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EDITORIAL

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The landscape of laparoscopic surgery is continually evolving, as evidenced by recent studies and case reports in various specialized fields. These advancements are not just technical but also expand our understanding of surgical diseases and their management.

A retrospective study led by Banabihari Mishra et al., focusing on the effectiveness of diagnostic laparoscopy in staging gastrointestinal and hepatobiliary malignancies, underlines the crucial role of minimally invasive techniques in cancer diagnosis and staging. The study's insights from a tertiary care center contribute significantly to the field, offering a blend of precision and less invasiveness.

Similarly, the work of Juan Carlos Martín-del Olmo and colleagues on transabdominal preperitoneal hernioplasty presents valuable data on surgical outcomes. With 288 consecutive cases, this study provides a robust foundation for understanding the efficacy and safety of this procedure, paving the way for improved patient care.

The review of laparoscopic gynecological procedures in Ethiopia by Eyasu Mesfin Kassa and Eskinder Kebede Weldetensaye is particularly noteworthy. It highlights the expanding reach of laparoscopic surgery in different geographical regions, addressing unique challenges and opportunities in the Ethiopian healthcare context.

Case report, such as the rare occurrence of extraskeletal primary osteosarcoma of the gallbladder reported by Majid Mushtaque and Samina Ali Khanday, provides invaluable insights into uncommon conditions, emphasizing the need for continuous learning and vigilance in surgery.

Each of these studies and reports, from the evaluation of laparoscopic cholecystectomy outcomes to the intriguing case of Rapunzel syndrome, contributes to a broader understanding of minimally invasive surgery. They highlight the importance of ongoing research, innovation, and sharing of knowledge in the surgical community.

As we look to the future, these studies and reports not only reflect the current state of laparoscopic surgery but also pave the way for new techniques, better patient outcomes, and a deeper understanding of the complexities of surgical diseases. The commitment of surgeons and researchers to advancing this field is commendable and essential for the continuous improvement of health care worldwide.

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ABSTRACT

Change of Trend from Open to Laparoscopic Gastrectomy for Locally Advanced Carcinoma Stomach: A Retrospective Single Institution Experience

Subbiah Shanmugam[1], Sathiyaseelan Balakrishnan[2]

Abstract

Introduction: Laparoscopic gastrectomy is gaining popularity over open gastrectomy for carcinoma stomach because of better early postoperative outcomes. In most of the studies, it is now evident that laparoscopic gastrectomy has a similar oncological outcome as that of open gastrectomy.

Materials and methods: In this study, we compared the outcomes of laparoscopic and open gastrectomy with D2 lymphadenectomy for locally advanced carcinoma stomach that were done in our institution from January 2015 to December 2019. We analyzed the intraoperative events, complication rate, duration of hospital stay, margin status, nodal yield, and the disease-free interval between the two groups.

Results: In the study period, 43 patients underwent gastrectomy for carcinoma stomach and 28 patients were on regular follow-up. Out of the 28 patients, 13 patients underwent open gastrectomy and 15 patients underwent laparoscopic gastrectomy. The disease-free interval for open gastrectomy was 13.3 months and for laparoscopic gastrectomy, it was 12.9 months. The average hospital stay was 18 days for open gastrectomy, and it was 11 days for laparoscopic gastrectomy with comparable postoperative complication rate, nodal yield, and margin status in histopathological examination.

Conclusion: The long-term oncological outcomes of laparoscopic gastrectomy with D2 lymphadenectomy were comparable with the conventional open surgery for patients with locally advanced gastric cancer with a reduced hospital stay and complication rate.

Keywords: Blood loss, Carcinoma, Early recovery, Gastrectomy, Laparoscopic, Open gastrectomy, Stomach.

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Introduction

Stomach cancer ranks third globally in terms of cancer-related deaths and is the fifth most frequent cancer worldwide. In India, stomach cancer ranks sixth in terms of frequency of cancer and sixth in terms of mortality from cancer.[1–3] Universally open surgery was considered as standard of care in cancer stomach. Nonetheless, laparoscopic gastrectomy is becoming more and more popular around the globe. When compared with open gastrectomy, recent studies have shown that laparoscopic gastrectomy results in a shorter stay in hospital, identical or less postoperative complications, with no significant differences in proximal and distal margins and almost harvesting equal number of nodes.[4–6]

Laparoscopic gastrectomy has an absolute benefit of a magnification, which makes it easier to see the operative field in closer manner. This facilitates surgeons to do a meticulous lymph nodal dissection which has significant prognostic value.[7] However, some authors are opposing laparoscopic gastrectomy, arguing that the techniques used during the procedure and the effects of pneumoperitoneum may raise the possibility of cancer cells spreading to adjacent organs, especially in the case of tumors with serosal breech (T4a) and nodal metastases. This could increase the local recurrence rate.[8] In locally advanced stomach cancer cases, laparoscopy is just as effective as open gastrectomy in terms of intraoperative and postoperative complications and oncological results, according to the KLASS 02 and LOGICA trials.[9,10]

Materials and Methods

In this study, we compared laparoscopic gastrectomy with open gastrectomy that were done for locally advanced carcinoma stomach in our center of oncology during the period from January 2015 to December 2019. Medical records of all these patients treated during that period were collected from the medical records department and details regarding intraoperative events, complication rate, duration of hospital stay, margin status, nodal yield and disease-free interval between the two groups were analyzed.

Patients with locally advanced carcinoma stomach who were admitted and operated on in our department during that period from 18 years of age to 70 years of age were included as study participants. Patients with metastatic disease and medically unfit for surgery were not included in the study.

For all these patients, we did either distal/subtotal/total gastrectomy with D2 lymphadenectomy. Patients who presented with gastric outlet obstruction and uncontrolled Malena were treated with upfront surgery followed by chemotherapy. Rest of

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the patients underwent perioperative chemotherapy followed by surgery.

Patients underwent open gastrectomy with midline laparotomy incision and laparoscopic surgery using a 12 mm camera port, 10 mm and 5 mm working ports, and two 5 mm retraction ports, and an incision of about 5 cm was used for specimen extraction and anastomosis.

Patients planned for perioperative chemotherapy were treated with FLOT regimen. Fluorouracil 2600 mg/m^2 IV continuous infusion over 24 hours on day 1, Leucovorin 200 mg/m^2 IV on day 1, Oxaliplatin 85 mg/m^2 IV on day 1, Docetaxel 50 mg/m^2 IV on day 1 for every 14 days. Four cycles of preoperative chemotherapy and four cycles of postoperative chemotherapy were given.

All patients were kept under regular follow-up with monthly physical examination and contract enhanced computer tomography of abdomen and pelvis six monthly for the first two years and annually thereafter. If the patient developed signs and symptoms of recurrence, those patients were subjected to imaging and esophago-gastroduodenal scopy.

Results

During the period of study, 43 patients underwent gastrectomy for locally advanced carcinoma stomach. Out of the 43 patients, 22 patients underwent open gastrectomy and 21 patients underwent laparoscopic gastrectomy. Among these patients 30 patients were males and 13 patients were females. Upfront surgery was done on 9 patients, and the remaining 34 patients underwent perioperative chemotherapy and surgery.

Out of the 43 patients, 28 patients were on regular follow-up. Among these patients, 13 underwent open gastrectomy and 15 patients underwent laparoscopic gastrectomy. Three patients underwent upfront surgery and 25 patients were subjected to perioperative chemotherapy and surgery.

- Intraoperative blood loss (Average)
- Open gastrectomy – 230 mL
- Laparoscopic gastrectomy – 133 mL
- *p*-value – 0.001

The mean blood loss during intraoperatively in open gastrectomy was 230 mL whereas in laparoscopic gastrectomy, it was 133 mL. Laparoscopic gastrectomy showed a gross reduction in intraoperative blood loss compared with open gastrectomy which is statistically significant (Fig. 1).

Postoperative Complications

Among patients who underwent open gastrectomy, 25.9% of the patients had postoperative complications and paralytic ileus was the most common complication followed by pulmonary complications, whereas among patients who underwent laparoscopic gastrectomy 13.9% of patients had postoperative complications. Paralytic ileus was the most common complication encountered in laparoscopic arm also.

Even though laparoscopic gastrectomy patients had less postoperative complication compared with open gastrectomy patients, these difference does not reflect in statistical significance (Table 1).

- Mean days of hospital stay (Fig. 2)
- Open gastrectomy – 18 days
- Laparoscopic gastrectomy – 11 days
- *p*-value – 0.0001

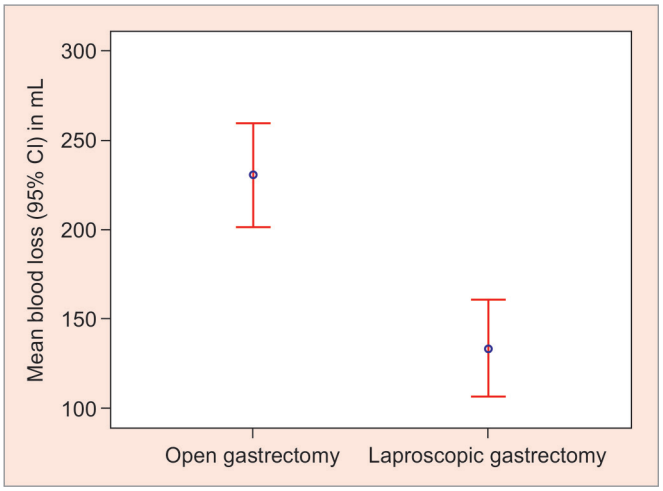

Fig. 1: Comparison of blood loss

Table 1: Comparison of complications

Complications	*Open surgery*	*Laparoscopic surgery*	*p-value*
Pulmonary complications	4	2	0.262
Surgical site infections	3	1	0.778
Anastomotic leak	2	2	0.877
Paralytic ileus	7	3	0.062

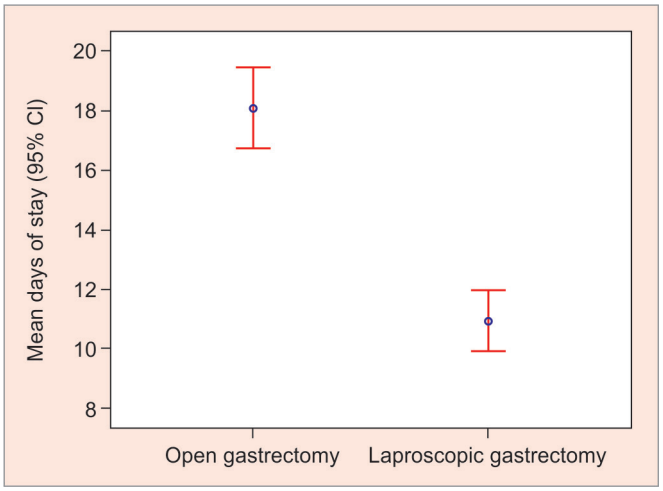

Fig. 2: Comparison of days of hospital stay

Patients who underwent open gastrectomy had a much longer hospital stay. The difference in duration of hospital stay between laparoscopic and open surgery was 7 days. Even though all of the laparoscopic gastrectomy patients were fit for discharge on postoperative day 7, due to logistic reason we had to discharge them after postoperative day 10.

Margin Status

Open

- Total gastrectomy: proximal – 1.9 cm, distal – 6.6 cm
- Distal gastrectomy: proximal – 3.9 cm, distal – 2.1 cm

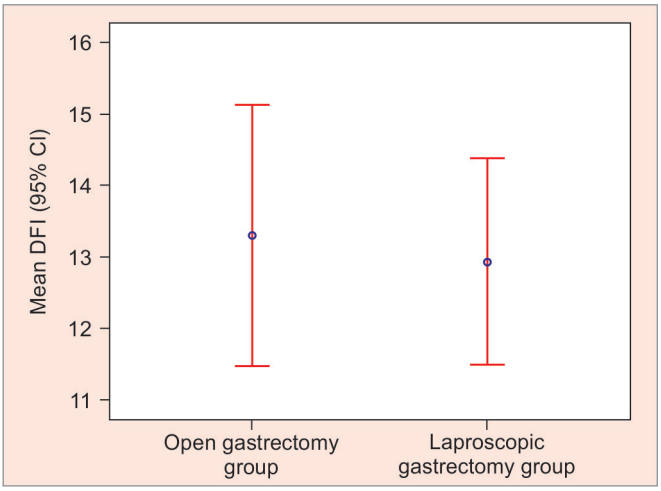

Fig 3: Comparison of disease-free interval

Laparoscopic

- Total gastrectomy: proximal – 2.0 cm, distal – 6.4 cm
- Distal gastrectomy: proximal – 3.6 cm, distal – 1.9 cm

Positive margins

- Open gastrectomy – 1
- Laparoscopic gastrectomy – 1
- *p*-value – 0.916

Nodal Yield Status

- Open gastrectomy 18.4 nodes
- Laparoscopic gastrectomy 17.8 nodes
- *p*-value – 0.125

The final histopathological examination revealed not much of difference regarding margins assessment and nodes harvested in open and laparoscopic gastrectomy patients. The average nodal harvest in open gastrectomy was 18.4 and in laparoscopic gastrectomy, it was 17.8. Among these patients, we had two patients with positive margins, both patients underwent total gastrectomy with D2 lymphadenectomy and both of them had positive proximal margin.

- Disease-free interval (28 patients)
- Open gastrectomy – 13.3 months
- Laparoscopic gastrectomy – 12.9 months
- *p*-value – 0.727

Among the 28 patients who were on regular follow-up, it was found that the disease-free survival for open and laparoscopic gastrectomy were 13.3 months and 12.9 months, respectively which was not statistically significant.

There was no death recorded during the first 30 days of surgery in both open and laparoscopic gastrectomy (Fig. 3).

Discussion

The prognosis of the gastrectomy patient depends on key factors like surgical margins, nodes harvested and complications encountered by the patient during surgery and in the postoperative period.[11] As per recent AJCC staging, locally advanced carcinoma stomach is defined as patients with stage Ib to IIIc excluding T4b and T1. On comparison with early stage disease, surgery in locally advanced gastric cancer is technically more difficult due to the absolute necessity of D2 lymphadenectomy.[12,13] It is unclear if laparoscopic techniques can accomplish a sufficient D2 lymph node dissection.[14]

In the present study, there was a significant reduction in intraoperative bleeding in laparoscopic gastrectomy patients when compared with open gastrectomy. In laparoscopic gastrectomy, due to its magnification capacity, we can clearly identify the blood vessels and thereby we can minimize the loss of blood during the surgery. From most of the recent studies around the world, It is now clear that having a laparoscopic surgery results in a much shorter stay in hospital and much less blood loss during the procedure.[10,11]

In the present study, we encountered complications, such as atelectasis, surgical site infections, anastomotic leak, and paralytic ileus. Pulmonary complications were treated with aggressive chest physiotherapy, nebulization, bronchodilators, and supportive parenteral antibiotics. Surgical site infections were treated with local wound care IV antibiotics according to pus culture and sensitivity. We also had paralytic ileus in some of our patients from both arms lasting for 4–8 days which may hamper the recovery and early discharge, those patients were managed by prokinetics, active mobilization, and masterly inactivity. There is no significant statistical difference in terms of postoperative complication rate in our study. While the JCOG0912 trial found similar rates of postoperative problems following laparoscopic and open gastrectomy, the KLASS-01 trial documented a decrease in postsurgery, complication rate, and duration of hospital stay following laparoscopic gastrectomy.[7,15]

We had two patients with microscopic positive margins in the final histopathological report, both were total gastrectomy patients, one from open gastrectomy arm and another from laparoscopic gastrectomy patients. Nodal yield in both open and laparoscopic surgeries in both distal and total gastrectomy was comparable and an adequate number of nodes were harvested for staging purposes.

Disease-free survival (DFS) is commonly defined as the time between a curative treatment and cancer recurrence, a second cancer, or death from any cause. Disease-free survival is a strong predictor of overall survival (OS). The significant association between DFS and OS can be explained in part to the short time between relapse and death in gastric cancer.[16] Various factors, such as lymph nodal metastasis, histological variant, such as signet cell type, undifferentiated histology, and palpable abdominal mass influence the recurrence rate and thereby the DFS. An immutable element could be poor tumor biology. On the other hand, higher rates of DFS are achieved by extensive resection, safe aggressive surgery (including multi-organ resections), microscopic negative margin resection, and sufficient lymph nodal dissection.[17] In patients with stomach cancer without warning symptoms, Maconi et al. observed that a 6-month delay in diagnosis had no effect on survival but appeared to be associated with a better prognosis, likely because the disease was in an earlier stage.[18]

In the present study, the disease-free interval in open gastrectomy was 13.3 months, ranging between 8 and 19 months, whereas in laparoscopic gastrectomy, it was 12.9 months with a range from 8 months to 17 months. For patients with locally advanced carcinoma stomach, the KLASS-02-RCT demonstrated that the relapse-free survival rate following laparoscopic distal

gastrectomy with D2 lymph nodal dissection is comparable to that of open distal gastrectomy.[9]

We ambulated all our patients on postoperative day 1 and the urinary catheter was removed on the same day. We continued epidural/parenteral analgesics for 2 days. We started a proper oral diet from day 5, starting from sips of clear fluids to soft solid diet. We started chest physiotherapy for all of our patients on postoperative day 1 along with spirometry exercises. Early ambulation of patients prevents postoperative pneumonia resulting from atelectasis.

It is possible to walk around early with a small abdominal incision rather than the larger laparotomy incision since it causes significantly less amount of pain. According to Schweickert et al.'s findings, early ambulation may help avoid delirium in postoperative period.[19] Reducing pain following surgery could potentially help patients in preventing delirium in postoperative period, as it is one of the causes of the condition,[14,20] in turn helps in early recovery and discharge of patients. This results in reduced hospital stay in laparoscopic gastrectomy patients which is statistically significant in comparison with open surgery.

Conclusion

In our institution, the long-term oncological outcomes of laparoscopic gastrectomy with D2 lymph nodal dissection were comparable to the conventional open gastrectomy for patients with locally advanced gastric cancer. A significant reduction in the duration of hospital stay and slightly lesser postoperative complication rate shows that laparoscopic gastrectomy will completely replace open gastrectomy in near future.

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ORIGINAL ARTICLE

Evaluation of Effectiveness of Diagnostic Laparoscopy in Staging of Gastrointestinal and Hepatobiliary Malignancies: A Retrospective Study from a Tertiary Care Center

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Abstract

Objective: To evaluate the role of diagnostic laparoscopy for staging in gastrointestinal (GI) and hepatobiliary malignancies and to avoid unnecessary laparotomies.

Materials and methods: We conducted a retrospective review of the medical records of all patients admitted to the Department of General Surgery, SCB Medical College and Hospital, Cuttack, Odisha, India from 2011 to 2021. The patients having abdominal malignancy were admitted to Surgery Department and following procedures undertaken that is history taking, clinical examination, routine examination, and special investigations. After initial assessment, they were subjected to laparoscopy.

Results: The study group had 30 cases (13 males and 17 females): 15 cases of stomach tumors; 13 cases of colorectal and 2 cases of biliary tract tumors. Laparoscopy could accomplish proper staging in 29 cases (96.7%) that is the sensitivity of staging laparoscopy is 0.97 and the specificity of the test is 1. Unnecessary and futile laparotomies were avoided in 13 patients (43.3%). Only 1 patient (3.3%) had to be subjected to laparotomy following staging laparoscopy and was found to be unresectable. Staging laparoscopy means duration in the resectable group was found to be 17.35 minutes which was lower than the mean duration in the unresectable group which is 20.76 minutes. There were no complications in 25 (83.7%) and only 5 (16.7%) had complications, in which 3 (10%) had operative wound sepsis, 2 (6.7%) had major respiratory complication. Staging laparoscopy was associated with decreased morbidity and pain, faster recovery and quicker initiation of adjuvant therapies.

Conclusion and interpretation: Staging laparoscopy has a very significant role in abdominal malignancies. It is very accurate in assessing peritoneal seedlings, and hepatic metastasis which are not found in imaging modalities. It is found to be more useful in staging gastric and extra-hepatic biliary tumors compared to colorectal cancers. It gives additional information regarding the extent of the disease intra-abdominally which changes the course of management in a significant number of patients. It has added benefit of performing biopsy from sites of dissemination and having histological confirmation. It spares malignancy patients from unnecessary laparotomies thereby decreasing hospital stay and cost expenditure when compared to open exploration.

Keywords: Appendectomy, Calot's triangle, Diagnostic laparoscopy.

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Introduction

One of the most prevalent cancers in humans is abdominal cancer. The purpose of this study is to determine if a laparoscopic approach is more accurate in patient management than open exploration. Many individuals with abdominal cancer are discovered to be unable to undergo resection during the investigation process. In this group of individuals, laparoscopy has been proposed as a sensitive approach for identifying metastatic illness. Minimal access surgery has been recommended in Oncologic practice with insignificant data demonstrating its efficacy. Diagnostic laparoscopy is more successful in establishing a diagnosis, can be therapeutic, and has less morbidity and mortality than a traditional laparotomy. The results of a diagnostic laparoscopy may alter the course of treatment. Laparoscopy is a surgical technique as much as an exploratory laparotomy, and it can be just as enlightening to the skilled eye. The exploratory laparoscopic incision allows the surgeon a better view of the whole peritoneal cavity than the typical exploratory incision does. Producing a high rate of positive diagnosis with laparoscopy requires a good foundation in surgery, great clinical acumen, knowledge and awareness of abdominal pathology, and other related factors.[1,2–5] The rebirth of interest in laparoscopy has made it possible for considerable breakthroughs to be achieved in the identification and staging of cancer, which is one of the most important and significant developments. The diagnosis of tumors that are found within the abdomen is increasingly being done using laparoscopy. In many cases of abdominal cancer, laparoscopy can avoid unneeded examination. This innovative approach may identify general metastases or secondary nodules in the liver, peritoneum, or adenopathy, eliminating the need

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for additional surgeries and saving the patient a very lengthy convalescence.[6,7]

The study's goals were to determine the significance of diagnostic laparoscopy in staging abdominal cancer and to evaluate the feasibility of avoiding needless laparotomies.

Materials and Methods

We conducted a retrospective review of the medical records of all patients admitted to the Department of General Surgery, SCB Medical college and Hospital, Odisha, India from 2011 to 2021.

Patients with abdominal malignancy were admitted to the Surgery Department, where the following procedures were performed: history taking, clinical examination, routine examination, and specific investigations. Following the preliminary they were treated to Laparoscopy for evaluation.

Inclusion Criteria

- Patients of both sexes
- Age > 18 years
- Histologically verified, clinically and radiologically suspected cancers necessitating surgery (laparotomy)

Exclusion Criteria

- Non-resectability on computed tomography (CT) scan
- Patient has uterine, ovarian, or cervix carcinoma
- Patient is unsuitable for general anesthesia

A thorough history of the patients was collected.

Reviewing the patient's medical records allowed us to learn such things as the person's age, gender, employment status, admission and release dates, surgery and clinical investigation dates. The patient had diagnostic laparoscopy, and the results were documented. Staging laparoscopy patients received further treatment based on the findings of the operation. Patients were tracked for the presence of any known problems, hospitalization, or costs related to hospitalization.

A complete examination was performed on every patient with a history of abdominal cancer, and the results were documented. Patients with a history of abdominal cancer had a full battery of diagnostic tests, including a local and systemic evaluation. Inspection, palpation, percussion, and auscultation were all performed on each person. Patients who were suspected of having abdominal cancer underwent a battery of diagnostic tests, including chest X-rays, erect abdominal X-rays, ultrasounds of the abdomen and pelvis, CT scans, and, if necessary, upper and lower gastrointestinal endoscopies, in addition to hematological analysis.

Laparoscopy: Following a thorough workup and investigations, a clinical diagnosis was established, radiological assistance was sought when possible, and patients were evaluated for diagnostic laparoscopy.

All patients were advised of the operation's risks and advantages, as well as the possibility of a laparotomy if necessary and the ultimate surgery if necessary. A 10 mm telescope was placed into the supra/sub umbilical port after creating a pneumoperitoneum with a verses needle or by introducing a blind trocar. In order to manipulate or biopsy intraabdominal illnesses, a second 5 mm port was placed in the upper or lower abdomen. The patient had a full abdominal examination, with biopsies taken as necessary. After that, laparoscopic therapeutic therapy was undertaken whenever feasible, along with thorough staging. When no more action was required, no further steps were taken. From the moment the first trocar is inserted until the completion of the staging phase is the operational time. From the day of surgery to the day of discharge or death, it was the recovery time. Wound sepsis (infection at the surgical site), respiratory distress, and other forms of morbidity were measured both during and after surgery. Death rates were also documented.

Table 1: Age and sex distribution

Age in years	*Male*	*Female*	*Total*	*Percentage (%)*
21–30	1	2	3	10
31–40	1	2	3	10
41–50	2	5	7	23.3
51–60	5	1	6	20
61–70	4	7	11	36.7
Total	13	17	30	100

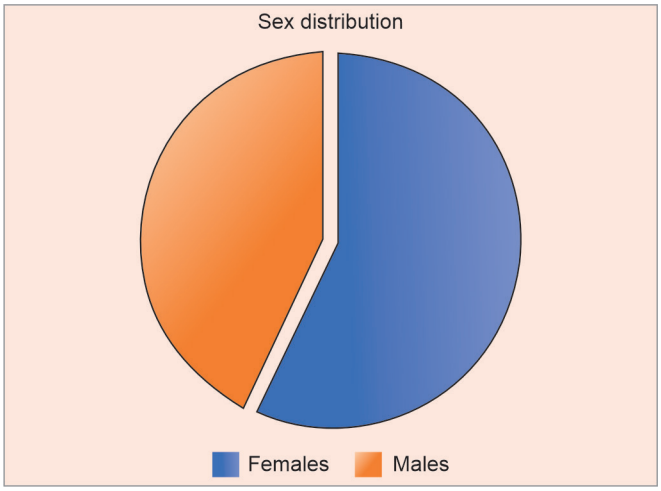

Fig. 1: Illustration of sex distribution

Results

The study group included 30 patients (13 men (43%) and 17 females (57%) (Table 1 and Fig. 1) shows 15 instances of stomach tumors (50%), 13 cases of colorectal tumors (43.3%), and 2 cases of biliary tract tumors (6.7%) (Fig. 2).

Laparoscopy could achieve correct staging in 29 patients (96.7%), implying that the sensitivity of staging laparoscopy is 0.97 and the specificity of the test is 1. In 13 patients (43.3%), unnecessary and futile laparotomies were averted. Only one patient (3.3%) required laparotomy when staging laparoscopy revealed that the tumor was unresectable. The mean time of staging laparoscopy in the resectable group was 17.35 minutes, which was less than the mean duration in the unresectable group of 20.76 minutes. Only 5 (16.7%) experienced problems, of which 3(10%) had operational wound sepsis and 2 (6.7%) had significant complications (major respiratory complication) (Fig. 3).

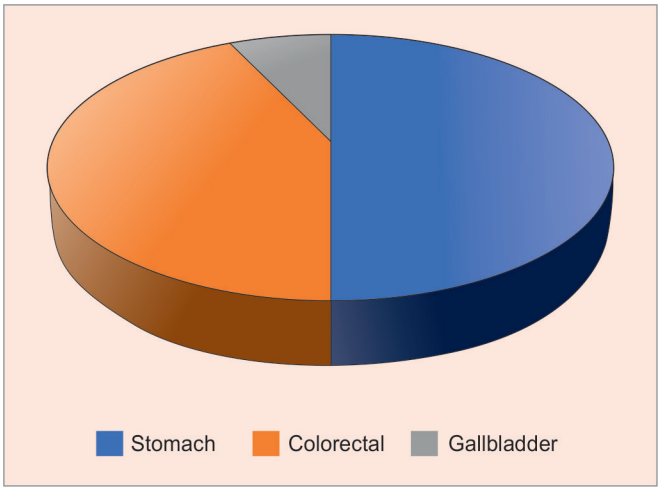

Fig. 2: Illustration of tumor site

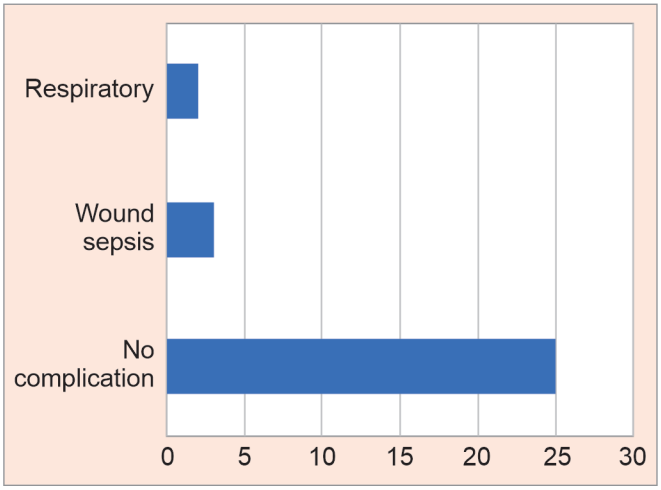

Fig. 3: Distribution based on number of complications

Laparoscopy staging was related with lower morbidity and discomfort, faster recovery, and earlier beginning of adjuvant treatments.

Discussion

Over the last decade, laparoscopy has surpassed open laparotomy as the preferred technique in patients requiring surgical diagnosis and treatment.

Cancer Staging

For those in need of if a tissue diagnosis is needed to direct treatment but cannot be obtained by image-guided needle biopsy or endoscopic techniques, laparoscopy is used as a biopsy method. Using laparoscopy, a surgeon may diagnose patients with obscure abdominal complaints, track their health over time, and identify them.[8,9] Laparoscopy for staging has become an essential method for determining whether or not a patient with a gastrointestinal malignancy is a candidate for a potentially curative resection.[10–16] The magnified view provided by a laparoscope allows the surgeon to detect metastases in the liver or peritoneum that would otherwise be undetectable with noninvasive imaging methods. Laparoscopic ultrasonography has the potential to imaging hidden liver metastases or the invasiveness of a local tumor, both of which would prohibit a curative resection. It has been projected that 20% of patients having staging laparoscopy for mixed upper gastrointestinal cancers would have occult metastases that were not detected on preoperative imaging.[10,17] Laparoscopy improved preoperative staging accuracy in a single cohort of 389 patients. In 41% of patients, including several who initially had benign lesions identified on preoperative imaging.[10] Hepatocellular carcinoma, gallbladder carcinoma, extrahepatic bile duct cancer, and certain periampullary cancers can all benefit from laparoscopic staging, as can lymphoma, esophageal cancer, gastric cancer, pancreatic adenocarcinoma, and other cancers of the digestive tract.[10,18–22] Most concealed metastases may be found with a simple laparoscopy and biopsy, but adding laparoscopic ultrasonography to the staging process might help find disease elsewhere, especially vascular invasion, which would also exclude removal. Diagnostic laparoscopy and laparoscopic ultrasonography imaging, a combination of diagnostic laparoscopy and laparoscopic ultrasonography, provides more precise staging and resectability information than preoperative imaging investigations for patients with primary or metastatic intraabdominal neoplasms, according to some authors.[23] Patients benefit in two ways with staging laparoscopy (SL)—it helps determine who needs neoadjuvant therapy for locally advanced disease and spares patients from exploratory laparotomies. Siewert makes an unambiguous claim. In particular, peritoneal carcinomatosis benefits from the improved preoperative staging made possible by surgical laparoscopy. Neoadjuvant chemotherapy is an example of a treatment that should be used if it may help patients. Otherwise, the benefits and risks need to be balanced accurately. Both the doctor and the patient might suffer from irresponsible laparoscopic surgery.[24] Critical technical components of are identified by Rosin et al. treatment-planning laparoscopy. The first point of contention is when it should be performed—either as a stand-alone therapy or just before the anticipated therapeutic operation. It's also debatable whether or not to do a full dissection with LUS and a peritoneal cytology sample, or whether or not to only examine with biopsy of suspicious lesions.[25] Oñate-Ocaña et al. describe a four-group staging system.[26] Disease progression from stage I (no serosal involvement) to stage II (serosal involvement) to stage III (invasion of surrounding organ) to stage IV (remote sickness). The proposed staging system is supposed to be a more straightforward alternative to TNM staging. It may be used to determine the best course of treatment for an individual patient and to stratify risk factors in advance of future randomized clinical trials.[26–28]

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ORIGINAL ARTICLE

Outcomes Following Transabdominal Preperitoneal Hernioplasty: A Retrospective Study of 288 Consecutive Cases

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Abstract

Aim: Surgical management of inguinal hernia (IH) through laparoscopic approaches is becoming increasingly common in surgical practice. However, there is still controversy regarding the indications and techniques used, such as totally extraperitoneal (TEP) or transabdominal preperitoneal (TAPP) repair. The purpose of this study was to evaluate the short- and long-term postoperative outcomes of TAPP hernioplasty in a series of 288 cases.

Materials and methods: A consecutive series of 288 patients who underwent laparoscopic TAPP repair between January 2006 and December 2019 were included. The inclusion criteria consisted of patients with a symptomatic bilateral hernia, recurrent hernia, suspicion of occult IH, and unilateral hernia for whom the procedure was specifically requested. Demographic data, operative details, and postoperative outcomes were registered.

Results: A total of 524 TAPP repairs were included in the study. The median operative time was 100 minutes for bilateral hernias and 75 minutes for unilateral hernias. The postoperative morbidity rate was 4.8%, and no mortalities were recorded. The median follow-up period was 21 (6–60) months. The recurrence rate at 60 months was 3.24%, and the incidence of chronic postoperative pain was 0.2%. Recurrence and neuritis were mainly associated with polyester meshes.

Conclusion: Transabdominal preperitoneal is a safe and effective surgical option for managing IHs, provided that patients and meshes are carefully selected.

Clinical significance: Nonpolyester meshes and nontraumatic fixation are associated with better outcomes.

Keywords: Inguinal hernia, Transabdominal preperitoneal, Transabdominal preperitoneal patch plasty.

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Introduction

Inguinal hernia (IH) is a common surgical pathology, with a lifetime incidence of 27–43% in men and 3–6% in women.[1] Each year, over 20 million patients require IH repair, making hernioplasty one of the most frequent surgical procedures.[2,3] Currently, two main surgical options are considered as follows: Open free-tension mesh repair (Lichtenstein) and laparoscopic techniques. The application of laparoscopy for groin hernia management began in the early 1990s, and since then, laparoscopy has gained acceptance among abdominal wall surgeons.[4–7]

The laparoscopic techniques of transabdominal preperitoneal (TAPP) and totally extraperitoneal (TEP) repair have followed parallel development, with ongoing controversy over which technique is the best in terms of low risk of complications, ease of learning, fast recovery, reproducible results, and cost-effectiveness.[2,8] Both laparoscopic approaches have become alternatives to open mesh IH repair, and the International Endohernia Society (IEHS) recognizes them as acceptable options for primary IH treatment.[9–11]

Recurrence rate and the incidence of chronic postoperative pain are the primary concerns when evaluating the effectiveness of these techniques. Mesh tension-free hernioplasty, whether open or laparoscopic, has been shown to be efficient in reducing recurrence rates and chronic postoperative pain compared to traditional open repair.[12,13] Additionally, randomized comparative trials have demonstrated the advantages of laparoscopy, including less early postoperative pain, faster recovery, and reduced chronic pain compared to open surgery.[2,14]

The TEP repair offers the advantage of avoiding the peritoneal cavity and peritoneal closure but has a steep learning curve and is associated with complications such as port-site hernias and visceral

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injuries. Transabdominal preperitoneal, on the contrary, allows for the assessment of bilateral hernia defects and the detection of occult contralateral hernias.[15,16] Transabdominal preperitoneal has shown similar outcomes to TEP and open hernia repair techniques in terms of postoperative pain, hospital stay, and recurrence rate comparable to the Lichtenstein technique.[17]

The objective of this study was to evaluate the postoperative and long-term results of the TAPP approach in patients with IH.

Materials and Methods

A protocolized program for laparoscopic IH treatment was initiated in January 2006. From December 2019, a total of 288 patients underwent surgery using the TAPP technique. The inclusion criteria for this study were bilateral IH, recurrent hernia, suspicion of occult contralateral IH, and patient-specific requests. Patients unfit for general anesthesia, those with strangulated hernia, and those with giant scrotal hernia were excluded. Demographic data, American Society of Anesthesiologists (ASA) classification, comorbidities, number of previous hernia repairs, type of hernia, and recurrence type of hernia were recorded. Short-term outcomes such as median operative time, intraoperative complications, postoperative pain, postoperative complications, and median postoperative stay were monitored. Long-term outcomes included hernia recurrence and chronic pain. Follow-up visits were scheduled at one, six, twelve, and twenty-four months after surgery, and additional visits were arranged as per the patient's request or their primary care physician.

Statistical analyses were conducted using the Statistical Package for the Social Sciences (SPSS), version 25.0 (SPSS Inc., Chicago, Illinois, USA). Demographics, perioperative data, operation details, length of hospital stay, morbidity, and mortality outcomes were presented as numbers and percentages for qualitative variables, and as medians and interquartile ranges (IQRs) for quantitative variables.

This study involved the use of data from clinical records. To ensure proper handling of information, data were treated confidentially and anonymously in accordance with the Spanish Organic Law 15/1999 of 13 December 1999 on Personal Data Protection [late-onset Pompe disease (LOPD)]. All methods were performed in compliance with the guidelines and regulations established by the Declaration of Helsinki (1964, revised in 1983) on biomedical research involving humans, the Spanish Royal Decree 1090/2015 of 4 December, which regulates clinical trials with drugs, the Research Ethics Committees with drugs, and the Spanish Registry of Clinical Studies. Informed consent was obtained from all patients, and ethical approval was granted by the Ethics Committee of Valladolid University (No. PI 20-1963).

Results

A total of 524 procedures were performed, consisting of 473 primary hernias and 51 recurrent hernias. The demographic features and characteristics of the hernias are presented in Table 1. The median age of the patients was 58 (49–67) years. Inguinal hernias were predominantly observed in males (95.1% vs 4.9%), and right-sided hernias were slightly more common than left-sided hernias (51% vs 49%). The most frequent hernia presentation was L2 (32.1%), followed by M1–M2 (28.6%) (Table 2).

The median operative time for unilateral hernias was 75 minutes (55.0–100.0), while for bilateral hernias, it was 110 (90.0–130.0) minutes. No major intraoperative complications occurred, and the overall morbidity rate was 4.8%, with no recorded mortalities.

Table 1: Demographics and preoperative parameters

Female	14 (4.9%)
Male	274 (95.1%)
Mean age (years)	58 (49–67)
Bilateral hernia	225 (85.9%)
Unilateral hernia	23 (4.4%)
Recidivated hernia	51 (9.7%)
ASA I	124 (43.2%)
ASA II	139 (48.1%)
ASA III	23 (8.0%)
ASA IV	2 (0.7%)
Previous abdominal surgery	51 (17.6%)

Table 2: Operative data

Right hernia	267 (51.0%)
Left hernia	257 (49.0%)
L1	82 (15.6%)
L2	175 (33.4%)
L3	94 (18%)
M1–M2	156 (29.8%)
M3	16 (3%)
F	1 (0.2%)
Mean operative time for unilateral IH	75 (55.00–100.0) minutes
Mean operative time for bilateral IH	110 (90.0–130.0) minutes

Table 3: Postoperative outcomes

Mean hospital stay: Days (range)	1.0 (1.0–2.0)
Overall 30-day morbidity	23 (4.4%)
Hematoma	13 (2.5%)
Seroma	6 (1.1%)
Wound infection (port site)	2 (0.4%)
Umbilical port hernia	2 (0.4%)
Recurrence	17 (3.2%)
Chronic postoperative pain	10 (1.9%)

There were no conversions to open repair. The median length of hospital stay was 1 (1.0–2.0) day. The following four different types of meshes were utilized: Polytetrafluoroethylene (PTFE) (2), polyester (225), polypropylene (PPL) (66), and polyvinylidene (PVDF) (231). Mesh fixation was accomplished with tacks in 81.2% (426) of cases and with glue (N-butyl-2 cyanoacrylate + methacrylosisolfolane) in 18.7% (98). Peritoneal closure was initially performed with tacks or staples and later with absorbable barbed sutures in 74.4% (385) of cases.

The average follow-up period was 21 (6.0–60.0) months, which included 80% of the patients. The 5-year follow-up was completed by 26.5% of the patients. The postoperative outcomes are presented in Table 3. Major complications (Clavien–Dindo IIIa) occurred in two patients (0.36%). In the early postoperative period, the most common complications were hematoma (2.50%, 13 cases)

and seroma formation (1.10%, 6 cases), all of which were resolved with conservative management. Two patients experienced wound infections (0.40%), and two developed a port-site hernia (umbilical port). No mesh-related infections were recorded. In terms of long-term outcomes, the recurrence rate was 3.2% (17 cases), and the rate of chronic postoperative pain was 1.9% (10 cases).

All recurrences were reoperated using the open Lichtenstein technique, except for three cases that were repaired using the laparoscopic approach. The majority of recurrences were detected between 6 and 16 months after surgery.

Discussion

Inguinal hernia repair is a widely performed surgical procedure that is significantly more common in men, occurring 9–12 times more frequently than women.[1,17] This gender distribution was also observed in our cohort, with 95% of the patients being male and 5% female.

Despite the increasing use of minimally invasive techniques, the open approach remains the predominant method for laparoscopic IH repair.[12] Several factors contribute to this preference. First, the laparoscopic approach involves a different surgical technique with unique anatomical references, requiring surgeons to acquire specific skills and undergo a learning curve, particularly for the preperitoneal approach.[18] Second, concerns regarding safety, complications, operative times, and cost still exist, limiting the widespread adoption of laparoscopic repair among abdominal wall surgeons.[19]

The primary objectives of abdominal wall surgery currently focus on improving outcomes and enhancing the patient's quality of life by minimizing surgical and postoperative complications while maintaining a favorable cost-benefit ratio.[20]

The initial priority in IH repair remains accurate diagnosis and identification of the hernia defect. In our study, we utilized the classification proposed by the IEHS to achieve this goal.[21]

Approximately 95% of IHs can be diagnosed through a basic physical examination, which should include an assessment of both groins. It is estimated that 70% of IHs are initially asymptomatic but may become symptomatic within 5 years.[2] However, the diagnostic approach for IH has evolved over time, with the increasing utilization of imaging techniques such as ultrasound scans, and in specific cases, computed tomography (CT) or magnetic resonance imaging (MRI).[2]

As part of our routine preoperative workup, we included an ultrasound scan, especially considering that 18% of patients (52 patients) showed suspicion of a hidden contralateral hernia. These findings align with data reported by other authors.[22] In cases where doubts persist and ultrasound results are negative or inconclusive, further imaging modalities such as MRI or CT can be considered.

An important aspect to consider is the management of recurrent IH, which was observed in 9.73% of patients (51 patients) in our cohort. The optimal technique for hernia repair, particularly in cases of recurrent IH, remains a subject of concern in the modern era of hernia surgery.[12] Recurrent IH has an incidence greater than 10%,[23] but this rate drops below 1% when tension-free prosthetic hernioplasty is utilized.[24]

Diagnosing recurrent IH is slightly more complex, particularly when establishing the correct anatomical classification. In our cohort, all recurrences were classified as the M type. Recurrence poses a challenge for surgeons due to technical difficulties associated with scar tissue, which hinders the identification of anatomical landmarks and results in a high re-recurrence rate ranging from 5 to 30%.[25] In such cases, imaging studies play a crucial role,[17] and the laparoscopic approach is highly recommended.[2,12]

However, there are situations where the laparoscopic approach is not recommended, including complex hernias (such as scrotal or incarcerated hernias), hernias following radical prostatectomy, and recurrences after TAPP/TEP procedures.[2] Despite these criteria, the IEHS suggests that TAPP and TEP may be considered as treatment options for complicated hernias if performed by experienced laparoscopic or endoscopic hernia repair surgeons.[10] In our series, we chose to exclude complex cases from the laparoscopic approach.

The TAPP technique carries a risk of serious, life-threatening complications.[2] Similarly, to other authors,[2,11] we paid special attention to potential intraoperative complications, particularly in situations involving previous abdominal surgery, specifically the inframesocolic approach, where adhesions may be present. In our cohort, 17.6% of patients had undergone previous abdominal surgery, and no complications were reported. In complex cases, imaging studies, such as CT or MRI, can aid in the appropriate planning of the procedure. However, for complex cases, it may be preferable to switch to an open repair technique.[11]

No intraoperative complications occurred, resulting in an overall morbidity rate of 4.8% and no fatalities. These findings support the safety of the procedure, as emphasized by other authors.[26]

The TAPP technique is associated with the most common immediate postoperative complications, namely seroma and hematoma, with reported incidences of approximately 10 and 3%, respectively.[2,10] Various aspects of the technique, such as the fixation method and case selection (particularly large and medial hernias), have been identified as independent risk factors for seroma formation.[2,27] In our study, we observed a low incidence of complications as follows: About 2.4% (13 cases) for hematomas and 1.1% (6 cases) for seromas. These complications were mainly associated with the use of polyester meshes (69.2% of hematomas and 100% of seromas) and tacks (69.2 and 50%, respectively). However, when glue was used for fixation, the incidence of these complications decreased (15.0% of hematomas and 16.70% of seromas), which contrasts with data published by other authors who reported a higher incidence of seroma with glue fixation.[27]

Long-term complications of hernioplasty include hernia recurrence and chronic pain.[20] Our recurrence rate was 3.2% (17 cases), which is consistent with findings from other laparoscopic series and open prosthetic repair studies.[2,22] A higher incidence of recurrence was observed with polyester meshes (9 out of 17 patients, 52.9%). In terms of the fixation technique, 7 recurrences were associated with glue, 5 with tacks, and 5 with absorbable tacks. These findings align with those reported by other authors.[28]

There is a discrepancy regarding the timing of postoperative recurrence. Some authors suggest that recurrences primarily occur within the first 2 years,[29] while in other series, most recurrences were observed between 5 and 10 years or even later.[23] In our cohort, we achieved a median follow-up of 21 months, with 26.5% of patients being followed up between 60 and 120 months.

Postoperative chronic pain is a common complication of hernioplasty, with an incidence of approximately 11% and a negative

impact on the patient's quality of life.[30] Factors contributing to the presence of postoperative chronic pain include mechanical injury caused by mesh fixation using nails, tacks, or medical adhesive, as well as nerve stretching due to mesh fixation.[26]

In our study, we employed various methods of fixation and recorded 10 cases (1.9%) of chronic postoperative pain. Among these cases, 60.7% involved the use of polyester meshes and fixation was performed using tacks in all instances. Therefore, our findings are consistent with those of other authors who found that glue fixation is associated with a lower incidence of chronic postoperative pain.[31]

We have reached the conclusion that TAPP is a secure and effective technique for IH repair, provided that patients and mesh selection are done adequately. However, we observed that recurrence and chronic postoperative pain were more prevalent among patients with polyester meshes.

It is important to acknowledge several limitations of this study. First, we did not have a control group consisting of patients undergoing TEP laparoscopic repair or an open approach group. Additionally, the group of patients treated with glue fixation was relatively small.

Clinical Significance

Nonpolyester mesh and atraumatic fixation are associated with better outcomes with respect to recurrence and chronic postoperative pain.

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ORIGINAL ARTICLE

Review of Laparoscopic Gynecological Procedures in Ethiopia

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Abstract

Introduction: Laparoscopy provides an alternative approach to open surgery in addressing the surgical need of the society. The absence of adequately qualified personnel has limited its use in Ethiopia.

Objectives: To describe the laparoscopic gynecologic procedures and determine the prevalence of grossly visible endometriosis in Ethiopia.

Materials and methods: Facility-based cross-sectional study conducted from 2018 to 2022 GC at 14 university hospitals across the country. Women who had gynecologic laparoscopic surgery with adequate documentation were included. Data were collected by the investigators. Data were compiled and analyzed using SPSS version 25.

Results: Data were collected from 236 study participants. The participants' mean age was 30.6 years (±5.43). Majority, 71.2% (168/236) were nulliparous. Tubal factor infertility alone was the commonest, 84.7% (200/236), indication for laparoscopy. Intraoperatively pelvic adhesion of different degrees was found in majority, 52.5% (124/236) of cases. The prevalence of grossly visible endometriosis was 3.4% (8/236). The prevalence of procedure-related intraoperative complications was 2.5% (6/236). Three of the six complications were inadvertent uterine perforation during inserting uterine manipulator for chromopertubation. All of the complications were detected intraoperatively and managed. No significant association was found between a dependent variable (presence of intraoperative complications) and selected independent variables.

Conclusions and recommendations: Tubal factor infertility was the commonest indication for laparoscopy in the present study. The prevalence of grossly visible endometriosis was low (3.4%). The prevalence of procedure-related intraoperative complications was low (2.5%) probably due to the less complex cases and procedures.

Keywords: Adhesions, Complications, Cross-sectional, Endometriosis, Infertility, Laparoscopy, Myoma.

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Introduction

Surgical diseases are estimated to account for 25–30% of the disease burden in the world; however, surgical care is not given the priority that it deserves in global health.[1] As a result, about 67% of the population in the world does not have timely access to affordable and safe surgical care.[1] Like in other low-to-middle-income nations around the globe surgical care is a major unmet need in Ethiopia.[2] Laparoscopy provides an alternative approach to open surgery in addressing the need.

Laparoscopy is an advanced surgical procedure where surgery is done using operating instruments inserted in to the peritoneal cavity through small incisions over the abdomen. It has been utilized in gynecologic surgery for over 40 years.[3] Laparoscopy also has special place in family planning service provision including contraception and management of infertility. Laparoscopy today is preferred over open laparotomy for most minor and major gynecologic procedures in many parts of the world.[4–16] In addition, laparoscopy is useful in locating and retrieving missed IUDs serving as a backup for IUD provision services.

Laparoscopy is especially useful in the diagnosis and management of endometriosis. Endometriosis is an underlying pathology responsible for considerable pathological cases of chronic pelvic pain and infertility.[17] The prevalence of endometriosis is estimated to be between 2 and 10% in women of reproductive age.[18,19] Laparoscopy is taken as the gold standard approach for endometriosis diagnosis and management in clinical practice.[20]

Laparoscopy has numerous benefits it offers to patients. Prior reports have shown that laparoscopy is safer and less expensive, and has less postoperative pain and shorter recovery time leading to a faster return to normal activities compared with laparotomy.[2,3,5] These advantages enable a better quality of surgical care and made laparoscopy very appealing to patients.

Laparoscopy is more complex and requires a higher cost to set up the service compared with that of open surgery. It requires a new set of equipments and consumables to initiate and maintain the service. It also requires a new set of skills that relatively take more time to fully develop. Hence, the higher initial cost and lack of well-trained health providers have been the main inhibitory factors for wide availability of laparoscopy in developing countries.

There are four levels in gynecologic laparoscopy. Diagnostic laparoscopy is labeled as level one. Minor laparoscopic procedures like biopsy taking and minor adhesiolysis are under level two. Major laparoscopic procedures, such as tuboplasty, ectopic pregnancy removal and extensive adhesiolysis are under level three. Advanced laparoscopy or level four is reserved for procedures including surgeries for pelvic malignancies, hysterectomy, and myomectomy.[21]

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Laparoscopy like other surgical procedures is associated with complications. These complications are generally grouped into minor and major categories.[4] Complications including minor bleeding, urinary tract infection and paralytic ileus are grouped under minor. Major complications include injury to the viscera (bowel, bladder, or ureter), bleeding or infection that require re-exploration, death or severe medical sequelae. Laparoscopy is associated with higher risk of injury to major pelvic vessels, bladder, and bowel.[4,12]

Laparoscopy has now become the preferred approach to perform gynecologic surgical procedures in many countries. It is now incorporated in many medical school curriculums around the world. However, it is still underutilized in many developing countries.[4] Lack of adequate funding to initiate and maintain laparoscopic services and lack of adequately trained manpower are the main reasons for the underutilization. Still, the progress observed in laparoscopy in many resource limited countries is encouraging.[22]

In Ethiopia; though some apparatuses were availed in both governmental and private hospitals, the absence of adequately qualified personnel has limited its use. Most of them are providing only levels one and two laparoscopic procedures due to lack of adequate skill and consumables. There are very limited researches in Ethiopia which provide review of gynecologic laparoscopic procedures. This study provides background information for further investigation in gynecologic laparoscopic surgery in a resource limited setting. The main objective of this study was to describe the laparoscopic gynecologic procedures and their outcome at fourteen university hospitals in the country.

Materials and Methods

This is a cross-sectional study done from 2018 to 2022 G.C. It was conducted at 14 university hospitals across the country which provide laparoscopic gynecologic procedure/surgery. The investigators provided laparoscopy surgical skills training to the 14 University Hospitals across the country from 2018 to 2020 G.C. In addition, the service and data collection continued at two of the target university hospitals after the phase out of the project. During the implementation of the project data on every laparoscopic surgical procedure was collected using a data collection format prepared for the purpose.

Women who had laparoscopic gynecologic procedure at the target hospitals and had adequate documentation were included in the study. Any intraoperative incident that changed the plan of surgery or required additional unplanned action like repair of laceration or laparotomy were taken as complication. Such complications include injury to major vessels and viscera (bladder, bowel, ureters), thromboembolism and postoperative peritonitis.

The presence or absence of intraoperative complications was the dependent variable. Independent variables included sociodemographic characteristic (age), Clinical characteristics (parity, abortion, ectopic, previous history (Hx) of pelvic/intraperitoneal infection, previous Hx of open abdominal/pelvic surgery, previous Hx of laparoscopic surgery, preoperative diagnosis), intraoperative/procedure data (nature of procedure, type of procedure, purpose of procedure, type of abdominal entry, primary trocar site, presence of adhesions, presence and degree of endometriotic lesions, duration of anesthesia, estimated blood loss, procedure duration), and postoperative data: postoperative course.

Table 1: Obstetric characteristics of women for whom laparoscopic gynecological procedures were done at 14 hospitals in Ethiopia from 2018 to 2022 G.C. ($n = 236$)

Variables	*Frequency (n)*	*Percent (%)*
Parity		
0	168	71.2
1	49	20.8
>1	19	8.0
Spontaneous abortion		
No	214	90.7
Yes	22	9.3
Induced abortion		
No	222	94.1
Yes	14	5.9
Ectopic pregnancy		
No	228	96.6
Yes	8	3.4
Previous surgery		
No	203	86
Yes	33	14
Previous laparoscopy		
No	235	99.6
Yes	1	0.4
Previous PID		
No	224	94.9
Yes	12	5.1

Data were compiled and analyzed using SPSS version 25. Surgical outcome was used as dependent variable dichotomized in to complicated and uncomplicated. The association of the dependent variable against independent variables was analyzed with logistic regression. Variables with ≤0.2 significance level in the bivariate logistic regression analysis were included in the multivariable analysis. Odds ratio with 95% confidence interval (CI) and p-value of < 0.05 were used to determine the presence and degree of association between outcome and independent variables.

Ethical clearance to conduct the study was obtained from the IRB of College of Health Sciences, Addis Ababa University. Each study facility also provided permission to collect the required data. The review used secondary data. Hence, no study subjects were interviewed or contacted. Confidentiality was respected during collection and handling of data.

Results

Data were collected from 236 study participants. The participants' age ranged 20–51 years. The mean age was 30.6 years (±5.43). The majority, 71.2% (168/236), were nulliparous. Previous history of ectopic pregnancy and abdominal surgery were present in 3.4% (8/236) and 14% (33/236) of participants, respectively. Only one participant had prior laparoscopic procedure (Table 1).

Tubal factor infertility alone was the commonest, 84.7% (200/236), indication for laparoscopy. In additional 9.3% (22/236),

Table 2: Preoperative diagnosis of women for whom laparoscopic gynecological procedures were done at 14 hospitals in Ethiopia from 2018 to 2022 G.C. ($n = 236$)

Preoperative diagnosis	*Frequency (n)*	*Percent (%)*
Tubal factor infertility	200	84.7
Tubal factor infertility and others	22	9.3
BTL	4	1.7
Others	8	3.4

Table 3: Intraoperative findings of laparoscopy procedures done at 14 hospitals in Ethiopia from 2018 to 2022 G.C. ($n = 236$)

Variables	*Frequency (n)*	*Percent (%)*
Pelvic adhesions ($n = 236$)		
Not present	112	47.5
Present	124	52.5
Cul-de-sac obliterated ($n = 124$)		
No	62	50
Yes	62	50
Myoma ($n = 236$)		
Not present	222	94.1
Present	14	5.9
Grossly visible endometriosis ($n = 236$)		
Not present	228	96.6
Present	8	3.4

tubal factor infertility was additional indication combined with other clinical conditions (Table 2).

In 42.8% (101/236) of cases laparoscopy was done for combined diagnostic and interventive purposes. Laparoscopy was done combined with hysteroscopy only in 8.1% (19/236). Varies needle was used for abdominal entry in majority, 69.9% (165/236) of cases. In the rest of the 30.1% (71/236), blind entry through modified palmer's point was used.

Intraoperatively pelvic adhesions of different degrees were found in 52.5% (124/236) of cases. In half of these cases, 50% (62/124), the adhesions were severe obliterating the cul-de-sac. Myoma of variable size was identified in 5.9% (14/236) of cases. The prevalence of grossly visible endometriosis was 3.4% (8/236). Five of the endometriotic lesions were chocolate cysts while the reset were dark nodules (Table 3).

The planned procedure was completed in most, 88.1% (208/236), of the cases. The procedure was converted to laparotomy only in one case due to difficulty to proceed with laparoscopy. In 11.5% (27/236) of cases the planned laparoscopy procedure was abandoned due to severe adhesions including frozen pelvis. The mean duration of the procedures was 43.3 ± 18.4 minutes.

The prevalence of procedure-related intraoperative complications was 2.5% (6/236). Three of the six complications were inadvertent uterine perforation during inserting uterine manipulator for chromopertubation. The rest were omental laceration (2/6) and bladder perforation (1/6) which were repaired subsequently. All of the complications were detected intraoperatively and managed accordingly.

Regression analysis was done for presence and strength of association between a dependent variable (presence of intraoperative complications) and selected independent variables but no statistically significant association was found.

Discussion

The present study provided a review of all types of gynecologic laparoscopic procedures performed during the study period. Tubal factor infertility was the commonest indication for laparoscopy in the present study. Indications for laparoscopy depend on the type of center or the qualification of the operator. Our finding is comparable to those reports from fertility/reproductive centers which reported infertility as indication in 60–76.3% of the cases.[23–25] In non-fertility centers, infertility accounts for much less proportion of indications.[22]

Pelvic adhesions are commonly found in laparoscopic study of infertile women. In our study, pelvic adhesion of different degrees was found intraoperatively in majority (52.5%) of cases. This finding is higher than many prior similar studies. An Indian study reported adhesions prevalence of 10% in diagnostic laparoscopy.[8] In another report, the prevalence of peritubal/periovarian adhesions were 6.3% and 22.2% in patients with primary and secondary infertility, respectively.[26]

Myoma was previously reported in 1–2.4% of infertile women with no obvious cause.[27] In our study, myoma of variable size was identified in 5.9% of cases. Our finding is comparable to reports from studies done in India and Pakistan in which fibroids were seen in 7% and 6% cases, respectively.[8,26]

Endometriosis is a common underlying cause of chronic pelvic pain.[17] And, laparoscopy is a uniquely useful approach in the accurate diagnosis and surgical treatment of endometriosis.[10] In women of reproductive age, the prevalence of endometriosis is estimated to be 2–10%.[18,19] The reported prevalence of endometriosis is much higher in infertile women and has been estimated to be 30%.[28] The prevalence of grossly visible endometriosis in the present study was 3.4%. This prevalence is within the reported range for women of reproductive age. However, it is much less than prior reports from infertile women, which is as high as 50%.[27] A 48.1% prevalence of endometriosis was also reported by a Nigerian study in cases with diagnostic laparoscopy.[29] There is no obvious explanation for the lower prevalence in the present study. One possible explanation to partially explain this is the high adhesion rate in our study which could burry endometriotic lesions making it non-visible by laparoscopy.

In the present study, the prevalence of procedure-related intraoperative complications was 2.5%. This finding is lower than the reports from many prior similar studies. Meta-analysis of 27 published randomized control trials involving 1,809 cases treated by operative laparoscopy revealed a complication rate of 8.9%.[30] In an Indian study of 3,724 laparoscopic procedures, complications occurred in 5.8% of all procedures.[31] The lower prevalence of complications in our study is possibly due to the less complex cases and procedures included in the study.

Conclusion

The most common indication for laparoscopy in our study was infertility related to tubal problems. The prevalence of grossly visible endometriosis in the present study was 3.4% which is much lower than that found in prior reports in infertile women. In the present study, the prevalence of procedure-related intraoperative

complications was low (2.5%) probably due to the less complex cases and procedures performed.

Clinical Significance

There are very limited researches in Africa which provide a review of gynecologic laparoscopic procedures. This study provides important background clinical information in the field in African set up.

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ORIGINAL ARTICLE

Evaluative Study of Outcome of Patients Undergoing Laparoscopic Cholecystectomy

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Abstract

Background: Laparoscopic cholecystectomy in management of gallbladder (GB) diseases requires scrutiny in term of indications, success and failure to give benefit to the patient. Its relevance and validity require to be assessed in present era.

Materials and methods: The study is carried out on patients admitted to municipal general hospitals of Ahmedabad. A total of 100 patients were observed and data were collected in the prescribed proforma consisting of details of the patient's history, clinical findings, pathological findings, radiological findings, operative findings, postoperative outcome.

Results: Observation and analysis of the data of the present series were interesting and important aspects were compared with the standard series. Injury to the biliary tree was the common reason for the conversion of laparoscopic cholecystectomy to open cholecystectomy.

Conclusion: With proper laparoscopic training and increasing experience of surgeons there is less chance to conversion of an open approach. Laparoscopic cholecystectomy is the best in terms of early recovery to routine life without any significant morbidity to the patient.

Keywords: Cholecystectomy, Evaluative, Laparoscopic cholecystectomy, Outcome.

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Introduction

Now days laparoscopic cholecystectomy has gained popularity for the removal of a diseased gallbladder (GB). Laparoscopic cholecystectomy essentially has replaced the open technique for routine cholecystectomies.[1] Indications of laparoscopic cholecystectomy are symptomatic gallstones, cholecystitis of acute/chronic/acalculous types, biliary dyskinesia, gallstone pancreatitis, and gallbladder polyps and gallbladder mass.[2]

An increase in age has direct correlation with the increase in the incidence of gallstone diseases. Females are more prone to form gallstone than males. Approximately 10–15% of the population has gallstones without symptoms.

Laparoscopic cholecystectomy is associated with certain complications like biliary stricture, obstructive jaundice, biliary fistula, septicemia, paralytic ileus, etc. Bile duct injury (BDI) is one of the most common, and dreaded complications of cholecystectomy.[3] Single and multi-institutional experiences have cited bile duct injury rates from 0 to 2% during laparoscopic cholecystectomy compared with historical rates from 0 to 0.4% during open cholecystectomy.[4,5]

A few major complications especially – vascular are life threatening and lead to increase mortality rate, therefore it require conversion into an open surgical approach to treat them. Iatrogenic perforation of the gallbladder with spillage of stones in the peritoneal cavity was found with an incidence from 10 to 30%.[6] Almost all minor complications both biliary and non-biliary are usually treated conservatively.

Common Anomalies and Variations of GB

Absent gallbladder – extremely rare, autopsy incidence of 0.03% has been reported.[7] Variation in size and shape of the gallbladder. Bilobed gallbladder, fundul diverticulum, phrygian cap, hour glass gallbladder.

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Variation in Position

Left-sided gallbladder, floating gallbladder. Floating gallbladder occurs when there is an increase in the peritoneal investment; this condition occurs in 5% of patients and predisposes to torsion, resulting in gangrene or perforation of the viscus.[8]

Double gallbladder, duplication of gallbladder with two separate cavities and two separate cystic ducts has an incidence of approximately 1 in 4,000.

Aims and Objectives

A study of the outcome of patients undergoing laparoscopic cholecystectomy with the following aims and objectives: (1) to estimate intraoperative and postoperative complications of laparoscopic cholecystectomy (2) to identify circumstances and risk factors that influence the complication of laparoscopic

cholecystectomy (3) to estimate the frequency of conversions to open cholecystectomy.

Materials and Methods

About 100 patients of having symptomatic cholelithiasis, after taking written informed consent, admitted in one of the Municipal General Hospitals of Ahmedabad city, India, were studied during period of 2 years, i.e., from May 2019 to September 2021.

This is a prospective, observational, and randomized study.

Inclusion Criteria

- Patients above the age of 18 years.
- Patient with symptomatic cholelithiasis and are planned for laparoscopic cholecystectomy.
- Patients has given written informed consent.

Exclusion Criteria

- Patients not fit for laparoscopic surgery.
- Age <18 years.
- Patient with gallbladder malignancy and CBD stone. A total of 100 patients for the clinical study will be randomly selected, who are planned for laparoscopic cholecystectomy during the period of evaluation with the above inclusion and exclusion criteria.
- Out of 100 patients in 50 patients, pneumoperitoneum was created using a Veress needle and in the rest of 50 patients, pneumoperitoneum was created by the open method. All selected cases will be studied from admission till discharge up to patient resume their normal work.
- Evaluation of the following parameters was done in each patient: Safety and efficacy of the procedure. Procedure time.
- Intraoperation complications.
- Postoperative complication.
- Postoperative pain.
- Duration of stay in hospital.
- Duration required to get back to normal activities.

*Mechanism of common bile duct injury: (Stewart–Way classification)[9]

Class I	The incision in cystic duct extended into CBD CBD mistook for cystic duct
Class II	Lateral damage to the CHD from cautery or clips placed on duct Associated bleeding and poor visibility
Class III	CBD mistaken for cystic duct, not recognized CBD, CHD, Rt, Lt hepatic ducts transected and/or resected
Class IV	RHD is mistaken for cystic duct, RHA is mistaken for cystic artery, RHD and RHA transected Lateral damage to the RHD from cautery or clips placed on the duct.

Results

A total of 100 patients underwent laparoscopic cholecystectomy. All cases underwent thorough physical examination, preoperative evaluation, and routine investigations and were subjected to surgery, the study of age predisposition, clinical features, USG findings, diagnosis, their complications were meticulously recorded. Short term Outcome of the operation was taken into account.

Table 1: Distribution of patients according to USG finding of thick wall gallbladder

	Laparoscopic cholecystectomy		*Laparoscopic converted to open cholecystectomy*	
USG finding	*Frequency*	*Percentage*	*Frequency*	*Percentage*
Thickened GB wall				
Yes	8	8.69	4	50
No	84	91.30	4	50
Total	92	100	8	100

Table 2: Distribution of patients according to USG finding of pericholecystic free

USG finding	*Laparoscopic cholecystectomy*	*Percentage*	*Laparoscopic converted to open cholecystectomy*	*Percentage*
Pericholecystic free fluid				
Yes	12	13.04	3	37.5
No	80	86.95	5	62.5
Total	92	100	8	100

In the present study around 53% population belongs to 21–40 year age group, Out of them 78% of the study population were females and 22% were males.

As shown in Table 1 out of 100 patients 12 patients (12%) had thick-walled gallbladder.

In the present study, among laparoscopic cholecystectomy group 8.69% population had USG finding of thickened GB wall and in laparoscopic converted to open cholecystectomy group 50% population had thickened GB wall. The *p*-value from Chi-square test is 0.00056417 which is statistically significant (Significant at $p < 0.05$).

As shown in Table 2, around 15% of the study population had pericholecystic free fluid.

In the present study, among laparoscopic cholecystectomy group 12 patients (13%) had USG findings of Pericholecystic free fluid, and in laparoscopic converted to open cholecystectomy group 3 patients (37.5%) had pericholecystic free fluid. The *p*-value from Chi-square test is 0.063149 which is statistically not significant (Significant at $p < 0.05$).

Out of 100 patients, 3 patients had common bile duct injury and 2 patients had common hepatic duct injury. About 3 out of 5 patients with biliary tree injury were converted to open cholecystectomy which was managed by calling an experienced surgeon, T tube inserted and primary repair were done, while rest 2 cases were managed laparoscopically with primary repair.

Out of 100 patients – in 8 patients conversion into open cholecystectomy had to be done.

As shown in Table 3, 47 surgeries were done by surgeons whose experience was <5 years among them 14.90% of surgery converted to open cholecystectomy, and 53 surgeries were done by surgeon whose experience >5 years among them 1.89% surgery converted to open cholecystectomy. The *p*-value from Chi-square test is 0.016717 which is statistically significant (Significant at $p < 0.05$).

In the present study, 2% population had vessel injury, and 1 patient had an injury to the cystic artery. One patient had an injury to the right hepatic artery which was diagnosed intra operatively. Both the patients were converted to open cholecystectomy.

Table 3: Distribution of patients according to reasons for conversion of laparoscopic cholecystectomy to open cholecystectomy

Reason for conversion of laparoscopic cholecystectomy to open cholecystectomy	*Frequency*	*Percentage*
Dense adhesions	1	12.5
Due to bleeding	2	25
Injury to biliary tree	3	37.50
Difficult calots dissection	2	25
Total	8	100

Table 4: Distribution of patients according to the duration of postoperative stay

Duration of postoperative	*Laparoscopic cholecystectomy*		*Laparoscopic converted to open cholecystectomy*	
Hospital stay	*Frequency*	*Percentage*	*Frequency*	*Percentage*
0–3 days	79	85.86	0	0
4–7 days	8	8.69	0	0
8–14 days	5	5.43	6	75
15–21 days	0	0	2	25
Total	92	100	8	100

In the present study, around 13.04% population had drain insertion among the laparoscopic cholecystectomy group and 100% population had drain insertion among the laparoscopic converted to open cholecystectomy group. The *p* value from Chi-square test is <0.00001 which is statistically significant (significant at $p < 0.05$). A reason for drain insertion is mostly spillage of bile during surgery, intraoperative bile leak (biliary injury), or intraoperative bleeding from gallbladder fossa.

Table 4 presents the distribution of patients according to the duration of postoperative stay following laparoscopic cholecystectomy and laparoscopic cholecystectomy converted to open surgery. The data includes the frequency and percentage of patients in each category of postoperative hospital stay.

Discussion

A total 51 patients (around 51%) of the study population belonged to the 31–50 years age group. Females have a common preponderance to the development of gallstones found in our study around 78%.

In the present study, 77% population presented with RHC pain, 17% population presented with vomiting, and 45% population presented with biliary colic. About 4% population presented with all symptoms. Around 26% population presented with biliary colic and RHC pain and 38% population presented with vomiting and RHC pain.

In the present study, 60% population was diagnosed with cholelithiasis, 11% with chronic calculus cholecystitis, 10% with acute calculus cholecystitis, 10% with perforated GB, and 4% with empyema GB.

In the present study, 46% of the population exhibited single calculus in the GB while the rest 54% of the population presented with multiple GB calculus. About 12% of the study population had their GB wall thickened, and among them 4% converted to open surgery which is statistically significant, which suggest USG findings of thickened gallbladder are positively associated with increased incidence of complications. Around 15% of the population had pericholecystic free fluid present in USG findings, among them 3% converted to open surgery, which is statistically not significant. These results were comparable to study Veen EJ et al.[10]

Radunovic M et al.[11] noted that the increased incidence of complications was seen in patients with ultrasonographic finding of gallbladder empyema and increased thickness of the gallbladder wall > 3 mm.

In 50% study population, pneumoperitoneum was created using a Veress needle among them 12 people (24%) developed port site bleeding. While in the other 50%, pneumoperitoneum was created via open method among them 7 people (14%) developed port site bleeding. Bleeding was stopped spontaneously by compressing the gauze piece.

In laparoscopic as well as laparoscopy converted to open cholecystectomy common complication found is bile duct injury. These Bile duct injuries can be evaluated via thorough clinical examination, standard preoperative evaluation, knowledge of hepatic biliary anatomy during surgery, the experience of the surgeon, and timely take a call for open conversion. Only 5% of cases in which bile duct injury occurred-they were managed by taking help of senior surgeon, intra biliary T tube insertion and primary suture repair.

In the present study, 10 patients developed postoperative bile leak. The Reason for bile leak in 3 patients was CBD injury (3%), while in the rest 7 patients (7%) bile leak was due to slippage of CD ligature/clips, which were confirmed by MRCP. These results were comparable to Mjäland O et al.[12] in which out of 11,164 patients who underwent laparoscopic cholecystectomy, 57 (0.5%) cases had bile duct injury. Taki-Eldin A and Badawy AE[13] reported in the 2011–2015 outcome of laparoscopic cholecystectomy, 12 patients (2.4%) had post-op biliary leakage.

In total 8 patients open cholecystectomy had to be performed. The commonest reason for conversion of laparoscopic cholecystectomy to open cholecystectomy was Injury to biliary tree in 3 patients (37.50%), intraoperative bleeding in 2 patients (25%), and difficult calots dissection in 2 patients (25%). These observations are similar to the Paredes Cotore JP et al.[14] results shows that 5% were converted to open/laparotomy, also in Al-Kubati WR[15] reported 336 patients underwent LC, out of it 43 patients (12.8%) had planned laparoscopic operations converted to open cholecystectomy intraoperatively.

In our study the average operating time was 106 minutes. The results of the present study were comparable to Haynes JH et al.[16] study, in which the average operating time was 130 minutes. Taki-Eldin A and Badawy AE[13] reported in 2011–2015 outcome of laparoscopic cholecystectomy mean operative time was 65.94 ± 11.52 minutes.

Around 9% of the study population developed an infection at the surgical site, among the study population laparoscopic cholecystectomy was done in 92 patient among them surgical site infections were present in 6.52% of surgery, in lap converted open cholecystectomy was done in 8 patient among them surgical site infection was present in 37.5%. Taki-Eldin A and Badawy AE[13] studies had similar results in which, 4.3% developed wound infection in laparoscopic cholecystectomy.

Around 92% of cases underwent laparoscopic cholecystectomy and 85% of them were discharged within 3 days, 8% people

discharged between 4 and 7 days, and only 5% population discharged between 8 and 14 days, the reason for prolonged stay in the laparoscopic cholecystectomy group is due to postoperative bile leak, surgical site infection. On the other hand, 8% population underwent lap converted to open cholecystectomy among them 75% people discharged between 8 and 14 days, and 25% people between 15 and 21 days. These results are statistically significant, suggesting that patients undergoing uncomplicated laparoscopic cholecystectomy were discharged earlier. The average postoperative hospital stay in our study was 4.5 days.

Among the laparoscopic cholecystectomy group 92.39% population returned to routine life within 15 days and 7.60% population returned to routine life within 30 days due to postoperative bile leak and surgical site infection. Whereas Among laparoscopy converted to open cholecystectomy 62.5% population returned to routine life within 30 days and 37.5% population returned to routine life after more than 31 days, which is statistically significant. The average time to return to routine life in our study was 15 days.

No mortality was noted in our study. Patients in whom only laparoscopic procedure had been done exhibited statistically significant improvements in postoperative morbidity and cosmetics. Study results are comparable with Tambyraja AL et al.[17] Outcome of laparoscopic cholecystectomy, in which one patient with gangrenous cholecystitis died after laparoscopic cholecystectomy.

Conclusion

In the last two decades laparoscopic cholecystectomy has gained so much popularity that one can say it should be the gold standard operative technique for symptomatic gallbladder calculi mainly due to it giving early postoperative recovery and lessening intraoperative time. It is used as a gold standard surgery for all types of gallbladder conditions like acute calculus cholecystitis, mucocele of GB, empyema of GB, etc.

Patients having perforated gallbladder, thickened GB, dense adhesions at Calot, pericholecystic free fluid are at a high risk of getting laparoscopic converted to open surgery. Common complications of laparoscopic cholecystectomy are postoperative bile leak and surgical site infection. Most of them were treated conservatively without further surgical intervention.

From the above data, one can say that in the hands of experienced surgeon with systemic laparoscopic training, there is a lesser chance of conversion into open surgery and overall it decreases complication rate.

Laparoscopic cholecystectomy requires fewer days of postoperative hospital stay, less postoperative pain, early mobilization, early discharge, and better cosmetics so patient satisfaction is achieved too. From All these advantages laparoscopic surgery should be excellent in creating early recovery to routine life without causing significant morbidity to the patient.

Disclosure Statement

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CASE REPORT

Extraskeletal Primary Osteosarcoma of the Gallbladder: A Rare Occurrence—A Case Report

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Abstract

Extraskeletal osteosarcoma (EOS) is a highly aggressive and rare mesenchymal tumor. We present a case of 50-year-old woman who underwent laparoscopic cholecystectomy for symptomatic gallstone disease. Histopathological examination confirmed high-grade osteosarcoma of the gallbladder.

Keywords: Case report, Extraskeletal, Gallbladder, Osteosarcoma.

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Introduction

Extraskeletal osteosarcoma (EOS) accounts for about 1% of malignant soft tissue tumors which arise from connective tissue embryologically derived from mesenchyme. Extraskeletal osteosarcoma is a high-grade neoplasm occurring most commonly in the extremities, the thorax, and the abdomen. To the best of our knowledge, there have been only four reported cases of EOS occurring in the gallbladder reported till date.[1–4]

Case Description

A 50-year-old female presented in the outpatient department with history of intermittent right upper abdominal pain, and flatulent dyspepsia of 6 months duration. There was no history of exposure to carcinogenic agents or radiation. Past history was insignificant. General physical and systemic examinations were normal as were the routine blood investigations. Ultrasonography of the abdomen revealed features consistent with cholelithiasis with chronic cholecystitis. The patient was subjected to laparoscopic cholecystectomy (four port). Intra-operative findings were inconclusive. The specimen was sent for histopathological examination. Cut sections revealed a globular mass measuring 3.5 cm × 1.5 cm within the lumen, which was attached to the fundal mucosa of the gallbladder by a narrow base measuring about 1.5 cm. The rest of the mucosa appeared atrophic. Microscopic examination of the sections from the globular lesion revealed features of high-grade sarcoma with numerous giant cells and areas of malignant osteoid formation (Fig. 1). Large areas of cartilaginous differentiation with areas of calcifications were also observed. The lesion was limited to the upper muscular layer of the gallbladder wall. The rest of the gallbladder sections revealed foci of xanthogranulomatous inflammation (Fig. 2). The resection margins and serosa were free and there was no perineural or vascular invasion noticed. The final histological diagnosis of high-grade osteosarcoma of the gallbladder was confirmed. Postoperatively, the patient was subjected to CECT abdomen, chest, and bone scintigraphy, all of which were negative and no further treatment was advised. The patient has been on regular monthly follow-up for last 6 months and has not had any evidence of recurrence or metastasis to date.

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Patient consent statement: The author(s) have obtained written informed consent from the patient for publication of the case report details and related images.

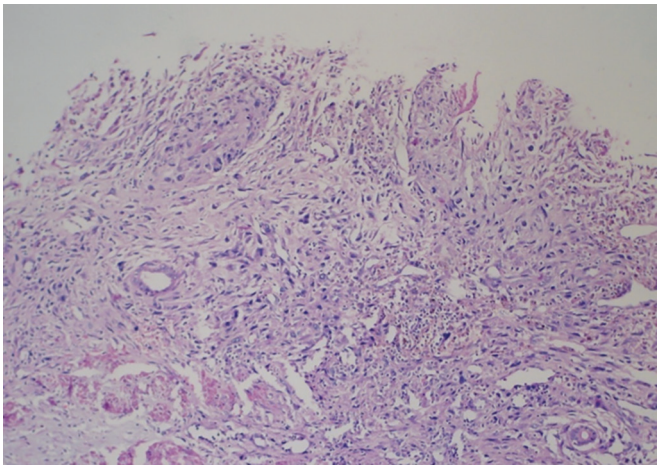

Fig. 1: Sections of the gallbladder show a focus in mucosa with pleomorphic malignant cells infiltrating the superficial muscular layer suggestive of features of high-grade sarcoma with numerous giant cells and areas of malignant osteoid formation

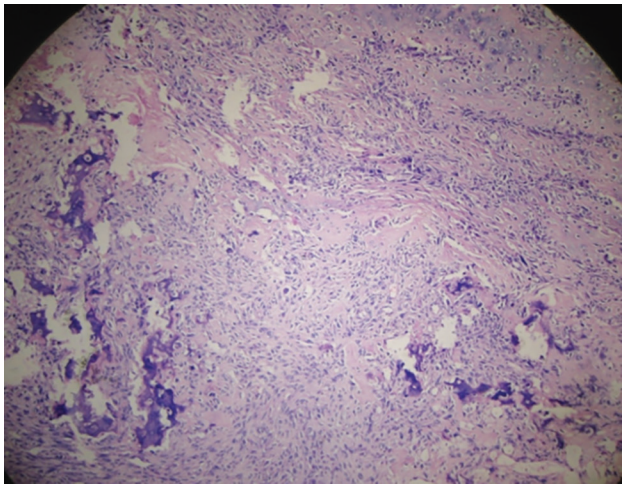

Fig. 2: Sections of the gallbladder revealing large areas of cartilaginous differentiation with areas of calcifications. The lesion is limited to the upper muscular layer of the gallbladder wall. The rest of the gallbladder sections revealed foci of xanthogranulomatous inflammation

Discussion

Extraskeletal osteosarcoma is defined as a malignant, highly aggressive mesenchymal tumor characterized by the production of osteoid in soft tissues without (or with minimal) attachment to the bone or periosteum.[5] The first case of extraskeletal osteosarcoma was reported by Wilson in 1941.[6] Extraskeletal osteosarcoma accounts for <1% of all soft tissue sarcomas and approximately 4% of all osteosarcomas.[7,8] Sites of involvement commonly include deep soft tissue of the thigh, gluteal region, upper extremities, and retroperitoneum, but can occur in any part of the body.[9] Primary extraskeletal osteosarcoma has also been reported to involve kidneys, urinary bladder, ureter, breast, mesentery, omentum, and liver.[10–16] Only four cases of extraskeletal osteosarcoma of the gallbladder have been reported in the literature.[1–4] Olgyai G et al.[1] documented the lesion on the serosal aspect, while in our case, the lesion is present on the mucosal surface infiltrating superficial portions of muscularis propria.

Most of the patients with EOS are more than 50 years of age.[15] The exact etiology of extraskeletal osteosarcoma is essentially unknown, although it has been seen in patients treated by radiotherapy for some other malignant lesion. Radiation-induced EOS can develop years following high-dose radiation.[14] The diagnosis is generally delayed as the symptoms of the disease are often vague or even absent for considerable periods. Microscopically, the tumor contains varying amounts of neoplastic osteoid, bone, and cartilaginous tissue in variable proportions with osteo-fibro-chondroblastic or giant (osteoclast) cells.[1]

Despite an adequate surgical excision of the tumor with adjuvant chemotherapy which is the best available form of treatment for patients with primary extraskeletal osteogenic sarcoma, they are known to have a poor prognosis.[12] The most common sites of metastases are the lung, regional lymph nodes, and the bone. There is no survival difference between the three main tumor subtypes and the bad prognostic factors include the tumor size and the proliferation index.[9] More than 80–90% of patients develop either local recurrence or/and metastasis to lungs and bone. Median survival time is 24 months, and the cause-specific survival rate at 5 years is less than 25%.[17]

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CASE REPORT

Iatrogenic Cystic Artery Pseudoaneurysm Post Laparoscopic Cholecystectomy: Original Case Report with Literature Review

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Abstract

Cystic artery pseudoaneurysm post laparoscopic cholecystectomy is a rare complication associated with potential risk of morbidity and mortality. This is a case of cystic artery pseudoaneurysm post laparoscopic cholecystectomy in a 27-year-old female who presented postop. day 10 post laparoscopic cholecystectomy with abdominal pain, melena, and hematemesis. Esophagogastroduodenoscopy showed no active bleeder, and initial computed tomography (CT) only showed gallbladder bed hematoma that was treated in percutaneous drainage. However, recurrent symptoms prompt a CT angiography that revealed a cystic artery pseudoaneurysm with hemoperitoneum. The pseudoaneurysm was successfully treated with transarterial catheter embolization of the cystic artery stump. She was well post intervention but required parenteral antibiotics resulting in a 2-week hospitalization, and eventually discharged.

Literature review reports only 10 cases of iatrogenic cystic artery pseudoaneurysm post laparoscopic cholecystectomy in the last two decades. Based on our literature review, the main presentation is usually hemobilia (70%), age of the patient ranging 26–79 years old, and timing of presentation ranging from 1 week to 3 years post laparoscopic cholecystectomy. The pathophysiology is often due to indirect or direct thermal injury during cauterization. Computed tomography angiography is the investigation of choice. Transarterial embolization is the treatment of choice with high success rate. However, surgery still plays a role in complex cases where embolization failed. There should be a high index of suspicion of such pathology, especially in patients who present with upper gastrointestinal bleed post cholecystectomy, so early diagnosis and treatment can be done.

Keywords: Aneurysm, Case report, Cholecystectomy, False, Hemobilia, Laparoscopic.

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Introduction

Laparoscopic cholecystectomy has been the gold standard of treatment for cholelithiasis in the 21st century. It has distinct advantages due to minimally invasive, reduced complications, and reduced hospital stay compared with open technique. It is very rarely associated with vascular complications. However, it does happen. The mechanism involved is likely due to thermal or direct injury to the vascular wall. Patients normally present with upper gastrointestinal bleed, abdominal pain, or jaundice. We here present a case report and literature review of cystic artery pseudoaneurysm post laparoscopic cholecystectomy. The presentation, diagnosis, and management are discussed.

Case Description

A 27-year-old female, who is postoperative day 11 of laparoscopic cholecystectomy presented to a private hospital with abdominal pain with hemodynamic instability. There were no intraoperative difficulties encountered during that time. Physical examination revealed that the patient was pale, with tender abdomen at the right hypochondriac region. Blood works and computed tomography (CT) scan revealed that the patient was anemic with Hb of 8.2, and CT scan showed gallbladder bed hematoma (Fig. 1). The patient is treated with blood transfusion, and an ultrasound-guided drainage of gallbladder bed hematoma was done. Subsequently, the symptoms resolved. However, the patient had an episode of upper gastrointestinal bleed 1 day post procedure, an urgent upper endoscopy was done, and no active or recent bleeders were identified. Computed tomography angiography was then done, which this time showed a cystic artery pseudoaneurysm and massive hemoperitoneum, which was not found in the first CT likely due to the masking effect of gallbladder bed hematoma. The recurrent symptom could also be explained by the loss of tamponade effect of gallbladder bed hematoma after drainage. A decision was made for angioembolization after a multidisciplinary discussion between the hepato-biliary team and interventional radiology team. Coiling of the right hepatic artery was then done (Figs 2 and 3). The patient

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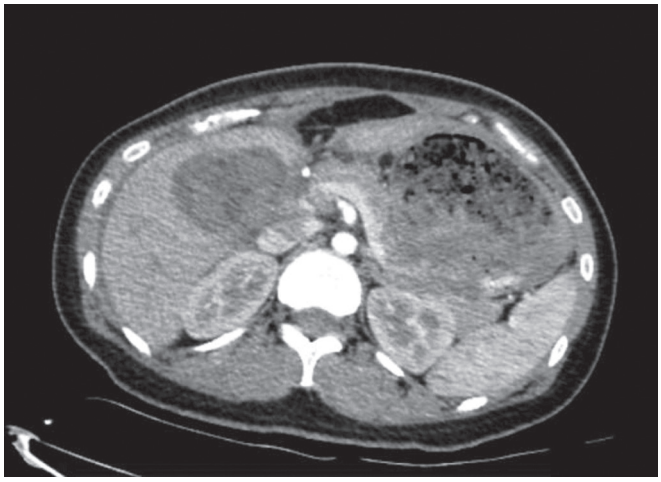

Fig. 1: Gallbladder bed hematoma

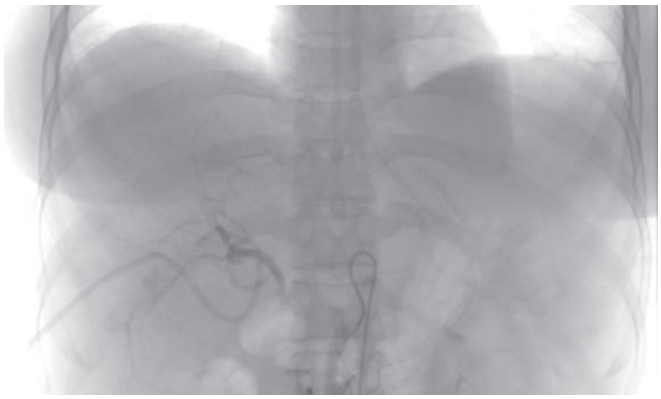

Fig. 2: Angiography preembolization

was well after that, with no more episodes of UGIB or abdominal pain, recovery was uneventful, and the patient was subsequently discharged.

Methods

An extensive literature search is carried out in the PubMed databases. All case reports of cystic artery pseudoaneurysms related to laparoscopic cholecystectomies from 2000 to 2020 are included (Table 1). Additionally, we present a case of cystic artery pseudoaneurysm that was treated in our center and included its data in the literature review.

Results

About 10 case reports were found between year 2000 and 2022, including our own case report. The main presentation was upper

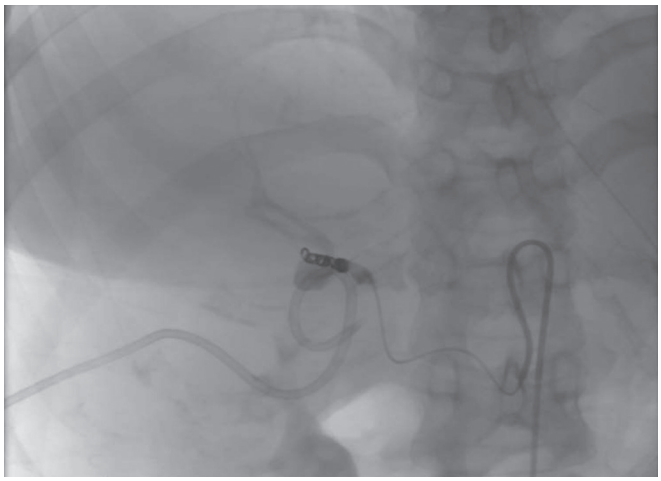

Fig. 3: Angiography postembolization

Table 1: Nine cases of iatrogenic cystic artery pseudoaneurysm post laparoscopic cholecystectomy on PubMed database from 2000 to 2020, including our case report

References	*Author*	*Year of article*	*Age*	*Sex*	*Symptoms*	*Time of presentation*	*Treatment*
Int Surg 2012;97(2):140–144[1]	Petrou A	2012	31	Female	Hemobilia	3 months	Angioembolization, followed by ligation of pseudoaneurysm
Trop Gastroenterol 2008;29(2): 107–109[2]	Moses V	2008	26	Male	Hemobilia	3 months	Angioembolization
Surg Today 2008;38(6):567–571[3]	Nakase Y	2008	63	Female	Hemobilia	11 days	Angioembolization
HPB (Oxford) 2006;8(4):318–319[4]	De Molla Nateo OL	2006	31	Female	Abdominal pain and jaundice	50 days	Ligation of RHA
J Laparoendosc Adv Surg Tech A 2006;16(6):609–612[5]	Heyn J	2006	78	Male	Hemobilia	1 year	Excision of pseudoaneurysm
Surgery 2002;131(5):585–586[6]	Saldinger PF	2002	50	Female	Hemobilia	1 week	Angioembolization
Hong Kong Med J 2018;24(2): 203–205[7]	To K	2018	56	Male	Hemobilia	4 weeks	Angioembolization
ACG Case Rep J 2017;4:e38[8]	Badillo R	2017	79	Male	Abdominal pain, Jaundice	15 months	Angioembolization
Clin Imaging 2014;38(4):522–525[9]	Kumar A	2014	45	Female	Hemobilia	3 years	Angioembolization and percutaneous thrombin injection
Current case report	Tan PH	2022	26	Female	Hemobilia	11 days	Angioembolization

gastrointestinal bleed 7 (70%), followed by abdominal pain with jaundice 3 (30%). There is a near-equal gender distribution of 6 females (60%) and 4 males (40%). The age of patients involved is wide, ranging from 26 to 79 years of age, with a mean of 48. Timing of presentation ranges from 1 week to 3 years post laparoscopic cholecystectomy. Eight patients were treated with angio-embolization (80%). Six were successful (75%), while two required further intervention. One case needed excision of pseudoaneurysm, while the other required percutaneous thrombin injection. Two cases (20%) were treated primarily with surgical intervention. There was no mortality reported in these 10 case reports.

Discussion

Cystic artery pseudoaneurysm post laparoscopic cholecystectomy is rare. Despite laparoscopic cholecystectomy being a common procedure in the 21st century, only about 10 cases were reported for the past two decades. Most case reports of vascular pseudoaneurysm post laparoscopic cholecystectomy were the involvement of right hepatic artery with only a minority involving cystic artery.[10] Multiple theories for development of such complication are proposed. Direct injury, thermal injury, and bile leaks leading to vascular wall damage are some of the proposed mechanisms. Thermal injury can be direct or indirect through metal clips. Bile acid from bile leaks causing erosion of vascular wall can be a cause as well. There was no mortality in case reports of cystic artery pseudoaneurysm reported. However, there are cases reported of mortality in other vessel involvement.

Based on our literature review, there is a wide age range of presentation ranging from 26 to 79 years of age. These data could possibly indicate that surgical factors such as difficult cholecystectomies rather than patient factors play a bigger role in the pathophysiology of such complications. However, there are insufficient data to prove this statement, as there are cases where these complications developed in the absence of intraoperative difficulties.[3] There is also wide timing of presentation postop. possibly due to the fact that the majority of pseudoaneurysms remain asymptomatic during the initial phase. However, regardless of the pathophysiology, age and time of presentation, the diagnostic and treatment modalities remain roughly the same.

Computed tomography angiography is the diagnosis of choice with high sensitivity. However, concurrent gallbladder bed hematoma could make the diagnosis difficult due to the masking effect during CT review. Modalities of treatment in most cases reported are angioembolization with a high success rate. Gel foam, coils, or thrombin can be used to embolize blood vessels. Regardless of the mode of embolization, most patients treated with transarterial embolization yield good outcome.[2,3,6–8] There is much less risk compared with surgery, and in most cases, only local anesthesia is needed. However, there is associated failure and complications, such as failure in coiling due to coagulopathies,[1] difficulties in placing, cannulation issues, misidentification of vessels, or loosely packed coils. In successful transarterial embolization, there are complications such as liver abscess,[3] ischemia, and post-procedure bleeding. In cases where service is not available or embolization failed, surgical repair would be recommended which yields good outcome.[1,4,5] The most common surgical options for pseudoaneurysm are either excision of aneurysm or ligation of the right hepatic artery. There are even reported cases where ligation of pseudoaneurysm was done laparoscopically.[11] Regardless of whether done open or laparoscopically, it does come with complications such as failure of excision. Ligation of the right hepatic artery can be done with a high success rate and a low risk of liver ischemia due to portal vein flow. Generally, surgical treatment yields good outcome based on recent literature review.[1] There is also one case reported where the cystic artery pseudoaneurysm was treated successfully with percutaneous thrombin injection. However, it does carry risk of liver ischemia, although it did not happen in this particular case.

Conclusion

Cystic artery pseudoaneurysm post laparoscopic cholecystectomy is rare but relevant in clinical settings as it is a very common procedure. There is a potential risk of high morbidity and mortality if not diagnosed and treated early. We as clinicians should have a high index of suspicion of such complications, especially in patients presenting with upper gastrointestinal bleed post laparoscopic cholecystectomy, so that it can be treated timely and appropriately.

Author's Contributuons

PHT – Data gathering, case report, and discussion writing, KCY – case report and discussion writing, ER – case report and discussion writing, NE – editor, and KK – editor.

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Availability of Data and Materials

All data and materials can be found on PubMed database with link given in references.

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CASE REPORT

Case Report: Moynihan's Hump: A Must Know Anatomical Variant for Every Laparoscopic Surgeon

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Abstract

Among the numerous anatomical variations in the hepatobiliary-vascular anatomy, Moynihan's hump, although rare, is a dangerous one. Failure of a surgeon to recognize it while operating can lead to complications like bile duct injury, bleeding and conversion to open surgery. We report a case of cholelithiasis, in which Moynihan's hump was identified during laparoscopic cholecystectomy and tackled with successfully. Further, we discuss the anatomy and surgical significance of this variation and conclude with the importance of adequate prior knowledge of hepato-biliary-vascular anatomy, achievement of critical view of safety and the use of indocyanine green dye as an adjunct to safely tackle this dangerous anomaly and prevent complications.

Keywords: Anomaly, Calot's triangle, Case report, Caterpillar hump, Laparoscopic cholecystectomy, Moynihan's hump, Right hepatic artery.

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Introduction

Rigorous research has shown us the high percentage of variations in the anatomy of the hepato-biliary-vascular region, but even today, despite the use of modern techniques and imaging, the complications of iatrogenic injuries have not reduced.[1]

Moynihan's hump is a rare (incidence of 3–13.3%) but disastrous variation, in which the right hepatic artery (RHA) has a tortuous course through the hepatocystic triangle, lying very close to the gallbladder with a short cystic artery. Misidentification of RHA as cystic artery can lead to inappropriate clipping, bleeding, or duct injury. In the literature, till date, the global proportion of Moynihan's hump in *in vivo* as well cadavers is only 7%.[1]

Case Description

A 44-year-old male presented with intermittent right hypochondriac pain of mild to moderate intensity and aggravating on eating, since the past 3 months with no comorbidities. An ultrasonogram of abdomen revealed cholelithiasis without any signs of cholecystitis. Patient underwent elective laparoscopic cholecystectomy for persistent biliary colic after preanesthetic fitness and consent. Patient was positioned in supine reverse Trendelenburg position. Pneumoperitoneum was created using Verees needle technique and subsequent trocars were inserted (anterior axillary, mid-clavicular, and epigastric) under vision. Initial visualization revealed a non-inflamed gallbladder with no adhesions. With adequate lateral traction at the Hartmann's pouch, Calot's triangle was dissected carefully at the level of infundibulum, just in line with sulcus of Rouviere. Medial and lateral peritoneum were dissected using monopolar hook to reveal a large tortuous artery running toward gallbladder and then away from it toward the liver. The size and the turning away of the artery from the gallbladder created a suspicion as to it being a tortuous RHA rather than cystic artery. On further gentle dissection using a monopolar hook, a small short cystic artery was seen arising from the tortuous RHA. Both the cystic artery and the RHA hump were anterior to the cystic duct (Fig. 1). Critical view of safety was

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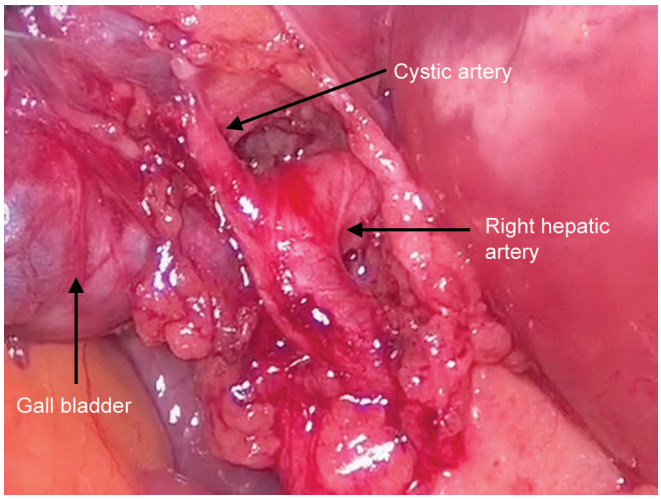

Fig. 1: Intraoperative image showing the single loop U-shaped Moynihan's hump of RHA with a short cystic artery arising from it. Both the vessels lie anterior to the cystic duct

achieved demonstrating a tortuous RHA with a short cystic artery along with a cystic duct. The cystic artery was clipped carefully close to the gallbladder without excessive traction. Cystic duct was clipped and cut and retrograde cholecystectomy was carried out with adequate hemostasis. Postoperative stay was uneventful and patient was discharged on post-op day two. Patient was asymptomatic at 3 months of follow-up.

Discussion

The anatomy of hepatobiliary triangle, that is, the biliary tree and cystic artery is complex due to three important reasons: (1) multiple vital structures (bile duct, hepatic artery, portal vein) lying in close approximation with each other, (2) multiple anatomical variations in biliary tree, cystic artery, and RHA, and (3) high incidence of these anatomical variations. These variations are as common as 20–50%.[1–5] Knowledge about these variations is a must for surgeons before operating in this critical area as the course of cystic artery cannot be determined preoperatively and can only be established by careful dissection during operative procedure. Lack of knowledge is one of the major causes of avoidable complications like bile duct injury and vascular injury. Vascular injuries can result in the conversion of laparoscopic approach to open and the incidence is 0–1.9% with a mortality of 0.2%.[3,6]

Moynihan's hump refers to the tortuous course of the RHA forming a U-shaped loop giving it a "caterpillar hump" appearance with an incidence of 3–13.3%.[1,7,8] As far as the etiology is concerned, there have been multiple theories but none have been proven to be the exact cause. According to Taylor CR,[9] architectural distortion due to cirrhosis of liver causes corkscrewing of intrahepatic arteries leading to a tortuous hepatic artery. As of now, no clinical evidence has been demonstrated to prove this hypothesis. According to Benson and Page,[4] it is not an anomaly but artifact created due to traction during cholecystectomy. Similar incidence of this anomaly in operated individuals and in cadavers disproves this hypothesis. Miyaki[10] suggested that the hump is embryological in origin. The embryonic liver is supplied by three segmental arteries arising from the aorta. The middle hepatic artery forms the future hepatic artery. The left and right fetal hepatic arteries become the accessory hepatic arteries from left gastric and superior mesenteric arteries in 25 and 18% of the cases. It is postulated that complete or partial persistence of the fetal arterial supply can lead to caterpillar hump.

Anatomically, the tortuous part of the RHA can either lie anterior to the common hepatic duct or posterior to it. The posterior location is more common (60%).[11] In our case, the artery lied anterior to hepatic duct. Depending on its tortuosity, the artery can course with a single loop (55% cases) when it is less tortuous and in double loop when it is more tortuous. The cystic artery is usually short whether it arises from single loop or double loop course, except when it arises from the proximal loop of the RHA.[12,13] Such characteristics of this anatomical variation can easily lead to complications due to (1) misinterpretation of RHA as cystic artery, (2) mechanical/tractional injury to RHA/cystic artery during dissection. These factors can cause:

- Misinterpretation of RHA as cystic artery and its complete ligation can cause right lobar ischemic necrosis of liver.
- Misinterpretation of RHA as cystic artery with its partial ligation can cause hepatic artery pseudoaneurysm leading to uncontrolled bleeding.
- Vascular injury to RHA/cystic artery leading to bleeding which obscures the surgeon's vision and prompts blind coagulation leading to injury or complete transection of bile duct.
- Conversion to open cholecystectomy due to uncontrolled bleeding from vascular injury.

Such iatrogenic complications can be prevented by simple preventive measures which include:

- Acquirement of thorough knowledge of hepatobiliary anatomical variations by the surgeon.
- Achieving the critical view of safety before ligating any structures and ensuring only two structures are attached to gallbladder.
- When in doubt about the anatomy, or difficulty in dissection of calot's triangle, a second opinion should be taken from senior surgeon and priority to be given to patient safety and outcome.
- Use of IV bolus of indocyanine green dye to delineate cystic artery – hepatic artery anatomy during cholecystectomy.[14]

Clinical Significance

Moynihan's hump is a rare but dangerous anatomical variation of hepatic artery and can only be detected intraoperatively. Failure to identify it can lead to complications like uncontrolled bleeding, conversion to open surgery, and injury to bile duct. To avoid these iatrogenic complications, a surgeon must know these variations in hepatobiliary anatomy and follow the rule of critical view of safety strictly. It is necessary to understand that each cholecystectomy must be approached as a new case and the surgeon should be thoroughly vigilant keeping his mind and eyes open.

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CASE REPORT

Heterotopic Pancreas and Gastric Mucosa in Meckel's Diverticulum: A Rare Cause of Bowel Obstruction. Our Experience and a Brief Literature Review: A Case Report

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Abstract

The triad of heterotopic pancreas and gastric mucosa in Meckel's diverticulum is an extremely rare condition. It is usually asymptomatic and often diagnosed only during surgery or diagnostic examinations for other diseases. Since it has no symptoms, it is found incidentally when the complications onset. We describe a case of Meckel's diverticulum with heterotopic pancreas and gastric mucosa who presented with a bowel obstruction in a patient with mental disability.

Keywords: Bowel obstruction, Case report, Ectopic gastric mucosa, Heterotopic pancreas, Meckel's diverticulum.

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Introduction

Ectopic pancreas, also known as heterotopic, is an anatomical abhorrent condition in which pancreas tissue has raised beyond its usual place without a real anatomical, neural or vascular relationship with the main body of pancreas. It is an uncommon disease that may involve every portion of the gastrointestinal tract.

Meckel's diverticulum is a bulge of small intestine wall present since birth and its origins from a wrong development of omphalomesenteric duct. It is present about 2% of the general population and it is frequently characterized by a habitual occurrence of ectopic tissue and approximately 4% of patients become symptomatic and require surgical excision.[1–3] Gastric mucosa, whose common complication are bleeding and ulceration, is the most common ectopic tissue present.[4,5]

Heterotopic pancreas, ectopic gastric mucosa and Meckel's diverticulum are very uncommon anatomical disorders and the presence of all three in a triad is extremely rare and often asymptomatic.[6] Acute abdominal pain, due to perforation or bowel obstruction, and other nonspecific symptoms are reported by patients but they are not pathognomonic for this disease. Based on the pathological examination, it is possible to make a definitive diagnosis.

Case Description

A 49-year-old man patient was admitted to our department in urgency with sudden abdominal pain localized in the right flank, nausea, vomiting, and diarrhea.

The patient had a history of hypertension, diabetes, and mental disability.

Physical examination on admission revealed abdominal tenderness mainly in the right flank with mild peritoneal signs of rebound and guarding. Abdominal distension and bloating were remarkable.

The laboratory exams were normal except for a neutrophilic leukocytosis; ultrasonography (US) showed diffused bowel distention without other anomalies of abdominal organs.

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Patient consent statement: The author(s) have obtained written informed consent from the patient for publication of the case report details and related images.

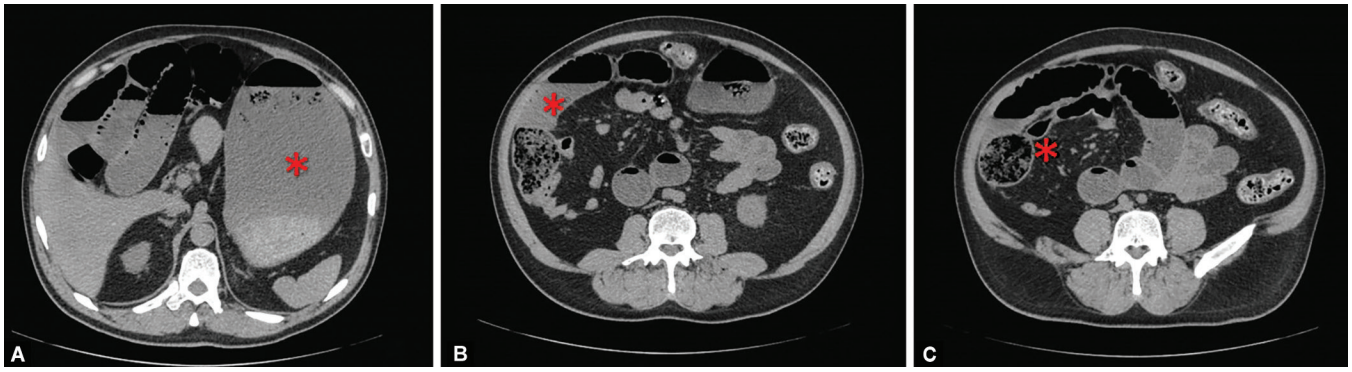
Computed tomography (CT) (Fig. 1) was performed and revealed huge gastric enlargement and widespread small bowel dilatation with air–fluid levels. Furthermore, the last tract of ileum appeared stretch with reduced caliber and peritoneal fluid was present. All radiological features emphasized a bowel obstruction.

The patient underwent explorative laparotomy that showed a diverticulum of the ileum about 60 cm from ileocecal valve with a bezoar inside it (Fig. 2). A segmental resection was performed.

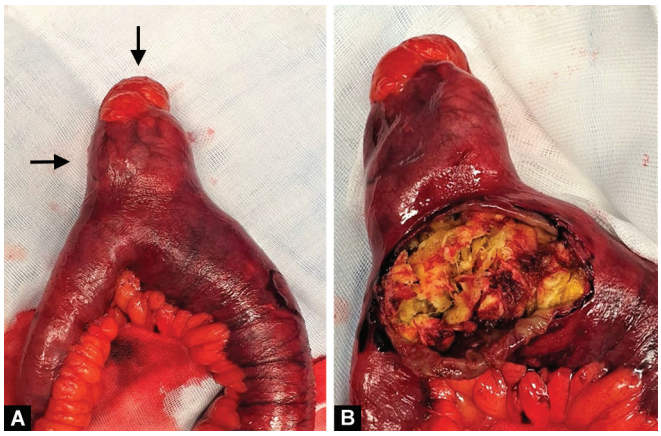
Recovery was uneventful; oral feeding restarted on second postoperative day and normal bowel functions were restored on third postoperative day. Drains were removed on fourth postoperative day and the patient was discharged on seventh postoperative day.

Pathology

Gross examination of specimen, on 10% formalin fixed, revealed an outpouching large 2 cm in diameter on the antimesenteric side of small bowel. Subsequent pathological examination revealed a



Figs 1A to C: Computed tomography (CT)-scan shows (A) Gastric enlargement; (B and C) Diffuse air-fluid levels



Figs 2A and B: (A) Segmental resection of ileum with Meckel's diverticulum (horizontal arrow) and nodular mass on serosal surface (vertical arrow); (B) Bezoar inside diverticulum

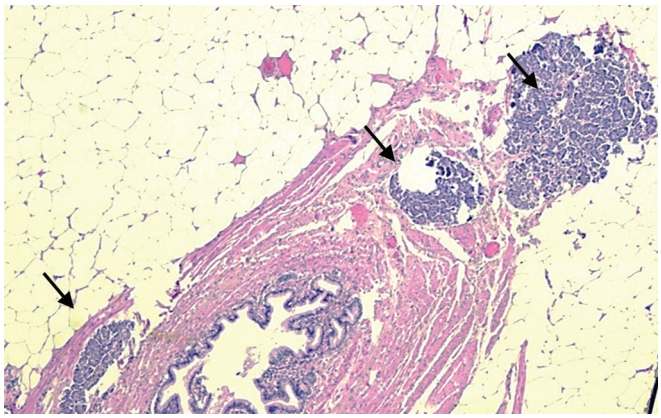


Fig. 3: Histological section (hematoxylin and eosin) of the small intestine. The figure shows the Meckel's diverticulum with the presence of heterotopic pancreatic tissue (arrow)

Meckel's diverticulum of ileum with a nodular mass, yellow–gray colored, large from 0, 2 to 1, 3 cm in diameter on serosal surface (Fig. 2A).

Microscopic examination (Fig. 3) on paraffin embedded sections revealed ectopic gastric epithelial tissue lining the diverticulum that consists of well-differentiated duct-like structures (some of these enlarged) intimately adjacent to muscle bundles (Figs 4A and B).

Ectopic pancreatic tissue, composed of acini, islets and ductal structures with the usual lobular architecture, was observed in subserosa (Fig. 4C).

In 1909, Heinrich[7] classified heterotopic pancreas in three types but in 1973 Fuentes et al. established the current classification.[8]

Using the modified criteria, we classified heterotopic pancreas in type 1 since exocrine tissue, excretory pancreatic ducts and islets of Langerhans were present.

Diagnosis of heterotopic pancreas inside a Meckel's diverticulum was made.

Discussion

Meckel's diverticulum is the most prevalent disease of alimentary tract present in 1–3% of autopsy caused by a wrong development of omphalomesenteric duct with an incomplete closure of it.[9] It originates from an unusual communication between the embryonic yolk sac and primitive mid-gut during first 2–3 weeks of pregnancy. In 1598, Fabricus Hildanus described for the first time a Meckel's diverticulum but only in 1809, when Johann Friedrich Meckel explained its embryological origin, it was named in this way.

Since it involves all layers of bowel wall, including muscularis propria and adventitia, it is classified as a true diverticulum. It occurs more frequently in males compared to female.

Meckel's diverticulum is frequently asymptomatic and it is diagnosed when complications occur or incidentally during surgery and radiological exams of small intestine.

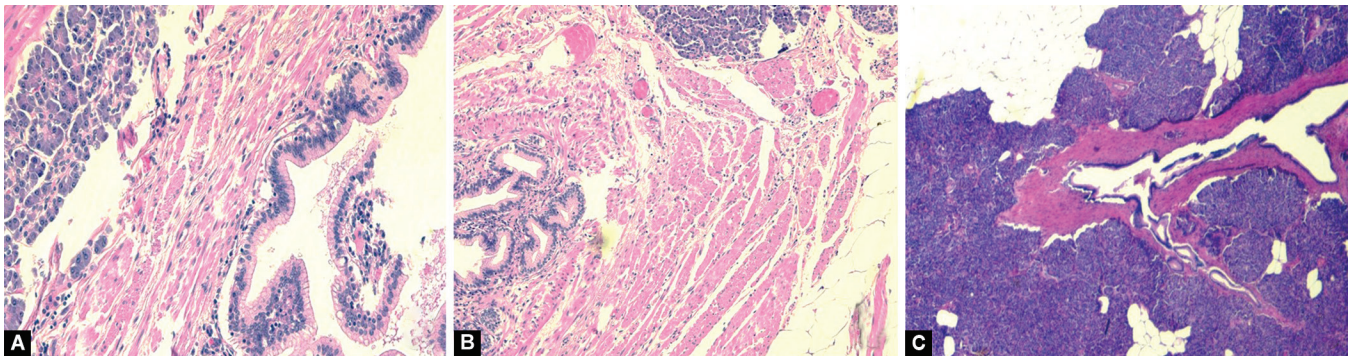
Clinical manifestations include gastrointestinal blending, obstruction, diverticulitis and neoplasm.

In the most important series recorded by Park et al. from 1950 to 2002, only 16% of the 1,476 patients collected were symptomatic and the most common complications were bleeding (38%), obstruction (34%) and diverticulitis (28%).[10]

Ectopic gastric mucosa is recurrently present in about half of Meckel's diverticulum with a reported incidence of 23–50% of the cases. Acid release from ectopic gastric mucosa may lead to ulcers and also to chronic or acute bleeding.[11]

In 1727, the first case of pancreatic tissue in a diverticulum of the ileum was described by Jean Schultz.[12,13] Since many patients are asymptomatic the real incidence remains undetermined and prevalence data show the presence of heterotopic pancreas at 0.2% of laparotomy and at 14% of autopsies.[13]

The origin of heterotopic pancreas is unclear, but surely it seems to data back to fetal life during the process of rotation of foregut and the following fusion of the dorsal pancreatic



Figs 4A to C: (A and B) Meckel's diverticulum with ectopic gastric mucosa and heterotopic pancreatic islets; (C) Pancreatic tissue with cystic dilatation of the ducts

buds with the ventral one. Some cells switch from it and develop into ectopic pancreas in any portion of the gastrointestinal tract.[14] Another theory is built on the pancreatic metaplasia of endodermal tissue.[15] Although heterotopic pancreas can be found in every part of the gut, it is usually found in the upper tract of gastrointestinal system.

Heterotopic pancreas may be classified into the following three types:

- Type I: With the presence of ducts, acini and endocrine islets similar to those visible in a normal pancreas.
- Type II: With a large number of acini, a few ducts and without islets.
- Type III: With several ducts, rare acini and without islets.

Pearson found heterotopic pancreas only in 3% of ileus and 6% of Meckel's diverticulum in 589 cases.[16] Another large series of 212 cases recorded by Dolan RV found only 1.4% cases of ectopic pancreas in the ileum wall and 5.2% cases in Meckel's diverticulum.[17]

Patients are usually asymptomatic unless intestinal obstruction, intussusception, inflammation or malignant change onset.[18] The symptoms (diverticulitis, ulceration and chemical irritation) may be caused by the release of hormones and enzymes from the ectopic tissue.

Trials focused on heterotopic pancreas and gastric mucosa in Meckel's diverticulum are few.

Approximately half of cases of small intestinal heterotopic pancreas are asymptomatic and when symptoms occur, abdominal pain and gastrointestinal bleeding are most common.[19,20] On the contrary, the association of heterotopic pancreas and gastric mucosa in Meckel's diverticulum may be quite symptomatic and may cause severe clinical manifestations and complications, in fact gastrointestinal bleeding is the onset symptom in these patients as well as small bowel obstruction.

Despite the development of modern diagnostic exams, the definitive diagnosis before surgery remains a challenge.

Computed tomography is first level exam in the study of small bowel diseases but still now is unknown the effective role in clinical practice for the diagnosis of heterotopic pancreas and Meckel's diverticulum, especially in urgency. Moreover, Meckel's diverticulum, mainly the ones smaller than 3 cm, may be difficult to distinguish from normal small bowel loops on CT-scan.[21]

According to the literature surgery is the gold standard management and a laparoscopic or open segmental small bowel resection is the right surgical choice.

Although the preoperative diagnosis is very difficult, the definitive diagnosis is based only on pathological examination of surgical resected.

Conclusion

Heterotopic pancreas and gastric mucosa in Meckel's diverticulum is an extremely rare condition, often asymptomatic. Preoperative diagnosis may be challenging and often difficult. Surgical resection is the standard treatment and the definitive diagnosis is confirmed by histological examination.

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CASE REPORT

Laparoscopic Distal Pancreatectomy for Primary Pancreatic Hydatid Cyst with Lateral Portal Hypertension: A Case Report

Shahbaz Bashir[1], Mubashir Ahmad Shah[2], Irshad Ahmad Kumar[3], Irfan Nazir Mir[4]

Received on: 01 August 2022; *Accepted on:* 20 February 2023; *Published on:* 19 December 2023

Abstract

Hydatid cysts of the pancreas are quite uncommon. Even more uncommon are pancreatic hydatid cysts associated with portal hypertension. The illness may manifest either simultaneously with systemic involvement or as an isolated pancreatic involvement. Both of these scenarios are possible. We provide the first instance of a patient who had a laparoscopic distal pancreatectomy for treatment of a pancreatic hydatid cyst associated with lateral portal hypertension. There were neither complications nor recurrences of the condition. A male patient of 25 years old was brought into our facility complaining of epigastric and back discomfort. The patient's upper abdominal contrast enhanced computed tomography showed a unilocular cystic lesion (10 cm × 9 cm × 7 cm) in the tail of the pancreas, coupled with several collaterals at the splenic hilum, along the greater curvature of the stomach, and at the pylorus. He had a laparoscopic procedure of distal pancreatectomy, along with a splenectomy. His recovery from surgery went well, and a histological analysis revealed a hydatid cyst in both the pancreatic tail and body.

Keywords: Case report, Hydatid cyst, Pancreatic surgery, Portal hypertension.

World Journal of Laparoscopic Surgery (2023): 10.5005/jp-journals-10033-1566

Introduction

Because of the broad availability of cross-sectional imaging methods, a rising number of pancreatic cystic neoplasms, the vast majority of which are found in asymptomatic individuals, are being detected.[1] Studies have shown that the occurrence of pancreatic hydatid cysts is less than 1%. This indicates that they are a relatively uncommon condition.[2] The illness may manifest either simultaneously with systemic involvement or as an isolated pancreatic involvement. Both of these scenarios are possible.

We present what we believe to be the first case ever documented in the worldwide medical literature of a patient who had laparoscopic distal pancreatectomy combined with splenectomy in order to treat a pancreatic hydatid cyst that was accompanied with lateral portal hypertension.

Case Description

A male patient aged 25 years who had a history of one episode of malena was hospitalized at our hospital complaining of epigastric discomfort that had been steadily worsening over the previous 3 weeks. There was no history of either medical treatment or surgical procedure. In respect to the pancreatic tail, a USG examination also showed an anechoic region with uneven boundaries of 7 cm × 8 cm × 7 cm. A unilocular cystic lesion of 10 cm × 9 cm × 7 cm was discovered by CECT (Fig. 1) in the body and tail of the pancreas. This lesion caused an obstruction in the splenic vein and several collaterals at the splenic hilum and along the greater curvature of the stomach.

One trocar with a 12 mm size, one with a 10 mm size, and two with a 5 mm sizes were inserted. The cyst was uncovered when the opening in the lesser sac was made. Ligaclips and hormonic were used in order to split the short gastric vessels in addition to the significantly dilated collaterals. A large cyst and the distal portion of the pancreas were removed from the retroperitoneum during the procedure. The attachments of the spleen were severed during the procedure. Close to the cyst, both the splenic artery and vein were severed and clamped with a surgical clip. Endostapler was used in order to section the pancreatic tissue. Finally, the cyst was mobilized, and the cyst and the distal pancreas as well as the spleen were removed by dissection. After that the specimen was extracted via a smaller incision that was made in the connection between the two 5 mm holes. An incision was made in the pancreatic cyst, and a layered hydatid membrane was extracted from the cyst (Fig. 2).

The patient was released without any issues 5 days after the procedure since his postoperative course was uncomplicated. The presence of a hydatid cyst in the pancreas was shown by the postoperative histological examination. CECT scans performed as a follow-up confirmed that there was no fluid accumulation and neither was any sign of recurrence.

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Patient consent statement: The author(s) have obtained written informed consent from the patient for publication of the case report details and related images.

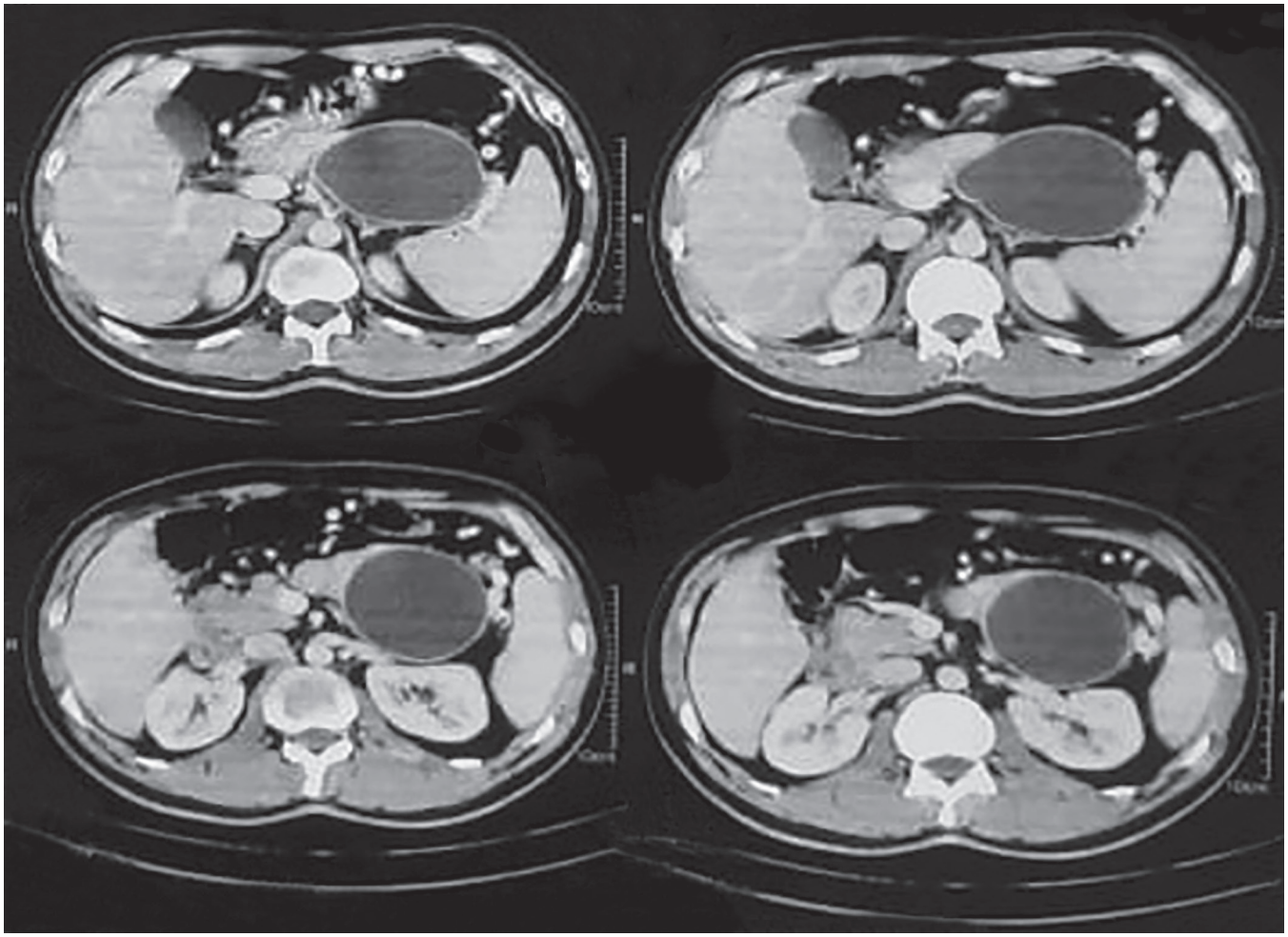


Fig.1: CT scan showing pancreatic cyst

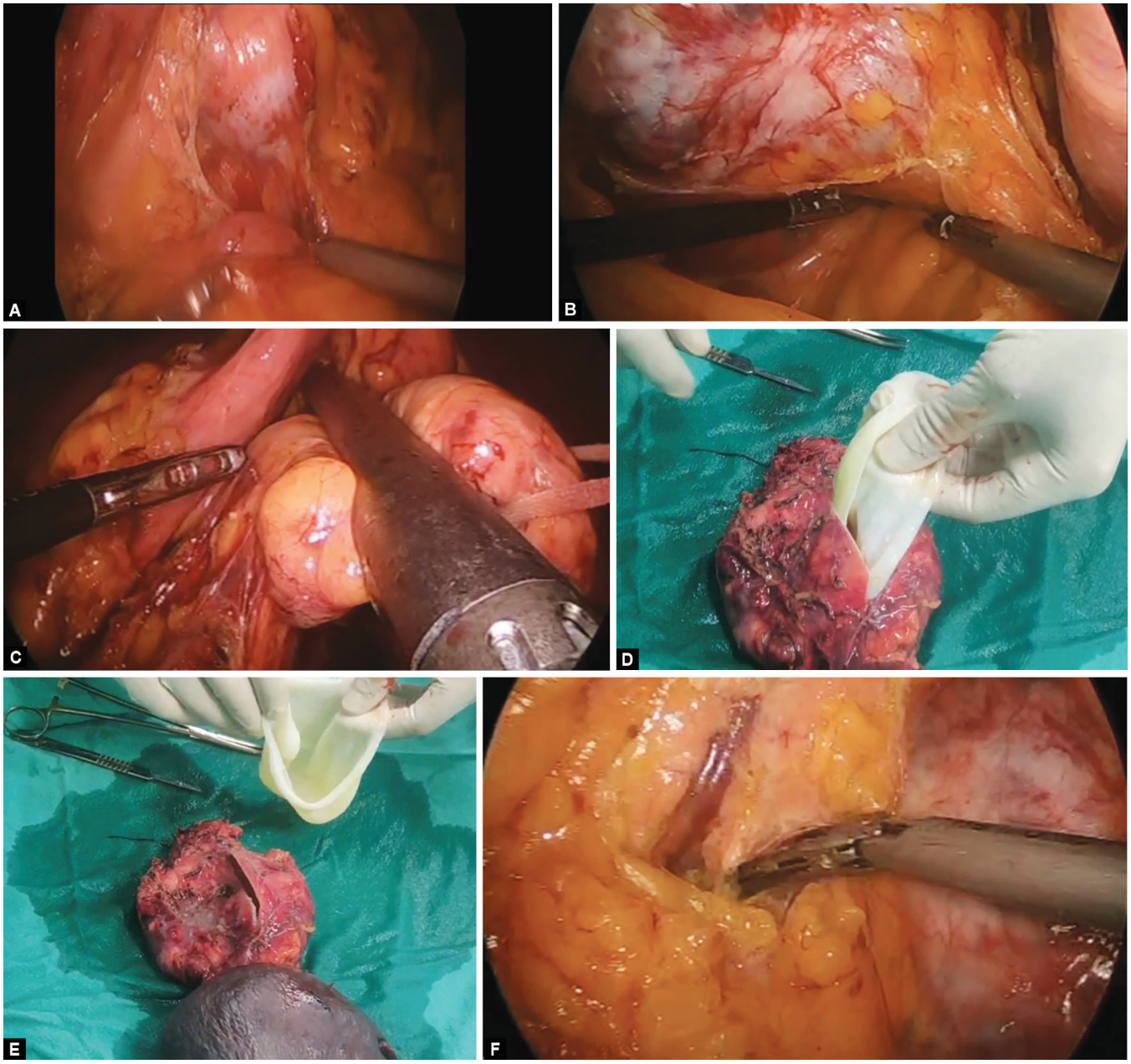
Discussion

When a pancreatic cystic lesion is detected in areas where *Echinococcus granulosus* is an endemic pathogen, it is important to take into mind the possibility of pancreatic hydatid cysts. In circumstances in which there is not also a contemporaneous hydatid cyst lesion in the liver, as was the case with our patient, the process of diagnosis is made much more challenging. The liver, followed by the lung, is the organ that is most often affected by the proliferation of parasites. Even in regions of the world where echinococcal illness is frequent, hydatid cysts developing in the pancreas are a rather rare occurrence. The existence of a serous cyst adenoma is the most prevalent form of a differential diagnosis that may be made between a hydatid cyst and a pancreatic cystic tumor. Even though it is very uncommon, pancreatic hydatidosis need to be taken into consideration when making a differential diagnosis of cystic lesions of the pancreas in the right epidemiological context.

About 50–57% of the cases, 24–34% of the cases, and 16–19% of the cases, respectively, have the pancreatic hydatid cysts positioned in the head of the pancreas, the corpus of the pancreas, and the tail of the pancreas.[3] The majority of instances of pancreatic hydatid cyst are characterized by the presence of a single lesion.

The clinical appearance might vary greatly depending on the location of the pancreatic cyst and how far it has spread throughout the pancreas. The primary clinical symptoms, which were seen in our patient, were pain and discomfort in the epigastric region, as well as vomiting. The external compression of the common bile duct may be a contributing factor in the development of obstructive jaundice. Cysts that were positioned in the body or the tail almost never produced any symptoms and could only be identified by their existence as a mass and the following impact it had. A complication, such as a rupture into the biliary tree or into the peritoneal cavity, abscess development, or the compression of splenic vein producing portal hypertension, as was found in our case, might nonetheless disclose the presence of a hydatid pancreatic cyst. Only via surgical removal of the pancreas can a definite diagnosis of hydatid disease of the pancreas be obtained.

Surgical procedures, both open and laparoscopic, as well as minimally invasive treatments, biopsy-aspiration-injection-reaspiration, and medicinal therapy are all potential alternatives for treating the condition.[4] Open surgical procedures have been accepted as the gold standard among the treatment options;[4] however, developing surgical techniques and technologies have enabled laparoscopic operations for hydatid cysts to be performed more safely.[4] In patients who are wanting to undergo full resection without opening the cyst, laparoscopic surgical procedures that are conducted by skilled surgeons are at least as effective and safe as open surgical procedures. This is particularly true in cases when



Figs 2A to F: (A) Left; (B) Right; Dissecting distal pancreas along with huge cyst; (C) Doing distal pancreatectomy; (D and E) Laminated hydatid membrane retrieved from the cyst; (F) Collaterals around distal pancreas

the cyst is not going to be opened.[5] Faraj et al.[6] were the first to describe a laparoscopic partial cystectomy for an isolated pancreatic hydatid cyst that did not result in any recurrence for a period of six months. Resection with clean margins should be conducted without opening the cyst until it can be shown that there are no cystic neoplasms present.

Conclusion

A primary infection of the pancreas with *E. granulosus*, which results in the development of hydatid cysts, is a disease that occurs infrequently. Cystic lesions of the distal pancreas, such as hydatid cysts, are amenable to laparoscopic excision, and the procedure is completely risk-free. It may be possible to keep the rates of complications and recurrence to a minimum by performing the necessary surgical resection followed by the necessary medicinal therapy.

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CASE REPORT

Rapunzel Syndrome Presenting with Intussusception and Pancreatitis: A Case Report

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Abstract

Background: Bezoars are ingested foreign materials accumulated most commonly in the stomach as a hard mass. A gastric bezoar composed of hair (Trichobezoar) that has a long tail that extends beyond the pylorus throughout the small bowel and very rarely to the cecum is described as Rapunzel syndrome.

Case presentation: A 14-year-old girl presented with abdominal pain (4 days) with bilious vomiting (1 day). Contrast-enhanced computed tomography (CECT) scan showed a bezoar extending from the stomach to the small bowel within a jejunojejunal intussusception. Serum amylase levels were also elevated. The entire bezoar was extracted laparoscopically after reducing the jejunojejunal intussusception, subsequently, the patient recovered well and has been well after 2 years.

Conclusion: Patients with Rapunzel syndrome can present with intussusception or with pancreatitis, or rarely with both, as seen in our patient.

Keywords: Case report, Children, Ileoileal intussusception, Laparoscopy, Pancreatitis, Rapunzel syndrome, Trichobezoar.

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Background

Trichobezoar was first reported in the 18th century, when Baudamant described a 16-year-old boy with this condition.[1] trichobezoars occur in patients with recognized diagnosis of trichotillomania (compulsive desire to pull out one's hair) and trichophagia (repeated ingestion of hair).[2] About 10% of patients with trichotillomania demonstrate trichophagia.[3] Typically, a history of psychiatric illness and anxious behavior is noted in such patients with trichobezoars.

It can take at least 6 months for a trichobezoar to induce symptoms although different time courses have been reported.[4] The diagnosis is usually delayed in patients with trichobezoars, as generally they do not always give a clear history of hair ingestion. Plain abdominal X-rays often show a nonspecific mass appearance in the left upper quadrant. Upper gastrointestinal contrast studies reveal a filling defect within the stomach[5] but are not diagnostic. Ultrasound scan will demonstrate increased echogenicity secondary to intermixed hair, food, and air in the bezoar, and these are suggestive of bezoars. Computed tomography (CT) scan imaging shows heterogeneous mass with trapped air and is usually diagnostic.[6,7]

Trichobezoars are usually confined to the stomach, however, they can form more distal to the stomach as well and extend into the small intestine as a tail and such cases are described as Rapunzel syndrome.[8] We present a unique case of Rapunzel syndrome who presented with both pancreatitis and jejunojejunal intussusception, which we believe has not been reported so far. Herein, we discuss the presentation as well as the laparoscopy-assisted management of this case.

Case Presentation

A 14-year-old girl presented to our ER with epigastric abdominal pain for 4 days, repeated episodes of bilious vomiting for 1 day, and a prolonged reduced appetite. She had been well previously, and her parents initially did not report of any medical problems in the past. She appeared malnourished, dehydrated, and had tachycardia. She also had tenderness in the epigastric region along with guarding. She was fluid-resuscitated immediately, and her vitals stabilized. Except for slightly elevated serum amylase 134 U/L, lipase levels 89 U/L, and neutrophilia 81%, the rest of the blood tests were within the normal range. An initial ultrasound scan of the abdomen showed epigastric fullness and intraluminal small-bowel echogenic pathology, which was unclear. In view of this and suspected pancreatitis, a contrast-enhanced computed tomography (CECT) abdomen was done, which showed jejunojejunal intussusception along with a long abnormal intraluminal mass acting as a lead point within the intussuscepted bowel loops. The intussuscepted mass was seen originating from a large ovoid structure occupying the entire stomach (Fig. 1). This ovoid structure of mixed density and interspersed air specs within the stomach was suggestive of

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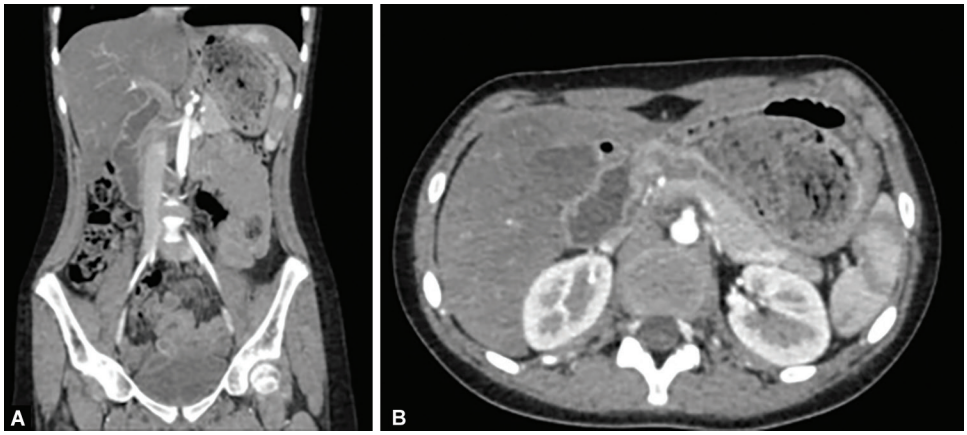

Figs 1A and B: CT images of our patient pre-op showing: (A) A large ovoid structure of mixed density and interspersed air specs occupying the stomach, consistent with bezoar; (B) Long segment of proximal jejunojejunal intussusception with oblong bezoar filling the lumen

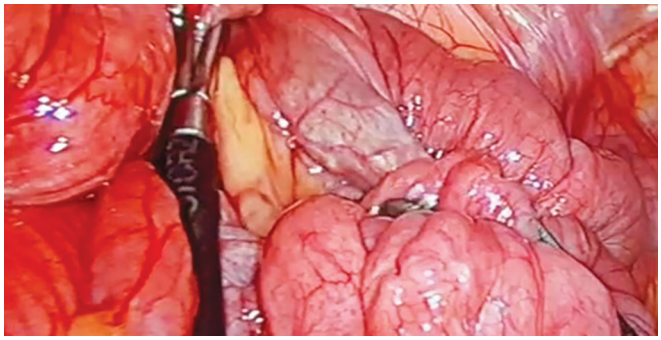

Fig. 2: Intraoperative laparoscopic picture showing jejunojejunal intussusception in our patient

a trichobezoar (ball of hair). On further inquiry, parents reported that their child had been ingesting hair in the past (6 years ago) but not recently.

In view of the CT findings, the child was taken up for emergency laparoscopy, after adequately counseling both parents and the child. Laparoscopic reduction of jejunojejunal intussusception (Fig. 2) was performed, followed by gastrotomy and excision of trichobezoar along with its 4-feet tail (Fig. 3), laparoscopically into an endo bag. The entire bezoar was brought out within the endo bag in toto through a small 4 cm pfannenstiel incision, and 2 drains were left *in situ*. Postoperatively, the child was kept nil oral with continuous nasogastric drainage, and broad-spectrum intravenous antibiotics continued. Serum electrolytes and trace elements were regularly monitored. Serum amylase levels returned to normal within few days. Cultures from the trichobezoar grew *Klebsiella pneumoniae* and *Escherichia coli*. Antibiotics were escalated and rationalized as per the sensitivity results.

However, soon she developed persistent low-grade fever, high bilious NG aspirates, and hypokalemia. Both drains had drained minimal serous fluid and stopped draining on day 3 postoperatively. Abdominal X-rays revealed dilated bowel loops, suggesting paralytic ileus, but her symptoms persisted. In view of this, an ultrasound scan of the abdomen was performed on day 4 following surgery. This showed multiple intra-abdominal collections with likely bowel adhesions and was confirmed by a repeat CT scan. The collections were drained, and adhesiolysis was performed laparoscopically on day 5. Intraoperatively, a small gastric leak was noted and was closed with an omental patch.

Fig. 3: Trichobezoar with its 4-feet long tail extracted via endo bag laparoscopically in our patient

Total parenteral nutrition (TPN) via a central venous line was commenced postoperatively. Subsequently, the fever subsided and the bilious NG aspirates reduced considerably. Oral feeds were introduced slowly to prevent refeeding syndrome. Serum electrolytes and trace elements were monitored regularly and were normal. She tolerated feeds very well, regaining her appetite, and walked home as a happy child with a total length of 10 days in the hospital. Both the patient and her parents were counseled adequately by our psychiatrist to address her trichophagia. After 2 years, the child, now an adult, is eating, drinking well, and had gained weight without any signs of recurrence of pancreatitis.

Discussion

Patients with Rapunzel syndrome can present with symptoms ranging from a painless mass per abdomen with early satiety, to bowel obstruction and frank gastrointestinal perforation.[9,10] Many associated complications with Rapunzel syndrome have been reported such as small-bowel intussusceptions, cholangitis, pancreatitis, hypoalbuminemia and biliary obstruction.[11] It has been postulated that the tail of the bezoar and the intraluminal strands interfere with small-bowel peristalsis, resulting in bowel dysmotility and acting as a lead point, predisposing such patients

to intussusception.[12] Another theory explained by Naik et al. is a purse-string effect due to shorter length of the bezoar tail compared with the length of the small intestine, leading to small bowel intussusception.[13] These small-bowel intussusceptions in Rapunzel syndrome have also been reported in patients with small-bowel obstruction[14] as well as in patients who were completely asymptomatic.[15] Our patient presented with bilious vomiting, which could have been secondary to either multiple high jejunojejunal intussusceptions causing bowel obstruction or pancreatitis, as both were seen in our patient.

Rapunzel syndrome is a very rare cause of pancreatitis but should be considered as one of the differential diagnoses. Pancreatitis due to obstruction of ampulla of vater by the bezoar has been reported.[16] Schreiber and Filston first described that the irritation by the bezoar tail extending into the duodenum causes edema and obstruction to the drainage of bile,[17] which explains the transient nature of the pancreatitis that resolves after removal of the bezoar as seen in our patient. Derangement of liver enzymes, acute cholangitis, and cholestasis are also some of the rare reported biliary complications caused by the bezoar.[17] Although 10 cases of pancreatitis associated with Rapunzel syndrome have been reported so far,[11] none of them report on both pancreatitis and jejunojejunal intussusception seen in Rapunzel syndrome, as seen in our patient.

Upper gastrointestinal endoscopy can establish the diagnosis of a gastric bezoar; however, endoscopic retrieval is difficult and rarely the definitive treatment.[18] The initial treatment of trichobezoars and Rapunzel syndrome is almost exclusively surgical. Most of these cases reported laparotomy for removal of the bezoar. However, laparoscopy-assisted removal of large and long bezoars is feasible but more challenging,[19–21] resulting in less scarring for the already mentally traumatized patients. In our patient, the entire 4-feet-long bezoar was removed in an endo bag laparoscopically assisted with a small pfannenstiel incision, and we recommend laparoscopic approach in all such cases.

Psychiatric evaluation is an important component of the treatment and should be done in every such patient to prevent relapse. Psychiatric intervention is effective in treating trichophagia and should be considered as a standard component of treatment.[22] Recurrence requiring reoperation has been reported in very few patients and is mostly due to lack of psychiatric follow-up.

Conclusion

Trichobezoars are usually confined to the stomach; however, they can extend as a tail into the small intestine, and such cases are described as Rapunzel syndrome. Patients with Rapunzel syndrome can be asymptomatic or present with bowel obstruction secondary to intussusception or with pancreatitis, or rarely with both, as seen in our patient.

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CASE REPORT

Should We Excise the Ectopic Liver Tissue Associated with the Gallbladder Encountered during Laparoscopic Cholecystectomy? Case Report

Zeki Öğüt[1], Adem Tunçer[2], Felat Çiftçi[3]

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Abstract

There is no consensus regarding the clinical management of hepatic choristoma, which is a rare condition during cholecystectomy surgeries. Data regarding the increased risk of malignancy are questioned. In our case, we added a new case to this discussion.

Keywords: Case report, Ectopic liver tissue, Gallbladder, Hepatic choristoma.

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Background

Choristoma means the presence of normal cells or tissues in abnormal localizations. The clinic of these tissues is usually insignificant, but depending on their appearance, they can be confused with malignant masses.[1] Ectopic liver, diaphragm, hepatic ligaments, omentum, stomach, adrenal glands, pancreas, spleen, esophagus, and umbilical cord can be found in intra, extra, and retroperitoneal regions such as retroperitoneum and thorax, but the gallbladder is the most common site.[2] In this paper, we will present a case of hepatic choristoma, which was discovered incidentally during elective laparoscopic cholecystectomy and did not require resection.

Case Description

A 44-year-old female patient was admitted to our clinic 2 months after her acute cholecystitis attack and treatment. The patient's physical examination was normal, and laboratory analyses were normal. There was no finding in favor of choristoma in the patient with cholelithiasis in his radiological imaging. Intraoperatively, incidentally, there was an ectopic liver tissue of approximately 15 × 5 mm in size, originating from the liver on the left side of the gallbladder and attached to the serosa of the gallbladder (Fig. 1). Standard laparoscopic cholecystectomy was completed without disconnecting the hepatic choristoma from the liver. Postoperative follow-up of the patient was uneventful. The histopathological findings were chronic cholecystitis and cholelithiasis.

Discussion

Hepatic choristomas are a rare condition that is usually encountered incidentally during abdominal surgery. Most hepatic choristomas are asymptomatic; rarely, they can be symptomatic.[3] Ectopic tissue is usually attached to the serosa of the gallbladder or within its wall. If the ectopic liver receives its blood supply from the liver parenchyma, resection may prolong bleeding and operative time, as it may cause uncontrollable bleeding during resection. Previous studies have reported increased malignancy due to vascular nutrition and biliary drainage of the choristoma.[4,5]

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Source of support: Nil

Conflict of interest: None

Patient consent statement: The author(s) have obtained written informed consent from the patient's parents/legal guardians for publication of the case report details and related images.

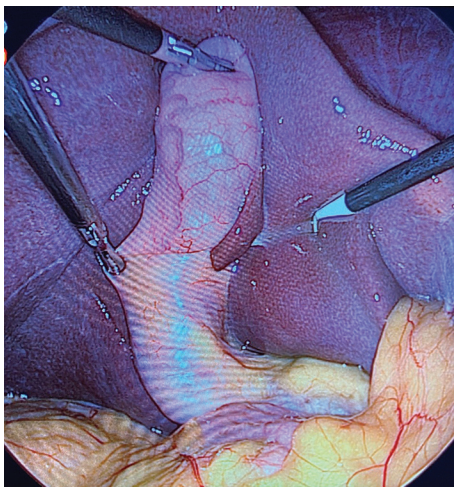

Fig. 1: Hepatic choristoma

In recent studies, it has been determined that these choristomas do not have any findings in favor of increased malignancy.[6] Since the risk of malignancy is not high, we did not resect the

choristoma in order not to prolong the operation time and not cause complications.

Clinical Significance

The thought that the risk of malignancy is greatly increased in hepatic choristoma should not lead us to major resections and major surgical procedures. We think it is very valuable to give the surgeon the right to make choices on a case-by-case basis.

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CLINICAL TECHNIQUE

Stapled Side-to-side Colo-anal Anastomosis in Middle and Upper Rectal Tumors: A Modification in the Technique

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Abstract

Aim: The aim of reporting this technique is to show the new surgical method and its feasibility.

Background: Stapled colo-anal anastomosis is preferred in laparoscopic and open anterior and low anterior resection (LAR). Placement of purse-string suture around the anvil in the colon is an important step. Failing to place these sutures properly can lead to an incomplete doughnut, which can further lead to an anastomotic site leak and a whole spectrum of complications thereafter.

Technique: We adopted an innovative method, where we inserted an anvil through the specimen site of the colon and brought out its pin through the antimesenteric site of the colon just before the division. It ascertains a complete doughnut each and every time in a quick time.

Conclusion: Stapled colo-anal anastomosis is an easy and quick method with equal safety as a handsewn method; however, failure of the purse-string suture is responsible for an anastomotic leak, which leads to short-term and long-term complications. This could be avoided by our adapted technique.

Clinical significance: This paper describes our technique, which can decrease the incidence of colo-anal anastomosis leak and all the spectra of postoperative complications, most importantly, sepsis and anastomotic stricture.

Keywords: Colo-anal anastomosis, Incomplete doughnut, Low anterior resection.

World Journal of Laparoscopic Surgery (2023): 10.5005/jp-journals-10033-1572

Aim

The aim of reporting this technique is to show a new surgical method and its feasibility, which is certainly able to get the complete doughnut in lower anterior resection procedure and subsequently decrease postoperative complications.

Background

Upper and middle rectal cancer is surgically managed by an anterior or low anterior resection (LAR). The minimally invasive method has been popularized and made easy with the introduction of a circular stapler. The main technical issue is to obtain a complete doughnut. Failing to do so can lead to anastomotic leak, sepsis, and subsequent anastomotic site stricture. This can further lead to poor outcomes in the form of significant morbidity and mortality. Various technical modifications have been advocated by different surgeons across the globe. Herewith, we are presenting a modified, quicker, and easier-to-perform surgical technique to get a complete doughnut each time.

Surgical Technique

Preoperative Preparation

Patients were kept on a liquid diet for 24 hours, followed by nil per oral for a minimum of 6 hours. Mechanical bowel preparation was done in all patients. Preoperative diverting stoma consent was taken in case of anastomosis below peritoneal reflection, poor nutritional status, and neoadjuvant chemoradiotherapy.

Intraoperative Technique

Patients were positioned in modified Lloyd-Davies position. Compression stockings were applied in all cases. Single doses of antibiotics covering gram-positive and gram-negative bacteria were given at the time of induction. All five standard laparoscopic ports were placed.

Resection

The rectum and descending colon were mobilized, keeping total mesorectal excision (TME) in mind and adequate proximal and distal margin with required lymphadenectomy. The rectum was distally divided with stapler by laparoscopic or open method.

Reconstruction

Reconstruction was done by making enterotomy at a point distal to the anticipatory proximal transection line (APTL), just enough to admit the anvil, and then the anvil was carefully migrated proximally to APTL by gradual milking (Fig. 1). The anvil pin was taken out through the teniae coli at the antimesenteric border of the colon and a silk suture was tied around the pin to avoid displacement

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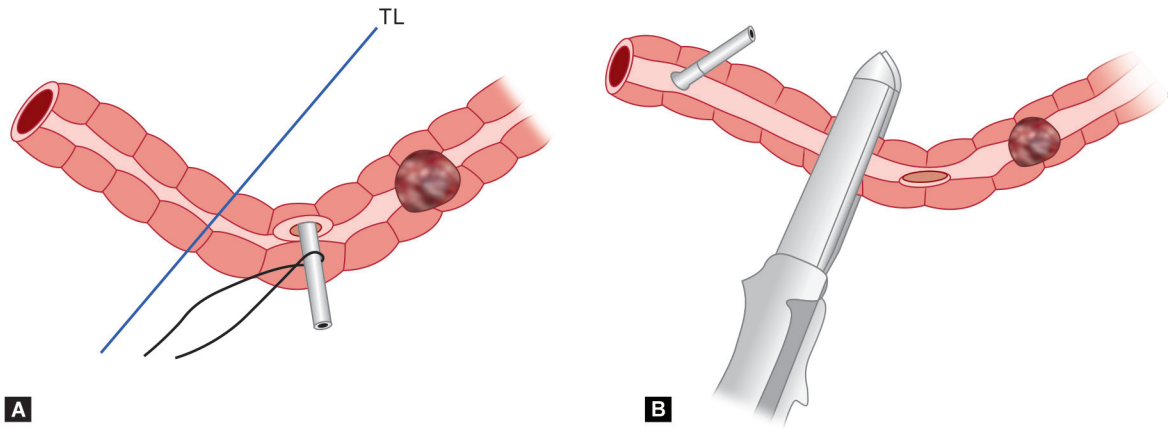
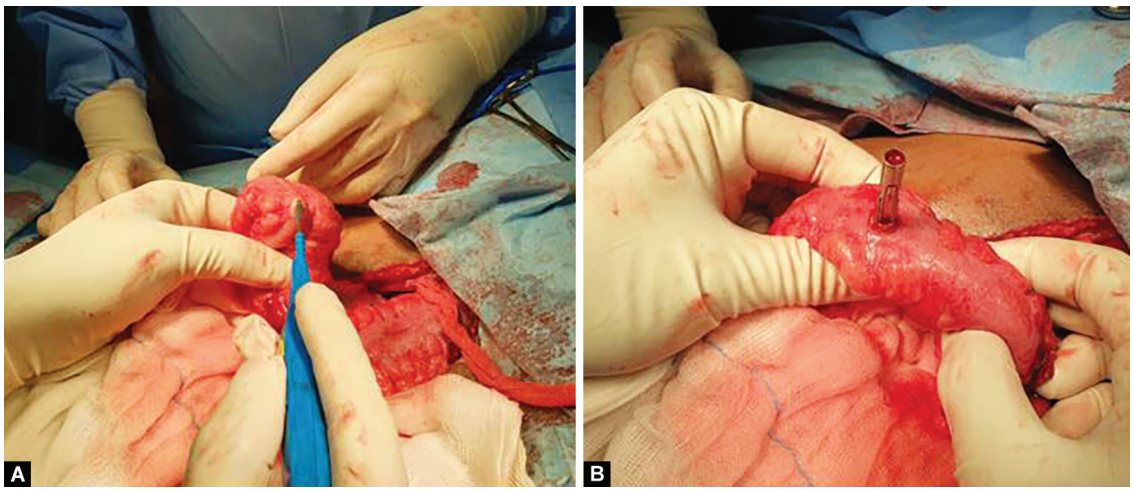


Figs 1A and B: (A) Insertion of the anvil and decided transection line (blue line TL); (B) Showing an already placed anvil pin and application of stapler at the proximal transaction line



Figs 2A and B: (A) Making enterotomy over the anvil pin; (B) Complete anvil pin taken out through a small-enough enterotomy

inside the bowel lumen (Figs 2 and 3). Thereafter, proximal transection was done at APTL with triple-row NTLC linear cutter stapler (Fig. 4). All the above procedures lead to the internalization of the anvil, and the anvil pin is already out and prepared for colo-anal anastomosis. Thereafter, the standard procedure of colo-anal anastomosis was performed with a circular stapler and did not need any closure of the colonic end after the accomplishments of anastomosis. Checking for doughnuts followed by an anastomosis air leak test was done by us as routine.

Postoperative Management

The patient is ambulated and allowed orally early. Drains were placed routinely and removed on the 3rd postoperative day.

Discussion

Rectal malignancy requires multimodality treatment, and surgery holds a key part. Circular stapler has made anterior resection or LAR procedure easier than conventional suture anastomosis. One of the most fearsome postoperative complications is anastomotic

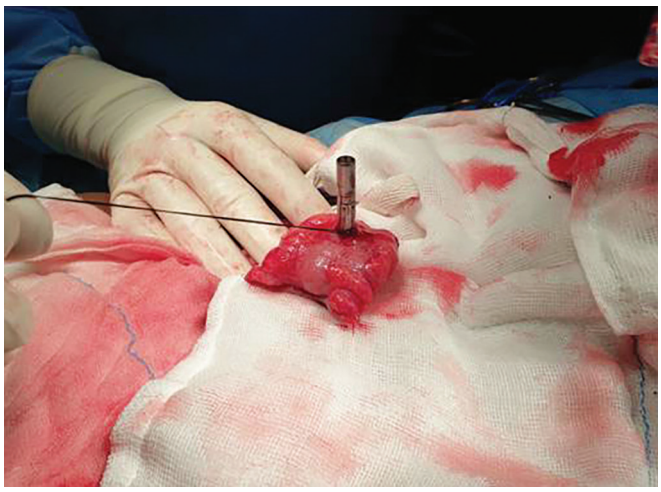
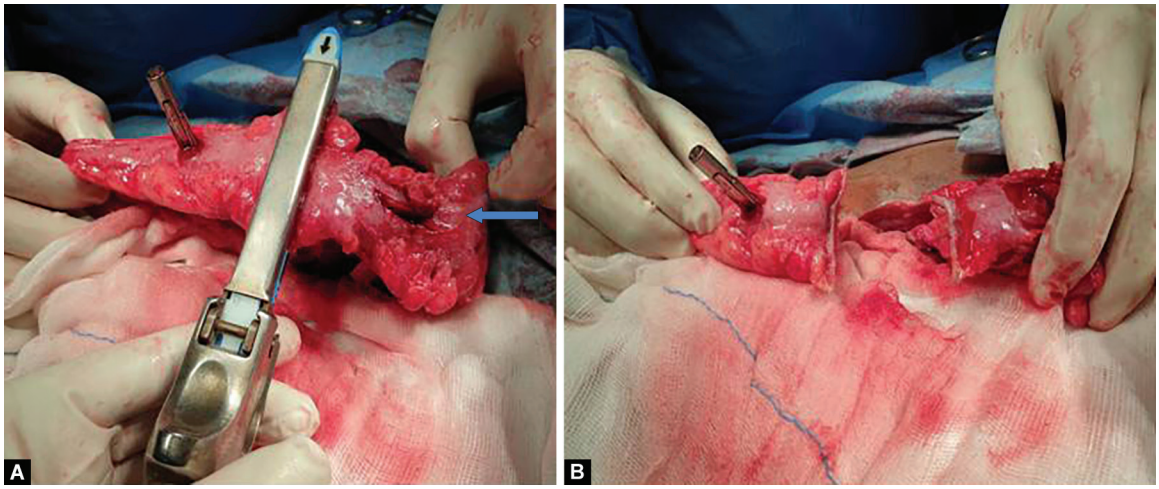


Fig. 3: Represents the anvil pin that already came out through enterotomy with the tying of a silk suture around the pin to avoid displacement inside the lumen



Figs 4A and B: (A) Proximal transection with NTLC linear cutter stapler on the decided transection line (arrow indicating a small enterotomy for anvil insertion); (B) After stapler transaction, showing the proximal-prepared colonic limb and distal specimen limb including the enterotomy site

site leak, which occurs in around 3–21% of patients.[1] This can lead to postoperative sepsis and anastomotic stricture as a long-term complication. There are many factors responsible for the anastomotic leak, e.g., patients' clinical profile, tumor type, location, preoperative radiotherapy, and technical factors.[2] Except for technical factors, all other factors are nonmodifiable. Stapled anastomosis is the norm in the era of minimally invasive surgery, as it has a similar complication rate as handsewn anastomosis.[3] There are two methods described for stapled anastomosis, i.e., single-staple and double-staple technique. The single-staple technique is difficult to perform, and the double-staple technique is preferred by most. There are various methods of double-staple technique, i.e., end-to-side or side-to-side. Distal division is followed by placement of anvil at the divided proximal end. After securing the anvil with purse-string suture, end-to-side anastomosis was done by EEA stapler anastomosis. Another technique was described by Baker's, where the anvil is placed distally. Through the divided end of the colon, the handle of the stapler is introduced and then side-to-side anastomosis is made. The colonic stump is closed at the end.[4] The first-described method is performed by most surgeons, which needs to take a purse-string suture around the anvil. The main disadvantage is not to get a proper suture around the anvil and an incomplete doughnut at the end. There are few surgeons who perform Baker's technique also. The main disadvantage of Baker's technique is to perform difficult closure of the colonic stump at the end in the presence of a narrow pelvis. It will require laparotomy for the introduction of the main component of the circular stapler to orient properly and it cannot be performed with a minimally invasive technique. In stapled anastomosis, the doughnut is important, as it is a surrogate marker of anastomotic integrity. Offodile et al. described that 19% (67/349) patients had technical failure following circular stapler application.[5] Among them, 19% (13/67) had incomplete and thin doughnuts. So, one among five technical failures is attributable to defective doughnuts. Few studies have shown that incomplete doughnuts can lead to a significant increase in the rate of postoperative anastomosis leak as compared with complete doughnuts. Incomplete doughnut can be due to multiple technical factors like diseased bowel margin, loose application of purse-string sutures, far-placed sutures, and sutures cut through during suture placement. All the above factors can be taken care of by taking out the anvil through taenia, which is the strongest part of the colonic wall. There is no need for placement of sutures around and application of a stapler at the proximal end of the colon. There will always be a good rim of doughnut proximally.

Advantages of this Technique

- Easy, quick, and convenient.
- No need for purse-string suture application for placement of anvil.
- Anvil coming out through the strong part of the colon, i.e., taenia coli.
- No issues of incomplete doughnut.
- No issues of proximal resection margin.
- No issues of blood supply to the distal stump or no mesenteric margin.
- Lesser chances of contamination.

In our experience, we have been using this method routinely, and we have not experienced any staple line-related complications as compared with the problems arising due to defective doughnuts. It could utilize any site of gastrointestinal where the circular stapler application is feasible. However, this technique can be practiced before recommending it as a routine practice.

Conclusion

Anterior or LAR with sphincter preservation is a standard procedure in carcinoma rectum. The problem of incomplete doughnut is the only modifiable technical factor that significantly increases postoperative morbidity and mortality. The above-mentioned method is easy, quick, and effective in avoiding the problem of incomplete doughnut and ultimately improving the outcomes; however, it further needs practice and evaluation.

Clinical Significance

This article describes our technique that is able to decrease the incidence of coloanal anastomosis leak and all the spectra of postoperative complications most importantly sepsis and anastomotic stricture.

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CLINICAL TECHNIQUE

Reproducible "Wrap" in Laparoscopic Fundoplication

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Abstract

Aim: The aim was to develop a simplified technique of correct wrap creation that is reliable, easy, and reproducible so that failure of antireflux surgery due to wrong wrap creation is prevented.

Background: Improper creation of the wrap is one of the causes of failure of antireflux surgery. Anatomical failures in wrap creation cause morbidity to the patient and will require reoperations. There is a need to standardize this technique so that correct floppy wrap with respect to the site of creation on the fundus of the stomach, position, and length of the wrap can be achieved.

Technique: The anterior wall and posterior wall of the fundus of the stomach are marked by silk sutures to aid in the creation of a 360-degree Nissen or a 270-degree Toupet wrap. This results in symmetry of the wrap on both sides, ensuring a floppy wrap with exact position and length. We have performed 20 cases of antireflux surgery (ARS) using this technique of wrap creation between January 2022 to September 2022. There was no recurrence of reflux symptoms, dysphagia or wrap failure requiring endoscopy or redo surgery in the postoperative period.

Conclusion: This technique of wrap creation is safe, reliable, easy to learn, teach, and is reproducible during laparoscopic Nissen (LN) and laparoscopic Toupet (LT) fundoplication.

Clinical significance: Our technique helps to standardize wrap creation in antireflux surgery. This results in a lesser chance of failure due to wrong wrap creation.

Keywords: Antireflux surgery, Geometry of wrap, Laparoscopic Nissen fundoplication, Laparoscopic Toupet fundoplication, Wrap.

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Background

Laparoscopic Nissen (LN) and laparoscopic Toupet's (LT) fundoplication are the two most common antireflux surgery (ARS) performed for gastroesophageal reflux disease (GERD) and Hiatus hernias (HH). The three principles of fundoplication are achieving adequate intraabdominal length of the esophagus, floppy wrap, and snug hiatal closure.[1]

Ideal wrap length in LN should be between 1.5 and 2 cm and it should be over the esophagogastric junction (EGJ) and lower esophagus.[2] One of the bites is taken on the esophagus to prevent the wrap migration. In LT, the wrap is fixed to either side of the esophagus using three bites from the wrap to the esophagus.

There have been various techniques described in the creation of the wrap to prevent wrap-related complications leading to recurrent GERD/HH. The anatomical causes of wrap failure are tight wrap, long wrap, slipped wrap, disrupted warp, migrated wrap, twisted wrap, and wrap on the stomach causing hourglass contraction.[3]

We herein describe a simple, reliable, reproducible technique of floppy and correct wrap creation during LN and LT.

Technique

Currently, we have used this technique of wrap creation during LN and LT performed in cases of GERD/HH. Four ports were used in 12 cases and 5 ports in 8 cases. In these 12 cases, liver retraction is facilitated by liver hammock stitch using No. 0 V-lock.[4] In the other eight cases, liver was retracted using Nathanson's retractor fixed to a stand.

After adequate intraabdominal length of esophagus was achieved (5 cm with traction and 3 cm without traction by umbilical tape) and division of short gastric vessels, the EGJ pad of fat was cleared using harmonic shears. We have not used esophageal bougie during wrap creation or for assessment of the floppiness of the wrap.

The assistant now grasps the fundus of the stomach and traction was given in such a way that EGJ and angle of His are seen. A point is marked on the anterior wall of the fundus of the stomach 3 cm from the EGJ (Figs 1A and 2A). Another point is marked 2 cm from the superior most point of the fundus of the stomach meeting the previous point (Figs 1A and 2B). These are done by means of a sterile measuring scale. This point on the anterior wall of the fundus is marked by 2–0 silk sutures (Fig. 2C).

The assistant now flips the stomach to expose the posterior wall of the fundus (Fig. 2D). Similar marking is made 3 cm from EGJ (Figs 1B and 2E) and 2 cm from the fundus of the stomach (Figs 1B and 2F) and this point is again marked with 2–0 silk sutures (Fig. 2G). The cut silk sutures on the posterior wall of the fundus are left close to the left crus.

The hiatal closure is then performed using interrupted 2–0 polyester. The silk suture from the posterior wall of the fundus

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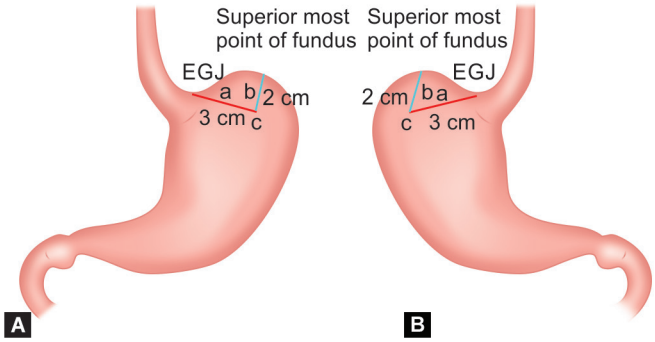
is taken anteriorly from the retroesophageal tunnel created and shoe–shine maneuver is performed.[5] This ensures a floppy wrap. The silk thread on the posterior wall and the anterior wall is now held and examined for symmetry on both sides of the wrap (Fig. 2H). The silk sutures on the anterior wall (left side) and posterior wall (right side) form the lower end of the 360-degree Nissen wrap. The wrap is approximated using 2–0 polyester at the EGJ (Fig. 2I). Then the upper end of the wrap is created taking a bite from the anterior wall of the esophagus taking care of the vagus (Fig. 2J). This suture is taken 2 cm from the lower end of the wrap (Fig. 2K). This suture bite on the esophagus is said to protect against wrap migration. Then a suture is taken exactly in between the upper and lower end to create a 2 cm, floppy, 360-degree wrap over the EGJ and esophagus (Fig. 2L).

In the case of LT, similarly, a 5 cm distance is taken from EGJ and 5 cm from the fundus of the stomach (Figs 3A, 4A and 4B). This is first taken on the anterior wall and then on the posterior wall (Figs 3B, 4C to 4G). The same procedure is followed and the wrap is fixed to both sides of the esophagus using three interrupted sutures taken 1 cm apart using 2–0 polyester forming a 3 cm long 270-degree wrap (Figs 4H to 4J). It is proved that a 3 cm Toupet wrap will result in better control of reflux symptoms than a 1.5 cm wrap.[2]

With the above technique of geometry of the wrap, we were able to achieve a wrap length of 2 cm for LN and 3 cm for LT. Long-term results of ARS depends also on wrap length.[2]

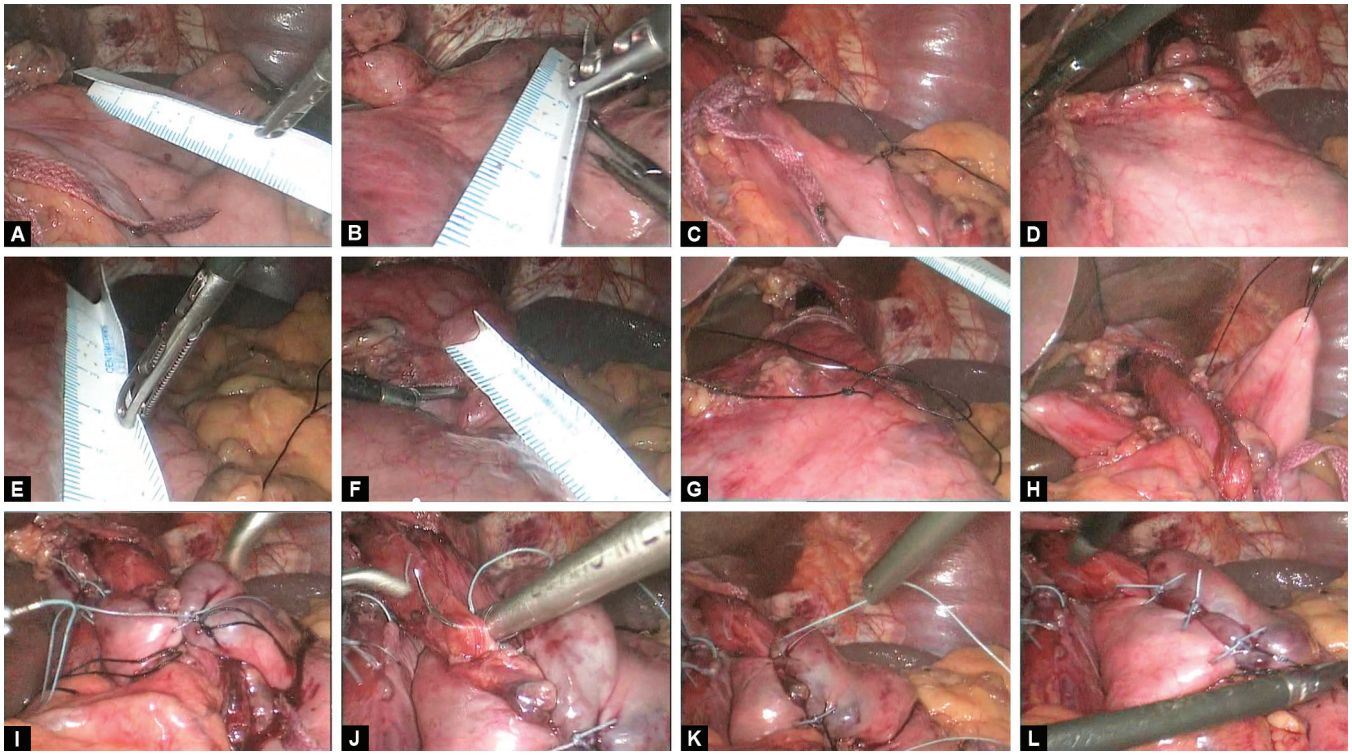
In both, the wraps were not fixed to the crus or the diaphragm. We believe that the wrap and the diaphragm ordinarily move in different planes and with violent motion of the diaphragm several times a day, such a point of attachment could conceivably contribute to disruption, although some surgeons routinely advocate it.



Figs 1A and B: Marking for Nissen fundoplication. (A) Anterior stitch – 3 cm from EGJ and 2 cm from superior most point on fundus; (B) Posterior stitch – 3 cm from EGJ and 2 cm from superior most point on fundus

Results

We have performed 20 cases of ARS using this technique of wrap creation between January 2022 and September 2022. All patients were evaluated preoperatively by upper gastrointestinal (GI) endoscopy. A 24-hour pH-metry and esophageal manometry were done in three patients who had atypical symptoms. Hiatus hernia was present in 12 patients and Barrett's esophagus in 1 patient. The mean age of the patient was 42.5 years with 12 females and 8 males. Furthermore, LN was performed in 17 and LT in 3 patients. The mean operating time using this wrap creation technique for



Figs 2A to L: Intraoperative images of creation of Nissen wrap. (A) Anterior measurement 3 cm from EGJ; (B) Anterior measurement 2 cm from superior most point on the fundus; (C) Anterior marking silk stitch; (D) Stomach flipped to view the posterior surface; (E) Posterior measurement 3 cm from EGJ; (F) Posterior measurement 2 cm from superior most point on the fundus; (G) Posterior marking silk stitch; (H) Symmetry of wrap on both sides; (I) First fundoplication stitch; (J) Bite to esophagus; (K) Second fundoplication stitch 2 cm above the first; (L) Third fundoplication stitch

LN was 62 minutes and LT was 68 minutes. All the patients were discharged on the first postoperative day (POD). The patients were on liquid diet till fifth POD, then gradually stepped up to soft diet. Proton pump inhibitors were stopped 6 weeks following surgery. The follow-up period was from 6 weeks to 10 months. None of the patients had transient or persistent dysphagia requiring endoscopic dilatation or a redo surgery due to anatomical fundoplication failure in the mentioned follow-up period. There was no recurrence of reflux symptoms or development of new symptoms in the follow-up period. Gas bloat was complained of by two patients who underwent LN which gradually subsided in 2 months by lifestyle modifications.

Discussion

Antireflux surgery is a technically demanding procedure and was first performed by Rudolph Nissen in 1955 and was published in the year 1956.[6,7] The first LN fundoplication was reported in 1991.[8] It has seen a tremendous growth in popularity and is now commonly performed by surgeons with expertise in laparoscopic surgery. Not only does experience reduce time of surgery but also reduce the anatomic failure rates.

Proper patient selection, surgical technique, and postoperative management play an important role in good outcomes following ARS. The patients should be evaluated well before being considered for surgery and motility disorders of the esophagus have to be ruled out by manometry in patients presenting with atypical symptoms. In our study, young patients, volume refluxers, patients with HH, and normal esophageal length and motility are considered for LN.

Persistent GERD symptoms or the development of new symptoms is considered a failure of ARS. Failure of ARS can occur due to anatomic problems with the fundoplication or the hiatus. Incorrectly constructed fundoplication, slipped wrap, migrated wrap, tight wrap, long wrap more than 3.5 cm, lateral torsion with corkscrew if the wrap goes to the right, recurrent hiatal hernia, and weakened antireflux valve results in failure of the procedure.[3] Most of these require redo ARS which is more challenging with an increased risk of esophageal and gastric injury.

Anatomically/geometrically correct wrap creation is very important for good outcomes.[9] Persistent dysphagia following ARS indicates a tight wrap, long wrap, wrongly created wrap, tight hiatal closure, or wrong selection of patient.

We have not used mesh during any of our procedures as there is no strong evidence to support the routine use of mesh in hiatal closure except in cases with very wide hiatus, that is, above 5 cm.[10,11]

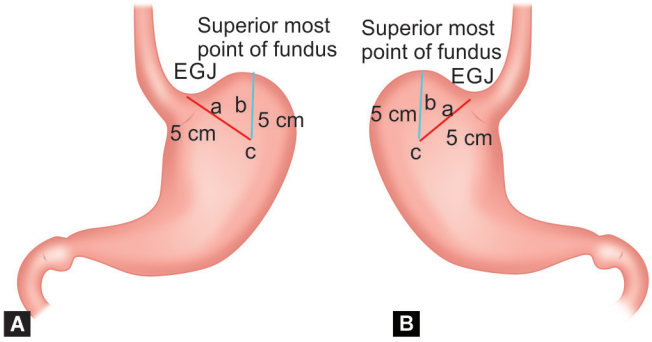
Anatomical failure of fundoplication occurs due to disruption or displacement of the wrap.

Horgen classified the fundoplication failures into the following types:[12]

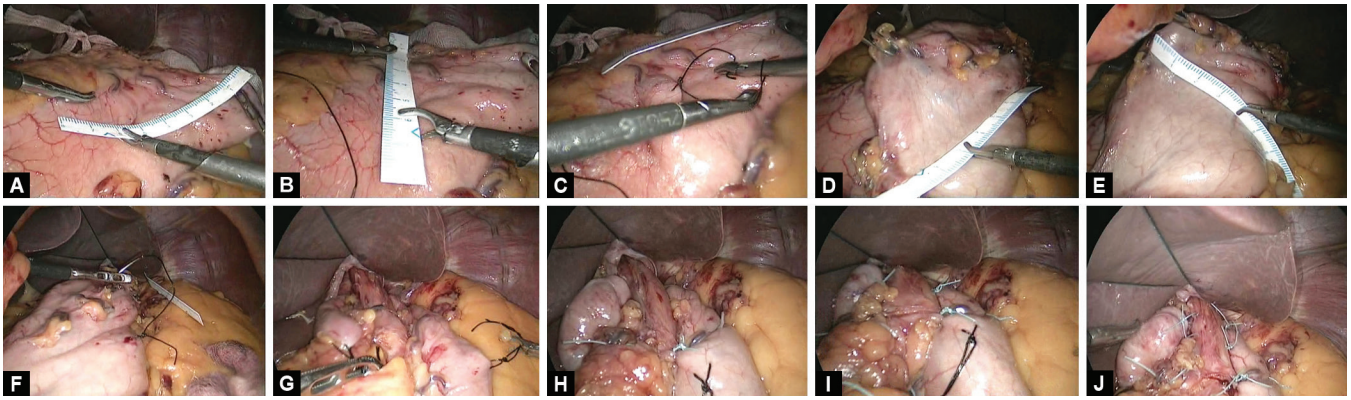
- Type I: Esophagogastric junction (OG) junction above the hiatus.
- Type I (A): Both wrap and OG junction above the hiatus.
- Type I (B): Wrap is below the diaphragm but OG junction has migrated above the diaphragm.
- Type II: A part of the stomach from the wrap itself has migrated above the hiatus.
- Type III: Wrap malformation. The body of the stomach has been used to form the wrap.

In types I and II failures, the crural component and in type III failures, incorrect creation of the wrap plays an important role.

Laparoscopic Nissen offers better reflux control than LT but with greater mechanical complications. The postoperative symptoms of gas bloat and dysphagia are more common with LN. The presence of esophageal motility disorders may affect surgical outcomes.



Figs 3A and B: Marking for Toupet fundoplication. (A) Anterior stitch – 5 cm from EGJ and 5 cm from superior most point on fundus; (B) Posterior stitch – 5 cm from EGJ and 5 cm from superior most point on fundus



Figs 4A to J: Intraoperative images of Toupet wrap. (A) Anterior measurement 5 cm from EGJ; (B) Anterior measurement 5 cm from superior most point on the fundus; (C) Anterior marking silk stitch; (D) Posterior measurement 5 cm from EGJ; (E) Posterior measurement 5 cm from superior most point on the fundus; (F) Posterior marking silk stitch; (G) Symmetry of wrap on both sides of esophagus; (H) First fundoplication stitch; (I) Second fundoplication stitch 1 cm above the first; (J) Third fundoplication stitch 1 cm above the second

In patients with esophageal dysmotility LN is contraindicated.[13] Laparoscopic Toupet has been favored as being more physiological by allowing venting from the stomach without compromising the antireflux barrier.[14]

Clinical Significance

The advantages of our technique of wrap creation:

- Ease of technique.
- Two marking sutures will not consume more time.
- Reproducible.
- Less chance of wrong wrap creation.
- Symmetry is maintained on both sides of the wrap: This will prevent any excess fundus posterior to the esophagus and thus herniation of the stomach into the mediastinum.
- Wrap exactly 2-cm length created on EGJ and lower end of the esophagus.
- Floppy wrap.
- Less chances of wrap-related complications.

The learning curve of ARS in literature is varied and the teacher is considered the most important factor influencing the results.[15] Since our wrap creation technique is easy to teach, learn, and is reproducible, it may reduce the learning curve of ARS.

Conclusion

This technique of wrap creation is safe, feasible, reliable, and reproducible during Nissen fundoplication and Toupet fundoplication and can be standardized. This may also lead to less failures of ARS requiring redo surgery due to wrong wrap creation.

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