

Case Report

Primary Laparoscopic Repair of Iatrogenic Rectal Perforation during Total Laparoscopic Hysterectomy Using an Endoscopic Automatic Anastomotic Device: A Case Report and Literature Review

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Abstract

Background: Rectal injuries are the most severe complications of gynecologic surgeries, especially total laparoscopic hysterectomy. In several cases, an ileostomy is performed as a lifesaving procedure. Recently, studies have suggested that primary repair should be attempted for all cases of intraperitoneal rectal injuries. To the best of our knowledge, previous case reports have not discussed the specific repair of a rectal injury involving all layers. **Case:** We report a case of rectal perforation during total laparoscopic hysterectomy and bilateral salpingo-oophorectomy that was laparoscopically repaired using an automatic anastomosis device. **Conclusions:** A rectal injury may be repaired laparoscopically if the bowel is adequately prepared preoperatively and a skilled surgeon is present.

Keywords: anastomosis; iatrogenic; rectal injury; rectal perforation; total laparoscopic hysterectomy

1. Introduction

Rectal injuries are among the most severe complications of gynecologic surgeries [1–3], and an ileostomy is performed during some laparotomy procedures as a lifesaving measure [1]. However, it has been suggested that early laparoscopic repair of iatrogenic colon perforation has similar outcomes as those of open surgical repair [4]. Colon perforations may be sutured laparoscopically if the colon is lightly damaged, such as in the case of a serosal injury. However, to the best of our knowledge, there is no specific case report of rectal injury repair involving all layers. We describe the use of an endoscopic automatic anastomotic device during laparoscopic repair of an iatrogenic perforation sustained by a patient during total laparoscopic hysterectomy (TLH). Similarly, we present a review of published literature on the topic.

2. Case

A 61-year-old woman (para 3) with no significant medical history was referred to our hospital because of lower abdominal pain. Ultrasonography revealed a 7-cm right ovarian dermoid and uterine myoma. Laparoscopic hysterectomy and adnexectomy were planned as additional emergency procedures. She was kept nil per os and was administered 34 g of magnesium citrate (Magcorol P® containing 2.71 g of magnesium; Horii Pharmaceutical Ind., Osaka, Japan) for bowel preparation the night before surgery. TLH and bilateral salpingo-oophorectomy (BSO) were performed under general anesthesia. The uterine and

ovarian tumors were resected using the ClearView® Uterine Manipulator (previously known as the Endopath Uterine Manipulator) (Clinical Innovations, LLC, Murray, UT, USA), and the procedure was uneventful (Fig. 1a). Afterward, the uterine manipulator was removed and the vaginal delineator (VAGI PIPE®; Hakko Medical, Tokyo, Japan) was changed. During colpotomy, the anterior vaginal wall was dissected followed by the posterior vaginal wall. However, the rectum was incised instead of the posterior vaginal wall (Fig. 1b) because the assistant physician erroneously inserted the delineator into the anus for laparoscopic hysterectomy (Fig. 1b). Subsequently, a surgeon confirmed the preoperative bowel preparation method and operative field, and a laparoscopic repair was performed. The laparoscopic repair procedure is shown in Fig. 2a–e.

The repair procedure involved temporary closure and closure using a stapler. The surgeon dissected the anterior wall of the rectum from the surrounding tissues and closed the rectal perforation temporarily with five simple interrupted stitches using 3-0 delayed-absorbable sutures (3-0 PDS-Plus; Ethicon, Inc., Somerville, NJ, USA) (Fig. 2a,b). To prevent intestinal stenosis, stapler suturing was performed in three steps (Fig. 2c), and the surplus tissues were resected (Fig. 2d,e). The rectum was closed with a stapler (ECHELON FLEX™ Powered ENDOPATH® Stapler; Ethicon Endo-Surgery Inc., Cincinnati, OH, USA) (Fig. 3).

Following rectal repair (Fig. 2e), the TLH and BSO procedures were completed. The total operative time was 278 min, with almost no blood loss. The final pathological



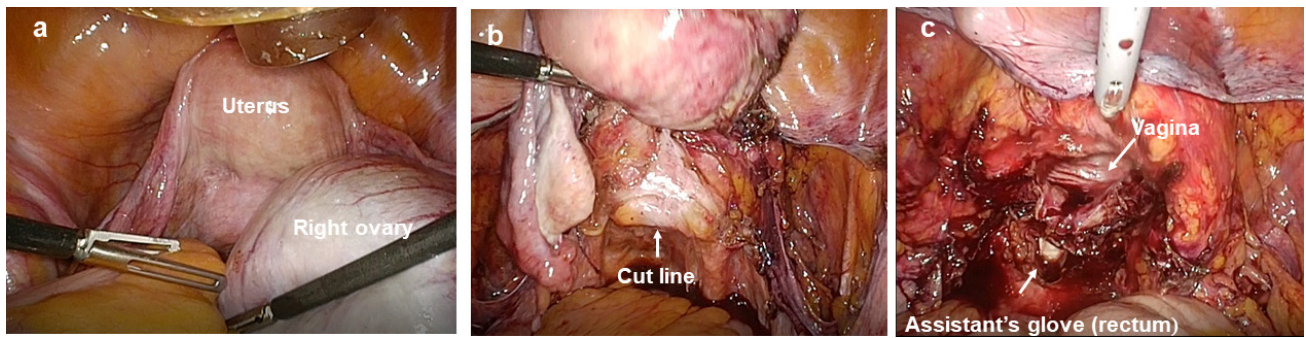


Fig. 1. Operating field and rectal perforation. (a) The operating field in the pelvic cavity. Using ClearView®, no adhesion is noted between the uterus and rectum or right ovarian tumor. (b) The vaginal pipe is incorrectly inserted into the rectum. The rectal wall appears posterior to the vaginal wall. White arrow: rectum wall mistaken for vaginal wall. (c) Rectal perforation is observed. White arrow: rectum wall (the assistant doctor inserted a finger into the anus); yellow arrow: vaginal wall.

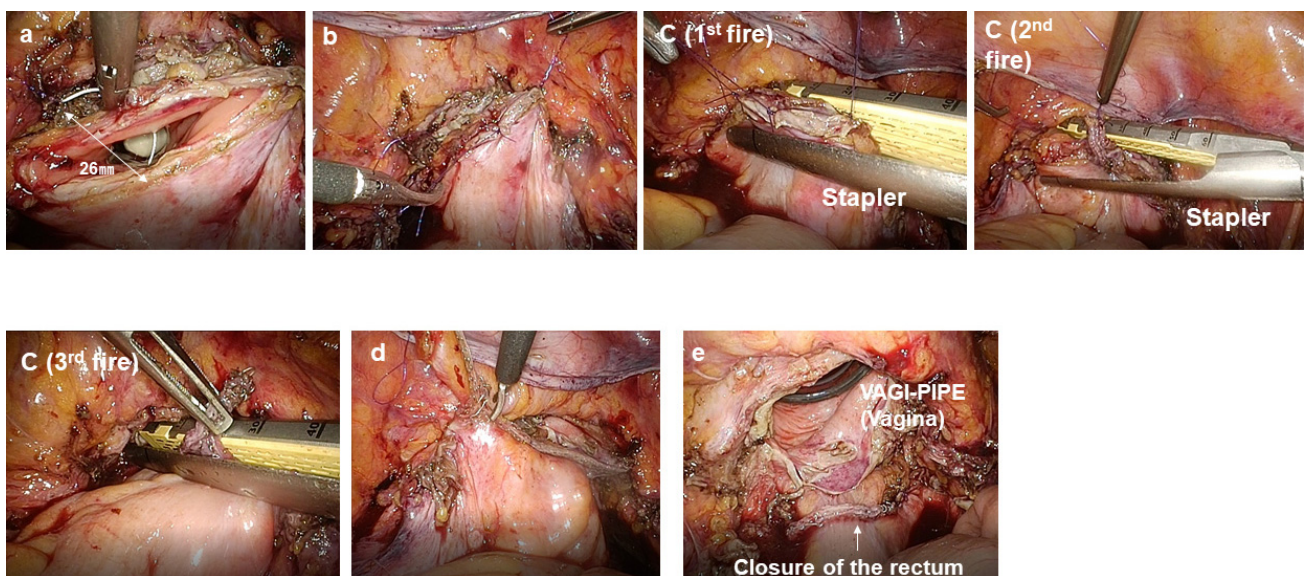


Fig. 2. Laparoscopic repair. (a,b) The surgeon dissects the anterior wall of the rectum from the surrounding tissues and closes the rectal perforation temporarily with five simple interrupted sutures using 3-0 delayed absorbable sutures (3-0 PDS-Plus; Ethicon, Inc., Somerville, NJ, USA). (c) Closure using a stapler. After pulling the aforementioned thread, the surgeon performs anastomosis using a stapler. To prevent intestinal stenosis, stapler suturing was performed in three steps. (d) Surplus tissues are resected. (e) Completion of the procedure and closure of the rectum.



Fig. 3. A stapler (ECHELON FLEX™ Powered ENDOPATH® Stapler; Ethicon Endo-Surgery Inc) is used to close the rectum.

diagnosis was mature ovarian teratoma and leiomyoma of the uterus. The patient's subsequent postoperative course was unremarkable. She started drinking water on postoper-

ative day 1 and consumed a solid meal three days later. She was discharged on postoperative day 8 and returned to her regular activities. Defecation was smooth even after discharge. Written informed consent was obtained from the patient to publish this case report and accompanying images. This study was approved by the Institutional Review Board at Fukuchiyama City Hospital (IRB No. 2020-2-46).

3. Discussion

We encountered a case of a patient who suffered rectal perforation during TLH and BSO. The perforation was successfully repaired laparoscopically using an automatic anastomosis device. Although rectal perforation during obstetric and gynecologic surgeries is rare, it is crucial to know



Fig. 4. Vaginal delineator (VAGI PIPE®; Hakko Medical, Tokyo, Japan) for use in laparoscopically-assisted total laparoscopic hysterectomy.

the ideal repair method in these cases. In Japan, the VAGI-PIPE® is manufactured by Hakko (Fig. 4) and is widely used to perform colpotomy as a part of TLH [5]. However, iatrogenic rectal injuries sometimes occur during TLH because of the misinsertion of VAGI-PIPE® into the anus instead of the vagina. The rectal wall may appear similar to the posterior vaginal wall when the VAGI-PIPE® is erroneously inserted anally (Fig. 1b). A limiting factor of the VAGI-PIPE® is that the uterine manipulator (ClearView® in the present case) should be removed before colpotomy since the anus, which is relaxed under general anesthesia, may be mistaken for the vagina, as in the cases reported by Yoshimura [3] and Okamoto [6]. Moreover, according to Asai *et al.* [1], even when the VAGI-PIPE® is inserted into the vagina, rectal perforation may still occur in the presence of adhesions between the uterus and rectum.

Currently, several types of instruments facilitate colpotomy during TLH [7]. A manipulator, such as the LUMI System® (CooperSurgical, Inc, Trumbull, CT, USA), VCare® (CONMED, Utica, NY, USA.), or Valtchev® (Conkin Surgical Instruments Ltd. Vancouver, BC, Canada), is fitted to the cervix showing the outline of the incision line from the start of surgery to colpotomy and may be the best choice, especially when resident or novice surgeons participate in the procedure. Patients who suffer rectal perforation undergo laparotomy in addition to temporary colostomies as the primary intervention [1]. Colostomy is the safest method for saving lives; however, the lack of published literature on the topic makes it difficult to decide between primary repair with diversion and primary repair only for the surgical management of rectal

Table 1. The American Association for the Surgery of Trauma rectal organ injury scale.

Grade	Injury description
I	(a) Contusion or hematoma without revascularization (b) Partial-thickness laceration
II	Laceration $\leq 50\%$ of the circumference
III	Laceration $>50\%$ of the circumference
IV	Transection of the colon
V	Transection of the colon with segmental tissue loss

injuries [8]. In the present case, although colostomy was considered suitable (in our judgment), a surgeon helped us choose anastomosis after verifying the preoperative bowel preparation and operative field. Rectal damage is generally classified according to the degree of impairment. Therefore, in emergency cases, the treatment strategy is selected according to the degree of damage. The American Association for the Surgery of Trauma classification of rectal organ injury is shown in Table 1 [9].

The management principles of rectal injury were developed based on wartime experiences [10]. Initially, colostomy was performed for all rectal injuries during World War II. At that time, most patients experienced high-energy injuries; therefore, colostomy was suitable for these cases and resulted in the mortality rate being reduced to 35% [10]. However, after the war, low-energy rectal injuries were more common. During the next few decades, rapid transport of injured patients and the development of antibiotics improved patient management. Consequently, the need for colostomy in all rectal injuries has been questioned. Ulger *et al.* [10] reported that primary repair may be performed for select patients with grade II rectal injuries. However, colostomy could be considered appropriate for patients with fecal contamination, long trauma treatment intervals, or sphincter injury. In addition, primary repair of rectal injuries without an ostomy should be considered for a select few rectal injuries. Papadopoulos *et al.* [11] reported that primary repair should be attempted as the initial surgical management for all penetrating colon and intraperitoneal rectal injuries. In 2013, Jo *et al.* [12] reported that rectal injury during laparoscopy in the gynecology field may be repaired successfully without colostomy, regardless of the size or mechanism of injury, if adequate rectal tissue is available and recognized during surgery.

It is unclear whether an iatrogenic colon perforation may be repaired by laparoscopic surgery. However, in our patient, performing laparoscopic repair appeared impossible because in the case of a large intestinal or rectal perforation, intestinal bacteria are scattered within and contaminate the abdominal cavity, which may lead to cardio-respiratory instability with worsening intestinal edema. Although no prospective data clearly define the indications for laparoscopic repair, a study from 2007 reported that based on an analysis of data by the Mayo Clinic, laparoscopic repair of

colonic perforation by an experienced professional is a viable alternative to the open approach [13]. In the study, seven patients underwent laparoscopic repair; of those, six underwent repair by closing the perforation with one or two layers of sutures, and one underwent repair with a laparoscopic linear stapler [13]. According to Llarena *et al.* [14], most bowel injuries are recognized intraoperatively. Therefore, laparoscopic repair is not contraindicated if the patient's intraoperative general state is considered stable. Although iatrogenic perforation occurred in our patient, it was recognized intraoperatively under a clear field. The degree of rectal injury was level II according to the American Association for the Surgery of Trauma classification. The operative field was not contaminated because of preoperative bowel preparation; hence, the surgeons decided to conduct a primary repair without colostomy.

It is critical to identify the preferred method for colorectal anastomosis (staples vs. sutures). One systematic review comparing the techniques of colorectal anastomosis reported that no technique was superior in terms of outcomes [15]. Moreover, although intraoperative technical problems were more common in those who had undergone stapling, there was no evidence of differences in the analyzed variables of the two groups. Consequently, it was suggested that both techniques were equally effective.

However, during gynecological laparoscopic surgeries, rectal or colon injury generally occurs when high energy devices, such as monopolar cutting device or sealing or ultrasonic devices, were used. Especially, rectum perforation commonly occurs deep within the pelvic cavity. Direct laparoscopic suturing requires advanced techniques. Moreover, debridement is necessary when the wound is infected, or the surrounding tissues are severely damaged. In contrast, the stapler used in this case could reach the desired pelvic area easily (Fig. 2c). Adjusting the head angle of the stapler toward the damaged section allowed for repair to be conducted in an ideal position.

4. Conclusions

In conclusion, even if rectal injury occurs, laparoscopic repair may be possible when performed by an experienced surgeon if the injury is confirmed during surgery. Gynecologists should possess adequate surgical knowledge of colon injuries and their corresponding treatment methods. We hope that our repair method will be helpful in clinical practice.

Abbreviations

BSO, Bilateral salpingo-oophorectomy; TLH, Total laparoscopic hysterectomy.

Author Contributions

All authors were involved in the management of the patient. TO analyzed the data and wrote the manuscript. AY

and SM contributed to editorial changes in the manuscript. All authors read and approved the final manuscript.

Ethics Approval and Consent to Participate

Written informed consent was obtained from the patient to publish this case report and any accompanying images. This study was approved by the Institutional Review Board at Fukuchiyama City Hospital (IRB No. 2020-2-46).

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Conflict of Interest

The authors declare no conflict of interest.

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