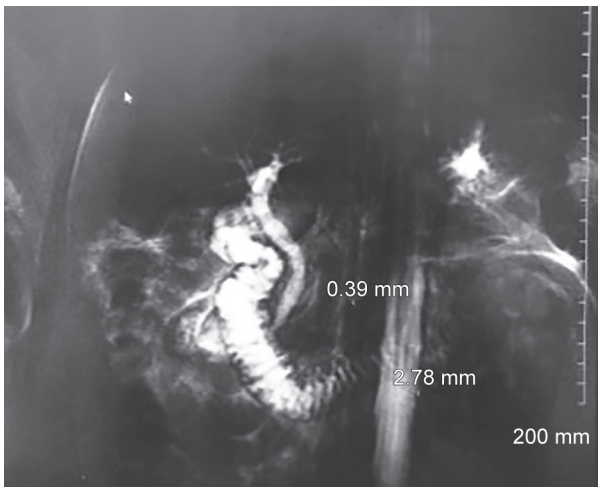

Fig. 4: Cholangiogram radiological image findings

for minimal bile leak. On postoperative day 2, the patient's liver enzymes started trending down to normal and able to tolerate a normal diet. The patient was discharged with instructions to follow up with a bariatric surgeon and urologist in a week and with minimal weight lifting instructions.

On postoperative day 12 of LC, the patient started having severe abdominal pain in the epigastric region with nausea and vomiting. Due to the nature of the severe epigastric abdominal pain, the patient presented to the ED. Vitals in the ED are all normal. The basic lab workup showed WBC of $17.72 \times 10^3/mm^3$, Hg 13.6 g/dL, total bilirubin of 2.60, AST 442 units, ALT 572 units, ALP 740 IU/L, and lipase of 6730 U/L which are summarized in Table 1. The abnormally high levels of lipase and liver enzymes are directed towards the diagnosis of AP. The patient is placed on NPO, IV fluids, and analgesics, and magnetic resonance cholangiopancreatography (MRCP) was done which was normal. The nature of pancreatitis later to cholecystectomy stipulated for endoscopic retrograde cholangiopancreatography ERCP. ERCP showed dilated common bile duct with a measurement of 1.2 cm with no stones, sludge, or biliary leak. Balloon sweep was done three times. Later, sphincterotomy was performed, which led to the free flow of bile, and a cholangiogram (Fig. 4) was done as well which showed no signs of a biliary leak. On day 3 of admission for abdominal pain, lab workup showed AST 138 units, ALT 299 units, ALP 508 IU/L. The patient was eventually switched to a liquid diet as tolerable and to a solid diet and was discharged on day 5 of admission for AP.

Discussion

We present the case of a 34-year-old female patient who underwent LC due to acute calculous cholecystitis. LC is more common in women; more than 60% of procedures are reported in women.[1,2] The mean age of presentation is close to 45 years with a standard deviation close to 10 years, in addition to 60% of procedures performed in those over 40 years of age.[1,2] However, 90% of patients with cholelithiasis between 18 and 49 years are operated on by LC.[8] There are many possible etiologies for AP such as alcoholism, medications, cystic fibrosis, hypercalcemia, hypertriglyceridemia, and trauma.[1,2] After ruling out these causes the patient recently operated for cholecystitis stands the next risk factor.

The patient was operated satisfactorily without any evidence of complication. It was seen that the patient presented a case of acute cholecystitis, which is considered a risk factor for conversion to open surgery;[9] however, our patient did not present this common complication. A study found that mild thickened (from 2–4 mm) gallbladder had more risk to present complications compared with normal wall thickness, 53.1 vs 10.5%.[10] In the case of our patient, she has a 2.5 mm thickened gallbladder. Regarding the stones found in the gallbladder, the stones were small and multiple. Some studies mention that the presence of smaller stones predisposes a greater risk of later pancreaticobiliary events.[11] To rule out bile leakage in the patient, a 99mTC-HIDA scan was performed. It is a useful tool for diagnosis of dyskinesia, small and multiple stones before surgery, but also could have some importance after surgery to diagnose some bile problems.[12] In the case of the patient, a minimal amount of bile leakage is shown; however, she did not require treatment at that time, so she was discharged and controlled in 1 week.

The patient presented with AP 12 days after surgery. This event is rare, having been reported in a previous cohort that 0.34% (40) of patients undergoing LC presented postoperative pancreatitis, of which only five presented the event between 1 and 10 days and 15 people between 10 and 50 days later, taking as a risk factor the change from LC to open surgery.[7] A case report showed a similar event 3 days postoperatively, but it was a 36-year-old man with the presence of small stones.[13] Also, one article describes that the rendezvous technique using an LC could prevent recurrent AP in patients who had AP previously.[14] As can be seen, the entity is rare and the time of onset variable in the first 2 weeks is very rare, in addition to the fact that it may manifest in the absence of a change from LC to open surgery, but small stones predispose the appearance of this postoperative event.

Endoscopic ultrasound (EUS) and MRCP were used to confirm the etiological diagnosis of the patient's condition. EUS and MRCP were compared in a systematic review, where it was observed that EUS is more specific for etiological diagnosis; however, MRCP is better to detect anatomical alterations.[15] In this case, only MRCP was performed on the patient and it was normal. Additionally, an ERCP with fluoroscopy was performed. ERCP is a highly used procedure to detect alterations in the hepatobiliary canal directly, and the use of additional fluoroscopy reduces radiation time, which benefits the doctor and patient.[16] Similarly, this procedure did not show any additional alteration. Finally, the patient presented the incidental finding of a right renal mass. The finding of renal masses is generally incidental due to other pathologies, in addition to the fact that the management is not immediate and the use of a core needle biopsy is preferred to determine the management.[17] In the imaging tests performed for the condition of cholecystitis in our patient, the renal mass was detected.

Conclusion

LC is a safe procedure; however, it can present complications such as postoperative pancreatitis before 2 weeks, especially if the patient had smaller stones. Therefore, good postoperative surveillance is necessary to prevent and manage similar cases.

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CASE REPORT

Role of Intraoperative Indocyanine Green Mapping in Laparoscopic Management of Median Arcuate Ligament Syndrome

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Abstract

Median arcuate ligament syndrome also known as Dunbar syndrome is caused by compression of the celiac axis by the median arcuate ligament. It typically presents with postprandial epigastric pain, weight loss, and vomiting, with the incidence being two cases per lakh in the third to the fifth decade.

Keywords: Arcuate, Indocyanine, Laparoscopic, Median.

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Introduction

Median arcuate ligament syndrome (MALS) is uncommon, caused by external compression of the celiac artery by the median arcuate ligament. Symptoms are postprandial abdominal pain, vomiting, and weight loss.[1,2–5] It is mainly a diagnosis of exclusion. A computed tomography (CT) scan, magnetic resonance angiogram, or sometimes angiogram is used to confirm the change in the shape of the celiac arteries and in the stenosis and poststenotic dilatation along with an abdominal Doppler. Several treatment options have been described in the management of MALS, including transluminal dilatation, surgical division of median arcuate ligament, or arterial bypass surgery.[6] However, the traditional treatment option includes surgery—open, laparoscopic, or robotic.[7,8] Minimally invasive surgical approaches, though technically challenging, have gained popularity in the management of MALS owing to its benefit of lesser postoperative pain and shorter hospital stay. We present a patient diagnosed to have MALS and treated successfully with laparoscopic decompression with intraoperative indocyanine green (ICG) mapping of the arteries and the ligaments.

Case History

A 70-year-old gentleman presented with epigastric pain—increasing after meals, vomiting—nonbilious in nature, and weight loss of 5 kg for 5 months. No epigastric bruits on physical examination. The patient had no medical comorbidities and no previous surgeries. Routine blood investigations and stool exam were normal. Upper gastrointestinal endoscopy was suggestive of a hiatus hernia. Ultrasonography of the abdomen was normal. Contrast-enhanced computed tomography of the abdomen with angiography was suggestive of significant (50–75%) stenosis of the celiac trunk ostium from its origin with poststenotic mild dilatation of the celiac trunk. A Doppler study of the abdomen was done in supine and erect postures and in the post-inspiratory and post-expiratory phases. It showed high velocities in the celiac trunk on inspiration and expiration in supine position (500 and 426 cm/s) and mildly high velocities in erect position (307 cm/s), classical of MALS.

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Conflict of interest: None

Surgical Technique

The patient was in a split-leg position with the surgeon standing in between the legs and the monitor at the head end of the patient. The camera system used is a 1588 Stryker system. A 10-mm viewing port was placed two-third one-third between the umbilicus and the xiphisternum. A 5-mm Nathanson retractor was used to retract the liver., another 10-mm working port in the left subcostal midclavicular line, and a 5-mm port right subcostal midclavicular line with a 5-mm retracting port in the left anterior axillary line at the level of the umbilicus. An additional 5-mm port was placed in the right paraumbilical region, midclavicular line as shown in Figure 1. We began the dissection by opening the pars flaccida and defining the right crus. The stomach was retracted to the left for better visualization. The left gastric artery was delineated and looped with a vascular loop and retracted and dissection followed up to the trifurcation of the celiac trunk. The trifurcation was identified using intraoperative ICG, which was administered by the anesthetist, 5 mg, and flushed with 10 mL of normal saline. After delineating trifurcation, dissection was carried out with ultrasonic shears till the origin of the celiac artery and the aorta as seen in Figure 2. A dense band over the celiac trunk was identified and confirmed by injecting intravenous ICG dye.

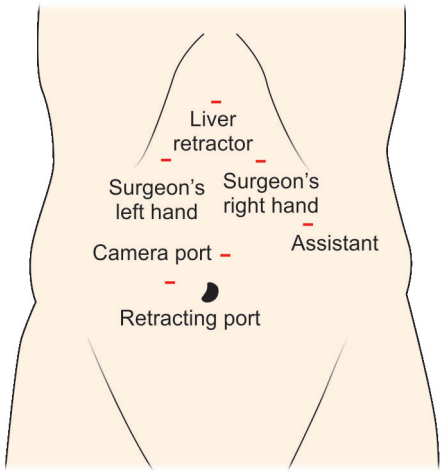

Fig. 1: Port positions

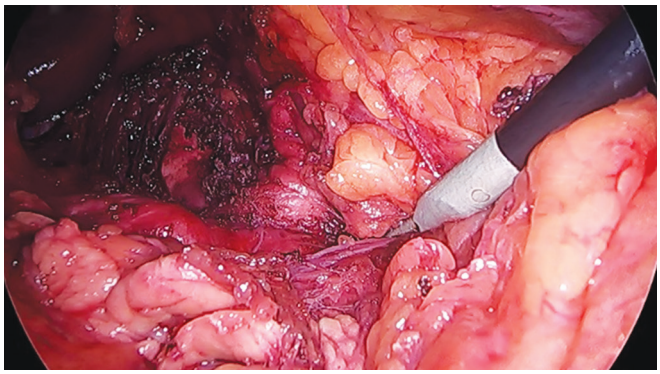

Fig. 2: Visualization of trifurcation

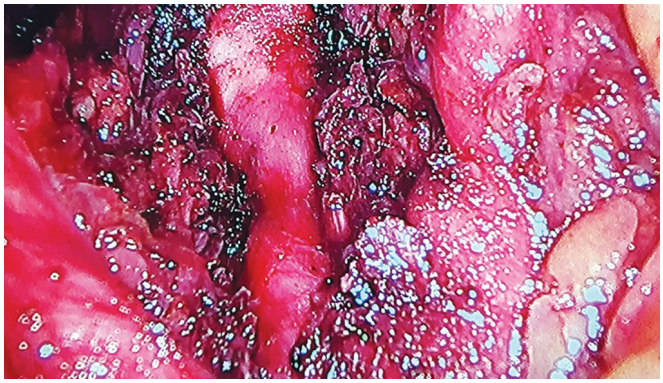

Fig. 3: Post-median arcuate ligament release

Complete adhesiolysis was done using a monopolar hook and a harmonic scalpel, taking care not to injure any major blood vessels. Complete release with 4-cm clearance over celiac, left gastric, and common hepatic arteries was done. Vascular stenosed segment and poststenotic dilatation appreciated after ICG mapping as seen in Figures 3 and 4. No dark band was appreciated encasing the vessels. A total of three injections of 5 mg of ICG were given; first at delineation of the trifurcation, second at the time of band visualization, and third post band trifurcation. Dissection-op time was 124 minutes and blood loss was minimal. The postoperative period was characterized by complete relief of symptoms. The patient was discharged on postop day 3. Repeat CT angiography was done postop at 2 weeks, which was normal. The patient was completely symptom free at 1-month follow-up.

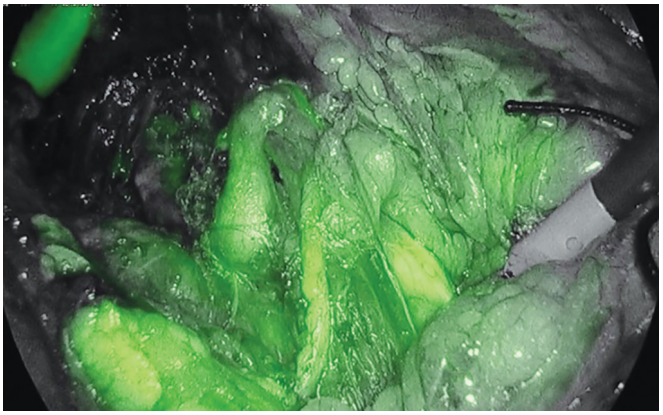

Fig. 4: Post-median arcuate ligament release, ICG mode

Discussion

MALS was first described by Harjola in 1963.[2] Once diagnosed, there are several options for the treatment of MALS: celiac artery decompression and celiac ganglionectomy,[7] celiac artery decompression and reconstruction, celiac artery decompression and dilatation, and celiac artery decompression and celiac artery endovascular stenting. However, with increasing reports on laparoscopic or robotic approaches, the focus now has been shifted to comparison between open and laparoscopic decompression of MALS, of which minimally invasive surgical approach offers immediate postop pain relief and shorter hospital stay,[8,9] earlier oral feeds, minimal risks of postop complications,[10] decreased blood loss, and better cosmetic outcome. We have published a paper on MALS previously, where we have encountered difficulty with the identification of the trifurcation. The use of ICG for intraoperative mapping for MALS has only been reported only once in the literature before.[11] It is useful in identifying the trifurcation and celiac axis as well as minimizing the risk of iatrogenic injury in otherwise risky dissection by clearly observing the location of the celiac axis and its major branches and confirmation of completion of dissection and to confirm the completion of division of the median arcuate ligament.

ICG dye is an iodophor and following its intravenous injection, it has shown negligible renal, peripheral, lung, or cerebrospinal fluid uptake of the dye.[12] ICG is a fluorescent agent with a peak spectral absorption and emission at 800 to 810 nm in blood or plasma. The principle of fluorescence imaging is to illuminate the tissue of interest with light at the excitation wavelength and observe it at longer emission wavelengths. ICG operates at near-infrared (NIR) wavelengths, at which tissues appear more translucent, thus providing information on deeper lying blood vessels and tissues. ICG is the only clinically approved dye for NIR fluorescence imaging.[16,17] Fluorescence imaging is a relatively new and rapidly evolving modality used in the intraoperative setting to delineate the vasculature and lymphatic drainage or demarcate between tumor and normal tissue.[13–15] In recent studies, its clinical application has

been tested in the treatment of cancer, laparoscopic procedures, and reconstructive colorectal and vascular surgeries.[16,17,18]

Conclusion

ICG mapping and NIR mapping may minimize the risk of injuring the celiac trunk and are useful to prevent injury to trifurcation and confirm the completeness of the median arcuate ligament division.

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CASE REPORT

Laparoscopic Management of Hydatid Cyst of Spleen: A Rare Case Report

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Abstract

Aim: Aim of reporting this case is to show the feasibility and outcomes of laparoscopic splenectomy in hydatid disease of spleen.

Background: Hydatid cyst is a zoonotic disease and it can affect humans. It can involve any organ; liver is the most common organ to involve, and in rare cases spleen could also be involved. Isolated splenic involvement is even rarer. Management is splenectomy. Laparoscopic splenectomy is feasible if uncontrolled spill is avoidable. Here we are presenting a case of laparoscopic splenectomy in an isolated splenic hydatid cyst.

Case description: A 41 years old lady presented with left upper abdominal Pain for six months. There was no chest or other abdominal complaints. Examination revealed a palpable spleen. Ultrasonography abdomen, contrast-enhanced computed tomography, and hydatid serology help to diagnose splenic hydatid, cystic echinococcosis type. Vaccination and perioperative albendazole were administered. She underwent laparoscopic splenectomy. Standard steps were followed to prevent spillage. The specimen was delivered through Pfannenstiel incision. Cut-section demonstrated hydatid membranes.

Conclusion: Isolated splenic hydatid is rare and rarely managed laparoscopically. It should be practiced when expertise available.

Clinical significance: Rare entity of isolated splenic hydatid cyst could be treated by laparoscopic method without causing any perioperative spill or complications and preserve all benefits of laparoscopic surgery in presence of expertise.

Keywords: Laparoscopic splenectomy, Splenic hydatid cyst.

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Background

Hydatid cyst is a zoonotic disease. Humans are accidental hosts and known as dead end in the chain of transmission. The liver is the most common site of infection followed by the lungs.[1] It can be disseminated to any part of the body. Spleen is rarely affected and isolated affection is even rarer. There are only a few cases reports in the literature. Surgery is the preferred treatment modality with perioperative albendazole. Open surgery is usually preferred to prevent spillage but a laparoscopic approach is feasible. We are presenting a case of symptomatic isolated splenic hydatid that was managed with laparoscopic splenectomy.

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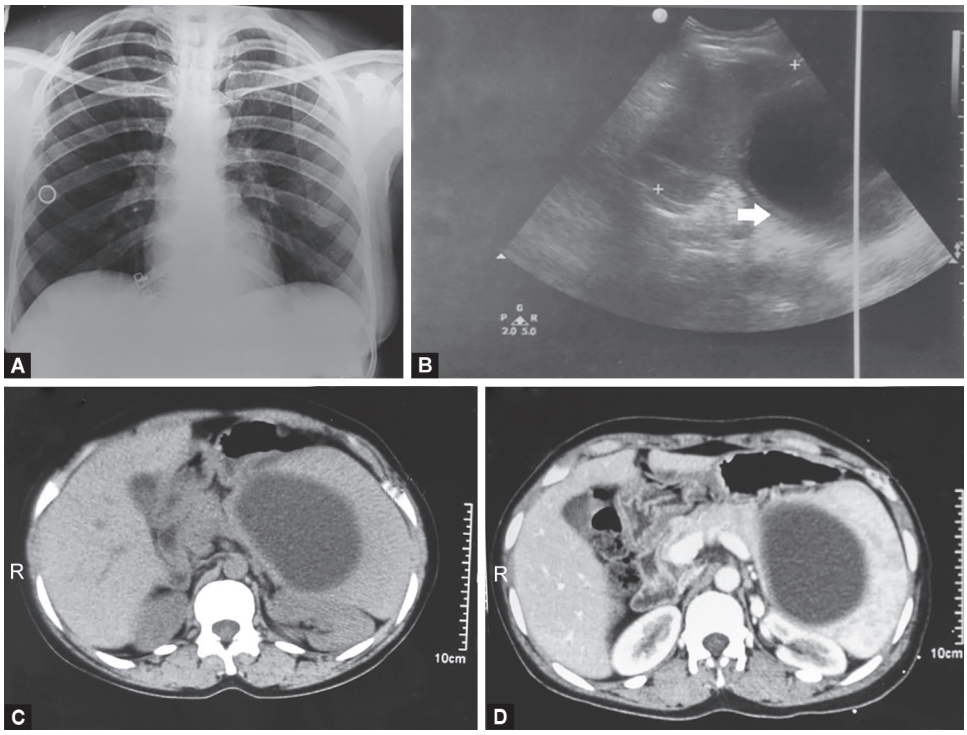
Conflict of interest: None

Case Description

A 41 years old lady presented with complaints of mild, dull aching pain in the left upper abdomen for 6 months. There was no pet breeding at home or in neighbor. She had no fever, jaundice, or loss of appetite or weight. She had no altered bowel habits. She did not complain of recurrent infections or easy bruising. She was averagely built and nourished. There was no cervical, axillary, or inguinal lymphadenopathy. Chest examination was normal. The spleen was palpable 4 cm below the left costal margin. No hepatomegaly or free fluid in the abdomen. With this, she was diagnosed with splenomegaly with no symptoms suggestive of hypersplenism. Her hemogram, renal and liver function tests, and coagulation profile were normal. Chest X-ray was normal. She was evaluated with abdominal ultrasonography (USG), which revealed an 11.3 × 11.2 × 10 cm cystic lesion in the inferior pole of the spleen with dependent hyperechoic contents. Echinococcal IgG (ELISA) was positive. Contrast-enhanced CT (CECT) revealed an enlarged spleen with a well-defined cystic lesion with a thin enhancing wall seen in the lower pole, measuring 11.5 × 10.5 × 9 cm. No septa or calcification or mural nodule demonstrated, and there was no other lesion in the abdomen. With these findings, she was diagnosed with asymptomatic splenic hydatid cyst probably cystic echinococcosis type (Fig. 1). She was planned for splenectomy along with the removal of cyst. With available expertise in advanced laparoscopy, she was planned for laparoscopic splenectomy. She was vaccinated against all three capsulated organisms. Two 10 mm and two 5 mm ports were placed as per convenience (Fig. 2). Standard steps were followed for splenectomy, and the spleen was removed through Pfannenstiel incision. There was no spillage of contents. Surgical specimen and its cut-section were shown in Figure 3. Histopathological examination demonstrated hydatid membranes. Postoperative course was uneventful and she was advised three weeks of



Figs. 1: (A) Chest X-ray posteroanterior view: normal skiagram; (B) USG abdomen showing hypoechoic cystic lesion with dependent hyperechoic contents; (C) Noncontrast CT showing hypodense lesion with no calcification; (D) Contrast-enhanced CT showing hypoattenuated lesion with no internal septa or mural nodule

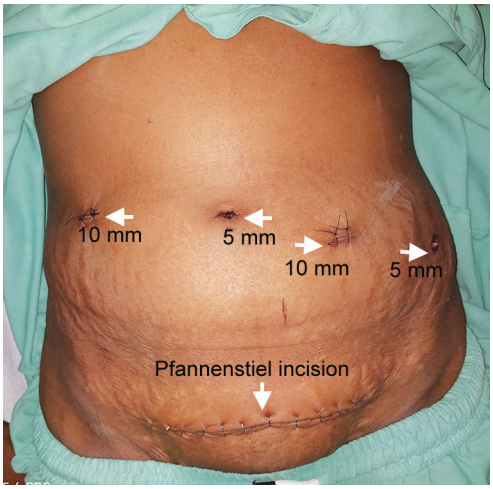


Fig. 2: Showing port placement and Pfannenstiel incision for specimen retrieval

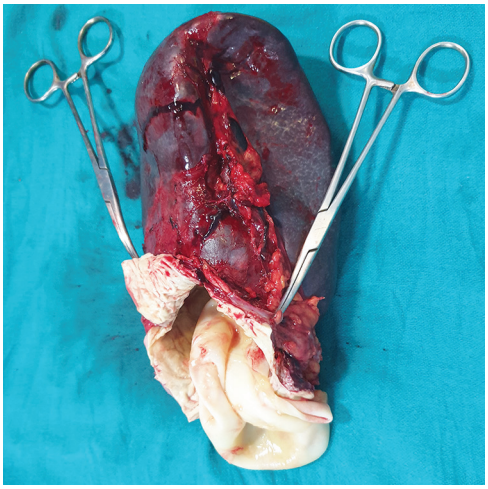


Fig. 3: Cut-section showing splenic cyst with membranes

albendazole treatment. She was discharged on postoperative day 5. On 6 months follow-up she is doing well.

Discussion

Hydatid cyst is a zoonotic disease and humans are affected accidentally. Mostly it is caused by *Echinococcus granulosus*.[2] Most common site of involvement is liver. It can involve any organ in the body, spleen is rarely involved by hydatid cyst 0.5 to 4%.[3] Isolated splenic involvement is even rare entity. The spleen may be involved through the splenic artery after bypassing liver and lungs or through retrograde involvement through the splenic vein.[4]

Patients usually present with upper abdominal symptoms. Pain is the most common complaint and it may be due to capsular stretching. If there is a cyst near hilum causing splenic vein compression, it may present with left-sided portal hypertension. There may be symptoms of hypersplenism also. Diagnosis is made with imaging (USG abdomen, CECT) and supported by hydatid serology. The final diagnosis is made on opening the

Table 1: Case reports/series of isolated splenic hydatid cyst

Author	*Year*	*Number of cases*	*Management*
Kumar et al.[2]	2016	1	Laparoscopic splenectomy
Vezakis et al.[9]	2012	2	1 case, open splenectomy 1 case, laparoscopic splenectomy
Gharaibeh[5]	2001	1	Lap splenectomy
Malik et al.[8]	2011	8	Open splenectomy
Hepgül et al.[11]	2010	1	Open splenectomy
Karakaya[6]	2007	2	Open splenectomy
Durgun et al.[7]	2003	14	Open splenectomy
Safioleas et al.[10]	1997	10	Open splenectomy

cyst and demonstrating the daughter cyst. Histopathology also helps in atypical cases. Management is mainly surgical with perioperative albendazole.[5] Open method is preferred as there is a fear of dissemination and anaphylactic reaction following rupture. But there are few reports in the literature of laparoscopic approach because of its technical challenges and risk of intraperitoneal rupture. In experienced hands, it is feasible and it provided all postoperative and cosmetic advantages of laparoscopy. Table 1 showing case series and reports on isolated splenic hydatid cyst and few among them were managed laparoscopically.[6–11] Our patient was also managed laparoscopically and recovered early with early resumption of daily activities.

Conclusion

Splenic hydatid cyst is a rare entity and isolated involvement is rarest. It requires surgical management without causing spillage. The laparoscopic approach has many advantages and it should be preferred when expertise available.

Clinical Significance

Here we are reporting a rare case of isolated splenic hydatid cyst, more importantly here we performed the surgery by laparoscopic method and shown excellent postoperative result, this showing the feasibly laparoscopic procedure even in splenic hydatid disease without any perioperative spill or complications in presence expertly of advance laparoscopy.

Acknowledgments

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The authors obtained consent from patients or close kin for the images and other clinical information to be reported in the journal. They understand that the names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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CASE REPORT

Role of Laparoscopy in Gastric Trichobezoar: A Case Report and Review of Laparoscopic Techniques in Pediatric and Adolescents

Prashant Jain[1], Ashish Prasad[2], Sarika Jain[3]

Abstract

This article presents a case report of the laparoscopic removal of a large gastric trichobezoar in a 13-year-old girl. We reviewed the various laparoscopic techniques and their modifications described in the literature for removal of gastric trichobezoar. Advantages and disadvantages of various techniques were also discussed.

Keywords: Children, Gastric trichobezoar, Laparoscopy.

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Introduction

Trichobezoar (ball of hair) is accumulation of hair in stomach and small intestine (Rapunzel syndrome). It is a rare condition usually seen in adolescent girls with a psychiatric disorder.[1] The management of gastric trichobezoar includes endoscopic/surgical removal along with the treatment of psychiatric instability. Various techniques have been used which includes laparotomy, endoscopy, laparoscopy, and laser fragmentation. We report a case of laparoscopic removal of a large trichobezoar in a 13-year-old girl and reviewed various laparoscopic techniques and its modifications described for removal of gastric trichobezoar.

Case Report

A 13-year-old female, presented with recurrent abdominal pain and vomiting, which had increased in severity for the last 2 days. Initial evaluation with ultrasound abdomen was normal. In view of persistent pain and fullness of the upper abdomen, she was evaluated by a gastroenterologist. The child underwent upper gastrointestinal endoscopy which revealed a large trichobezoar involving the stomach and extending into the whole of the duodenum and proximal jejunum. Endoscopic removal was attempted twice but only the tail part could be removed. The girl was then planned for laparoscopic removal of the trichobezoar.

A 12 mm infraumbilical port was used and two 5 mm ports in epigastrium and left hypochondrium. Pneumoperitoneum was created using 12 mm pressure. Gastrotomy incision of about 6 cm was made over anterior wall of the stomach. To stabilize the stomach, two stay sutures were taken through the edge of the stomach wall and were brought out through the anterior abdominal wall. With the help of graspers and suction, the bezoar was gradually separated avoiding any peritoneal contamination. Our job was made easier by previous endoscopic mobilization of the tail of bezoar. An auto retrieval endobag was placed inside the abdomen, and bezoar was carefully passed inside the bag without causing any peritoneal spillage (Fig. 1). It was then placed in the right quadrant of the abdomen meanwhile the gastrotomy was repaired in two layers using polydioxanone 2/0 suture. A thorough saline wash was given. The trichobezoar was retrieved piecemeal with minimal fragmentation through the umbilical port (Fig. 2). The procedure took about 2 hours and 30 minutes. The size of the bezoar was 12 × 10 × 7 cm weighing about 200 gm.

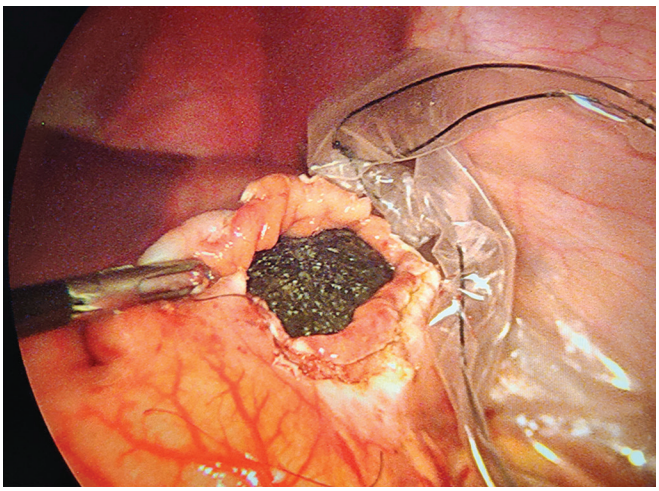

Fig. 1: Laparoscopic gastrostomy and placement of endobag

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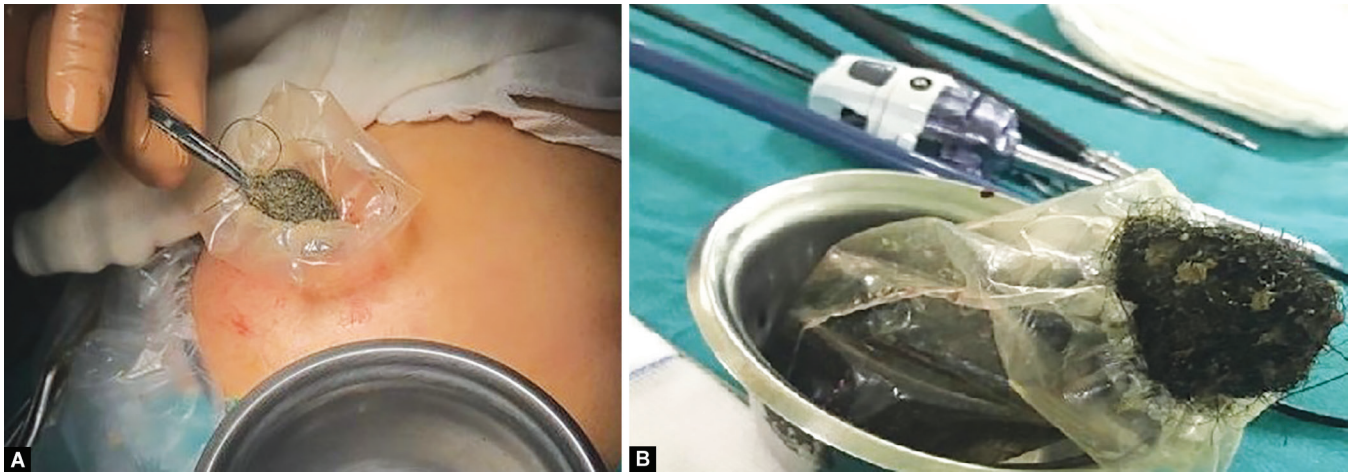

Figs. 2A and B: Trichobezoar specimen retrieved through umbilical port

The postoperative course was uneventful. She was started on liquid diet on the first postoperative day and was discharged on third postoperative day after psychiatric consultation.

Discussion

Conventionally laparotomy has been used for the removal of gastric trichobezoar. Endoscopy has also been tried for removal but it has its own disadvantages like it is a time taking procedure, requiring multiple sessions and has a high failure rate. Since the advent of laparoscopy, few reports have been published in the literature about its use in gastric trichobezoar removal, the first being by Nirwasa et al. in 1998.[2]

The ideal approach is still not clear. The main challenge in removal of gastric trichobezoar is the usual large size of the bezoar and the associated risk of peritoneal and wound contamination. To overcome this, laparoscopic techniques have been modified by various surgeons especially the technique of extraction. A detailed search of the literature was done to understand the various laparoscopic techniques used in retrieving the gastric trichobezoar.

We reviewed the published pediatric and adolescent cases of gastric trichobezoar till 18 years of age in which laparoscopic or laparoscopic-assisted procedures were performed. The youngest child was 4-year-old who had undergone complete removal of large trichobezoar weighing 192 gm through a 12 mm port.[3]

A total of 23 reported cases performed by 20 surgeons were reviewed. Three procedures that were used for retrieving trichobezoar were (1) complete laparoscopic removal without extending the port incision,[3,4] (2) laparoscopic-assisted removal /laparoscopic-assisted mini-laparotomy,[2,5] and (3) laparoscopic-assisted gastrocutaneopexy.[1,6]

Laparoscopic removal mainly involves the three-or four-port placements. The step used were (a) gastrotomy with or without stay sutures, (b) mobilizing the bezoar within the stomach, (c) placing the bezoar inside the endobag, (d) closure of gastrostomy by endostaplers or suturing, and (e) retrieval of the mouth of endobag through large 10 or 12 mm port and then removing the specimen piecemeal or after fragmenting it with the scissors.

Laparoscopy as compared to laparotomy definitely has the advantages of less postoperative pain, better cosmesis, and most important less risk of wound infection. It has the benefit of confirming any spillage and irrigation of the peritoneal cavity to avoid any intra-abdominal complications.[3] But then it has its own disadvantages like it is a technically difficult procedure especially in a young child with limited abdominal space. The placement of trichobezoar without any spillage and peritoneal contamination inside the endobag needs hands of experienced and skilled laparoscopic surgeon.[7] If not performed carefully, it can make the procedure messy with significant intra-abdominal contamination.

The operative time, in my view, mainly depends on the size of the bezoar, the size of the patient, and the operating skills of the surgeon. The duration of the procedure using complete laparoscopic removal varied from 2.10 hours to 3.5 hours except in a case in which intragastric ports were used which took about 6 hours.[8] Our procedure took about 2.30 hours. The most important factor which increases the duration of the procedure is the fragmentation and removal of bezoar. Most of the bezoars including ours were more than 10 cm in size.

Kanetaka et al.[9] described a two-channel method technique which combined gastroscopy along with laparoscopy to remove a bezoar of about 100 gm. The technique involved gastroscopic retrieval after the trichobezoar was fragmented by an intragastric laparoscope. Although minimal invasive does not seem to be a feasible option for large bezoars as it requires multiple passages of endoscope in the stomach.

Laparoscopic-assisted removal of trichobezoar has been reported in eight cases.[2,5] The trichobezoar after placing inside the endobag was retrieved either by extending the port incision or by making a separate 3 to 5 cm incision in suprapubic (Pffenesteil incison)/left subcoastal/hypochondrium incision or midline incision. The most important benefit of this procedure is that it reduces the operative time. By increasing the length of the incision, extraction of the specimen especially the large ones becomes relatively easy. Although it defeats the purpose of minimal access surgery. Wound infection risk can be minimized with the use of endobag or a wound protector. Although the duration of surgery was not mentioned in most of the cases, we presume it to be relatively less as compared to the complete laparoscopic procedure.

Another reported procedure is laparoscopic-assisted gastrocutaneopexy used in nine cases of gastric trichobezoar.[1,6]

This procedure involves the placement of infraumbilical port with an extended skin incision. The anterior wall of the stomach is fixed to the skin on the perimeter of the wound to prevent the spillage of contents into the peritoneal cavity. Anterior gastrotomy is made and trichobezoar is pulled out piecemeal or in fragments without causing any contamination. The gastrotomy is then closed in two layers after releasing the seromuscular attachment to the abdominal wall.[1]

Javed et al.[1] who used this technique in three cases with an incision of 4 to 5 cm reported excellent outcomes with average duration of the procedure being 45 minutes. Similar technique was used by Iftikhar et al.[6] in two cases in which a small umbilical incision of 1.5 cm was used to remove a bezoar of size more than 10 cm. Although the size of the incision was similar or even less than what has been used in laparoscopic-assisted procedures, a temporary gastrostomy minimizes the contamination and also reduces the duration of the procedure. Tudor et al.[10] recommended running suture while fixing the stomach to the anterior abdominal wall along with the use of the Alexis device which provides extra protection and also prevents trauma to the gastric mucosa. This technique definitely seems to be promising as it requires no laparoscopic handling of bezoar and so the risk of peritoneal and wound contamination is minimal. The duration of surgery is less and so it is useful in cases of large bezoar.

Conclusion

Laparoscopy or laparoscopy-assisted procedures are safe and feasible options in pediatric and adolescent age-group. In view of the rarity of the problem, laparoscopic skills are hard to acquire which makes it more challenging and less preferred option by many surgeons. Despite its challenges, modifying and individualizing the technique definitely helps in improving the outcome. The technique opted should be minimally invasive with minimal or no contamination. At the same time, the procedure should not get prolonged especially in an unstable and critical patient. The laparoscopic skills, size of the patient, the size of the bezoar, and the condition of the patient are important factors in deciding the technique. A preoperative CT scan and endoscopy can be beneficial in accessing the size and extent of the bezoar.

Clinical Significance

While planning for laparoscopic removal of trichobezoar, one should have a preoperative assessment about the size of the bezoar. The laparoscopic approach or its modifications should be planned taking into consideration, the size of the bezoar and also the condition of the child to tolerate the duration of surgery and anesthesia. Due precautions should be taken to avoid any peritoneal or wound contamination.

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CASE REPORT

Congenital Midgut Malrotation Presenting as Acute Duodenal Obstruction in an Adult—Laparoscopic Management

Rafique U Harvitkar[1], Abhijit Joshi[2]

Abstract

Background: Intestinal malrotation is a congenital anomaly, wherein the midgut fails to rotate completely or partially during the early embryological developmental phase. The rotation is usually counterclockwise at 270° around the axis of the superior mesenteric artery (SMA). Malrotation is most commonly seen in pediatric population with the majority of patients presenting in their early childhood before the first year of life. Acute duodenal obstruction due to midgut malrotation in an adult is a rare manifestation. Therefore, midgut malrotation should be the differential diagnosis in an adult with bowel obstruction.

Case description: We present a case of a 26-year-old male who presented with acute-onset abdominal pain with multiple episodes of bilious vomiting. Contrast-enhanced computed tomography of the abdomen (CECT) revealed intestinal malrotation with all parts of the duodenum (D1–D4) toward the right of the midline. The patient underwent an emergency laparoscopic Ladd's procedure. Postoperative recovery was uneventful.

Conclusion: Adult patients with vague abdominal symptoms should raise a high index of suspicion for malrotation. An early and prompt diagnosis will prevent fatal complications associated with this disease and can be managed laparoscopically by Ladd's procedure.

Keywords: D1 to D4 of the duodenum, Embryologic development, Intestinal malrotation, Ladd's band, Ladd's procedure.

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Introduction

Intestinal malrotation is a congenital anomaly, wherein the midgut fails to rotate completely or incompletely during the early embryological developmental phase. Developmental failure of the ligament of Treitz leads to the presence of duodenojejunal flexure (DJ) along with the small bowel toward the right side of the vertebrae. Intestinal malrotation affects 1 in every 500 neonates, and 65–85% of malrotation cases present within 4 weeks of life.[1,2] However, 90% of cases present within the first year of life.[3]

Intestinal malrotation presenting in an adult is a very rare entity. It accounts for 0.0002% to 0.02% of all cases of intestinal malrotations.[3] Most of these cases are asymptomatic and diagnosed incidentally on radiological imaging or unrelated surgery. Hence, it is difficult to determine the exact counts of patients with malrotation.

However, a few of these patients may present with acute or chronic symptoms. Acute symptoms include nausea, vomiting, abdominal pain, abdominal distension, constipation, or obstipation. Whereas, chronic symptoms include intermittent dull aching or crampy abdominal pain and altered bowel habits (diarrhea/constipation) with general weakness. The surgeon should be vigilant while evaluating an adult patient with acute or chronic symptoms of intestinal obstruction. Undiagnosed cases can lead to fatal complications, such as bowel ischemia or necrosis.

In 1932, Ladd was the first to discover the peritoneal bands responsible for midgut malrotation, hence named Ladd's bands.[4] We herein report a case of acute intestinal (duodenal) obstruction caused by midgut malrotation.

Case Description

A 26-year-old male with no comorbidities was admitted to the emergency ward with acute-onset abdominal pain and multiple episodes of bilious vomiting for 2 days. For 2 years, he had intermittent dull aching epigastric pain, diagnosed as "chronic gastritis."

The patient did not experience fever, altered bowel habits, or melena. He did not give any history of previous surgeries. He was hemodynamically stable.

Physical examination revealed abdominal distension, epigastric tenderness, and an empty rectum. The patient was admitted for further evaluation with a provisional diagnosis of acute exacerbation of chronic gastritis. He was kept nil by mouth and started on intravenous fluids, proton pump inhibitors, antiemetics, and continuous nasogastric tube aspiration. His symptoms started progressively worsening despite 2 days of conservative medical management. Hence, he was investigated further. Routine blood investigations were unremarkable.

Radiological imaging:

- The erect abdominal X-ray revealed a "double-bubble sign."

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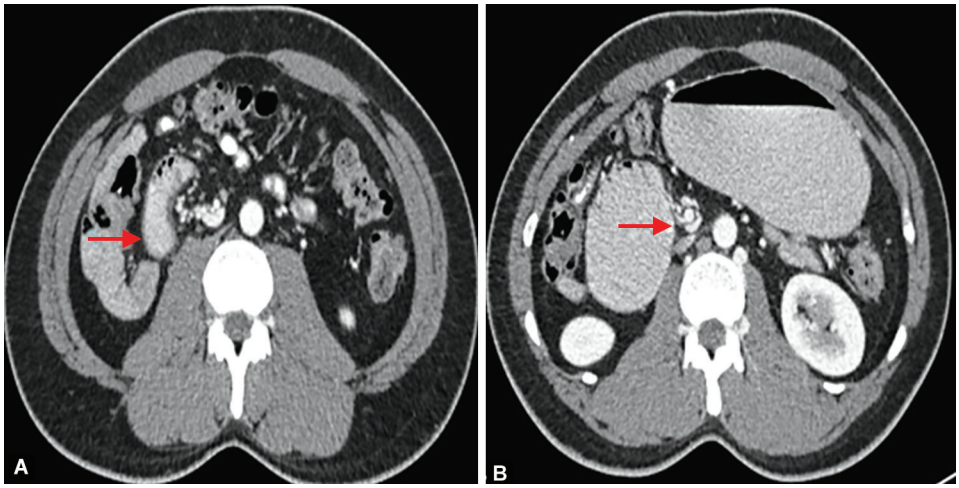
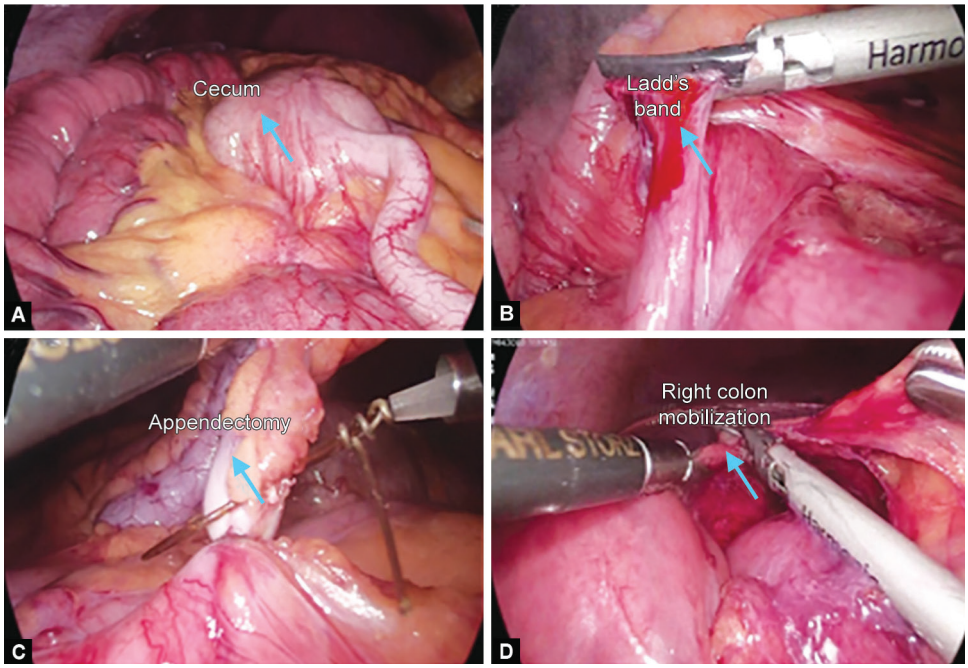


Figs. 1A and B: CT scan of the abdomen: (A) axial view showing the duodenum toward right of the vertebral column (B) "whirlpool sign" of mesenteric vessels



Figs. 2A to D: Laparoscopic view: (A) abnormally located cecum with the appendix toward the left upper abdomen with the small bowel toward the right side, (B) Ladd's band being divided, (C) Appendectomy, (D) Right colon mobilization medially along the hepatic flexure

- Contrast-enhanced computed tomography (CECT) of the abdomen revealed:
  - Gross distension of the stomach and duodenum.
  - The third and fourth parts of the duodenum were not seen, traversing toward the left side of the spine with the DJ seen orienting to the right of the midline (Fig. 1A). The caliber of the small bowel immediately distal to the distended duodenum appears normal.
  - Swirling of the root of the mesentery and superior mesenteric vein (SMV) seen around the super mesenteric artery (SMA) in a counterclockwise fashion, suggestive of "whirlpool sign" (Fig. 1B). Inverse relation of SMA and SMV was suggestive of intestinal malrotation, resulting in midgut volvulus.

Given the above radiological findings, the patient was posted for surgery. At laparoscopy, the small bowel was seen on the right side of the abdomen, whereas the appendix and cecum were seen in the left hypochondriac region. There were multiple bands seen, traversing from the cecum laterally, extrinsically compressing the distal duodenum. The patient underwent laparoscopic Ladd's procedure with the following steps (Figs 2A to 2D):

- Division of Ladd's bands (Fig. 2B)
- Broadening of the small intestinal mesentery
- Appendectomy (Fig. 2C)
- Placement of the small bowel along the right gutter and colon along the left gutter

The patient tolerated the procedure well. Postoperative recovery was uneventful. He was discharged on day 3 of the surgery on a full diet.

Discussion

Intestinal malrotation is a congenital anomaly that results from incomplete or abnormal rotation of the bowel during

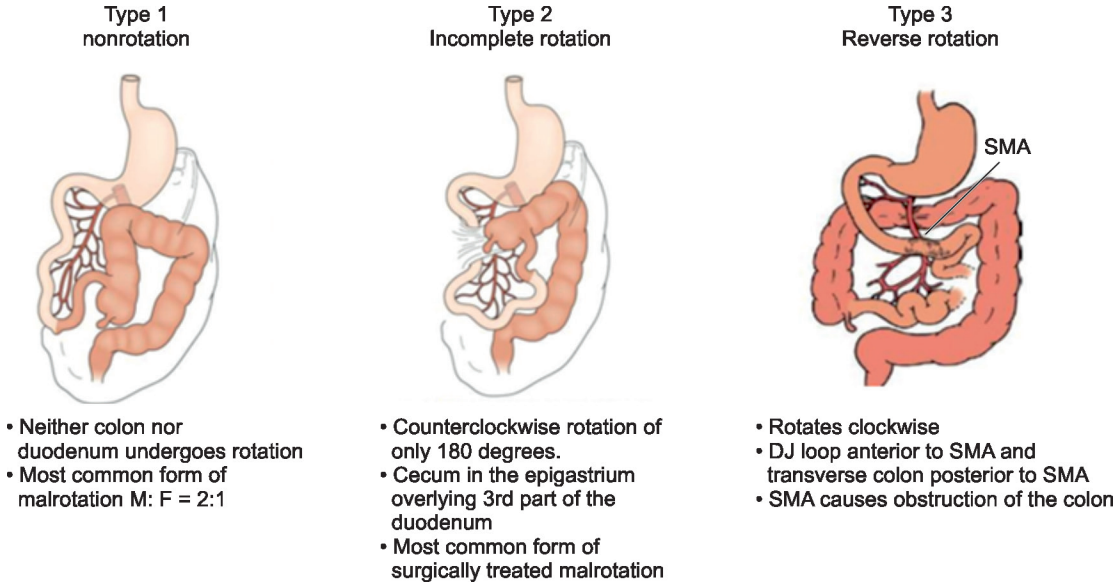


Fig. 3: Stringer classification of malrotation: type 1: nonrotation, type 2: incomplete rotation, and type 3: reverse rotation

embryogenesis. Franklin Mall was the first to describe the development and position of the human intestine in 1897.[5] Stages of normal rotation include herniation, rotation, retraction, and fixation.

During normal embryonic development, the bowel protrudes into the base of the umbilical cord and promptly elongates. As it returns to the abdominal cavity, it undergoes 270° counterclockwise rotation around the axis of the SMA, and as a result, the DJ is commonly located to the left of the first lumbar vertebra (L1), and the terminal ileum in the right iliac fossa. This results in a broad mesentery, running obliquely down from the DJ flexure to the cecum, avoiding rotation around SMA.[6] Any deviation from normal rotation results in malrotation with the shorter root of the mesentery, making it more vulnerable to volvulus.

Stringer classified malrotation based on the embryological state of development into three main types as (Fig. 3): type I (nonrotation) here DJ lies on the right and the colon on the left, type II (duodenal malrotation) with the cecum in the epigastric region overlying the third part of the duodenum, and type III (combined duodenal and cecal malrotation) here DJ loop anterior to SMA and transverse colon posterior to SMA.[7] Our patient had type II malrotation.

Patients with malrotation can present with acute or chronic symptoms or incidental findings on imaging/surgery. Acute manifestations (sudden-onset abdominal pain, bilious vomiting, or obstipation) may suggest midgut volvulus. However, dull aching/crampy abdominal pain, altered bowel habits, and malabsorption are vague chronic symptoms.[8]

CECT scan of the abdomen is the gold standard imaging modality for adult malrotation; however, an upper gastrointestinal contrast study is reserved for the pediatric population. Computed tomography (CT) can demonstrate inversion of SMA and SMV, bowel position and viability, and volvulus (whirlpool sign) (Fig. 1). Other less common modalities include ultrasonography and magnetic resonance imaging of the abdomen.[9]

Patients with malrotation can be treated by Ladd's procedure. The basic principle of the surgery remains the same, irrespective of the technique (open/laparoscopy).

There are six key elements in the operative correction of malrotation via Ladd's procedure (Fig. 2).[10]

1. Entry into the abdominal cavity and evisceration
2. Counterclockwise detorsion of the bowel (acute cases)
3. Division of Ladd's bands
4. Broadening of the small intestine mesentery
5. Incidental appendectomy
6. Placement of the small intestine along the right flank and colon along the left flank of the abdomen

There are controversies regarding the management of incidental intestinal malrotation. The following can be considered a relative contraindication for performing the Ladd's procedure:

- Patient with asymptomatic or incidentally found rotational anomaly
- Complex cardiac disease (i.e., heterotaxy) with asymptomatic malrotation
- Older patients with chronic symptoms without volvulus

However, each of these may still warrant elective Ladd's procedure, with the risk of future volvulus as high as 20%. Magnified vision, faster recovery, less hospital stay, and early mobilization are the main advantages of laparoscopic surgery over open technique. Hence, it was preferred in our case. The patient was mobilized on the same evening and discharged on day three.

Conclusion

An important feature noted in our case is our patient's previous history of dull aching, vague abdominal pain which was misdiagnosed as "chronic gastritis." This suggests that intestinal malrotation and volvulus may be worth considering, with a high index of suspicion in an adult patient presenting with chronic vague symptoms of the abdomen. The early and prompt diagnosis will prevent fatal complications associated with this disease. Malrotation can be managed laparoscopically by Ladd's procedure.

Patient Consent

Written informed consent was obtained from the patient for publication of this case and any accompanying images.

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CLINICAL TECHNIQUE

A Novel Technique Using Mesh to Repair a Recurrent Large Indirect Inguinoscrotal Hernia

Ho L Chong[1], Adnan Taib[2], Andrew N Wilson[3], Muhammad A Khan[4], Alexandrina Braniste[5], Ateeq Jamil[6], Ali Warsi[7]

Abstract

Background: The positioning of a slit mesh around cord structures during laparoscopic transabdominal preperitoneal (TAPP) hernia repair rests the mesh better without kinks, thereby minimizing recurrences. However, studies also suggest that insufficient closure of the mesh slit may lead to recurrences.

Aim: This report describes a novel technique using AbsorbaTacks (Covidien) to close the mesh slit and refashion an artificial 'deep ring' to minimize recurrence.

Technique: We report the case of a fit 82-year-old Caucasian male presenting with a recurrent large right indirect inguinoscrotal hernia (8 x 8 × 7 cm with 4 × 4 cm deep inguinal ring). The patient underwent a TAPP repair with a background of unsuccessful open repair by another surgeon previously. Following mesh deployment, the mesh was lifted up by the cord structures, which was under tension due to a large defect. A slit was made in the inferomedial aspect of the mesh. This allowed it to be wrapped around the cord structures. The overlapped trouser flaps were then stapled together encircling the cord, by AbsorbaTacks to create a secure artificial 'deep ring'. Edges of the mesh were also standardly affixed by AbsorbaTacks to the pectineal ligament and posterior abdominal wall. This creates a secure four-point fixation of the mesh scaffold to prevent 'windsock' effect, which happens when the mesh is pushed into the widened deep inguinal ring, leading to early recurrences. The peritoneal incision was also closed with AbsorbaTacks.

Conclusion: No complications were registered during the early postoperative period. The patient had an uneventful recovery and was discharged within 20 hours with simple analgesia. No recurrence was reported during the 6 months follow-up period.

Clinical significance: The anchoring of a slit mesh with tackers around the cord structures can be used to repair large recurrent inguinal hernias laparoscopically following an open repair. This technique potentially minimizes further recurrences.

Keywords: Case report, Inguinoscrotal hernia, Laparoscopy, Mesh fixation, Mesh migration, Recurrent, Slit mesh, Transabdominal preperitoneal (TAPP).

Abbreviations: TAPP: Transabdominal preperitoneal; TEP: Totally extraperitoneal

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Background

Inguinal hernia repairs are one of the most commonly performed general surgical procedures worldwide.[1] Annually, more than 75,000 hernia repairs with mesh are performed within the National Health Service in England alone.[2] Primary and recurrent inguinal hernia repairs can be carried out openly or laparoscopically. A laparoscopic mesh repair, an evolving technique, is well known for its minimally invasive advantages, such as less postoperative pain, earlier recovery, and shorter hospital stay, as compared to an open repair.[3] Depending on the approach, a laparoscopic transabdominal preperitoneal (TAPP) hernia repair or totally extraperitoneal (TEP) hernia repair can be performed.[4]

Available evidence suggests that a considerable proportion (15%) of all inguinal herniorrhaphies are performed due to recurrences,[5] which may be due to structural weakness of the abdominal wall and distorted anatomy.[6] The European Hernia Society guidelines have recommended that a posterior preperitoneal approach should be the procedure of choice for the management of all recurrent inguinal hernias after previous open repair unless otherwise indicated.[7]

However, there is controversy arising around the optimal technique for mesh placement within the preperitoneal space during a TAPP repair.[8] Some surgeons presume that the positioning of a slit mesh around the cord structures rests the mesh better without kinks, thereby minimizing recurrences. However, studies also suggest that insufficient closure of the mesh slit may lead to further recurrences.[12] This report describes a novel technique using AbsorbaTacks (Covidien) to close the mesh slit and refashion a deep artificial ring in a large recurrent inguinoscrotal hernia to achieve a successful repair.

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Source of support: Nil

Conflict of interest: None

Technique

We report the case of a fit 82-year-old Caucasian male, presenting with a recurrent large right indirect inguinoscrotal hernia (8 × 8 × 7 cm with 4 × 4 cm deep ring). This patient underwent a

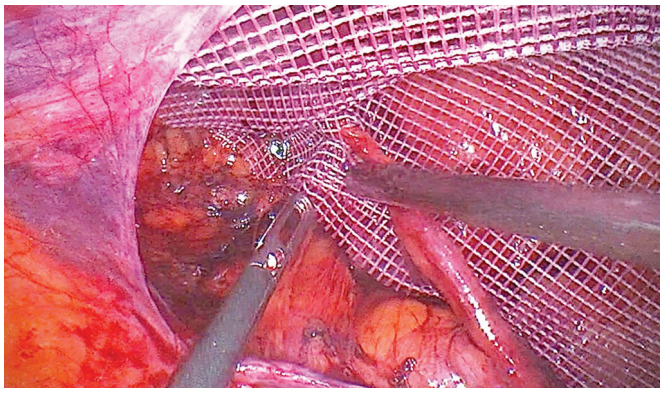

Fig. 1: Laparoscopic view of the large right indirect inguinoscrotal hernia

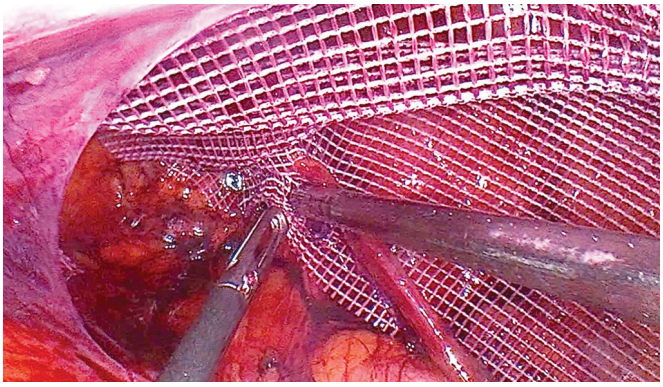

Fig. 2: Laparoscopic view of the trouser flaps anchored and overlapped by AbsorbaTacks

TAPP repair (Fig. 1). He had previously undergone an open surgical repair performed by another surgeon.

Under general anaesthesia, the ports and a pneumoperitoneum were established. Using the standard Hasson technique, a 10-mm supraumbilical camera port and two 5-mm bilateral operating ports 4 cm equidistant to the umbilicus were inserted under direct vision. The patient was placed in a Trendelenburg position (30° head down).

After inspection of the inguinal region, the peritoneum was transversely opened 2 cm above the upper border of the direct inguinal ring. Dissection of the preperitoneal space was carried out to identify and expose the key anatomical landmarks in the retro-inguinal space. Subsequently, the indirect hernia sac was carefully dissected from the spermatic cord and was reduced.

A polyester mesh of size 10 × 15 cm (Prietex 2D heavyweight) was fashioned to the appropriate size and deployed into the preperitoneal space. An effort was made to ensure that the mesh was positioned flatly over the cord structures without any kinks. However, the inferomedial aspect of the mesh seemed to be lifted up due to the tight cord structures, which were stretched over a large direct inguinal ring.

As the femoral vessels lie at very close proximity to the inferomedial corner of mesh there were no natural structures to fix the mesh onto safely. Therefore, a slit was made to the inferomedial aspect of the mesh directly over and posterior to the cord. To encircle the cord within the slit, the two legs of the trouser flaps were carefully anchored together anterior to the cord using two AbsorbaTacks. This created an artificial deep ring to hold the mesh firmly around the cord structures (Fig. 2).

AbsorbaTacks were used to fix the inferomedial edge of the mesh to pectineal ligament and onto the posterior abdominal wall (superomedially, and also laterally). Two additional tackers were also used to secure the mesh firmly along the superior border. Together with the inferior medial AbsorbaTacks forming an artificial deep ring, the mesh scaffold was held more securely by a '4-point fixation' instead of the standard '3-point fixation' (Fig. 3).

The peritoneal incision was closed with AbsorbaTacks. Trocars were removed under direct vision. The 10 mm supraumbilical port was closed with size 1-J Vicryl and the skin was closed with staples. 20 mL of 0.25% Marcaine was infiltrated to the ports for analgesia and 10 mL was infiltrated for a right ilioinguinal nerve block.

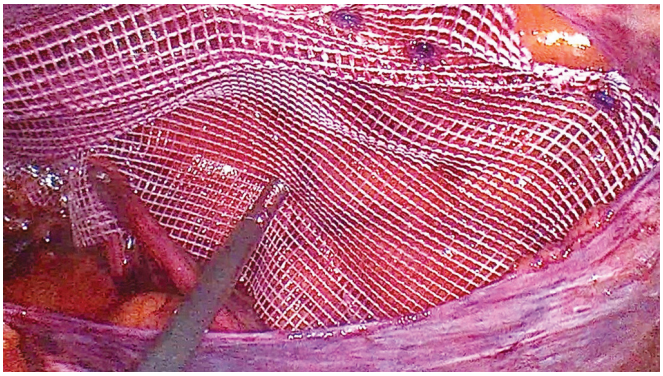

Fig. 3: Laparoscopic view of mesh fixation

Results

The patient had an uneventful recovery and was discharged within 20 hours of the operation with simple analgesia. No recurrence at 6 months nor any complaint of chronic pain were reported.

Discussion

A tension-free repair of large recurrent inguinal hernias is often technically challenging due to intrinsically weakened muscles of the abdominal wall, scar tissue formation, as well as distorted anatomy.[6] In a randomized trial of 1983 patients, Neumayer et al. concluded that the recurrence rate of a laparoscopic repair was up to 10.1%.[9] With mesh techniques, it is established that mesh cannot match the properties of natural tissue, which often leads to displacement. Apart from mesh displacement, Fitzgibbons et al. stated that potential mechanisms of recurrences also include folding or invagination of mesh and migration of mesh,[10] which is akin to a 'windsock effect'.

In normal anatomy, the deep inguinal ring transmits the spermatic cord in the male and the round ligament of the uterus in the female into the inguinal canal. Due to the inconsistency of tension within the weakened abdominal wall, cord structures may exert mechanical stress along the inferior edge of the mesh, which will alter mesh position over time.[3] By introducing a slit, this allows the mesh to 'sit' better without folding as the slit creates a space which allows cord structures to pass through.

Usually, mesh fixation at the inferior aspect is precluded due to the femoral vessels in the 'triangle of doom' medially and the 'triangle of pain' laterally.[13] Thus, stapling the trouser flaps to encircle the cord structures help to securely fasten the mesh inferiorly. This helps to prevent folding of mesh within the preperitoneal space

and to avoid superior leverage of mesh by the cord structures, thus reducing the risk of recurrence.

Currently, evidence for a reduction in recurrence by the slit mesh placement technique is inconclusive.[8] There are only three studies comparing the outcomes of slit vs non-slit mesh during a laparoscopic TAPP repair.[11,12,14] Although these studies failed to prove an advantageous difference with slit mesh in terms of recurrence rate, none of them are well designed randomised controlled trials.

Leibl et al. suggested that some recurrences are associated with insufficient closure of the mesh slit.[12] This may be due to two reasons. First, it has been well documented that mesh shrinkage is a major issue in laparoscopic hernia repair.[15] It is generally recognized that intraperitoneally placed mesh will shrink up to 40% and lose its flexibility considerably, after five years.[16] Second, gas insufflation of the abdominal cavity is a crucial element in laparoscopic surgery which significantly expands the abdominal surface volume. The effects of abdominal deflation after surgery and the anticipated mesh shrinkage over time may therefore result in dislodgment of the cord structure from the slit. Therefore, by anchoring the two trouser flaps of the mesh slit together around the cord structures, a secure fixation point is created. This fixation point anchors the mesh in a consistent location, which helps to ensure coverage of the myopectineal orifice despite the effects of mesh shrinkage.[17] Moreover, this also refashions a deep artificial ring to prevent re-entry of intra-abdominal content through the defective deep inguinal ring. Regarding concerns of circumferential scaring causing postoperative pain, there is no evidence of spermatic cord injury caused by slit mesh reported.[18]

Finally, fixation of mesh edges onto the abdominal wall distributes tension across the mesh surface, hence smoothing out the folds. The secured positioning prevents 'windsock' effect, where the mesh becomes distally displaced as it may travel along the cord if it were only fixed onto it.

Conclusion

We conclude that the creation of a new deep ring around the cord structures using a slit mesh and tacks is a novel and successful technique that could be used to repair large recurrent inguinal hernias laparoscopically to minimize further recurrence.

Declarations

Ethics approval and consent to participate: This research does not require Ethics Committee approval. All the procedures have been performed in accordance with the Helsinki Declaration of 1964 and later versions.

Consent for publication: Written informed consent was obtained from the patient regarding the publication of this paper and the associated images.

Availability of data and material: Not applicable.

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